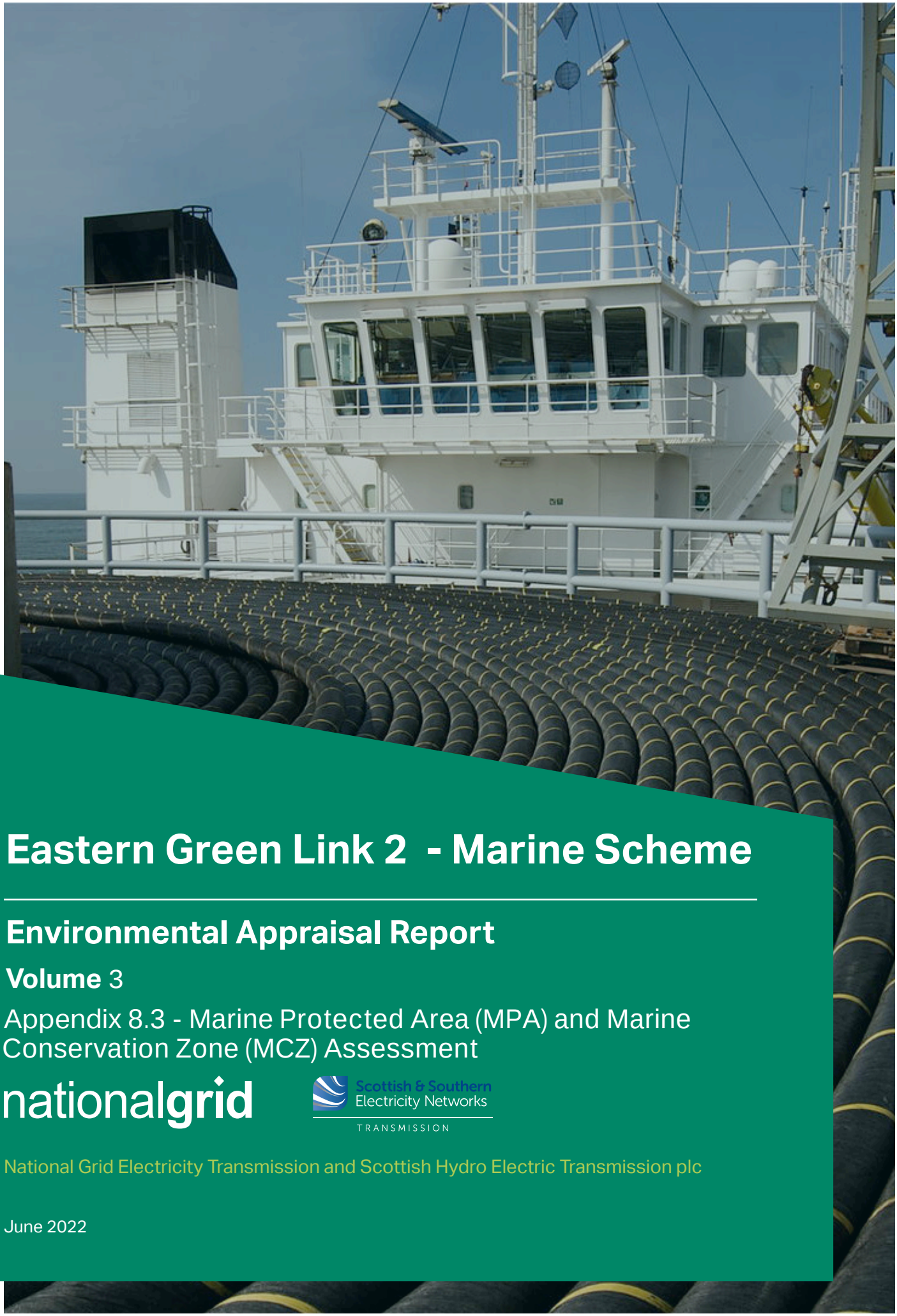

Eastern Green Link 2 - Marine Scheme

Environmental Appraisal Report

Volume 3

Appendix 8.3 - Marine Protected Area (MPA) and Marine Conservation Zone (MCZ) Assessment

nationalgrid

Scottish & Southern Electricity Networks
TRANSMISSION

National Grid Electricity Transmission and Scottish Hydro Electric Transmission plc

June 2022

Prepared for:

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Wessex Archaeology (Marine Archaeology); and

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8.3 Marine Protected Area and Marine Conservation Zone Assessment

8.3.1 Introduction

8.3.1.1 Overview

National Grid Electricity Transmission (NGET) and Scottish Hydro Electric Transmission (SHE Transmission) are jointly developing proposals for a subsea High Voltage Direct Current (HVDC) Link between Sandford Bay in Peterhead and Fraisthorpe Sands in Bridlington, referred to as the Eastern Green Link 2 (hereafter referred to as 'the Project') (see Environmental Appraisal Report (EAR) Volume 2 Chapter 2: Project Description).

NGET and SHE Transmission will be submitting Marine Licence applications (MLAs) to the Marine Scotland Licensing Operations Team (MS-LOT) and the Marine Management Organisation (MMO) for the marine elements of the Project between Mean High Water Springs (MHWS) at Sandford Bay and MHWS at Fraisthorpe Sands; these elements are referred to as the 'Marine Scheme'.

8.3.1.2 Report Scope

Specific consideration of the potential for effects to occur on Scottish Marine Protected Areas (MPAs) and English Marine Conservation Zones (MCZs) is required as part of MLAs in Scottish and English waters respectively, as set out in Section 83 of the Marine (Scotland) Act 2010[1] and in Section 126 of the Marine and Coastal Access Act 2009[2] (MCAA).

The assessment process for MCZs considered during the licensing process is outlined by the MMO in its guidance document 'Marine Conservation Zones and Marine Licensing' (MMO, 2013). No formal guidance on the MPA assessment process has been issued by Marine Scotland.

The purpose of this report is to inform the MPA / MCZ assessment process in determining whether the Marine Scheme is capable of significantly affecting:

- Protected features of an MPA / MCZ; and / or
- Any ecological or geomorphological process on which the conservation of any protected features of an MPA / MCZ is (wholly or in part) dependant.

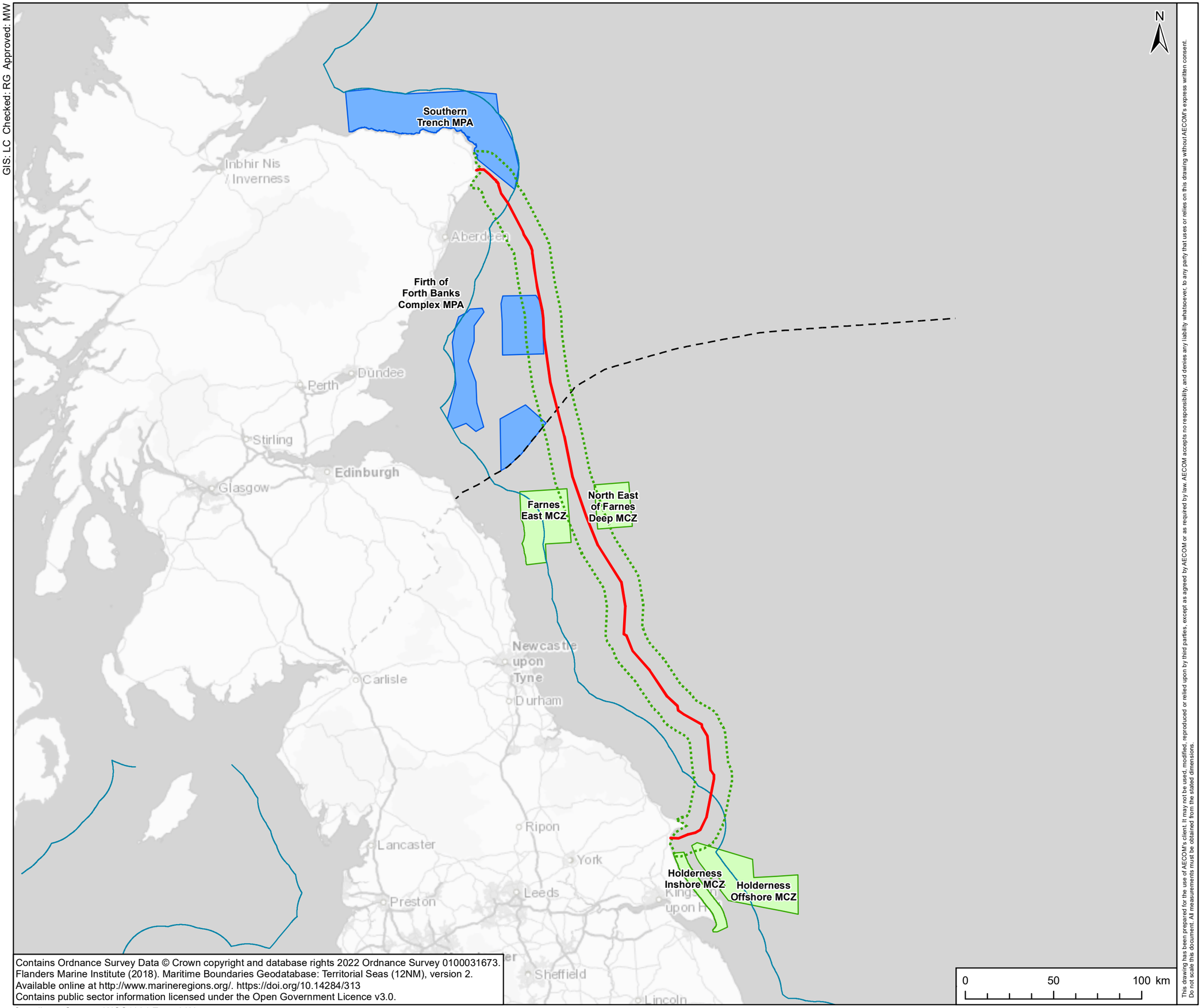
This assessment follows the steps and procedures set out in the MMO (2013) guidance document for MCZs, the purpose of which is to provide supporting information to inform the consideration of potential impacts on MPAs and MCZs by MS-LOT and the MMO respectively. It accordingly describes the Marine Scheme (Section 8.3.1.3) and the Marine Installation Corridor, identifies the potential impact pathways that could arise from the planned activities (Section 8.3.3) and identifies the MPA / MCZ sites that could be affected (Section 8.3.4).

