Eastern Green Link 2 – Marine Scheme

European Protected Species Licence Application Supporting Information and Risk Assessment

January 2023

For: National Grid Electricity Transmission and Scottish Hydro Electric Transmission Plc

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Quality information

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1. Introduction

1.1 Project Overview

National Grid Electricity Transmission (NGET) and Scottish and Southern Electricity Networks (SSEN) Transmission (also known as Scottish Hydro Electric Transmission plc (SHE Transmission) under licence) are jointly developing a submarine High Voltage Direct Current (HVDC) link between Peterhead in Aberdeenshire and Drax in North Yorkshire, referred to as the Eastern Green Link 2 Project (EGL2; hereafter referred to as 'the Project') (Figure 1. Proposed Eastern Green Link 2 Marine Installation Corridor (including designated sites for which marine mammals are a protected feature)**Figure 1**). The cable route length for the marine section (hereafter referred to as the 'Marine Installation Corridor') is approximately 440 km (435.7 km).

The Project is a major reinforcement of the electricity transmission system which will provide additional transmission capacity between the north and south of the UK across transmission network boundaries, ensuring that green energy is transported from where it is produced to where it is needed. It is particularly required to help bring Scotland's extensive reserves of renewable energy to millions of homes across the rest of the UK.

The Project, comprising installation, operation, and decommissioning phases, is currently the subject of two (separate) ongoing Marine Licence Applications (MLA) which, at the time of writing, are nearing determination (MLA reference for English waters: MLA/2022/00273; and MLA reference for Scottish waters: 00009943).

1.2 Purpose of the Report

It is necessary to undertake a further geophysical survey of the Project Marine Installation Corridor as there is the potential for unexploded ordnance (UXO), resulting from wartime military operations or more recent military training activities, to be present on the seabed along the cable route. These UXOs present a potentially significant health and safety hazard to cable construction work. Where identified as a hazard, it is necessary to remove confirmed UXO prior to construction (this is activity is not included within this report). The UXO geophysical survey is required for the identification and confirmation of the presence of any UXO hazards prior to installation.

The purpose of this document is to identify and assess the UXO geophysical survey activities that have the potential to affect cetaceans (whales, dolphins, and porpoises), marine turtles, (all of which are European Protected Species (EPS)), seals, and basking sharks (which whilst not EPS, are also of conservation concern as Marine Protected Species (MPS)[1]), along the Marine Installation Corridor. The risk to EPS species is assessed for Scottish, English, and offshore waters in this single report.

This risk assessment considers the potential effects of the proposed activities on species of conservation concern in the context of relevant legislation and guidance (see **Sections 5** and **6**), assessing the need for an EPS licence(s) and providing the information required by the Marine Scotland Licencing and Operations Team (MS-LOT) and the Marine Management Organisation (MMO) in support of any such applications. As such, all survey activities which have the potential to impact Marine Protected Areas (MPAs), EPS, and additional MPS (such as seals and basking shark), have been assessed.

[1] Basking shark are afforded legal protection within the 12 NM limit in UK territorial waters under Wildlife and Countryside Act 1981 (as amended); and seals are protected as Annex II species under the EU Habitats Directive. These species are considered in this assessment which otherwise relates to EPS.

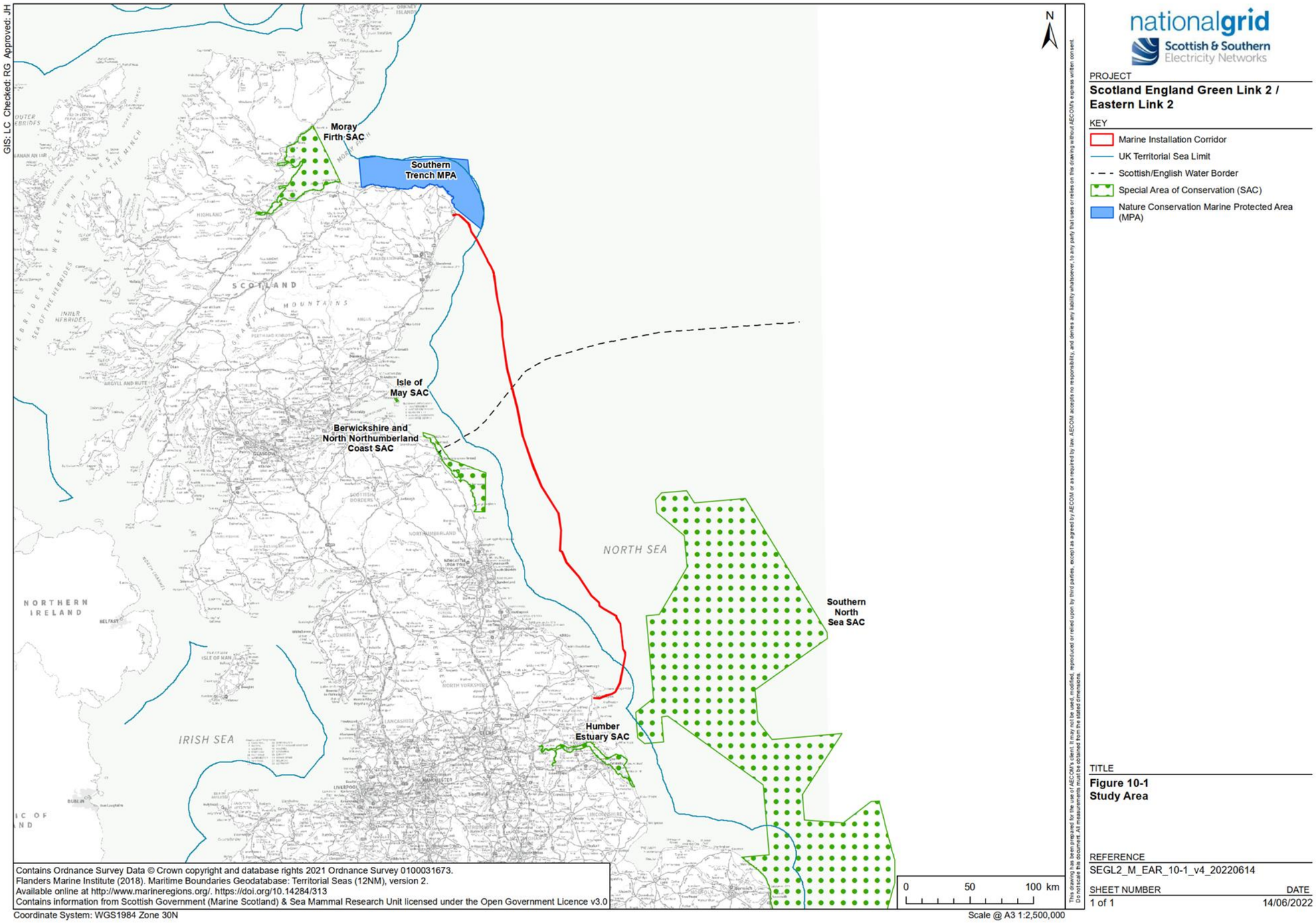

Figure 1. Proposed Eastern Green Link 2 Marine Installation Corridor (including designated sites for which marine mammals are a protected feature)[2]

[2] All other designated sites relevant to this ERA are listed in Appendix A

2. Legislative Context

All cetaceans and marine turtles are listed under Annex IV of the European union (EU) Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (known as the Habitats Directive) as EPS requiring strict protection.

The need to assess EPS in waters off England and Scotland relate to two articles of legislation:

- The Conservation of Habitats and Species Regulations 2017 (known as the Habitats Regulations) which transpose the Habitats Directive into national law. This legislation covers waters within the 12 nautical mile (NM) limit (known as territorial waters); and
- The Conservation of Offshore Marine Habitats and Species Regulations 2017 (known as the Offshore Regulations) which transpose the Habitat Directive into UK law for all offshore activities. This legislation covers UK waters beyond the 12 NM limit.

Both of these Regulations provide for the designation and protection of European sites (in this case Special Areas of Conservation (SACs)) and the protection of EPS. In Scotland only, Regulation 39(2)(a) of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations) sets out additional protection to EPS species from disturbance.

Although the UK is no longer part of the EU, the Habitats Directive is transposed into law by The Habitats Regulations and the Offshore Habitats Regulations. These regulations are still in force following the UK's withdrawal from the EU, meaning the strict protections for EPS remain.

Both the Habitats Regulations 2017 (under regulation 43) (and the Habitats Regulations 1994 in Scotland only) and the Offshore Regulations 2017 (under regulation 45) state that it is an offence to:

- deliberately capture, injure, or kill an EPS (including all cetaceans);
- deliberately disturb an EPS; or
- damage or destroy a breeding site or resting place of an EPS.

Disturbance is defined as an activity which impairs the ability of the EPS to survive, breed, rear/nurture their young, to migrate or an activity which significantly affects the local distribution or abundance of the species.

If the risk of injury or significant disturbance cannot be reduced to negligible levels with mitigation, then an EPS licence (Scotland) or Marine Wildlife Licence (England) is required. In the UK, the relevant licensing is conducted through the national regulators (MMO for England and MS-LOT for Scotland). In England, if it is concluded that there are no significant impacts, a Marine Licencing exemption notification can be submitted to the MMO. The Joint Nature Conservation Committee (JNCC) is the overarching statutory adviser on UK and international nature conservation. Licences are granted under the following circumstances:

- The reason for the licence relates to one of the specified purposes listed in the Habitats Regulations;
- There is no alternative way to reduce injury or disturbance risk; and
- The action covered under the licence is not of detriment to the 'favourable conservation statuses of the species.

Favourable Conservation Status (FCS) is defined in the Habitats Directive as the following:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable element of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

As shown in **Figure 1**, the proposed Marine Installation Corridor and landfall location are located both within and outside the 12 NM limit of the English and Scottish territorial waters. Therefore, both the Habitats and Offshore Regulations apply.

Other relevant legislation includes:

- For seals: The Protection of Seals (Designated Sea Haul-out Sites) (Scotland) Order 2014, and Marine (Scotland) Act 2010;
- For basking shark: Wildlife and Countryside Act 1981 (as amended).

3. Description of Planned Activities

The operation of survey vessels as part of the UXO geophysical survey has the potential to disturb EPS and other species of conservation concern via the generation of underwater sound. There is also an increased risk of collisions between survey vessels and these receptors.

A series of parameters have been defined in the following section which represent a worst-case scenario. These parameters have been based on previous UXO geophysical survey specification and previous experience of comparable UXO geophysical survey activity.

3.1 Extent

The length of the Project Marine Installation Corridor is approximately 440 km (435.7 km), with 154.2 km occurring in Scottish waters and the remaining 286.2 km in English waters. A further breakdown of the survey distances is shown in **Table 1**.

Table 1. Survey distances (km) within the nearshore (i.e., water depths of <10 m), territorial* (<12 nm) and offshore (>12 nm) Scottish and English waters

Country	Survey area	Distance (km)
Scotland	Nearshore	1.3
	Territorial waters	24.7
	Offshore	128.2
England	Nearshore	8.7
	Territorial waters	31.4
	Offshore	246.1
**Excluding nearshore area*		

3.2 Timing and Duration

The UXO geophysical survey is anticipated to commence Q2 2023. However, the exact programme is subject to the appointment of the survey contractor, vessel availability, their final survey strategy and weather conditions.

Currently, the total survey duration is anticipated to be approximately 130 days (including weather and other downtime). Within this period works shall be completed in the nearshore and offshore areas of the route concurrently. A breakdown of the approximate survey durations within each sea area is shown in **Table 2** below. These durations have been calculated on a pro-rata basis and are indicative only.

Within English waters, surveying in nearshore areas is expected to take approximately 20 days to complete whilst surveying of the remaining territorial and offshore waters is expected to take 12 and 73 days, respectively. Within Scottish waters, geophysical survey of the nearshore and the remaining territorial and offshore waters is expected to take approximately 37, 8 and 38 days, respectively.

Works within the territorial and offshore areas will be undertaken 24-hours a day, seven days a week whereas within the nearshore area a 12-hour working day shall be adopted seven days a week.