The Marine Scheme and the Marine Installation Corridor, in the context or relevant MPA and MCZ locations, are presented in Figure 1.

A summary of the assessment process is presented in Figure 2.

[1] https://www.legislation.gov.uk/asp/2010/5/part/5/crossheading/general-duties-of-public-authorities
[2] https://www.legislation.gov.uk/ukpga/2009/23/part/5/chapter/1/crossheading/duties-of-public-authorities

GIS: LC Checked: RG Approved: MW



Coordinate System: WGS1984 Zone 30N

Scale @ A3 1:2,000,000

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Scottish & Southern Electricity Networks

PROJECT
Eastern Green Link 2

KEY
- Marine Installation Corridor
- 10km Study Area
- UK Territorial Sea Limit
- Scottish Adjacent Waters Boundary
- Nature Conservation Marine Protected Area (MPA)
- Marine Conservation Zone (MCZ)

TITLE
Figure 1-1
The Project Marine Scheme Cable Route and MPA and MCZs within 10 km

REFERENCE
SEGL2_M_EAR_1-1_v1_20220525

SHEET NUMBER
1 of 1

DATE
25/05/2022

8.3.1.3 Project Description

The Project is a major reinforcement of the electricity transmission system which will provide additional transmission capacity between Scotland and England. This reinforcement is an essential part of a wider strategy of ensuring an efficient network that can facilitate achieving the net-zero targets the UK government has set.

The Project comprises of the following three components:

- **Scottish Onshore Scheme**: From the existing transmission system and an adjacent substation approximately 1 km of buried high voltage alternating current (HVAC) cable will connect to a proposed converter station. A further approximately 1 km of buried HVDC will extend from the proposed converter station to the landfall at Sandford Bay, Peterhead. The scope of the Scottish Onshore Scheme ends at Mean Low Water Springs (MLWS), and is covered by a separate consent application which has been made to Aberdeenshire Council;
- **Marine Scheme**: Commencing at Mean High Water Springs (MHWS) within Sandford Bay, approximately 436 km of subsea HVDC cable, comprising 150 km in Scottish waters and 286 km in English waters, will extend to MHWS at Fraisthorpe Sands on the East Riding of Yorkshire coast. This comprises the subject of the MLAs to MS-LOT and the MMO, which this EAR supports; and
- **English Onshore Scheme**: From MLWS at Fraisthorpe Sands, approximately 67 km of underground buried HVDC will connect to a proposed converter station in Drax within the Selby District. The proposed converter station will then connect to an existing substation within the boundary of the Drax Power Station by approximately 100 m of HVAC cable. This is subject to a separate consent application which will be made to East Riding of Yorkshire Council and Selby District Council.

This MPA and MCZ Assessment refers to the Marine Scheme, which extends from Sanford Bay, Peterhead (Scottish landfall) to Fraisthorpe Sands, Bridlington (English landfall). The Marine Scheme comprises a submarine HVDC cable system, within a Marine Installation Corridor approximately 436 km long and up to 500 m wide.

The Marine Installation Corridor follows a broadly north to south alignment from kilometre point (KP) 0 at the Scottish landfall, to KP436 at the English landfall (see EAR Volume 2 - Chapter 1: Introduction). Approximately 150 km of the Marine Installation Corridor is within Scottish waters (territorial and offshore) and approximately 236 km within English waters (territorial and offshore).

The Scottish and English elements of the Marine Scheme fall within the regulatory responsibilities of the MS-LOT and the MMO, respectively.

Horizontal Directional Drilling (HDD) will be used to achieve landfall in both Scotland and England, with drilling works undertaken from onshore temporary drilling compounds, one within each of the Scottish and English Onshore Schemes. Use of HDD means there will be no trenching works in the intertidal zone (between MHWS and MLWS). Installation of the subsea cable will be carried out in several campaigns, the length of which will be related to the cable carrying capacity of the main Cable Lay Vessel (CLV).

A three-phase route optioneering and feasibility study was conducted to identify potential landfall locations, and corresponding subsea route options. This, in combination with the 2018/2019 Network Options Assessment, (National Grid, 2019) resulted in the selection of the current Marine Installation Corridor. This route has been designed to balance technical feasibility, whilst avoiding sensitive environmental receptors, such as designated sites. As a result the Marine Installation Corridor runs directly adjacent to the Firth of Forth Banks Complex MPA between KP84 to KP118 but is not inside the MPA, and it also avoids any other MPAs or MCZ's.

Further information can be found in EAR Volume 2 – Chapter 2: Project Description and Chapter 5: Alternatives and Design Development.

8.3.1.4 Legislative Framework

Marine (Scotland) Act 2010

MPAs in Scottish territorial waters are designated under Section 1 of the Marine (Scotland) Act 2010. The development of the Scottish MPA network has involved work between Marine Scotland, the Joint Nature Conservation Committee (JNCC), Natural England (NE), Historic Environment Scotland, the Scottish Environment Protection Agency and NatureScot (formerly Scottish Natural Heritage). The approach for identifying MPAs followed a science-based process as set out in the Scottish MPA Selection Guidelines[3].

Section 83 of the Marine (Scotland) Act 2010 places specific duties on Marine Scotland relating to MPAs within Scottish territorial waters, and marine licence decision making. Section 83 applies in the Scottish marine area where:

- A public authority has the function of determining an application (whenever made) for authorisation of the doing of any act;
- The act is capable of affecting (other than insignificantly):
  - A protected feature in a Nature Conservation MPA;
  - A stated purpose for a Demonstration and Research MPA;
  - A marine historic asset in a Historic MPA; and
  - Any ecological or geomorphological process on which the conservation of any protected feature in a Nature Conservation MPA, or on which the stated purpose for a Demonstration and Research MPA, is (wholly or in part) dependent.
- The proposal results in a significant risk of hindering the achievement of the conservation objectives of the MPA.

MPAs in Scottish offshore waters (i.e., beyond 12 NM) are designated under the MCAA 2009 (see below).

To ensure Marine Scotland remains compliant with Marine (Scotland) Act 2010, specific consideration must be given to MPAs during the marine licence decision making process.

Marine and Coastal Access Act 2009

MCZs in English territorial and offshore waters and MPAs in Scottish offshore waters (beyond 12 NM), are designated under the MCAA 2009; they provide protection for a range of important marine habitats, species and geological formations. In conjunction with other existing international and national designations, these sites contribute to an ecologically coherent network of MPAs in the North East Atlantic and North Sea.

MCZs in English waters have been identified through the MCZ Project which was set up in 2008 and led by the JNCC and NE. The purpose of the MCZ Project was to identify and recommend MCZs to Government for designation. At the time of this assessment, a total of 91 sites have been designated.

By virtue of Section 116 (7) of the MCAA 2009 an MCZ designated by the Scottish Ministers under Section 116 of the MCAA 2009 is to be known as a MPA and any reference to an MCZ in the MCAA 2009 is to be read as a reference to an MPA. The only MPA in Scottish offshore waters potentially affected the Marine Scheme, and therefore designated under MCAA 2009, is the Firth of Forth Banks Complex.

Under Section 126 of the MCAA, MS-LOT and the MMO have a duty to consider MCZ/MPAs during marine licence decision making, and applies where:

- A public authority has the function of determining an application (whenever made) for authorisation of the doing of an act; and
- The act is capable of affecting (other than insignificantly):

3 https://www.webarchive.org.uk/wayback/archive/3000/https://www.gov.scot/Resource/0051/00515466.pdf

– The protected features of an MCZ; and

– Any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or part) dependent.

To ensure the MMO remains compliant with MCAA obligations, the MCZ assessment process has been integrated into the existing Marine Licence decision making process. Hence, there is a requirement for specific information relating to potential interactions with MCZs within waters licenced by MMO (i.e., English waters) to be provided.

8.3.2 Assessment Methodology

Guidance published by the MMO (2013) describes how MCZ (and MPA) assessments can be undertaken during the process of marine licence decision making. The MMO guidelines recommend a staged approach to assessment, involving the following sequential stages:

- **Screening** – Determine whether the licensable activity is taking place within or near an area being put forward or already designated as an MCZ and whether the activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ, or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant. If the answer is yes, then proceed to Stage 1.
- **Stage 1 MCZ Assessment** – Is the authority satisfied that there is no significant risk of the activity hindering the conservation objectives stated for the MCZ, and can the authority exercise its functions to further the conservation objectives of the site? If the answer is no to either of these questions, then the authority must consider whether there are other means of proceeding with the activity which would create a substantially lower risk of hindering the achieving of the site conservation objectives. If the answer is still no, then proceed to Stage 2.
- **Stage 2 MCZ Assessment** – This stage looks at whether the benefit to the public clearly outweighs the risk of damage to the environment and seeks to satisfy the authority that the applicant can make arrangements to undertake measures of equivalent environmental benefit to the damage which the activity will have on the MCZ.

These stages are presented in Figure 2.

In the absence of formal guidance from MS-LOT in relation to the assessment of Scottish MPAs during the licence decision making process, the MMO guidance (2013) for English MCZ assessments has been applied to Scottish MPAs in this appraisal to ensure adequate information is provided to enable Marine Scotland to appropriately consider MPAs, thereby remaining compliant with the Marine (Scotland) Act 2010. This is in accordance with the approach set out during non-statutory Scoping in July 2021.

To determine whether Section 126 of the MCAA 2009 and Section 83 of the Marine (Scotland) Act 2010 apply, it is necessary to consider the geographical proximity of the Marine Scheme to the MCZs and MPAs, and the potential for proposed activities to affect the designated features of an MCZ or MPA, or the ecological/ geomorphological processes upon which designated features are reliant.

A risk-based approach is recommended by the MMO when determining the proximity of an activity to an MCZ (or MPA). The application of appropriate buffer zones to the protected features of an MCZ or MPA under consideration, as well as consideration of the potential risk of impacts from activities at greater distances from the MCZ is necessary. If the screening stage determines that Section 126 and Section 83 do apply, it is necessary for MS-LOT and the MMO to assess which elements of Section 126 and Section 83 should apply to a MLA.

In line with the precautionary approach encouraged by the MMO guidance, the screening process has considered any MCZ or MPA site located within 10 km of the Marine Scheme. This is considered to be a sufficiently precautionary buffer around the Marine Scheme that exceeds the maximum Zone of Influence (ZoI) of Marine Scheme activities that are likely to impact MCZ or MPA designated features in this instance.

EAR Volume 2 – Chapter 8: Benthic Ecology and Chapter 10: Marine Mammals have presented appraisals of the potential effects of the Marine Scheme on the ecological marine environment, with

definitions of impact, effect and significance of effects on the identified receptors drawn from the Chartered Institute of Ecology and Environmental Management (CIEEMs) Guidelines for Ecological Impact Assessment in Britain and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018, and updated September 2019). These definitions have also been used within this MCZ Assessment, with the term 'effect' to express the consequence of an impact. This is expressed as the 'significance of effect' and is determined by considering the magnitude of the effect alongside the importance, or sensitivity, of the receptor or resource, in accordance with defined significance criteria (EAR Volume 2 – Chapter 4: Approach to Environmental Appraisal).

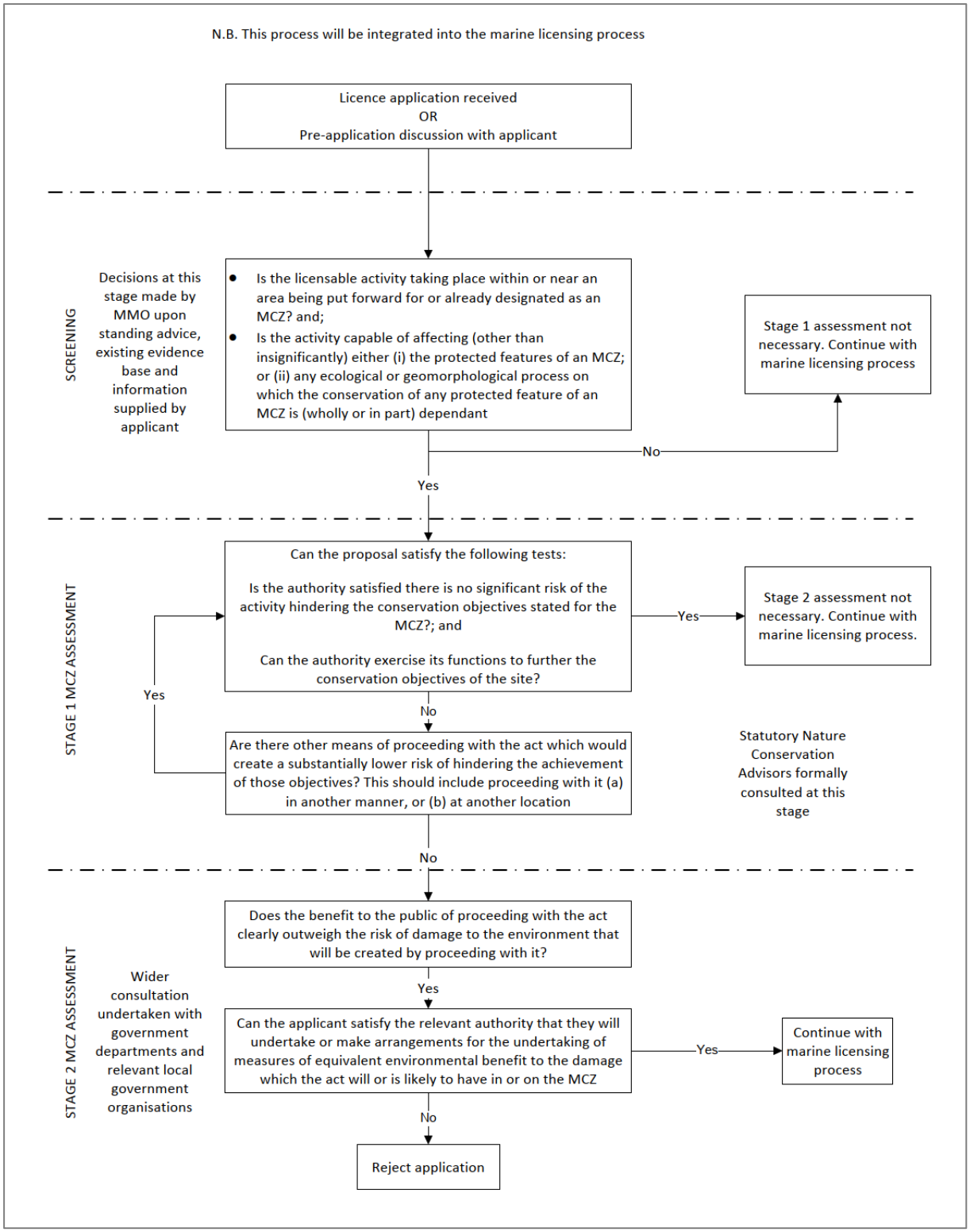

Figure 2: Summary of the MCZ assessment process used by the MMO in marine licence decision making (MMO (2013))

8.3.3 Potential Impacts, Effects and Zones of Influence

The protected features of identified MPAs and MCZs fall into one of four categories: 'subtidal benthic habitats', 'subtidal benthic species', the 'presence of marine mammals' or geological features. The impact pathways and associated ZoI considered within this assessment are those that specifically relate to these receptors. A summary of impact pathways and associated ZoI which have been established through technical work undertaken and reported within the EAR are presented in Table 1. All ZoI are based on the worst-case scenario of separate cable lay, unless stated otherwise in Table 1.

Additional information on the impact pathways outlined in Table 1 are provided in the following sections.

Table 1: Summary of impact pathways and associated ZoI

Potential impact	Zone of influence (ZoI)
Landfall preparation and installation	
HDD operations and cable pull in	Up to 0.01 km^2 at each landfall
Vessel anchoring and use of spud legs	Up to 0.0003 km^2 at each landfall
Route preparation and cable installation	
Temporary physical disturbance to subtidal benthic habitats and species	106.0 km of boulder clearance plough (25 m swathe) and 340 km of mechanical trenching (15 m swathe). Giving a total footprint of 7.6 km^2 per cable, so 15.2 km^2 for separate lay.
Permanent loss of subtidal benthic habitats and species due to placement of hard substrates on the seabed	Remedial and planned rock berm up to 138 km totaling approximately 1 km^2 per cable or 2 km^2 for separate lay.
	Crossings 6 x pipeline crossings with an approximate footprint of 4,750 m^2 each 18 x cable crossings with an approximate footprint of at 4,100 m^2 each Totaling approximately 0.1 km^2 per cable or 0.2 km^2 if separate lay.
	Rock protection at landfalls 0.01 km^2 per landfall, 0.02 km^2 total (same for separate/bundle).
Temporary increase in suspended sediment concentrations (SSC) sediment deposition leading to contaminant mobilisation, turbidity and smothering effects on subtidal habitats and species.	Footprint of the proposed works plus 1.5 km buffer; based on professional judgement and consideration of worst-case for fine particulates (Chapter 7: Physical Environment).
Underwater sound	Maximum effective deterrence range of 5 km from the sound source.
Changes to marine water quality effects from the use of HDD drilling fluids and accidental leaks and spills from vessels, including loss of fuel oils	Footprint of the proposed works plus 1.5 km buffer for fine sands and 4.3 km buffer for silts and clays; based on professional judgement and consideration of worst-case for fine particulates (Chapter 7: Physical Environment).
Cable operation and maintenance	
Disturbance to intertidal and subtidal benthic habitats and species due to subsea cable thermal emissions	Up to approximately ~1 m from the cable, dependent upon the heat carrying capacity of particular sediments.
Disturbance to intertidal and subtidal benthic habitats and species due to subsea cable electromagnetic field (EMF) emissions	For the separated cables, the magnetic field resulted in a combined field slightly above the background level at 20 m from the cable.
Maintenance the same as route preparation and cable installation	See route preparation and cable installation, noting that durations and extents of activities will be significantly reduced.
Decommissioning	

Potential impact	Zone of influence (ZoI)
Potential effects the same as route preparation and cable installation	Anticipated to be analogous to route preparation and cable installation.