To allow for possible delays in survey deployment (e.g., due to poor weather conditions etc.) the licence applications are made for the period of 01 April 2023 to 31 March 2024.

Table 2. Approximate survey durations (days) within the nearshore (i.e., water depths of <10 m), territorial (<12 NM) * and offshore (>12 NM) Scottish and English waters.

Country	Survey area	Total Survey Duration (days)
Scotland	Nearshore	37
	Territorial waters	8
	Offshore	38
England	Nearshore	20
	Territorial waters	12
	Offshore	73
**Excluding nearshore area*		

3.3 Proposed Vessel(s)

It has been assumed that two vessels will be required to deliver the surveys – one smaller nearshore vessel (approximate length of 13 m) to undertake surveys in water depths of <10 m LAT and a larger offshore vessel (approximate length of 60 m) for water depths of >10 m LAT. However, it is possible that a second vessel may be mobilised for both the nearshore and offshore areas due to either programme or availability constraints.

Offshore vessels are expected to mobilise from a major port on the east coast of either England or Scotland (such as Hartlepool or Aberdeen), whilst inshore vessels are expected mobilise from any of the ports nearby to the respective nearshore work areas (i.e., Peterhead and Bridlington).

3.4 UXO geophysical survey Activities

The UXO geophysical survey includes four activities, three of which use acoustic methods which have the potential to disturb EPS. These are outlined in **Table 3** below, along with the equipment specifications anticipated to be used by the UXO geophysical survey contractor. The makes and models presented in **Table 3** are examples of systems that may be used for the surveys (they are consistent with the Applicant's previous UXO geophysical survey experience).

Table 3. UXO geophysical survey activities and the required equipment specifications for the nearshore and offshore survey areas

Survey activity	Equipment specification	Nearshore survey – example make and model	Offshore survey - example make and model
Magnetometer	A device that measures magnetic field or magnetic dipole moment. The survey data will be acquired using a very high-resolution caesium vapour magnetometer or equivalent.	Geometrics G-882	
Underwater acoustic positioning (USBL)	All subsurface positioning of towed systems must use an Ultra-Short Base Line (USBL) underwater positioning system. Slant range accuracy of the USBL system used must be better than 0.1 % slant range at 20 dB Signal-to-Noise Ratio (SNR).	Easytrak Nexus 2	Kongsberg HiPAP 502, 2 Poles available, iXBLUE GAPS & Sonardyne Ranger 2
Multi-beam echo sounding (MBES)	A hull or tow-fish mounted swathe or multi-beam echo sounder system. A single beam echo sounder shall be used on all survey lines to validate the multi beam interpretation.	Dual head Teledyne RESON SeaBat® 7125-SV2, Full R2Sonic 2024 or 2022 multibeam survey systems	Hull-Mounted Kongsberg Maritime EM 2040 Dual Rx system, R2Sonic 2024 (200-400 kHz, optional 700 kHz)

Survey activity	Equipment specification	Nearshore survey – example make and model	Offshore survey - example make and model
Side Scan Sonar (SSS)	The SSS is expected to be dual frequency hydrographic sonar with preferably a dual frequency chirp configuration.	EdgeTech 4200 Series, EdgeTech 4125 (400/900 kHz), Edgetech FS4200 SP (300-600kHz dual frequency)	EdgeTech 4200 Series, EdgeTech 4125 (400/900 kHz),

3.5 Sound Source Levels

To calculate the level of sound propagation needed for the assessment of impacts to EPS, the maximum noise output, or sound source level (SSL) for each survey activity is required. These values depend on the equipment being used, the power level at which it is being operated and the pulse length.

At the time of writing, a contractor for the UXO geophysical survey had not been appointed. Therefore, for the purpose of this assessment, published sound source levels have been used. These SSLs, which are presented in **Table 4**, have been derived from user manuals and/or survey data and assume that the equipment is being operated at the highest power levels and the longest pulse lengths. This provides the most conservative SSLs and ensures the assessment is representative of worst-case.

A number of the sound sources can be screened out of the appraisal either directly on the basis of their inherent acoustic characteristics (see below), or have such low sound source intensity that they are effectively masked by other sources:

- A magnetometer does not emit an acoustic signal in the water column. Therefore, no sound propagation calculations or mitigation are specifically proposed, and it can be **screened out of any assessment of impacts to EPS**;
- For MBES, no mitigation measures are required in waters less than 200 m, as the higher operating frequencies used fall outside the hearing frequencies of cetaceans and other marine receptors, and the sounds produced are likely to attenuate more quickly than the lower frequencies used in deeper waters (JNCC, 2017). Therefore, no sound propagation calculations or mitigation are specifically proposed for MBES, and it can be **screened out of any assessment of impacts to EPS**;
- The SSS will use a dual operating frequency of 600/900 kHz. This is beyond the hearing range of any EPS. Therefore, no sound propagation calculations or mitigation are specifically proposed, and it can be **screened out of any assessment of impacts to EPS**;
- USBL provides high resolution positioning data for the geophysical survey activities. The normal operating frequency is in the range of 25-35 kHz which is within the hearing range of cetaceans. **USBL is screened into the assessment of impacts to EPS;** and
- Based on the approximate lengths of potential survey vessels presented in **Section 3.3**, nearshore and offshore surveys are representative of small (<50 m) sized vessels. In comparison to background vessel activity in the North Sea, the additional vessels operating as part of the UXO geophysical survey are not considered to be a deviation from baseline conditions and do not represent a risk to EPS. Therefore, no sound propagation calculations or mitigation are specifically proposed for survey vessels, and it can be **screened out of any assessment of impacts to EPS**.
- Therefore, the only activity associated with the Marine Scheme that is within hearing range of EPS and has the potential to have adverse effects, is the operation of the USBL (
-

Table 4).

Table 4. Sound source levels for survey equipment

Survey activity	Operating Frequency (kHz)	Sound Source Level (SPL_{peak} dB re 1 uPa @1m)	Reference	Screened into risk assessment?
Magnetometer	N/A	N/A	Equipment specification sheets	x
MBES	170-450	221-235	Genesis Oil and Gas Consultants, 2011	x
SSS	600-900	210-226	Genesis (2011) and equipment specification sheet	x
USBL	25-35s	207 193 (SEL)	Equipment specification sheets	✓
Medium Sized Survey Vessel[3]	<1	173 (rms#)	Prideaux (2017)	x
# As a sound source that is continuous in nature the units for vessel sound pressure levels are route-mean-squared (rms).				

3.6 Actions Requiring Licencing

Under the Habitats Directive it is an offence to deliberately capture, injure or kill an EPS (including all cetaceans); deliberately disturb an EPS; or damage or destroy a breeding site or resting place of an EPS (see **Section 2**). Therefore, this application and associated risk assessment are submitted in relation to the potential for UXO geophysical survey activities, as described above, to disturb EPS. The key pathways for impact include:

- Lethal effect and physical injury to EPS from survey activities;
- Underwater sound disturbance to EPS from survey activities; and
- Increased risk of collisions with EPS and turtles.

3.7 Assessment of Satisfactory Alternatives

The UXO geophysical survey is required to assess the seabed conditions and identify any UXO (and/or any other ferrous objects) along the proposed Marine Installation Corridor and therefore, the requirement for these surveys is inherently linked to the requirement for the proposed Marine Installation Corridor. As outlined in **Section 1**, the Project is required to meet a specific need – to provide additional transmission capacity between the north and south of the UK across transmission network boundaries and help bring Scotland's extensive reserves of renewable energy to millions of homes across the rest of the UK.

In the Network Operations Assessment (NOA) 2020 report the Project was prioritised and noted as one of the 'Critical' options to proceed, and in December 2020 the Project was given Accelerated Strategic Transmission Investment (ASTI) status by Ofgem. Since then, the identification of a Marine Installation Corridor was achieved via a series of specialist studies considering technical, environmental, and economic factors as well as consultation with stakeholders regarding optioneering and corridor development. These are further detailed within the ongoing MLA (MLA/2022/00273).

The cable for the Project cannot be installed without a detailed inspection of the seabed to identify any potential UXO as their presence represents a significant risk, and therefore a scenario whereby the surveys are not undertaken is not an option in this instance.

[3] Sound source data for medium vessels from Prideaux G (2017), 'Technical Support Information to the CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities', Convention on Migratory Species of Wild Animals, Bonn.

4. Baseline Characterisation

4.1 Study Area and Key Data Sources

The study area has been determined at a scale that recognises the highly mobile and transient nature of many EPS and the potential implications of local impacts on wider populations. For example, there are known to be wide ranging coastal movements of bottlenose dolphin and long-distance foraging trips of up to 135 km by grey seals.

The study area for the baseline encompasses the Greater North Sea Ecoregion (North Sea, English Channel, Skagerrak and Kattegat) (ICES, 2018) but with focus on the western North Sea along the east coast of Scotland and England where the Marine Installation Corridor is to be located (**Figure 1**). This extent takes into consideration (where available) species specific data based on Management Units (MU) published by the Inter Agency Marine Mammal Working Group (IAMMWG) (IAMMWG, 2022). The International Council for Exploration of the Seas has defined Assessment Units (AU) for marine mammals, such as a North Sea AU for harbour porpoise. For less common species the AU areas are much larger.

Therefore, the broad study area for the marine mammal baseline is the North Sea AU (ICES, 2018), with a focus on the region that encompasses the Marine Installation Corridor and the most extensive marine mammal movements.

As part of the Small Cetaceans in European Atlantic waters and the North Sea (SCANS) Project, surveys have been undertaken within the study area to estimate the abundance of small cetaceans across the North Sea. The first survey was undertaken in 1994 and involved standard boat-based line transect surveys and aerial transect surveys based on the specific methods of Hiby and Lovell (1998) to estimate, for the first time, the abundance of various cetacean species in the North Sea and Celtic Sea. This programme has evolved and was repeated in 2005 (Hammond, *et al*., 2013) (i.e., SCANS-II) and again in 2016 (Hammond P. S., *et al*., 2017), updated in 2021 (Hammond P. , *et al*., 2021) (i.e., SCANS-III).

It should be noted that SCANS surveys were conducted in the summer (predominantly July) and therefore data is representative of summer distributions only (Hammond P. , *et al*., 2021). However, it is understood that the densities of cetaceans around the British Isles are likely to be highest during this season (Waggitt J. , *et al.,* 2019). Therefore, the abundances presented are considered to represent the worst-case scenario and show the highest likely abundances to be encountered within the study area. The Marine Installation Corridor will pass directly through survey Blocks R and O (**Figure 2**). Block R includes Scottish and English waters; Block O is entirely within English waters. Estimates of abundance for each marine mammal species have been derived for each survey block and for the total survey area.

Although the Marine Installation Corridor is in proximity to Blocks S and T, these are located approximately 25 km and 24 km north of the Scottish landfall, respectively. This is beyond the UXO geophysical survey area and therefore have not been considered further.

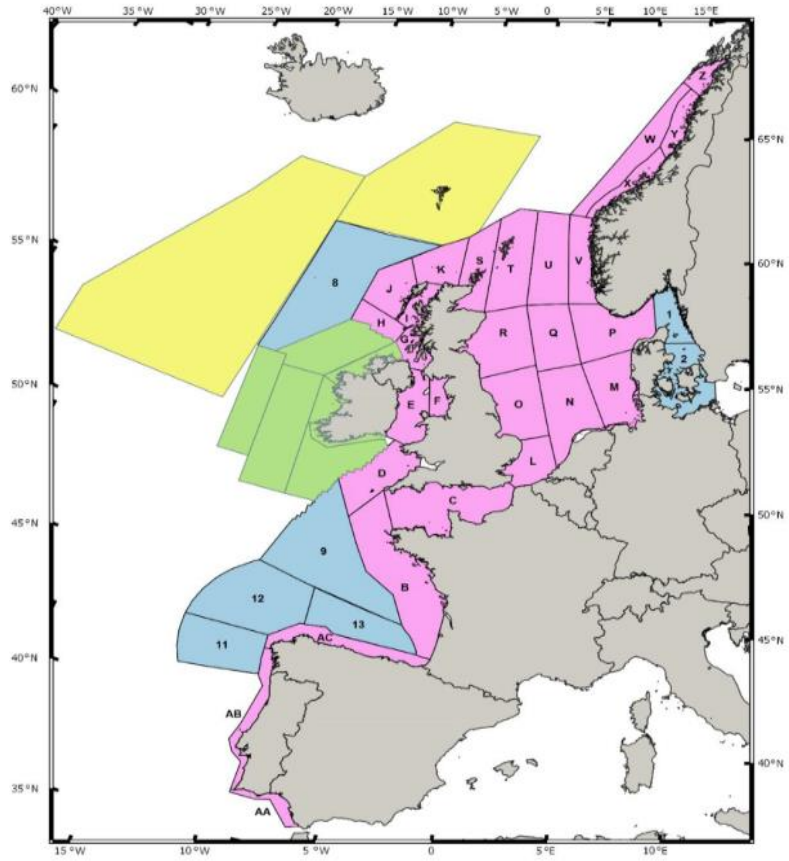

Figure 2. SCANS-III survey blocks – blue areas were surveyed by vessel and pink areas by air (Hammond P. S., *et al.*, 2017).

Other key data sources include:

- WWT Data (2001 – 2008) - WWT Consulting carried out aerial surveys for water birds. Opportunistic sightings of cetaceans, seals, turtles, sharks, and ocean sunfish were also recorded and reported in WWT Consulting (2009). This data provides information about the distribution and abundance of these taxa around the British Isles;
- Heinänen & Skov, (2015) – which has developed distribution models for harbour porpoise within the UK Exclusive Economic Zone based on 18 years of survey data collected as part of the Joint Cetacean Protocol;
- Waggit *et al*. (2019) – provides updated distribution models for 12 species of cetacean covering the northeast Atlantic based on survey data collected between 1980 and 2018; and
- Special Committee on Seals (SCOS) – SCOS provides scientific advice to the government annually on matters related the management of seal populations. This includes information related to the abundance, distribution.

4.2 European Protected Marine Species

4.2.1 Cetaceans

Within the Greater North Sea Ecoregion, the four most commonly occurring or resident cetacean species (ICES, 2019) include:

- Harbour porpoise *Phocoena phocoena*;
- Bottlenose dolphin *Tursiops truncatus*;
- White-beaked dolphin *Lagenorhynchus albirostris*; and
- Minke whale *Balaenoptera acutorostrata*.

This baseline characterisation focuses on these four key cetacean species including those considered by ICES to be common to the study area and for which Management Units (MUs) have been defined. A summary of the conservation protection afforded to these cetacean species is presented in **Table 5**.

In addition to these four species, a further five species that occur regularly in the region but are less common (ICES, 2019) are also considered within the assessment. These include the short-beaked common dolphin *Delphinus delphis*, Atlantic white-sided dolphin *Lagenorhynchus acutus*, long-finned pilot whale *Globicephala melas*, killer whale *Orcinus orca*, and Risso's dolphin *Grampus griseus*.

The IAMMWG has defined species MUs for a total of seven cetacean species. These include all those mentioned above with the exception of long-finned pilot whale and killer whale (IAMMWG, 2022).

Other species may also be occasional visitors within the study area, these include humpback whale *Megaptera novaeangliae*, sperm whale *Physeter catodon*, and beaked whales *Mesoplodon bidens*. While not specifically assessed, these species are covered by the other species detailed in this risk assessment.

Table 5. Summary of protection measures in place for the four most common cetaceans known to be present in the study area.

Common name	Latin name	Wildlife and Countryside Act, 1981	EC Habitats Directive (Annex)	Bonn Convention (Appendix)	Bern Convention (Appendix)	ASCOBANS	Priority Marine Features (Scotland)
Resident/common species							
Harbour porpoise	*Phocoena phocoena*	✓	II, IV	II[1]	II	✓	✓[6]
Bottlenose dolphin	*Tursiops truncatus*	✓	II, IV	II[2]	II	✓	✓[6]
White-beaked dolphin	*Lagenorhynchus albirostris*	✓	IV	II[3]	II	✓	✓[6]
Minke whale	*Balaenoptera acutorostrata*	✓	IV	-	II	-	✓[6]
Other cetacean species							
Atlantic white-sided common dolphin	Lagenorhynchus acutus	✓	IV	II[3]	II	✓	✓[5]
Short-beaked common dolphin	Delphinus delphis	✓	II, IV	II[2]	II	✓	✓[6]
Long-finned pilot whale	Lagenorhynchus albirostris	✓	IV	II[3]	II	✓	✓[5]
Killer whale	Orcinus orca	✓	IV	II	II	✓	✓[6]
Risso's dolphin	Grampus griseus	✓	IV	II[2]	II	✓	✓[4]

Bonn Convention:
[1] North and Baltic Sea, western North Atlantic, Black Sea and Northwest African populations
[2] North and Baltic Sea populations
[3] Only North and Baltic Sea populations
Priority Marine Features:
[4]Territorial waters
[5]Offshore waters
[6]Both

4.2.1.1 Harbour Porpoise

The harbour porpoise has a widespread distribution across the North Sea and Scottish waters, (Sea Watch Foundation, 2012a; Hague, Sinclair, & Sparling, 2020). Harbour porpoises are most common in waters less than 100 m deep, and rarely exceed 200 m depth (Evans, Anderwald, & Baines, 2003). They are present throughout the year, with numbers peaking from July to September (Hague, Sinclair, & Sparling, 2020). Numbers during the winter months tend to be lower, though it is suggested this may be due to decreased detectability during the winter. They forage mainly for sandeel *Ammodytes* sp. (Maeda, *et al*., 2021) and grow up to 1.5 m in length (MacLoed, Begona Santos, Reid, Scott, & Pierce, 2007). For the east coast waters of the UK, the highest density of animals occurs in the southern region of the North Sea (Hague, Sinclair, & Sparling, 2020), reflected in the designation of the Southern North Sea SAC specifically for harbour porpoise.

Harbour porpoise have been sighted in all SCANS-III blocks in Scottish waters (Hague, Sinclair, & Sparling, 2020) (Hammond, *et al*., 2021), generally being observed in small groups of up to three individuals. Block R, located in both Scottish and English waters, covers the largest proportion of the Marine Installation Corridor (**Figure 2**). The mean group size observed from the SCANS-III data was 1.38 individuals for Block R. In Block R an estimated abundance of 38,646 individuals (95% CL = 20,584 – 66,524) was recorded with a density of 0.599 animals per km^2 (Hammond, *et al*., 2021). Within the Marine Installation Corridor, the lowest SCANS-III density is recorded around the Scottish landfall (Hague, Sinclair, & Sparling, 2020) in Block R. The highest densities are shown to be in offshore waters of Block R, with densities starting to extend south into Block O.

In offshore English waters, beyond the 12 NM limit, Block O covers the southern extent of the Marine Installation Corridor (**Figure 2**) and was identified as having the highest abundance of harbour porpoise within the corridor. SCANS-III data give an estimated abundance of 53,485 individuals (95% Confidence Limits (CL) = 37,413 – 81,695), with a density of 0.888 individuals per $km^{2,}$ for Block O. The mean group size observed from SCANS-III data was 1.31 individuals, compared to an average of 1.35 individuals across all blocks (Hammond, *et al*., 2021). **Figure 3** presents the density distribution of harbour porpoise throughout the study area as determined during the SCANS-III survey undertaken in 2016. These densities suggest that harbour porpoises are highly likely to be present in the Marine Installation Corridor, particularly in the section passing through Block O.

Recent model predictions by Waggitt *et al*. (2019) for both summer and winter densities of harbour porpoise show summer densities increasing towards the Scottish landfall and encompassing the Marine Installation Corridor in offshore waters of the northern North Sea (**Figure 3**). Seasonal variation models produced by Waggitt *et al*. (2019) show a northward shift in harbour porpoise density between April-September to north eastern Scotland including Peterhead and the northern North Sea, with densities showing a southward shift during October to March, bringing higher densities of harbour porpoise to the English landfall and the central North Sea.

The most recent abundance estimate reported for the North Sea MU, was derived from updated data by IAMMWG (2022) of the SCANS-III survey (Hammond, *et al*., 2021) where 346,601 individuals (95% Confidence Interval (CI) = 289,498 – 419,967) were reported (**Table 7**). Of these, 159,632 individuals (95% CI = 127,442 – 199,954) were thought to be present in the UK portion of the Management Unit (MU) (i.e., abundance within the UK Exclusive Economic Zone (EEZ)) (IAMMWG, 2022).

The only site designated for harbour porpoise, located within 50 km [4] of the Marine Installation Corridor is the Southern North Sea SAC, located entirely in English waters (**Figure 1**) (JNCC, 2021a). This site is located 19 km to the southeast of the Marine Installation Corridor, in close proximity to the English landfall. See **Section 6** for further information on relevant designated sites.

The harbour porpoise is considered to be 'threatened and declining' in the Greater North Sea by the OSPAR commission. However, in the UK the range and future prospect of the harbour porpoise is considered to be of 'favourable' conservation status although the overall trend in the conservation status of this species is unknown (JNCC, 2019). Globally this species is considered 'vulnerable' by the International Union of Conservation of Nature (IUCN) (IUCN, 2021).

[4] A distance of 50 km has been selected as the distance within which SACs for cetaceans should be considered. This is based on SAC impact buffer zones agreed for the 'Habitat Regulations Assessment for the Northeast, Northwest, Southeast and Southwest Marine Plans' and guidance by the JNCC.

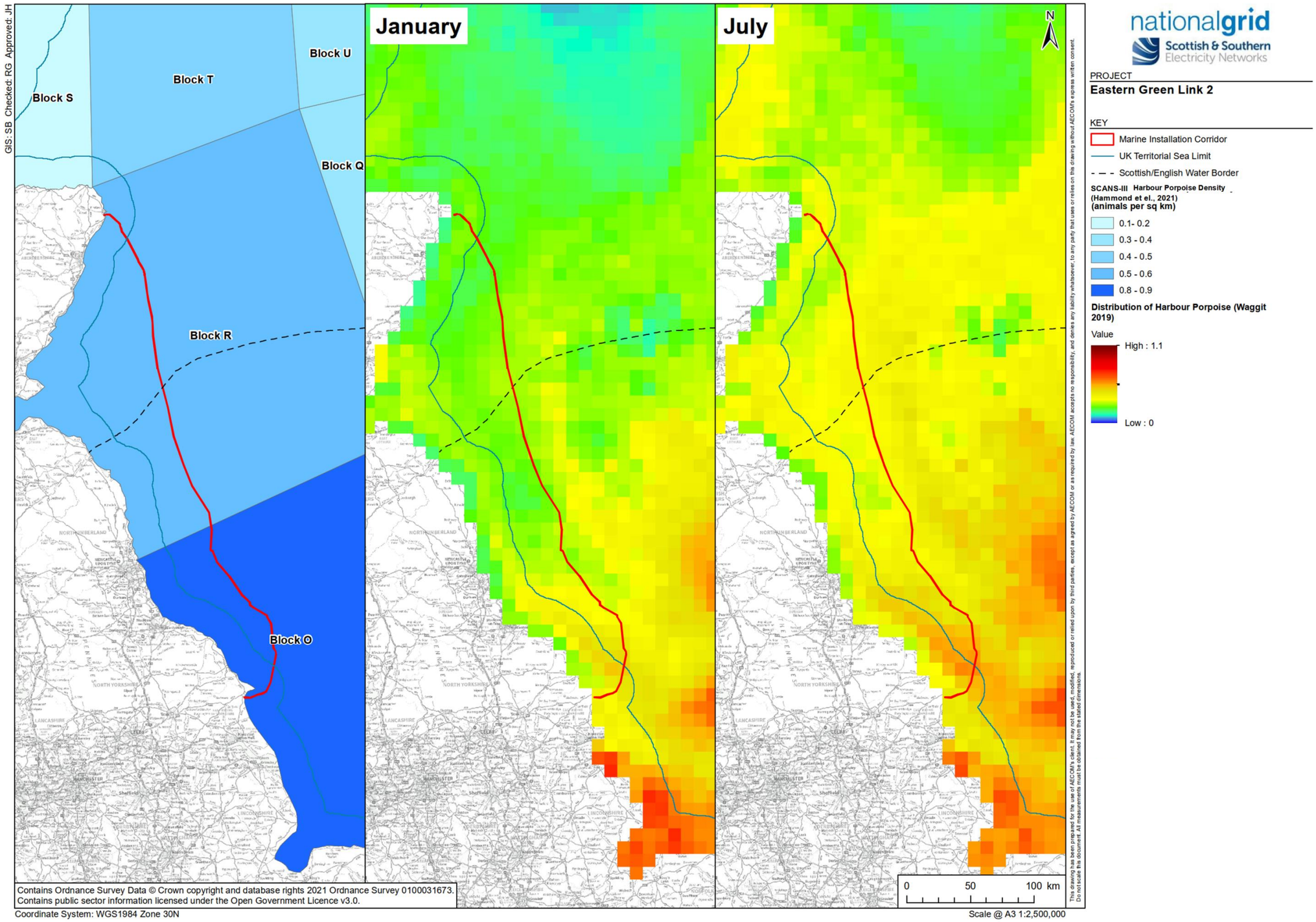

Figure 3. Estimated density of harbour porpoise for blocks surveyed during SCANS-III (July 2016) (Hammond, *et al*., 2021) and spatial variation in predicted densities (individuals/km^2) in January and July (Waggitt J. , *et al.*, 2019).