8.3.3.1 Temporary Physical Disturbance – Subtidal Benthic Habitats and Species

Installation Phase activities associated with route preparation and cable installation can lead to direct physical disturbance (i.e., reworking) of substrate, which may lead to disturbance and/or loss of benthic habitats and species within the footprint of, and in the immediate vicinity of, the works. Sensitivity to physical disturbance varies between receptor: for mobile receptors displacement, physiological or morphological damage may occur; whilst for sedentary or less mobile receptors, the likely impacts are physiological or morphological damage and mortality.

The potential impacts and effects of Operation and Maintenance and Decommissioning Phases are envisaged to be the same as Installation Phase, however, no impacts are anticipated from the operation of the cable itself during the Operation and Maintenance Phase.

8.3.3.2 Permanent Loss - Subtidal Benthic Habitats and Species

The permanent placement of external cable protection such as rock placement, concrete mattresses or other types of cable protection on the seabed could lead to disturbance and/or loss of benthic habitats and species. This would also introduce artificial hard substrata which could have the capacity to function as an artificial rocky reef, allowing species dependant on hard substrates (including Invasive Non-Native Species (INNS)) to colonise areas that might have previously been unsuitable. Where artificial hard substrate is placed in areas of soft and fine sediment types, there is expected to be a direct loss of this particular habitat under the footprint of the cable protection. In areas already characterised by hard substrate, the addition of cable protection is not expected to produce a major change to the habitats present.

The potential impact and effect of the Decommissioning Phases is envisaged to be the same as the Operational Phase.

8.3.3.3 Increased SSC - Subtidal Benthic Habitats and Species

Installation Phase activities have the potential to increase SSCs, disturbing the seabed and creating a sediment plume within the water column. This in turn can lead to increased deposition as suspended sediments settle out of the water column. Increased SSC can lead to elevated turbidity levels which may affect rates of photosynthesis and an increase in sediment load can reduce the feeding efficiency and subsequent growth rates of filter feeders if clogging of feeding structures occurs. Any contaminants, such as heavy metals and toxins, within the sediments may also be released into the water column and could alter marine water quality, with subsequent indirect effects on benthic species.

Increased deposition can smother the seabed, potentially resulting in changes to seabed geomorphology, sediment structure and habitats. This would have an impact on species that currently rely on these habitats for food and refuge, leading to potential indirect effects on survival, growth, reproduction and displacement of individuals.

The potential impacts and effects of Operation and Maintenance and Decommissioning Phases are envisaged to be the same as Installation Phase activities, however, no impacts are anticipated from the operation of the cable itself during the Operation and Maintenance Phase.

8.3.3.4 Underwater Sound – Marine Mammals

The only activities associated with the Installation Phase of the Marine Scheme that may result in disturbance to marine mammals from underwater sound are the operation of the sub-bottom profiler and the acoustic positioning system (USBL) during geophysical surveys. Underwater sound from other activities during the Installation Phase are all low intensity and masked by the sound of vessel movements. The increase in vessel movements during the Installation Phase involves a small number of vessels (see EAR Volume 2 Chapter 13: Shipping and Navigation), which are generally transient along the Marine Installation Corridor and will not result in a significant increase in vessel movements.

Therefore, this will not result in a significant increase in ambient vessel sound or a significant impact on marine mammals. These activities have, therefore, been screened out of the assessment for underwater sound.

The potential impacts and effects of Operation and Maintenance and Decommissioning Phases are therefore envisaged to be the same as Installation Phase in respect to geophysical surveys.

8.3.3.5 Collision Risk – Marine Mammals

The Installation, Operation and Maintenance, and Decommissioning phases of the Marine Scheme will require the deployment of several vessels, including for relevant phase activities, including geophysical surveys. This increases the risk of collisions between marine mammals and Marine Scheme vessels, which can result in severe injury and possible death.

This risk is most likely to affect larger marine mammals, such as whales, but has the potential to also put smaller marine mammals at risk. Collisions are likely to result in serious injury during contact with propeller blades or the bow, hull, skeg, and rudder (Schoeman, Patterson-Abrolat, & Plön, 2020). The severity of the impact is highly dependent on impact location and seriousness of injuries.

8.3.3.6 Water Quality - Subtidal Benthic Habitats and Species, and Marine Mammals

Changes to marine water quality arising from the use of HDD drilling fluids and additives, accidental leaks and spills from vessels and the mobilisation of sediment bound contaminants has the potential to indirectly affect benthic habitats and species, and marine mammals through toxicity and contamination. Whilst no activities are planned in the intertidal, any change to water quality in the nearshore could affect intertidal areas during high tide, in addition to subtidal and surrounding waters, depending on the scale of the spill.

The potential impacts and effects of Operation and Maintenance and Decommissioning Phases are envisaged to be the same as Installation Phase, however, no impacts are anticipated from the operation of the cable itself during the Operation and Maintenance Phase.

8.3.3.7 EMF – Subtidal Benthic Habitats and Species

During cable operation, HVDC cables emit EMFs, which have the potential to affect benthic receptors in the immediate vicinity of the cables. The cable design includes a metallic outer sheath so the cables will produce no external electrical field though there is potential for induced electrical fields via the movement of the sea through the cable's magnetic field (EAR Volume 2 Chapter 2: Project Design and Appendix 2.1: EMF and Compass Deviation Assessment).

The design for the Marine Scheme comprises two HVDC cables laid either in two separate parallel trenches (unbundled) spaced up to a maximum of 30 m apart, or in a single trench with the cables bundled together. For both approaches the target depth of lowering is approximately 1.5 m and the minimum depth of lowering negating the need for additional cable protection will be approximately 0.6 m. In the bundled configuration, the interactions between the magnetic fields associated with the opposing poles results in cancellation, and a reduced overall field strength. Where the cables are separately laid, the distance between the two poles reduced the degree of field cancellation, and as such the resulting field are of greater strength.

As the separate trench solution represents the worst-case scenario, this has been considered by this assessment.

8.3.3.8 Thermal Emissions – Subtidal Benthic Habitats and Species

The operation of trenched submarine HVDC cables generates heat due to resistance in the conductor components which can warm the cable surface and adjacent environment (i.e., sediments). The rate of heat loss, and magnitude of environmental heating, is dependent on several factors: most notably the amount of power passing through the cables; the design of the cables; and the thermal properties of the surrounding seabed, which is influenced by sediment grain size in particular. Thermal emissions from trenched submarine cables can result in physical and chemical changes to the benthic

environment, including changes in bacterial activity and interference with the make-up of microorganism communities (Taormina, et al., 2018). Benthic organisms have varying tolerance to increases in temperature, for example *Nephrops* spp. have a 'very low' sensitivity to increases in temperature (Sabatini & Hill, 2008), whereas the slender sea pen *Virgularia mirabilis* has a 'moderate' sensitivity (Hill & Wilson, 2000).

8.3.4 Screening

The assessment approach applied during the MCZ and MPA screening has been based on the guidance document 'Marine conservation zones and marine licensing' (MMO, 2013) and is presented in Figure 3.