4.2.1.2 Bottlenose dolphin

The bottlenose dolphin is a large species reaching 2.5 m to 4.0 m in length and weighing up to 275 kg (Sea Watch Foundation, 2021a). There are two distinct ecotypes of bottlenose dolphin in UK waters – a wide-ranging offshore type, and an inshore type that tends to stay within 30 km of the coast and demonstrates habitat fidelity (Hague, Sinclair, & Sparling, 2020). There are several inshore groups in UK waters, with limited interchange between them (Robinson, *et al*., 2012; Cheney, et al., 2013; IAMMWG, 2022). There is relatively little known about the offshore ecotype compared with the coastal ecotype (Waggitt J. , *et al.*, 2019).. The coastal ecotype is resident to Scottish waters, found throughout the year, mostly in waters less than 150 m deep (Hague, Sinclair, & Sparling, 2020). However, numbers generally peak between July and October. Resident populations include those found in areas such as the Moray Firth SAC. The bottlenose dolphin has highly diverse and flexible feeding techniques, often displaying cooperative feeding, where dolphin pods work together to tightly pack fish shoals from opposite sides, consuming the fish from either side (Taylor & Saayman, 1972).

The study area falls within two IAMMWG Mus for this species: the Coastal East Scotland MU and the Greater North Sea MU. For the UK portion of the Greater North Sea MU the most recent abundance estimate was 1,885 individuals (95% CI = 476 – 7,461) (IAMMWG, 2022) (**Table 7**). However, very few bottlenose dolphins have actually been observed within the Greater North Sea MU (Thompson, *et al*., 2011).

A summary of SCANS-III abundance data for bottlenose dolphin is provided in **Figure 4** and **Table 6**. Block R had the highest abundance, with 1,924 individuals (95% CL = 0 – 5,048) with a density of 0.030 animals/km^2 were observed (**Figure 4**). Pods of bottlenose dolphin within Block R had a mean group size of 5.25 (Hammond P. S., *et al*., 2017). This block had the highest abundance and covers the largest proportion of the Marine Installation Corridor including the Scottish landfall. Pods of bottlenose dolphin within Block R had a mean group size of 5.25 individuals. No bottlenose dolphins were recorded in Block O in English waters.

The findings of the SCANS-III surveys are consistent with long-term data sets (1980 – 2018) used by Waggitt *et al.* (2019) to predict densities of bottlenose dolphin across the northeast Atlantic. These data have shown that there is very little variation offshore in bottlenose dolphin density in the North Sea throughout the year, with densities remaining low (**Figure 4**). There were no data reported for coastal bottlenose dolphins in these predictions as coastal ecotypes were excluded.

The Coastal East Scotland MU, which is entirely in UK waters has an estimated abundance of 189 individuals (95 % CL = 155-216) (IAMMWG, 2021). The Coastal East Scotland MU includes the resident bottlenose dolphin population in the Moray Firth SAC (Thompson, *et al.*, 2011). The latest population estimate for the Moray Firth SAC bottlenose dolphins was taken in 2016 where 103 individuals were recorded (95% CI = 93 – 115). Although inter-annual variability has been observed, the number of bottlenose dolphins using the SAC has remained stable (Cheney, Graham, Barton, Hammond, & Thompson, 2018).

However, the bottlenose dolphin population along the eastern coast of Scotland and England has been increasing in size and expanding in range, with future expansion and distribution shifts likely to occur (ArsoCivil, *et al.,* 2019).

In particular, since the data collected on bottlenose dolphin to inform the designation of the Moray Firth SAC, prior to 2005, the range of this population has extended south beyond the boundary of the SAC, as far south as the Firth of Forth and Berwick-upon-Tweed (Hague, Sinclair, & Sparling, 2020; ArsoCivil, *et al.,* 2021), around 300 km away (Hague, Sinclair, & Sparling, 2020). In recent years, the Firth of Tay and Tay Estuary, and St Andrews Bay, have been identified as important areas for Moray Firth bottlenose dolphins (Hague, Sinclair, & Sparling, 2020; ArsoCivil, *et al.,* 2021), particularly in the summer months, with an estimated 52% of the Moray Firth population found here (ArsoCivil, *et al.,* 2019).

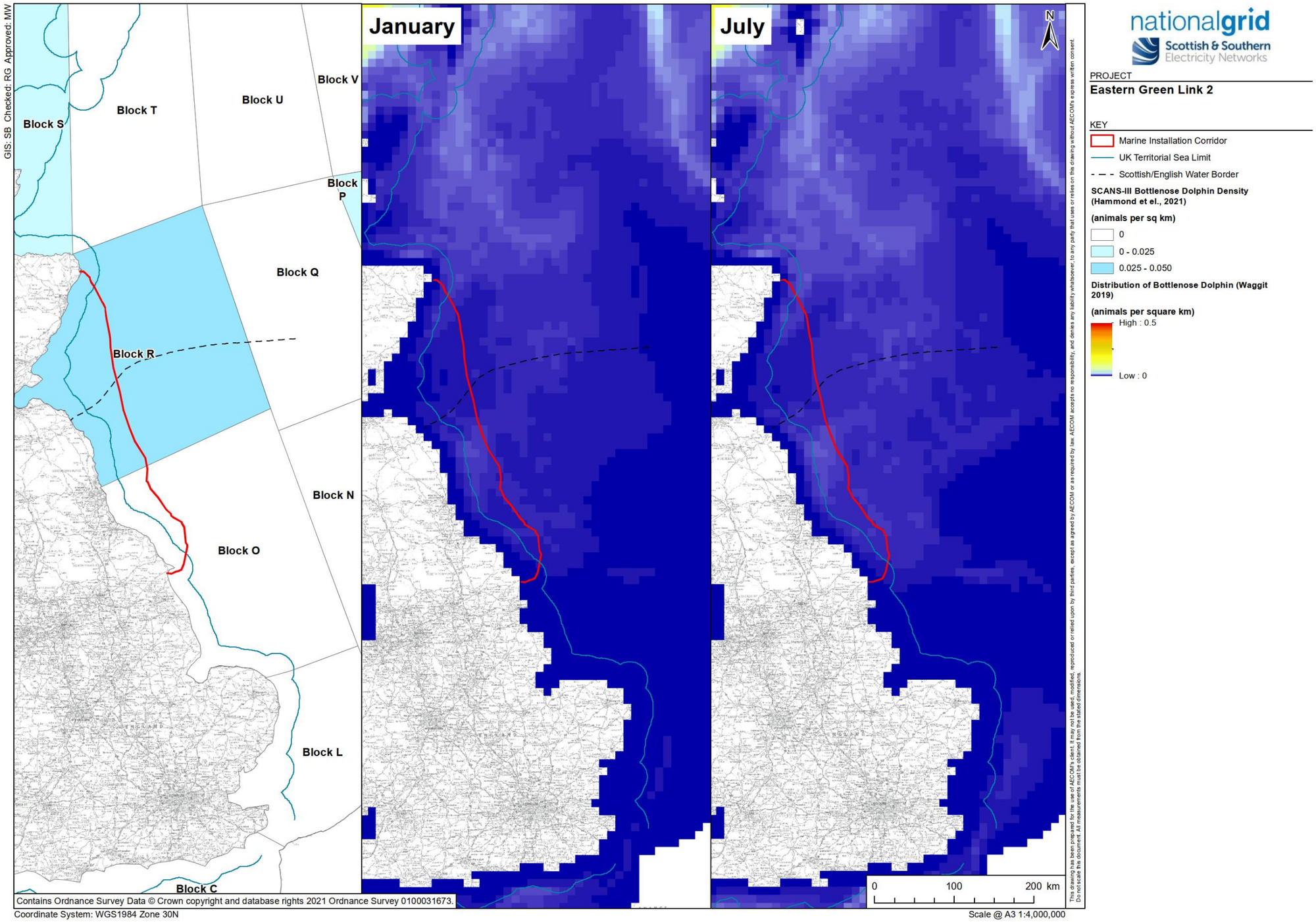

Figure 4. Estimated density of bottlenose dolphin for blocks surveyed during SCANS-III (July 2016) (Hammond P. , *et al*., 2021) and spatial variation in predicted densities (individuals/km^2) in January and July (Waggitt J. , *et al.*, 2019)

4.2.1.3 White-beaked dolphin

The white-beaked dolphin is endemic to the North Sea (Sea Watch Foundation, 2012b), with around 36,000 individuals thought to be in the population (IJsselddijk, *et al*., 2018). This species prefers waters less than 200 m deep and is present year-round in Scottish waters but is most frequently observed during the summer months, peaking in August (Hague, Sinclair, & Sparling, 2020). This is indicated by increases in density in the northern and central North Sea during the summer (Waggitt J. , *et al.*, 2019). Prey of the white-beaked dolphin comprises of 95% fish, with haddock and whiting being the most important (Canning, *et al*., 2008), though they also feed on cephalopods and crustaceans (Sea Watch Foundation, 2012b).

Based on both survey data and modelling, the density of white-beaked dolphin close to the coast is very low (Hammond, *et al.*, 2021). During the SCANS-III survey, high estimated densities were recorded in the northern North Sea (Hammond, *et al*., 2021). Data show there is a high-density hotspot of white-beaked dolphin in eastern Scottish offshore waters, including in Block R (Hague, Sinclair, & Sparling, 2020). In Block R, a total of 15,694 individuals (95% CL = 3,022 – 33,340) with a density of 0.243 individuals per km^2 were recorded (**Figure 5**).

In English territorial waters and within the EEZ, which falls within Block O, density was very low (Hague, Sinclair, & Sparling, 2020). In this block a total of 143 white-individuals (95% CL = 0 – 490) were estimated, with a density of 0.002 individuals per km^2 (Hammond, *et al*., 2021).

Recent model predictions indicate reasonably high densities of white-beaked dolphin within the whole of the northwestern region of the North Sea, particularly around the coast of northeast England and northern Scotland, with densities persisting in the latter region during the winter (Waggitt J. , *et al.*, 2019). There have also been reports of sightings around Flamborough Head (WWT Consulting, 2009), located approximately 5 km to the north of the English landfall. However, modelling data indicate density in this region is low (Waggitt J. , *et al.*, 2019) (**Figure 5**). Modelling also shows the region of higher density expands southwards during the summer months towards the southern North Sea (Waggitt J. , *et al.*, 2019) and includes the region in which the Marine Installation Corridor and the Scottish and English landfalls sit. This suggests that while it is likely that white-beaked dolphins will be present around the Marine Installation Corridor in Scottish waters throughout the year, their presence in English waters is less likely but may increase in the summer months.

The IAMMWG MU for white-beaked dolphin is the Celtic and Greater North Sea MU. The most recent estimated abundance for white-beaked dolphins in the Celtic and Greater North Seas MU is 43,951 individuals (95% CI=28,439 – 67,924) (**Table 7**). Of these, 34,025 individuals (95% CI=20,026 – 57,807) are believed to occur in the UK portion. The estimate was derived from the updated SCANS-III abundance estimates for continental shelf waters, representing the core range for this species (IAMMWG, 2021; Hammond P. , *et al.*, 2021).

At present this species is considered to have a ‘favourable’ conservation status in UK waters (JNCC, 2019) and globally it is of ‘least concern’ (IUCN, 2021).

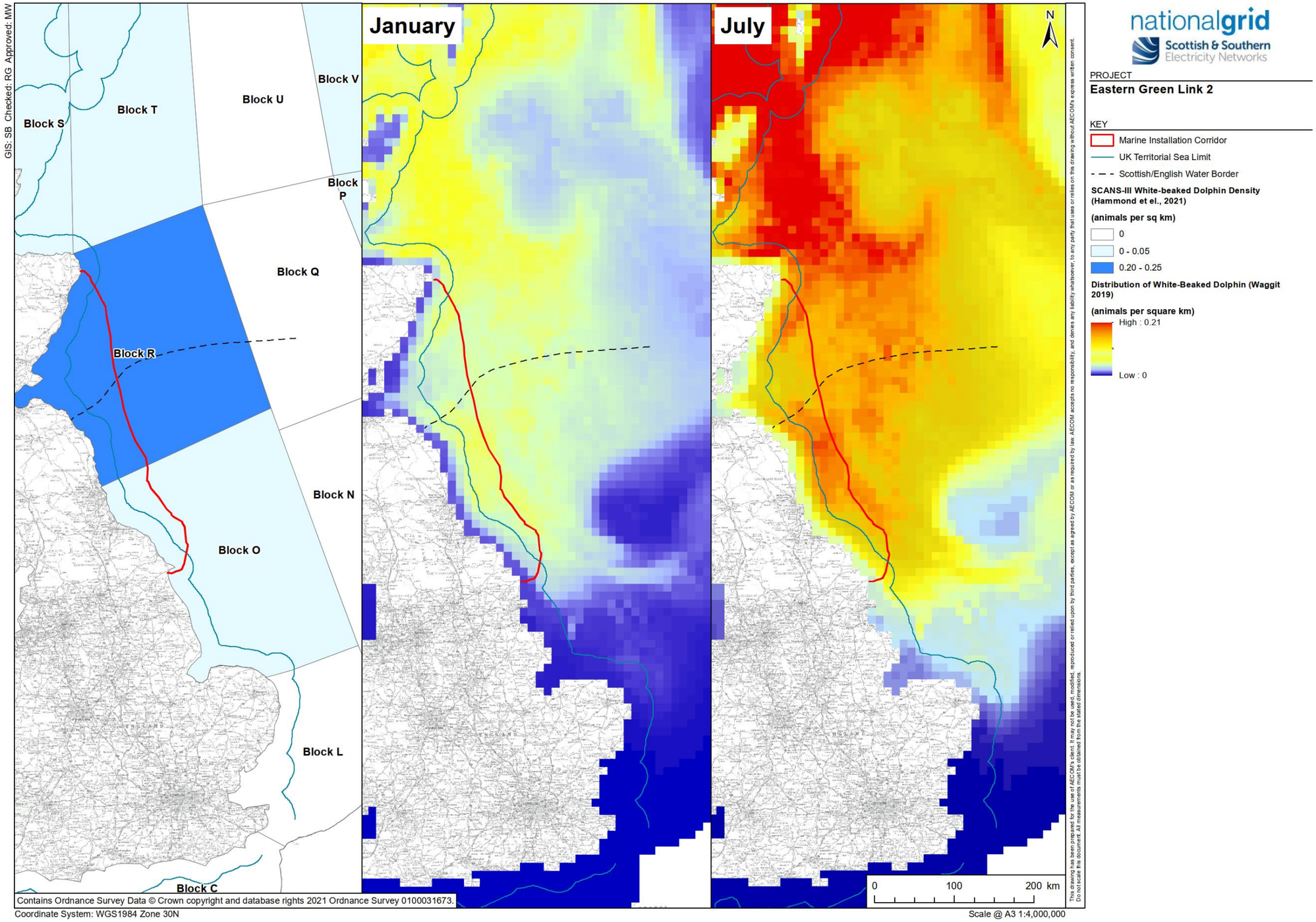

Figure 5. Estimated density of white-beaked dolphin for blocks surveyed during SCANS-III (July 2016) (Hammond P. , *et al.*, 2021) and spatial variation in predicted densities (individuals/km^2) in January and July (Waggitt J. , *et al.*, 2019).

4.2.1.4 Minke whale

The minke whale is relatively common in UK waters, concentrated in coastal waters around Scotland with most sightings between June and August (Hammond, *et al*., 2021). They are also present in offshore areas of the North Sea indicating the density of this species within the Marine Installation Corridor will be high. It has been suggested there are three different foraging behaviours exhibited by minke whales: using fast movements in different directions, associating their foraging with seabird feeding activity (particularly in late summer (Evans, Anderwald, & Hepworth, 2008), and using lunge feeding (de Boer, 2010). The dominant prey item is sandeel, however they also feed on other fish species including herring, haddock, and mackerel (Olsen & Holst, 2001).

Figure 6 provides a summary of SCANS-III data for minke whale. Hague *et al*. (2020) state that density predictions for the minke whale are high in the north and east of Scotland. Hodgson (2014) reports that minke whales show preference for areas with high primary productivity and photosynthetically active radiation, as well as euphotic depth and suggests that they require high densities of prey for effective foraging. SCANS-III density data shown in Hague *et al*. (2020) also displays a hotspot of minke whale located in Block R. Block R exhibited the highest abundance of all the survey blocks (Hague, Sinclair, & Sparling, 2020) with 2,498 individuals (95% CL = 604 – 6,791) recorded and a population density of 0.039 individuals per km^2. The average group size was 1.18 (Hammond, *et al*., 2021). The hotspot also extends south offshore into Block O where 603 individuals (95% CL = 109 – 1,670) were recorded (**Figure 6**). The population density was estimated to be 0.010 individuals per km^2, and the average group size was 1.0 (Hammond, *et al*., 2021). However, in the location of the English landfall in Block O, data shows that density is much reduced despite an increase abundance (Hague, Sinclair, & Sparling, 2020).

There is a small southward trend in density observed in the summer months extending from the northern North Sea into the central North Sea (Waggitt J. , *et al*., 2019) (**Figure 6**). Density also increases in the northern North Sea in Block S, particularly around the north-east coast of Scotland during this time (Waggitt J. , et al., 2019; Hague, Sinclair, & Sparling, 2020). Minke whale presence has been observed to increase in the Moray Firth SAC around June and July, related to the location of aggregations of suitable prey, particularly sandeels, as predicted by the environmental variables underlying these groupings, such as increased photosynthetically active radiation associated with increased productivity (Hodgson, 2014). This increase suggests it is likely minke whales will also be present around the Scottish landfall during the summer months and the offshore regions of the Marine Installation Corridor.

The IAMMWG MU for minke whale is the Celtic and Greater North Sea MU. The most recent estimated abundance is 20,118 individuals, of which 10,288 individuals (95% CI=6,210-17,042) are believed to occur in the UK EEZ (Hammond, *et al*., 2021) (**Table 7**). The Southern Trench Marine Protected Area (MPA) MPA is located 1.96 km north from the Marine Installation Corridor, and is in place to protect the minke whale, as well as other biodiversity features.

This species is considered to have a ‘favourable’ conservation status in UK waters with respect to its range (JNCC, 2019) and is of ‘least concern’ globally (IUCN, 2021).

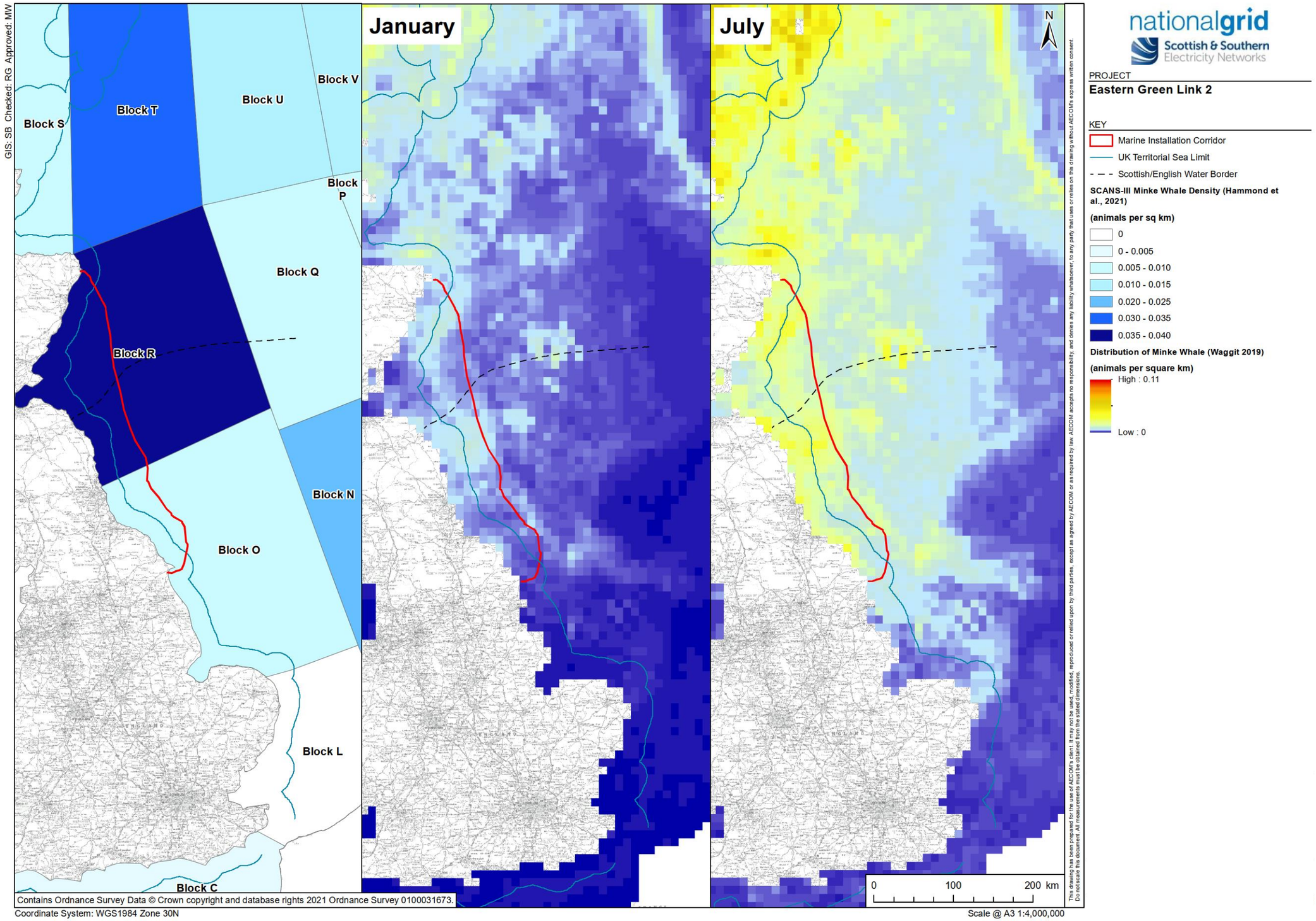

Figure 6. Estimated density of minke whale for blocks surveyed during SCANS-III (July 2016) (Hammond P. , *et al.*, 2021) and spatial variation in predicted densities (individuals/km^2) in January and July (Waggitt J. , *et al.*, 2019).