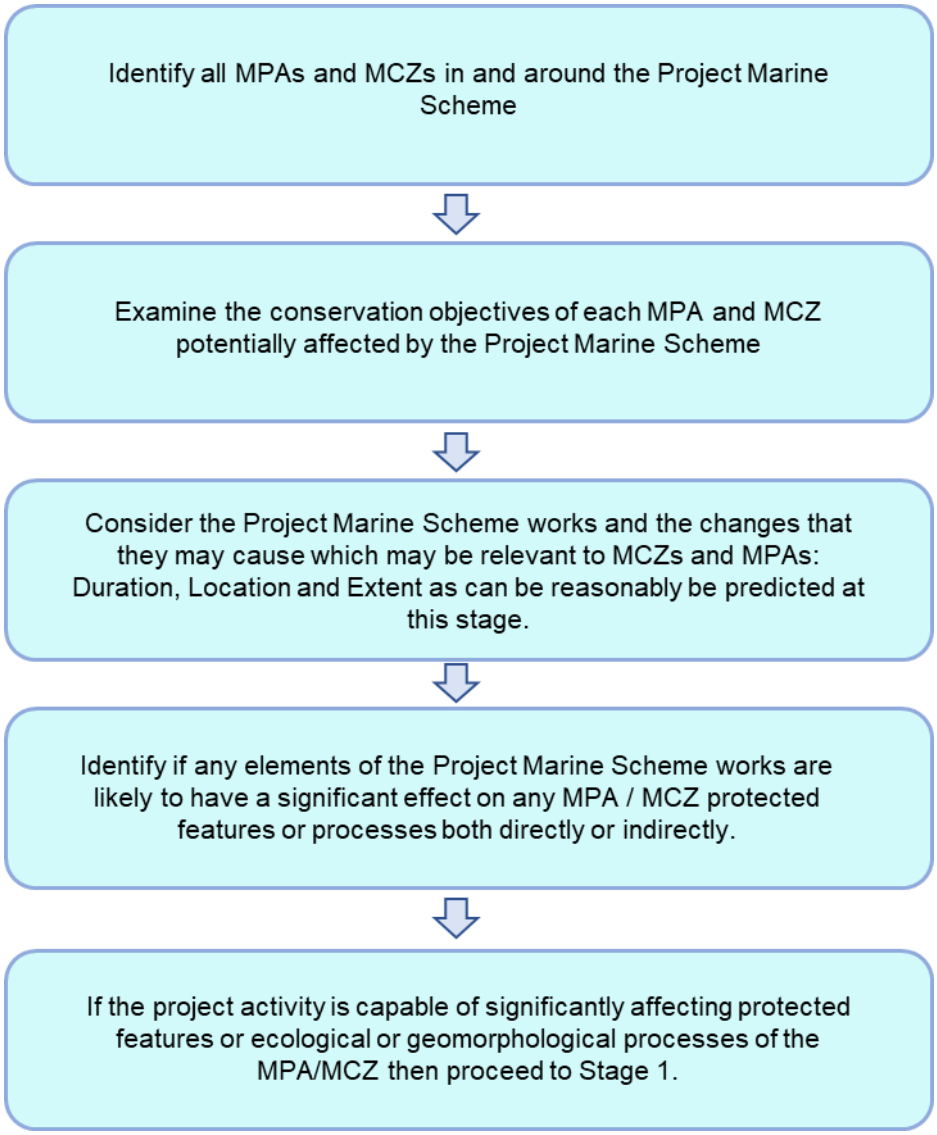

Figure 3: MPA / MCZ screening process

A Geographic Information System (GIS) was used to map boundaries of MPA and MCZ sites in relation to the Marine Scheme. To determine whether each receptor has the potential to interact with the Marine Scheme, it was necessary to understand the nature of (and existing baseline for) the protected biodiversity features. Information on the protected biodiversity features for the MPAs / MCZs screened into this assessment are presented in the sections below.

This information has been used to compare the activities of the project against the sites' protected features to identify impact pathways.

8.3.4.1 MPA (Scotland) Screening Assessment

Based on the application of the MMO (2013) guidance to Scottish MPAs discussed above, it is considered that Section 83 of the Marine (Scotland) Act 2010 would apply if it is determined through the course of screening that:

> "*the activity is capable of affecting (other than insignificantly) either: (i) a protected feature in a Nature Conservation MPA; (ii) a stated purpose for a Demonstration and Research MPA; (iii) a marine historic asset in a Historic MPA; or (iv) any ecological or geomorphological process on which the conservation of any protected feature in a Nature Conservation MPA, or on which the stated purpose for a Demonstration and Research MPA, is (wholly or in part) dependent*".

Based on MMO (2013) guidance, Section 126 of the Marine and Coastal Access Act 2009 would apply if it is determined through the course of screening that:

- *"the licensable activity is taking place within or near an area being put forward or already designated as an MCZ; and*
- *the activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant".*

Two MPA sites were identified and progressed through screening, as detailed below and summarised in **Error! Reference source not found.**.

Table 2: Screening for MPAs.

Site Name	Protected Features	Distance to Marine Scheme (km)	Potential Impact Pathway(s)	Likelihood of Interaction
Southern Trench MPA	Burrowed mud Fronts Minke whale *Balaenoptera acutorostrata* Shelf deeps Quaternary of Scotland Submarine mass movement	1.96	Underwater noise (Minke whale)	**Possible** Underwater noise could cause temporary injury or disturbance, or there could be vessel collision, and therefore the Southern Trench MPA has been screened in for Stage 1 assessment.
Firth of Forth Banks Complex MPA	Ocean quahog *Arctica islandica* aggregations Offshore subtidal sands and gravels Shelf Banks and Mounds Moraines representative of the Wee Bankie Key Geodiversity Area	30 m from Marine Installation Corridor at the closest point	As detailed in Section 8.3.3.	**Possible** Due to the potential for a number of different effects to benthic habitats and species the Firth of Forth Banks Complex MPA has been screened in for Stage 1 assessment.

Southern Trench MPA

Overview

The Southern Trench MPA is located off the Aberdeenshire coast in northern Scotland. It features an oceanographic front[4] whose nutrient concentrations and primary production attract fish species like mackerel, herring, and cod. Such aggregations of primary production and fish species have the potential to serve as important foraging grounds for marine predators such as mammals and seabirds (Scales, et al., 2014).

Persistently above average densities of minke whale are drawn to this area specifically for foraging purposes (Nature Scot, 2019). This species is also protected under the Conservation (Natural Habitats, &c.) Regulations 1994 and the Wildlife and Countryside Act 1981. Other protected features of the Southern Trench MPA include burrowed mud and shelf deeps which also host diverse benthic communities (Nature Scot, 2019). Burrowed mud is a Priority Marine Feature and listed on the OSPAR list of Threatened and Declining Habitat. Shelf deeps, which are comprised of valleys, canyons, and troughs, support the formation of burrowed mud.

Conservation Objectives

The Conservation Objectives of the Southern Trench NC MPA 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.

Screening

Based on a distance of 1.96 km from the Marine Scheme, the Southern Trench MPA is considered to fall inside of the ZoI of the underwater noise (marine mammals) impact pathway and the vessel collision pathway (see Table 2). The Southern Trench MPA has therefore been screened in for Stage 1 assessment. This MPA has been screened out for all other pathways.

Firth of Forth Banks Complex MPA

Overview

The Firth of Forth Banks Complex MPA is located offshore eastern Scotland (beyond 12 NM), encompassing Berwick, Scale and Montrose Banks, and the Wee Bankie shelf banks and mounds. This is a highly productive area that supports rich wildlife assemblages, and its qualifying features include ocean quahog *Arctica islandica* aggregations, offshore subtidal sands and gravels, and shelf banks and mounds (JNCC, 2014).

The ocean quahog is listed on the OSPAR List of Threatened and/or Declining Species and Habitats. It is a slow growing and incredibly long-lived filter feeder that lives buried in soft sediments meaning it is often slow to recover following disturbance, and this region (OSPAR Region II) is particularly under threat from seabed disturbance (OSPAR Commission, 2009).

Subtidal sands and gravels are listed under Section 2(4) of the Nature Conservation (Scotland) Act 2004 (formally UK Biodiversity Action Plan (BAP) Priority Habitat), with offshore sediments considered a Priority Marine Feature in Scottish waters. They are one of the most common habitats in UK waters supporting an array of biotopes and benthic life. This habitat is vulnerable to threats including pollution from riverine discharge, sewage, oil exploration, and physical disturbance from trawling, dredging, and aggregate extraction (JNCC, 2016). Shelf banks and mounds are elevated areas of seabed created by strong currents, formed by the accumulation of great volumes of sediments. Their structure creates an ideal surface for species to colonise and support the growth of benthic communities (Nature Scot, 2020).

Conservation Objectives

With respect to offshore subtidal sands and gravels within the Firth of Forth Banks Complex MPA, this means that:

[4] Boundary between two different water masses which can result in mixing and concentration of nutrients and primary production

- Extent is stable or increasing; and
- Structures and functions, quality, and the composition of characteristic biological communities (which includes a reference to the diversity and abundance of species forming part of or living within the habitat) are such as to ensure that they remain in a condition which is healthy and not deteriorating.

With respect to the ocean quahog aggregations within the Firth of Forth Banks Complex MPA, 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.

With respect to the shelf banks and mounds large-scale feature within the Firth of Forth Banks Complex MPA, this means that:

- The extent, distribution and structure is maintained;
- The function is maintained so as to ensure that it continues to support its characteristic biological communities (which includes a reference to the diversity of any species associated with the large-scale feature) and their use of the site for, but not restricted to, feeding, courtship, spawning, or use as nursery grounds; and
- The processes supporting that feature are maintained.

Screening

The Marine Installation Corridor runs directly adjacent to the east of the Firth of Forth Banks Complex MPA between KP84 and KP118. At the closest point the Marine Installation Corridor is 30 m from the MPA boundary. The Firth of Forth Banks Complex MPA is considered to fall within the potential ZoI associated with the following pathways arising from the Marine Scheme (see Table 2):

- Temporary increase in SSC sediment deposition leading to contaminant mobilisation turbidity and smothering effects on subtidal habitats and species; and
- Changes to marine water quality effects from the use of HDD drilling fluids and accidental leaks and spills from vessels, including loss of fuel oils.

The maximum swathe for temporary disturbance during the Installation Phase is 25 m and there will therefore, be no direct disturbance within the MPA. The maximum swathe for permanent disturbance during the Installation Phase is 8 m, although this is within the temporary disturbance swathe, and thus permanent disturbance is also not expected to occur within the MPA.

The maximum distance from the cable for effects resulting from submarine cable thermal emissions is expected to be approximately 1 m. An increase in submarine EMF emissions are not expected to exceed 20 m from the cable. Thus, it is not expected that submarine cable thermal and EMF emissions will cause an impact within the MPA.