4.2.1.5 Other cetacean species

In addition to the four most common species, an additional five cetaceans are likely to occur within the study area at times but are less common. These species are also of conservation interest and are therefore also protected under national and international legislation (**Table 5)**. These species include:

- Atlantic white-sided dolphin;
- Short-beaked common dolphin;
- Long-finned pilot whale;
- Orca; and
- Risso's dolphin.

Atlantic white-sided dolphin

Atlantic white-sided dolphins prefer deeper, cool waters (7 ºC to 12ºC), and are often found along the edges of continental shelves at water depths of 100 m to 500 m (Reid, Evans, & Northridge, S.P, 2003). In UK waters this species is distributed in a broad zone from the west of Ireland to the north and northwest of Britain. They are found in low numbers in deep offshore waters around the north of Scotland and northern North Sea during the summer (Hague, Sinclair, & Sparling, 2020) but are rare in the central and north eastern North Sea ((Reid, Evans, & Northridge, 2003; Waggitt J. , *et al.,* 2019). Modelling by Waggitt *et al*. (2019) shows very low densities around the UK in both summer and winter months (Hague, Sinclair, & Sparling, 2020). The most recent estimated abundance for white-sided dolphins in the Celtic and Greater North Seas MU is 18,128 individuals (95% CI=6,049-54,323), with 12,293 of these individuals (95% CI=3,891-38,841) occurring in the UK portion (IAMMWG, 2022). There are only density estimates for Block R. Block R had an abundance of 644 individuals (95% CI=0-2,069) and a density of 0.01 individuals per km^2 (Hammond, *et al*., 2021). The mean group size reported is 3 individuals.

Short-beaked common dolphin

The short-beaked common dolphin is often found in continental shelf waters, particularly in the Celtic Sea and Western Approaches to the Channel, and off southern and western Ireland (Waggitt J. , *et al.*, 2019), in average group sizes of 14 individuals (Reid, Evans, & Northridge, S.P, 2003). It has been observed occasionally in the North Sea, mainly in summer (June to September) (Reid, Evans, & Northridge, S.P, 2003), with distribution more concentrated offshore and to the west of Scotland (Hague, Sinclair, & Sparling, 2020). There are estimated to be a total of 56,556 individuals (95% CI=33,014-96,920) within the Celtic and Greater North Seas MU (IAMMWG, 2022). Of these, 13,607 individuals (95% CI=8,720-21,234) are predicted to occur within the UK proportion of the MU. There are no abundance or density estimates available for Blocks R or O for this species.

Long-finned pilot whale

The long-finned pilot whale is a deep-water species (greater than 200 m), rarely sighted in the shallower waters around northern Scotland, the northern North Sea and the Channel (Reid, Evans, & Northridge, S.P, 2003; Hague, Sinclair, & Sparling, 2020; Waggitt J. , *et al.,* 2019). This species tends to be found to the west of the UK; however, densities are still low (Hague, Sinclair, & Sparling, 2020; Waggitt J. , *et al.,* 2019). There are no abundance or density estimates available for the relevant SCANS blocks for this species, or for the MU.

Orca

In UK waters, orca are most common off northern and western Scotland and to a lesser extent west and south of Ireland. They are usually seen as solo individuals or in groups of eight individuals maximum (Evans, Anderwald, & Baines, 2003). They are rarely observed in the central North Sea (Reid, Evans, & Northridge, S.P, 2003). Modelling by Waggitt *et al*. (2019) shows that there are low densities of orca in the northern North Sea and eastern Scottish waters, and around much of the UK throughout the year, with very little seasonal variation (Hague, Sinclair, & Sparling, 2020; Waggitt J. , *et al.,* 2019). Abundance or density estimates for orca were not reported in SCANS data (Hague, Sinclair, & Sparling, 2020).

Risso's dolphin

Risso's dolphin is a continental shelf species (Frantzis & Herzing, 2002; Reid, Evans, & Northridge, 2003). The coastal ecotype is present throughout the year in Scottish waters, with densities increasing

during the summer months (Hague, Sinclair, & Sparling, 2020). Most sightings in UK waters are in western Scotland, with the waters surrounding the Outer Hebrides forming a hotspot (IUCN, 2021). There are other clusters of sightings in the southern Irish Sea and off southwest Ireland. There are few records of this species within the central and southern North Sea (Reid, Evans, & Northridge, 2003). There have been some sightings reported in winter off the northeast coast of Scotland. There are no abundance or density estimates from SCANS data for this species. There are estimated to be a total of 12,262 individuals (95% CI=5,227 - 28,764) within the Celtic and Greater North Seas MU (IAMMWG, 2022). Of these, 8,687 individuals (95% CI=2,810 – 26,852) are predicted to occur within the UK portion of the MU.

4.2.1.6 Summary of Cetacean Abundance and Density Estimates

Approximate abundances and densities for the four frequent/resident cetacean species within the vicinity of the Marine Installation Corridor are provided in **Table 6 and Table 7** below. These data are based on the most recent SCANS-III surveys for survey Block O and R (Hammond P. S., *et al*., 2017).

Block O has a particularly high abundance and density of harbour porpoise whilst Block R immediately to the north has a high abundance and density of all four species (in relative terms), and so appears to be of importance to cetaceans.

Table 6. Summary of abundance and density estimates for the four key cetacean species by SCANS-III survey block.

SCANS-III Survey Block	Species	Density (individuals/km^2)	Total population size per block
O (East coast of England)	Harbour porpoise	0.888	53,485
	Bottlenose dolphin	0	0
	White-beaked dolphin	0.002	143
	Minke whale	0.010	603
R (Northeast of England and east of Scotland)	Harbour porpoise	0.599	38,646
	Bottlenose dolphin	0.030	1,924
	White-beaked dolphin	0.243	15,694
	Minke whale	0.039	2,498
Source: (Hammond P. , *et al*., 2021)			

Table 7. Summary of abundance of the four key cetacean species by MU

Species	MU	Total Abundance in MU	Total abundance in UK portion of MU
Harbour porpoise	North Sea MU	346,601	159,632
Bottlenose dolphin	Greater North Sea MU	2,022	1,885
	Coastal East Scotland MU#	224	224
White-beaked dolphin	Celtic and Greater North Sea MU	43,951	34,025
Minke whale	Celtic and Greater North Sea MU	20,118	10,288
Source: IAMMWG (2022) *# Bottlenose dolphin population estimate taken from (ArsoCivil, et al., 2021)*			

4.2.2 Sea Turtles

The leatherback sea turtle *Dermochelys coriacea* is the largest species of marine turtle and the only one to regularly visit higher latitude waters. Each summer leatherbacks migrate to UK waters where they feed on jellyfish. They are primarily found on the western coast although occasional sightings are recorded on the east coast of Scotland and northeast coast of England (Botterell, Penrose, Witt, & Godley, 2020; Reeds, 2004) (**Figure 7**).

In addition to the leatherback turtle, loggerhead *Caretta caretta*, green *Chelonia mydas*, hawksbill *Eretmochelys imbricate,* and Kemp's Ridley turtles *Lepidochelys kempii* are very occasionally observed in UK waters, although there are almost no sightings of these species on the east coast of Scotland and northeast coast of England.

Turtles have a hearing range at low frequencies only, with highest sensitivity between 100 and 400 Hz with some reports of hearing up to 1.2 or 2 kHz. The operating frequency of USBL sound sources (**Table 4**) is significantly outside this hearing range and therefore, the potential impact to turtles from underwater sound disturbance is not considered further.

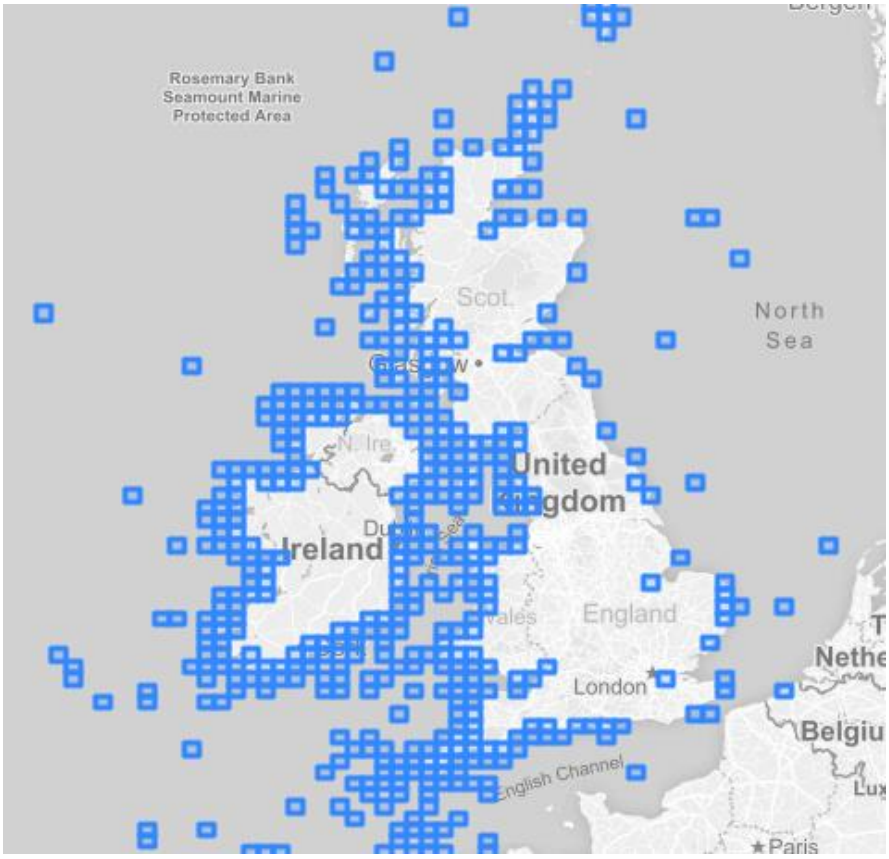

Figure 7. Sightings of leatherback turtle around the UK and Ireland (Reeds, 2004).

4.3 Other Marine Species

4.3.1 Pinnipeds

Whilst not EPS, pinniped species including the harbour seal *Phoca vitulina*, and grey seal *Halichoerus grypus,* are protected as Annex II species under the EU Habitats Directive. Their haul-out sites are also protected by The Protection of Seals (Designated Sea Haul-out Sites) (Scotland) Order 2014. These species are considered below.

4.3.1.1 Harbour seal

Approximately 32% of European harbour seals are found in the UK (SCOS, 2021). The estimated total population of harbour seals for the UK from most recent counts during the moulting season 43,750 (approximate 95% CI: 35,800-58,300) (SCOS, 2021). Around 85% of the total UK population of harbour seals are located in Scotland (SCOS, 2021). On the east coast of Scotland, their distribution is restricted with individuals concentrated in major estuaries (Carter, *et al.*, 2020) (**Figure 8**). The Marine Installation Corridor falls within the East Scotland Seal MU and the Northeast England Seal MU. Recent summer mean harbour seal counts (2016-2021) identified 343 and 79 individuals within these two MUs, respectively (SCOS, 2021).

As an Annex II species of the EU Habitats Directive, the harbour seal is a designating feature of a total of 16 SACs in the UK (SCOS, 2021). Three of these, the Firth of Tay and Eden Estuary SAC in eastern Scotland and the Wash and North Norfolk Coast SAC in East Anglia, occur in the North Sea. These SACs support nationally important breeding colonies of harbour seal (~7% of the total UK population). The Firth of Tay and Eden Estuary SAC is located 93.5 km to the west of the Marine Installation Corridor, whilst the Wash and North Norfolk Coast SAC is located over 100 km south of the Marine Installation Corridor and beyond the survey area.

The mean at-sea usage of harbour seals (i.e., the mean count of seals in the water at any point) is concentrated within the immediate vicinity of these SACs with very little offshore presence (Russell, Jones, & Morris, 2017; Carter, *et al*., 2020). Harbour seals persist in discrete regional populations, usually staying within 50 km of the coast (Russell, Jones, & Morris, 2017; Russell & McConnell, 2014). Harbour seals use haul-out sites to give birth and moult, leaving the haul-out site to forage (SCOS, 2021), during which they can spend up to 12 hours in the water (Thompson, Mackay, Tollit, Enderby, & Hammond, 1998). The highest abundance of hauled-out harbour seals appears to occur during the moulting season in the late summer months (August to September), with a slightly lower number of hauled-out seals during the pupping season of the early summer months (June to July) (Wilson S. , 2001). There is also variation between sexes, with females spending more time hauled-out in June and September compared to males, and less time in October to May (Cunningham, *et al*., 2009). However, it appears that time spent hauled-out is dependent on prey availability, with harbour seals in areas of high prey availability spending more time foraging and feeding (Härkönen, 1987).

When harbour seals leave haul-out sites to forage, they normally travel distances between 10 km and 60 km (Thompson, Mackay, Tollit, Enderby, & Hammond, 1998). This suggests that harbour seals from haul-out sites in both Scotland and England are unlikely to forage in the Marine Installation Corridor. Although some foraging trips have been recorded up to 144 km from haul-out locations (Cunningham, *et al*., 2009), these are rare and a 50 km screening distance for harbour seal activity is considered to be appropriate for this species.

The overall UK population of harbour seal has increased from 25,600 individuals in the 2007-2009 period to 31,500 individuals in the 2016-2021 period (SCOS, 2021). However, in the East Scotland MU, harbour seal counts have stayed fairly low, with some decline (SCOS, 2021). Populations are declining in the Firth of Tay and Eden Estuary SACs; and even as populations fluctuate in the Moray Firth, there is no indication of recovery (SCOS, 2021). The East Scotland Seal MU has the lowest count of harbour seals compared to all other Scottish Seal MUs (SCOS, 2021). However, the global conservations status of harbour seal is of ‘least concern’ (ICES, 2019).

4.3.1.2 Grey seal

Approximately 36% of the world’s grey seal population breeds in the UK. The main concentration of grey seals around the UK are in the Inner and Outer Hebrides and in Orkney (Duck, 2010) and Scottish waters are home to 80% of the total UK population (SCOS, 2021).

The east coast of Scotland and England is also home to a number of breeding populations (SCOS, 2021). The most recent data, for 2020, estimate the UK grey seal population size to be approximately 157,300 individuals (approximate 95% CI 144,600-169,400) (SCOS, 2021). Regional pup production estimates for North Sea colonies within proximity to the study area are presented in **Table 8**.

As an Annex II species of the EU Habitats Directive, the grey seal is the designating feature of a total of 13 SACs in the UK. Two of these, the Isle of May SAC and the Berwickshire and North Northumberland Coast SAC are located approximately 90 km and 38 km to the west of the Marine

Installation Corridor respectively. Both sites support important grey seal breeding colonies. The grey seal is also a qualifying feature, but not the primary reason for designation of the Humber Estuary SAC (located approximately 51 km southeast from the Marine Installation Corridor).

Grey seals use haul-out sites for breeding, resting, and moulting (SCOS, 2021). There is a designated grey seal haul-out site located at Ythan River Mouth approximately 25 km west from the Marine Installation Corridor, which provides protection to around 2,000 grey seals throughout the year (Marine Scotland, 2017), which represents around 26% of the Scottish east coast grey seal population (River Ythan, 2021; NatureScot, 2017). Modelling by Carter *et al*. (2020) shows grey seal mean at-sea usage to be high around the Ythan River Mouth. For seals using haul-out sites to be affected by Marine Scheme activities, the activities would need to be occurring very close to the haul-out site, approximately within 2 km. There are however no designated grey seal haul-out sites located within 2 km of the Marine Installation Corridor so potential reckless harassment, as per the Conservation of Seals under the Marine (Scotland) Act 2010 (Scottish Government, 2014) is not expected to occur at this site. A summary of designated haul-out sites is presented in **Section 6.2**.

Grey seals can however forage over distances of up to 135 km without returning to the haul-out site, over periods of one to thirty days (SCOS, 2020). They typically forage along the seabed reaching depths of 100 m (SCOS, 2021). McConnell *et al*. (2001) tagged seals in the North Sea and estimated that seals in this location spend 43% of their time within 10 km of a haul-out site. Modelling by Russel *et al*. (2017) and Carter *et al*. (2020) (**Figure 9**) shows that grey seals forage along the majority of the eastern England and Scotland coast, and north eastern North Sea.

Mean at-sea usage of grey seals varies along the Marine Installation Corridor (Carter, *et al*., 2020). There are hotspots of high grey seal density close to the Scottish landfall, extending eastwards into the Marine Installation Corridor. Russell *et al*. (2017) shows higher at-sea usage on the Northumberland coast. South of these areas mean at-sea usage is much lower, in the portion of the Marine Installation Corridor offshore of Sunderland, until density increases to a hotspot around the Humber Estuary. In close vicinity to the English landfall there is an increased density of grey seals (Russell, Jones, & Morris, 2017; Carter, *et al*., 2020) (**Figure 9)**.

Given the foraging distances of up to 135 km in much of the eastern and northern North Sea, and modelling data (Russell, Jones, & Morris, 2017; Carter, *et al*., 2020), it is highly likely that grey seals could be frequently travelling through the Marine Installation Corridor. Greys seals particularly from the Isle of May SAC, Berwickshire and North Northumberland SAC, and Humber Estuary SAC are likely to forage in the Marine Installation Corridor, given the high at-sea usage in this area (Russell, Jones, & Morris, 2017; Carter, *et al*., 2020). Grey seals have also been recorded to repeat the same foraging trip from haul-out sites (SCOS, 2021), and return to the same haul-out site 88% of the time (McConnell, Fedak, Lovell, & Hammond, 2001), making possible interactions with surveys even more likely.

The UK grey seal population is considered to be stable and increasing, particularly within the eastern England colonies (SCOS, 2021). Pup production at the Isle of May SAC has reached an asymptote, which has been the case since late 1990s. In the Berwickshire and North Northumberland Coast SAC, pup production is increasing. Overall, this species is at ‘favourable’ conservation status in the UK (JNCC, 2019). Globally, populations are also considered to be increasing and therefore the conservation status of this species is of ‘least concern’ (IUCN, 2021).

Table 8. Recent grey seal pup production estimates from 2019 for colonies located within proximity to the proposed survey area (SCOS, 2021).

Location	Haul-out locations	2019 pup production estimate	Distance of colony to nearest point of Marine Installation Corridor
Firth of Forth	May Fast Castle Inchkeith	7,261	May – 90 km Fast Castle – 74 km Inchkeith – 131 km
Farne Islands	1 haul-out	2,823	50 km
Total		**10,084**	

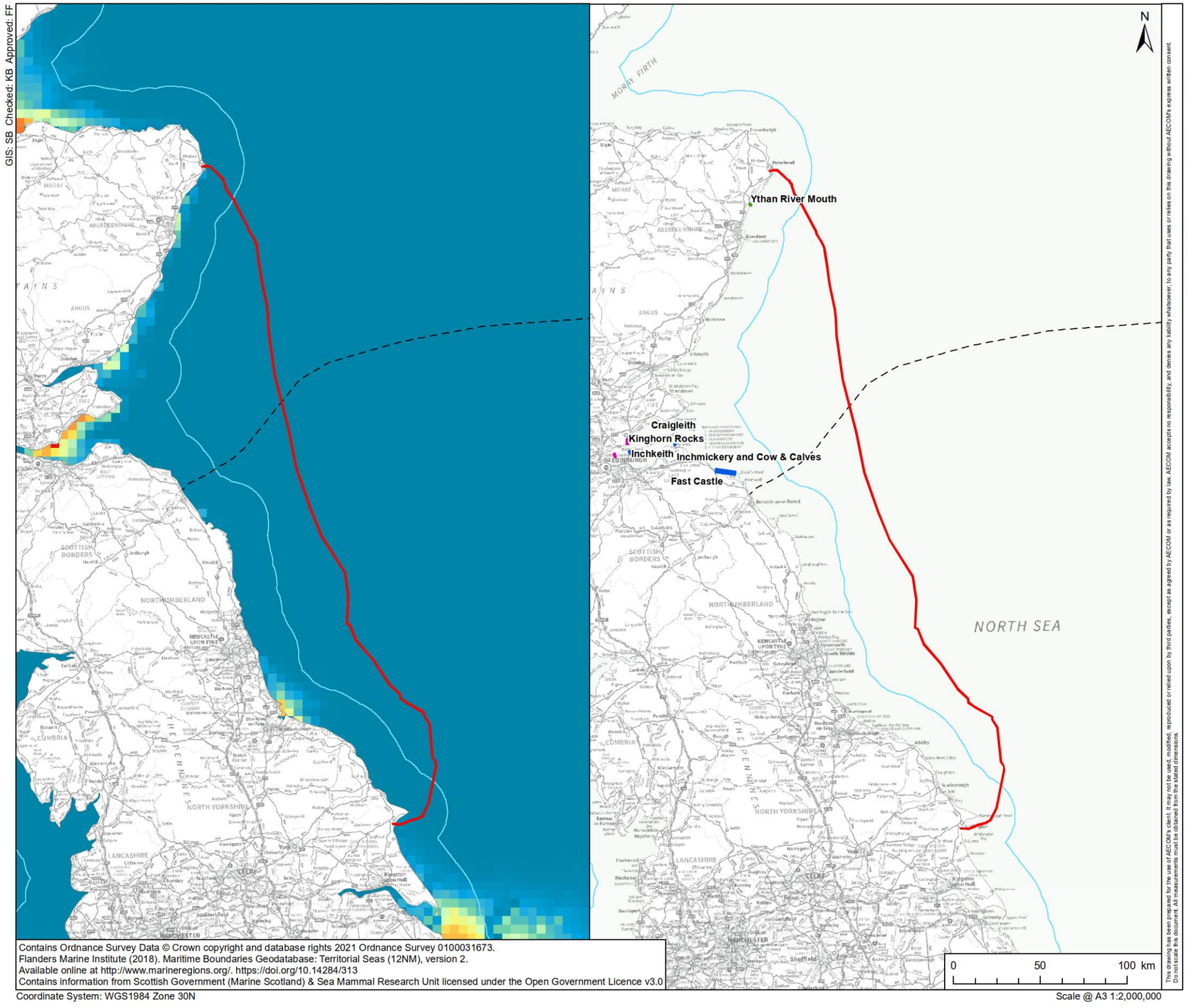

Figure 8. Mean percentage of at-sea population (estimated to be present in each 5 km x 5 km grid cell at any one time) of harbour seals from haul-outs in the British Isles (Carter, *et al.*, 2020).