Therefore, the Firth of Forth Banks Complex MPA is not considered to fall within the potential ZoI associated with the following pathways arising from the Marine Scheme:

- Temporary physical disturbance to benthic habitats and species and geological features;
- Permanent loss of subtidal benthic habitats and species and geological features due to placement of hard substrates on the seabed;
- Disturbance to benthic habitats and species due to submarine cable thermal emissions; and
- Disturbance to benthic habitats and species due to submarine cable EMF emissions.

The Firth of Forth Banks Complex MPA has therefore been screened in for Stage 1 assessment for assessment of the effect of increased SSC and changes in water quality.

8.3.4.2 MCZ (England) Screening Assessment

The MCZ Assessment Guidelines (MMO, 2013) indicate that following the identification of MCZs to be considered, Section 126 would apply if it is determined through the course of screening that

> "*the activity is capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant.*"

Four MCZ sites were identified and progressed through screening, as detailed below and summarised in Table 3.

Table 3: Screening for MCZs

Site Name	Protected Features	Distance (km)	Potential Impact Pathway	Likelihood of Interaction
Farnes East	Moderate energy circalittoral rock Subtidal coarse sediment Subtidal mixed sediments Subtidal sand Subtidal mud Sea-pen and burrowing megafauna communities Ocean quahog	4.88	No potential pathways identified	**Screened Out** – The Farnes East MCZ falls outside of the ZoIs associated with the impact pathways that have the potential to affect the designated features and therefore, Farnes East MCZ has been screened out and does not require a Stage 1 assessment.
North East of Farnes Deep	Subtidal coarse sediment Subtidal mixed sediments Subtidal sand Subtidal mud Ocean quahog	3.12	No potential pathways identified	**Screened Out** – The North East of Farnes Deep MCZ falls outside of the ZoIs associated with the impact pathways that have the potential to affect the designated features and therefore, North East of Farnes Deep MCZ has been screened out and does not require a Stage 1 assessment.
Holderness Inshore	Intertidal sand and muddy sand Moderate energy circalittoral rock High energy circalittoral rock Subtidal coarse sediment Subtidal mixed sediments Subtidal sand Subtidal mud Spurn head (subtidal geological feature)	7.74	No potential pathways identified	**Screened Out** – The Holderness Inshore MCZ falls outside of the ZoIs associated with the impact pathways that have the potential to affect the designated features and therefore, Holderness Inshore MCZ has been screened out and does not require a Stage 1 assessment.

Site Name	Protected Features	Distance (km)	Potential Impact Pathway	Likelihood of Interaction
Holderness Offshore	North Sea glacial tunnel valleys Ocean quahog Subtidal coarse sediment Subtidal mixed sediments Subtidal mixed sediments	5.50	No potential pathways identified	**Screened Out** - The Holderness Offshore MCZ falls outside of the ZoIs associated with the impact pathways that have the potential to affect the designated features and therefore, Holderness Offshore MCZ has been screened out and does not require a Stage 1 assessment.

Farnes East MCZ

Overview

Farnes East MCZ is situated offshore northeast England, approximately 11 km from the Northumberland coast, covering 945 km^2. The site is designated for moderate energy circalittoral rock, subtidal coarse sediment, subtidal mixed sediments and subtidal sand; the general management approach for these features is 'maintain in favourable condition'. The MCZ is also designated for subtidal mud, ocean quahog and seapen and burrowing megafauna communities; the general management approach for these protected features is 'Recover to favourable condition'. The shallower areas of the site, in the west, are dominated by subtidal coarse sediment and subtidal mixed sediments, while the eastern half of the site consists largely of subtidal sand.

The sedimentary habitats in Farnes East MCZ also support populations of ocean quahog. This species is a protected feature of the MCZ. The ocean quahog is also an OSPAR Threatened and/or Declining species and a species Feature of Conservation Importance listed on the Ecological Network Guidance (ENG).

Two species of seapen; slender seapen *Virgularia mirabilis* and phosphorescent seapen *Pennatula phosphorea* have been observed living on the mud habitat in the Farnes East MCZ. Norway lobster *Nephrops norvegicus* are also present within the deep mud habitat, constructing burrows and mainly emerging in the evening to feed. As a result, as well as being designated for the broad-scale habitat subtidal mud, the habitat Feature of Conservation Importance; seapen and burrowing megafauna communities is also protected in the Farnes East MCZ. This habitat is also designated on the OSPAR List of Threatened and/or Declining Species and Habitats.

Conservation Objective

Subject to natural change, the moderate energy circalittoral rock, subtidal coarse sediment, subtidal sand, subtidal mud, subtidal mixed sediments and sea-pen and burrowing megafauna communities' features are to remain in or be brought into favourable condition, such that their:

- Extent is stable or increasing; and
- Structures and functions, quality, and the composition of their characteristic biological communities are such as to ensure that they are in a condition which is healthy and not deteriorating.

Subject to natural change, the ocean quahog feature is to recover to favourable condition, such that:

- The quality and extent of its habitat is stable or increasing; and
- The population structure allows numbers to be maintained or increased.

Screening

The Farnes East MCZ is located 4.88 km from the Project Marine Scheme and thus falls outside of the ZoI of the impact pathways identified in Section 8.3.3 (see Table 3**Error! Reference source not found.**). Therefore, Farnes East MCZ has been screened out and does not require a Stage 1 assessment.

North East of Farnes Deep MCZ

Overview

North East of Farnes Deep MCZ is located 55 km offshore the Northumberland coast in England and covers 492 km^2. It is comprised of predominantly sandy sediment, gravelly sand and mud. It supports a diverse range of flora and fauna, including the ocean quahog, designated on the OSPAR List of Threatened and/or Declining Species and Habitats as well as a Feature of Conservation Importance listed on the ENG. During a 2012 survey, 410 infaunal and 39 epifaunal species were observed (JNCC, 2017).

Conservation Objective

With respect to Subtidal coarse sediment, subtidal sand, subtidal mixed sediments and subtidal mud within the North East of Farnes Deep MCZ, this means that:

- Extent is stable or increasing; and
- Structures and functions, quality, and the composition of characteristic biological communities (which includes a reference to the diversity and abundance of species forming part of or inhabiting each habitat) are such as to ensure that they remain in a condition which is healthy and not deteriorating.

In relation to the ocean quahog within the North East of Farnes Deep 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.

Screening

The North East of Farnes Deep MCZ is located 3.12 km from the Marine Scheme and thus falls outside of the ZoI of the impact pathways identified in Section 8.3.3 (see Table 3**Error! Reference source not found.**). Therefore, North East of Farnes Deep MCZ has been screened out and does not require a Stage 1 assessment.

Holderness Inshore MCZ

Overview

Holderness Inshore MCZ covers 309 km^2 north of the Humber estuary in England. Its seabed is comprised of mud, rock, sand, and sediment, supporting a range of organisms, including algae, sponges, and commercially significant fish and crustaceans. Uniquely, the Holderness Inshore MCZ covers a portion of the nearby beach and intertidal which is home to an equally diverse range of infauna. The site also protects the geological feature Spurn Head, an active spit system extending across the mouth of the Humber estuary.

Conservation Objective

The conservation objective of the Zone is that the protected features:

- so far as already in favourable condition, remain in such condition; and
- so far as not already in favourable condition, be brought into such condition, and remain in such condition.

Screening

The Holderness Inshore MCZ is located 7.74 km from the Marine Scheme and thus falls outside of the ZoI of the direct impact pathways identified in Section 8.3.3 (see Table 3). This MCZ is also located outside the distance at which any temporary increase in SSC and changes in physical processes are likely to have any indirect effect (see EAR Volume 2 Chapter 7: Physical Environment). Therefore, Holderness Inshore MCZ has been screened out and does not require a Stage 1 assessment.

Holderness Offshore MCZ

Overview

Holderness Offshore MCZ covers an area of 1,176 km^2 and is located approximately 11 km offshore the Holderness coast in England. The seabed is predominantly subtidal coarse sediments, with subtidal sand and mixed sediments. These habitats support a range of benthic fauna, including crustaceans, starfish and sponges. The site is also an important spawning and nursery ground for several fish species, including sole *Microstomus kitt*, plaice *Pleuronectes platessa*, and sprat *Sprattus sprattus*. The site also hosts aggregations of the long-lived ocean quahog.

Conservation Objective

With respect to subtidal coarse sediment, subtidal sand and subtidal mixed sediments within the Holderness Offshore MCZ, 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.

With respect to the ocean quahog within the Holderness Offshore 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.

Screening

The Holderness Offshore MCZ falls outside of the ZoI of the impact pathways identified in Section 8.3.3 (see Table 3). Therefore, Holderness Offshore MCZ has been screened out and does not require a Stage 1 assessment.

8.3.5 Stage 1 Assessment

8.3.5.1 MPA (Scotland) Assessment

The key potential effects and pathways for the Southern Trench MPA and Firth of Forth Banks Complex MPA, which are screened in for assessment, are appraised below.

Southern Trench MPA

Underwater sound (marine mammals)

A number of activities undertaken during the Installation Phase of the Marine Scheme will generate underwater sound (EAR Volume 2 Chapter 2: Project Description). A detailed underwater sound appraisal has been undertaken, with the results presented in the EAR Volume 2 Chapter 10: Marine Mammals. This concluded that the majority of the underwater noise sources detailed above do not have the potential to adversely affect marine mammals, either on the basis that their operating frequencies make them inaudible to marine mammals, or their source levels were not great enough to pose a risk of injury or significant disturbance. The only activities associated with the Marine Scheme that are within hearing range of marine mammals and have the potential to have adverse effects, are the operation of the USBL and the SBP, the results of these appraisals are summarised below, with further detail available in the EAR Volume 2 Chapter 10: Marine Mammals.

The effects of underwater sound on marine mammals are generally split into the following categories:

- **Auditory injury** - a consequence of damage to the inner ear of marine mammals, the organ system most directly sensitive to sound exposure, can result in hearing loss, also known as Permanent Threshold Shift (PTS); and
- **Behavioural responses** – are highly variable and context-specific ranging from increased alertness, altering vocal behaviour, interruption to feeding or social interaction, alteration of movement or diving behaviour, temporary or permanent habitat abandonment. In some circumstances, sound from explosions or military sonar, have been associated with animal responses such as panic, flight, or stranding, sometimes resulting in indirect injury or death could occur. Minor or temporary behavioural responses are often simply evidence that an animal has heard a sound. Anthropogenic underwater sound may also partially or entirely reduce the audibility of signals of interest such as those used for communication and prey detection.

Cetaceans produce and receive sound over a wide range of frequencies for communication, orientation, predator avoidance and foraging (Tyack, 2008). For the determination of the impact of underwater sound on cetaceans they have been classified into three functional hearing groups (low, high and very high frequency[5]) based on their peak hearing range (Southall, et al., 2007). Minke whales are Low Frequency (LF) cetaceans, having an auditory bandwidth of 7 Hz to 35 kHz.

The most up to date sound exposure criteria for auditory injury in marine mammals have been published by the US National Marine Fisheries Service (NMFS), often referred to as the NOAA criteria (NMFS, 2018), and updated in a recent peer-reviewed academic paper (Southall L. , et al., 2019). The thresholds for PTS are based on dual criteria of unweighted, instantaneous peak sound pressure levels (SPL_{peak}) and M-weighted cumulative Sound Exposure Levels (SEL_{cum}) (Table 4).

Table 4: Quantitative thresholds for auditory injury effects (PTS) in marine mammals.

Marine Mammal Hearing Group	Impulsive Sound Sources	
	PTS	PTS
	SEL_{cum}	SPL_{peak}
Minke Whale - LF cetaceans	183	219

SPL thresholds are unweighted peak SPL in dB re 1 µPa. Cumulative SEL thresholds are weighted for marine mammal hearing range and the units are dB re 1 $\mu Pa^2 s$

There are no widely agreed quantitative thresholds for behavioural disturbance, reflecting both a lack of empirical evidence and a high level of variability in behavioural responses, which are often unrelated to the sound level received (Gomez, et al., 2016) (Southall, et al., 2021). Nevertheless, a threshold of 160 dB SPL_{rms} is still adopted by NOAA in relation to behavioural disturbance from impulsive sounds for all cetaceans[6].

Sound attenuates as it propagates through water and the local oceanographic conditions will affect both the path of the sound into the water column and how much sound is transmitted. A standard geometric spreading calculation was used to determine the propagation of underwater sound from the USBL and SBP activities, in order to estimate the ranges to which cetaceans may be subject to injury or disturbance. The results are summarised in Table 5.

Table 5: Estimated injury and disturbance ranges (m) for minke whale

Acoustic source	Injury (LF Cetaceans)		Disturbance
	SPL_{peak}	SEL_{cum}	
USBL	<10 m	<10 m	63 m
SBP	18 m	116 m	4,642 m

[5] These were previously described, by Southall et al., 2007, as low, mid and high frequency functional hearing groups.
[6] See: https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/esa-section-7-consultation-tools-marine-mammals-west

SPL units are dB re 1 µPa; cumulative SEL units dB re 1 µPa^{2}s

The predicted injury and disturbance impact zones from USBL sound, based on both the SPL_{peak} and SEL_{cum} thresholds indicates these effects are only likely to occur if a minke whale is within a few metres of the equipment, which is considered highly unlikely given the manoeuvrability of minke whales, and their relatively low population density of 0.04 animals/km^2 (Hammond et al., 2021) within the Southern Trench MPA. Thus, impacts from USBL can be ruled out.

There is a theoretical risk of injury for the use of SBP, out to a range of 116 m from the acoustic equipment. As such, a number of mitigation measures recommended in the JNCC guidelines for minimising the risk of injury in marine mammals (JNCC, 2017) will be adopted. The measures below will be included in a Marine Mammal Protection Plan (MMPP), as part of the Construction Environmental Management Plan (CEMP) developed for the project. Further details of mitigation measures can be found within EAR Volume 2 Chapter 17: Schedule of Mitigation and Commitments.

The JNCC guidance minimises the potential for injury to cetaceans from the SBP activities through the use of marine mammal observation. Thus, before a geophysical activity begins, there will be a period of observation of a 500 m mitigation zone by a qualified Marine Mammal Observer (or passive acoustic monitoring in the case of operations during the hours of darkness). Following the observation period, SBP survey activities only commence after a period when no animals have been observed. Thus, the likelihood that a minke whale is within the 161 m injury at the point at which the SBP is activated is considered to be very low.

The worst-case disturbance range results from the use of SBP, where minke whale may be disturbed up to approximately 4.6 km from the acoustic equipment. The predicted density of minke whales in the vicinity of the Southern Trench MPA is 0.04 animals/km^2 (Hammond et al., 2021), as such up to three minke whales may be present within the area subject to acoustic disturbance at any one time, which represents <0.001% of the UK portion of the Celtic and Greater North Sea Management Unit. Furthermore, the SBP will not be operating continuously, it will be activated used as and when required for investigations of particular areas of the seabed where additional information is required to inform installation. Therefore, SBP sound disturbance will be intermittent, short-term and temporary, particularly considering the SBP will not be continuously moving along the Marine Installation Corridor. Thus, any one area is subject to ensonification for a short period of time.

With the inclusion of the embedded mitigation measures, there is no potential for injury to marine mammals as a result of underwater sound emitted by the project activities. There will be some behavioural disturbance however, particularly from the operation of the SBP, but the duration is considered to be short-term, intermittent and temporary, and the extent of the effect limited in terms of the number of individuals and the level of behavioural response. Such disturbance is not predicted to interfere with any important habitat or foraging areas, behaviours or life stages and so the magnitude of the impact is predicted to be negligible**.** As such, no significant effects on the protected minke whale features of the Southern Trench MPA are anticipated, hence the conservation objectives of the site will not be compromised. Section 83(2) of the Marine (Scotland) Act 2010 is discharged because there is no significant risk of the Marine Scheme of affecting, other than insignificantly, the protected features of the MPA or resulting in a significant risk of hindering the achievement of the conservation objectives of the MPA.

Assessment Conclusion	Conservation objectives will not be hindered.

Vessel collision risk (marine mammals)

The Installation, Operation and Maintenance, and Decommissioning Phases of the Marine Scheme will require the deployment of several vessels as detailed in EAR Volume 2 Chapter 2: Project Description. The presence of vessels has the potential to increase the risk of vessel collision with marine mammals.

The marine mammals most at risk of vessel collision are larger species, such as minke whale (Schoeman, Patterson-Abrolat, & Plon, 2020). As a result, marine mammals often exhibit behaviour avoidance in the presence of marine vessels (Palka & Hammond, 2001; Wisniewska, et al., 2018; Roberts, Collier, Law, & Gaion, 2019).

The severity of injury caused to marine mammals by vessel strikes is dependent on where the injury occurs on the body, and the extent of the injuries, e.g., the depth of the gash. Larger marine mammals have layers of thick blubber which is considered to offer some protection to the individuals and therefore reduce the likelihood of sustaining a severe injury, however more research is required regarding the relationship between species and injury severity (Schoeman, Patterson-Abrolat, & Plon, 2020).

The severity of collision risk is thought to be dependent on vessel speed and draft depth, as higher speeds produce a greater impact force and larger drafts have been associated with increased mortality (Rockwood, Calambokidis, & Jahncke, 2017; Schoeman, Patterson-Abrolat, & Plon, 2020; Winkler, Panigada, Murphy, & Ritter, 2020). Although species-specific relationships of collision risk require further research, several behavioural factors have still been identified that may play an important role, including amount of time spent at the surface and avoidance behaviours (Schoeman, Patterson-Abrolat, & Plon, 2020).

Vessels associated with Marine Scheme typically operate at low speeds of four to six knots and transit at slightly greater speeds of 10 to 14 knots. At these speeds, it is unlikely that vessels pose a significant risk to marine mammals. There will be smaller vessels present, but these will be accompanying, and thus travelling at similar speeds, to the larger vessels and so unlikely to represent a significant collision risk. Some studies have correlated avoidance behaviour with sustained or increased vessel traffic (Culloch, et al., 2016; Erbe, et al., 2019), and marine mammals are likely habituated to some vessel presence in the North Sea.

During the Marine Scheme, there will be no substantive change from baseline vessel activity in the Marine Installation Corridor (see EAR Volume 2 Chapter 13: Shipping and Navigation). The Scottish Marine Wildlife Wating Code (embedded mitigations) will also be adhered to as a matter of best practice (see EAR Volume 2 Chapter 17: Schedule of Mitigation).

Therefore, with embedded mitigations in place, no significant effects on the protected minke whale features of the Southern Trench MPA are anticipated as a result of increased vessel presence, hence the conservation objectives of the site will not be compromised. Section 83(2) of the Marine (Scotland) Act 2010 is discharged because there is no significant risk of the Marine Scheme of affecting, other than insignificantly, the protected features of the MPA or resulting in a significant risk of hindering the achievement of the conservation objectives of the MPA.

Assessment Conclusion	Conservation objectives will not be hindered.

Firth of Forth Banks Complex MPA

Temporary increase in SSC, sediment deposition leading to indirect effects of contaminant mobilisation, turbidity and smothering effects on subtidal habitats and species

Installation Phase activities will disturb seabed sediments which is likely to contribute to temporary increases in SSC and sediment deposition. As the Marine Installation Corridor passes directly adjacent to the Firth of Forth Banks Complex MPA, the MPA falls within the ZoI for sediment suspension/deposition.

Large increases in SSC and sediment deposition can have significant impacts on marine organisms, with the potential to smother benthic life (Pineda, et al., 2017). Sessile benthic organisms are particularly at risk as many are filter feeders and increased sediment loads can clog their feeding apparatus (Pineda, et al., 2017). Disturbance to seabed sediments can also resuspend any contaminants that have settled in the environment, which can also be ingested by organisms, or contaminate adjacent areas when they resettle (Bancon-Montigny, et al., 2019).

Calculations have been undertaken to estimate the extent of sediment dispersion before deposition as a result of installation activities. The method for these calculations, and the results, are reported in EAR Volume 2 Chapter 7: Physical Environment.

The extent of the effect depends on sediment particle size and the level of water movement. The distance travelled by suspended coarse sand, typical of the majority of the sediments affected, before

deposition, is expected to be around 247 m. Fine sands, silts and clay may, however, be transported beyond the Marine Installation Corridor with any fine sand settling on the seabed up to 1.5 km from the point where it is mobilised. Based on the calculated settling velocities, silt-sized material could remain in suspension for several days and may therefore travel significant distances. However, given the small proportion of fine sediment (which is primarily between KP210 and KP241), and that dispersion processes will also act to dilute the concentration of silt carried in suspension, elevated concentration levels beyond 1.5 km from the source will be negligible. It is considered that there will be no significant elevated concentration levels beyond the distance calculated for fine sand which corresponds to a maximum 1.5 km from the point of mobilisation.

Based on these calculations, any measurable change in suspended sediment concentrations will be temporary and localised i.e., mostly within the bottom 5 m of the water column and also within the extent of the Marine Installation Corridor. The finer fractions that are transported further will be diluted so that the SSC will be low and the deposition thickness on the seabed, where the sediment is able to settle, will be negligible.

Ocean quahog is designated on the OSPAR List of Threatened and/or Declining Species and Habitats. As an active suspension feeder / surface deposit feeder, it is particularly vulnerable to increased SSC which may clog its feeding system. Previous studies into the resilience of the ocean quahog to changes in suspended solids in the water column (Morton, 2011) have however found that this species naturally occurs in silty sediments in sheltered to wave exposed conditions, where the surface of the sediment is probably regularly mobilised, and where accretion rates are moderate to high. Therefore, increase in turbidity (suspended sediments) may not adversely affect the species, especially as it can avoid sudden changes by burrowing for several days.

Subtidal sands and gravels are listed under Section 2(4) of the Nature Conservation (Scotland) Act 2004 (formally UK BAP Priority Habitat). This habitat alongside shelf banks and mounds both support diverse benthic communities (Nature Scot, 2020), which are similarly susceptible to the impacts of increased sediment deposition and contaminant resuspension. A review of Installation Phase activities in similar sediment habitats found no significant changes to communities in a range of sediment types, falling within local natural variability (RPS, 2019). Habitats which were comprised mostly of sediments, such as subtidal sands and gravels, often recovered swiftly after disturbance, quickly reflecting pre-construction baselines and adjacent unimpacted areas (RPS, 2019). Areas with a higher composition of fine sediments (e.g., sandy muds and muddy sands) showed remnants of trenching and light scaring, although of a low relief (RPS, 2019).

The predicted temporary increase to SSC levels and associated depositional loads from operations in comparison to natural background levels is expected to be relatively minor. When considering this in conjunction with the natural occurrence of ocean quahog in silty environments and the recoverability of sands and gravels, the impact of temporary SSC to the designated features of the Firth of Forth Banks Complex MPA will not significantly affect the stated conservation objectives. Section 126(6) of the MCAA is discharged on the basis that there is no significant risk of the Marine Scheme hindering the achievement of the conservation objectives stated for the MPA.

Assessment Conclusion	Conservation objectives will not be hindered.

Changes to marine water quality effects from the use of HDD drilling fluids and accidental leaks and spills from vessels, including loss of fuel oils

Discharge from construction works to the marine environment has the potential to alter water quality which could affect sensitive habitats and protected species. The only planned discharges into the marine environment would come from the HDD operations planned in the nearshore environment at both landfall locations. However, the nearest landfall, at Peterhead, is over 70 km from the Firth of Forth Banks Complex MPA. Considering the distance of the MPA from the HDD location and the likely swift dispersal of released fluids, changes to water quality from HDD drilling fluids are unlikely to impact the protected features and conservation objectives of the MPA.

The risk of accidental release of pollutants (e.g., fuels, oils, and chemicals) from vessels, however, is present throughout the entire length of the Marine Installation Corridor. Contaminants have the potential

to settle within benthic sediments and affect the communities present. Studies have indicated that benthic sediments contaminated with oils and hydrocarbons resulted in a reduced density of macrofauna, as well as differences in recruitment and development of assemblages (Berge, 1990; Stark, Snape, & Riddle, 2003).

Within the Firth of Forth Banks Complex MPA, ocean quahog, subtidal sands and gravels, shelf banks and mounds and moraines are identified as protected features, each being vulnerable to impacts from accidental release of pollutants.

Embedded mitigation measures will be implemented to minimise the release of drilling fluid leaks from the end of the ducts (EAR Volume 2 Chapter 2: Project Description and Chapter 17: Schedule of Mitigation). The discharged drilling fluids will also be subject to immediate dilution and rapid dispersal within the marine environment, particularly as the release will be in the shallow nearshore area where there is likely to be significant wave and tidal water movement.

To ensure the risk of accidental spills is as low as reasonably practicable, the project will adhere to relevant guidance (e.g., Pollution Prevention Guidance). A CEMP, including an Emergency Spill Response Plan and Waste Management Plan, will be implemented during the installation phase of the project to minimise releases (EAR Volume 2 Chapter 2: Project Description and Chapter 17: Schedule of Mitigation). Appropriate Health, Safety, and Environment (HSE) procedures (identified in the CEMP) will also be implemented, with appropriate consideration of weather conditions and personnel limits to reduce risk of accidental spillage. Furthermore, preparedness and swift response is essential for effective spill management and as such, response plans will be in place should an incident occur. Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. Planned effluent dischargers will be compliant with MARPOL Annex IV ‘Prevention of Pollution from Ships’ standards.

Although spills are highly likely to impact any benthic habitat or species regardless of protection status, with necessary HSE measures the likelihood of this occurring is very low. However, should any accidental release of contaminants occur it would likely be small in volume, and rapidly dispersed and diluted by waves and tides. As such, accidental release of contaminants is unlikely to significantly affect the protected features and stated conservation objectives of the Firth of Forth Banks Complex MPA. Section 126(6) of the MCAA is discharged on the basis that there is no significant risk of the Marine Scheme hindering the achievement of the conservation objectives stated for the MPA.

Assessment Conclusion	Conservation objectives will not be hindered.

8.3.6 Summary and Conclusions

This report has been produced to provide the necessary information to allow MS-LOT and the MMO to meet their specific duty for MPA/MCZs as outlined in Section 83(2) of the Marine (Scotland) Act and Section 126 of the MCAA 2009. The first stage of the assessment process was screening to identify if MPAs/MCZs within 10 km of the Marine Scheme requiring full assessment in the Stage 1 Assessment process.

The screening concluded that a possible risk of the Marine Scheme affecting the designated features and/or conservation objectives of two MPAs was present. During this process, the Farnes East MCZ, North East of Farnes Deep MCZ, Holderness Inshore MCZ and Holderness Offshore MCZ in English waters, were ruled out for the subsequent assessment as they fell outside of the distance of all predicted ZoIs.

A Stage 1 Assessment was completed for the Southern Trench MPA in Scottish waters due to the site falling within the ZoI of the following impact pathway:

- Underwater noise; and
- Marine mammal accidental collision risk.

A Stage 1 Assessment was also completed for the Firth of Forth Banks Complex MPA in Scottish waters due to the site falling within the ZoIs of the following impact pathways:

- Temporary increase in SSC and deposition leading to physical disturbance and/or loss of benthic habitats and species; and
- Changes to marine water quality from the use of drilling fluids and the release of sediment bound contaminants and bacteria leading to indirect effects on benthic habitats and species.

The Stage 1 Assessment found that these impact pathways are not considered to have significant effects on the designated features or the conservation objectives of the Southern Trench MPA and Firth of Forth Banks Complex MPA.

Accordingly, the conditions of Section 83(2) of the Marine (Scotland) Act 2010 and Section 126 of the MCAA 2009, as determined under Stage 1 of the MCZ assessment process, can be met and that there is no significant risk to any of the identified designated features or conservation objectives of the sites as a result of the Marine Scheme.

8.3.7 References

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