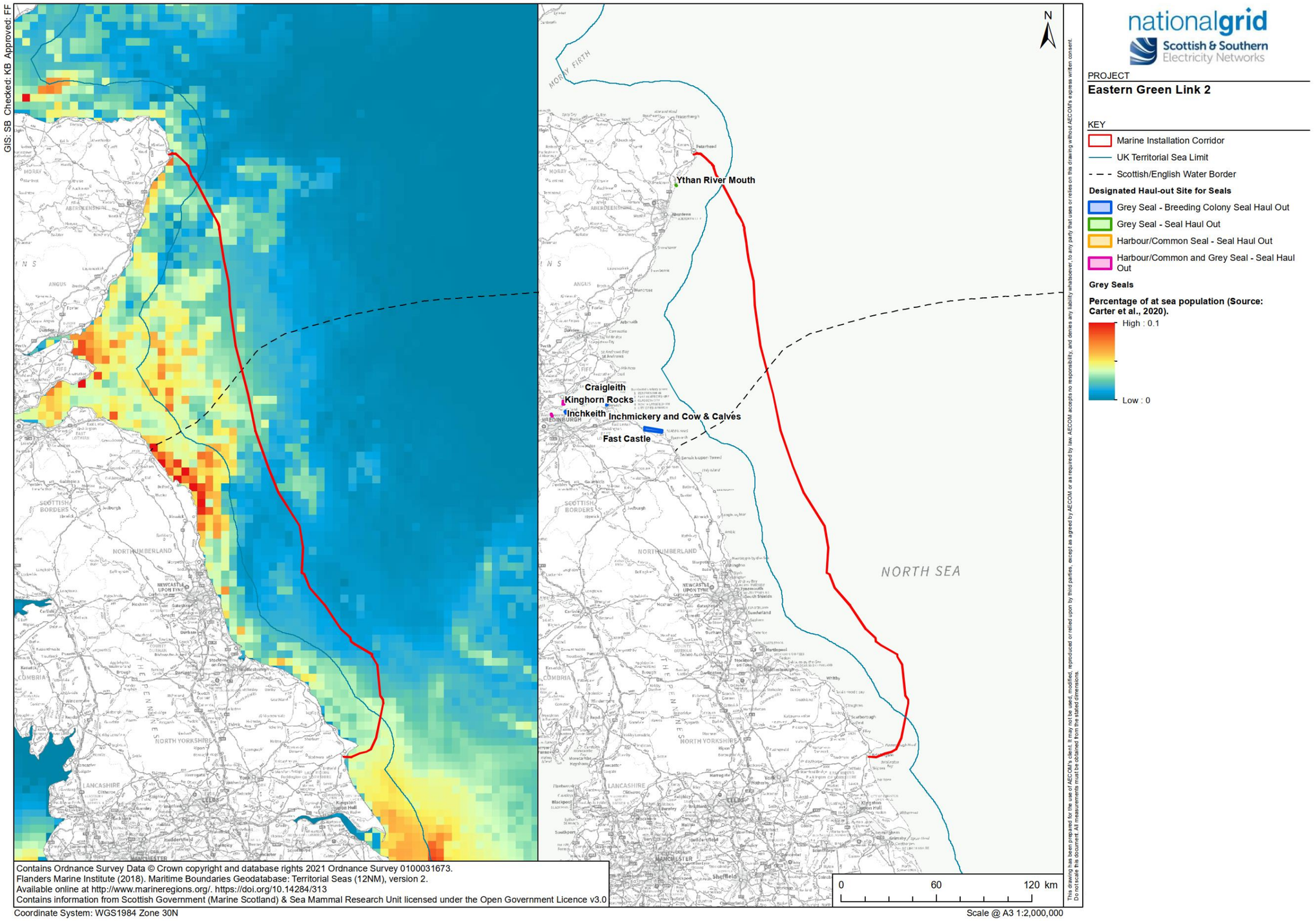

Figure 9. Mean percentage of at-sea population (estimated to be present in each 5 km x 5 km grid cell at any one time) of grey seals from haul-out sites in the British Isles (Carter, *et al*., 2020).

4.3.2 Basking Shark

Whilst not EPS, the basking shark, *Cetorhinus maximus*, may also be considered to be of conservation concern. The basking shark is listed under Schedule 5 of the Wildlife and Countryside Act 1981. This species primarily occurs in waters around the southwest coast of England, west coast of Scotland and around the Isle of Man (Witt, *et al.*, 2012; Doherty, *et al.*, 2017a; Doherty, *et al.*, 2017b; Austin, *et al.,* 2019). It is occasionally present in waters off the east coast of Scotland and northeast England, although sightings are rare (**Figure 10**). The basking shark is an elasmobranch, a species that lacks any gas-filled cavities such as a swim bladder and is regarded as having low sensitivity to underwater sound.

Therefore, considering the low likelihood of presence and the low sensitivity of this species to underwater sound the potential impact to basking shark from underwater sound disturbance is not considered further in this assessment. Nevertheless, some of the mitigation measures adopted for cetaceans, such as soft-starts, will also provide protection to any individuals in the vicinity of the survey.

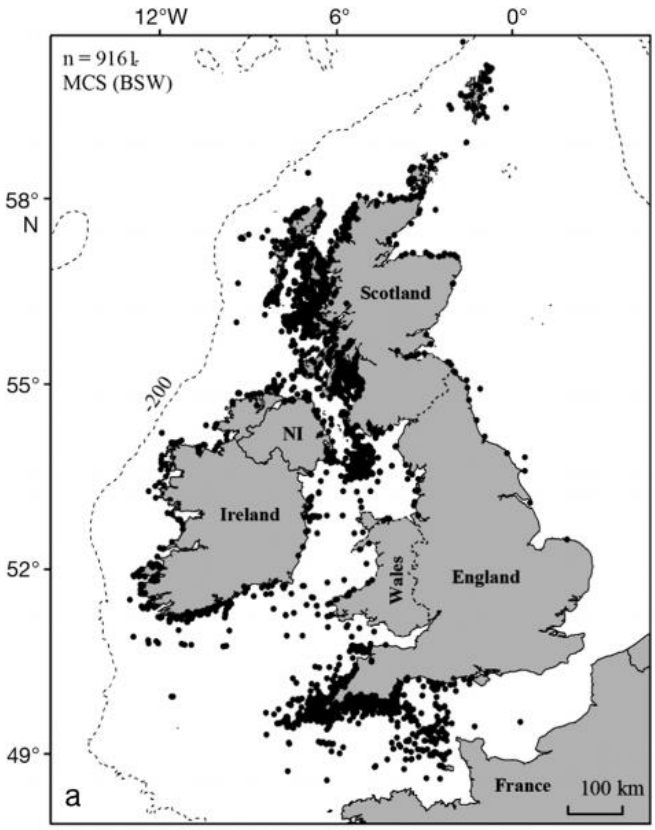

Figure 10. Spatial distribution of basking shark sighting records (1988 to 2008) showing the locations of all sighting's records (Witt, *et al*., 2012).

4.3.3 Other fish species

Fish species may be present in proximity to the UXO geophysical survey activities, such as sandeel, sea lamprey *Petromyzon marinus* and river lamprey *Lampetra fluviatilis*, which are qualifying species of three designated sites known to occur within 50 km of the survey area for the marine installation corridor (Tweed Estuary SAC, Humber Estuary SAC, and Turbot Bank MPA). However, the nearest designated site (Tweed Estuary SAC) is over 11 km away, significantly beyond the range at which any notable impact on fish would occur. Whilst lamprey have the potential to migrate beyond the boundary of the SAC, and therefore interact with the proposed survey activities, they are considered (along with sandeel) to have a low sensitivity to underwater sound. For example, both morphological and recent physiological results suggest lamprey only detect particle motion (Popper & Hawkins, 2019), a unidirectional effect unlike sound pressure. Furthermore, lamprey are likely to occur in low abundance in proximity to the Marine Installation Corridor and are not a primary reason for site designation.

The hearing range of fishes varies widely between species. Those with a swim bladder, such as Atlantic cod *Gadus morhua* are sound pressure sensitive at higher frequencies and some species of herring-like fishes, but not the Atlantic herring *Clupea harengus,* can detect sounds above 20 kHz (ultrasound) (Popper, ***et al***., 2014). The acoustic survey equipment for the UXO geophysical survey, including USBL, use very high frequency acoustic signals, beyond the hearing range of any fish in the project area.

Given the distances to sites with fish species as a designated feature and the low sensitivity of fish species to the frequencies of sound produced by the USBL, the potential impact to fish species from underwater sound disturbance is not considered further in this assessment.

4.4 Summary

Based on the information provided in **Section 4.2** and **4.3**, the species that will be considered further within the risk assessment are:

- cetaceans; and
- pinnipeds (including harbour seal and grey seal).

Therefore, those species that will not be considered further in the assessment due to their rarity on the east coast of Scotland and northeast England, and/or low sensitivity to underwater sound disturbance include:

- sea turtles; and
- fish species, including basking shark

5. Risk Assessment

5.1 Underwater Sound and Marine Mammals

Ambient underwater sound is the background sound level made up of a broad range of individual sound sources present in the ocean of both natural and anthropogenic origin. Many marine organisms, including marine mammals and fish, use sound for communication, to locate mates, to search for prey, to avoid predators and hazards, and in the case of cetaceans, for short- and long-range navigation (OSPAR, 2009).

Anthropogenic underwater sound sources arise from activities in and near the sea such as dredging, construction, hydrocarbon exploration and production, geophysical surveys and sonars, among others (Richardson, Greene, Malme, & Thomson, 1995). Vessel movements also have the potential to produce a significant amount of underwater sound.

The proposed UXO geophysical survey will use acoustic sound sources to gather acoustic imagery and bathymetry. These activities will generate underwater sound that could affect marine fauna. There is also a risk of collisions between survey vessels and marine fauna. Each of these impacts have been considered in **Sections 5.3** and **5.4**.

5.1.1 Marine Mammal Hearing Sensitivity and Anthropogenic Sound

Sound from anthropogenic activities can negatively impact marine mammals as it influences their ability to echolocate, communicate and it can cause physical harm (through disorientation leading to beaching, and in extreme cases, trauma to the auditory apparatus) (Southall, *et al.,* 2007). Sound can cause certain cetacean species to change their behaviour and may result in increased alertness, modification of vocalisations, interruption, or cessation of feeding or social interactions, alteration of movement or diving behaviour, and temporary or permanent habitat abandonment. In severe cases, animal responses may include panic, flight, or stranding, which could sometimes result in indirect injury or death.

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) **Table 9**. Different species will be sensitive to different frequencies and the harbour porpoise, the most common species around the Marine Scheme is known to be particularly sensitive to underwater sound and is categorised in the very high frequency (VHF) functional hearing group. There will be high frequency hearing dolphin species also present, but these are generally much less sensitive to underwater sound.

Seals (and other pinnipeds) also produce a diversity of sounds, though generally over a lower and more restricted bandwidth (generally from 100 Hz to several tens of kHz). Their sounds are used primarily in social and reproductive interaction, both in water and air (Southall, *et al.*, 2007).

Table 9. Functional marine mammal hearing groups and auditory bandwidth and potential species within the study area

Cetacean hearing group	Species	Estimated auditory bandwidth	Key species potentially present in survey area
Low frequency (LF)	**Baleen whales**	7 Hz to 35 kHz	Minke whales
High frequency (HF)	**Dolphins, toothed and beaked whales**	150 Hz to 160 kHz	Bottlenose dolphin White beaked dolphin
Very High frequency (VHF)	**True porpoise and some small whales**	275 Hz to 160 kHz	Harbour porpoise
Pinnipeds in water (PW)	**Seals**	50 Hz to 86 kHz	Grey seal

[5] These were previously described, by Southall *et al.,* 2007, as low, mid, and high frequency functional hearing groups.

Cetacean hearing group	Species	Estimated auditory bandwidth	Key species potentially present in survey area
			Harbour seal

Source: Southall et al. (2007)*; NMFS* (2018)*; and Southall et al.* (2019).

There are four species of cetacean occurring in the SCANS III study areas around the Marine Scheme at an abundance high enough for animal density estimates to have been determined (Hammond P. , *et al.*, 2021) (These are the harbour porpoise (VHF), the white beaked dolphin (HF), the bottlenose dolphin (HF) and the minke whale (LF). There is, therefore, potential for animals in each of three functional hearing groups to be present in the vicinity of the Marine Scheme during survey activities.

The impact of underwater sound in marine mammals is 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);injury to the auditory system of cetaceans from either brief exposure to extremely high sound levels or following more prolonged exposure to lower levels of continuous sound (Richardson, Greene, Malme, & Thomson, 1995). This injury is a change in hearing sensitivity and is known as a hearing threshold shift, which may be a permanent threshold shift (PTS) or temporary (TTS). PTS is considered to be injury. TTS is not as hearing does return to normal;
- **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.

5.1.2 Impact Threshold Criteria

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, *et al.,* 2019). The thresholds for PTS are based on dual criteria of unweighted, instantaneous peak sound pressure levels (SPL_{peak}) and frequency-weighted Sound Exposure Levels (SEL) (**Table 10**).

Table 10. Quantitative thresholds for auditory effects (PTS) in marine mammals.

Hearing group	PTS	
	SPL_{peak}	SEL
LF	219	183
HF	230	185
VHF	202	155
PW	218	185

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

Source: NMFS (2018); and Southall *et al. (2019).*

5.2 Underwater Sound Propagation Calculations

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. The spreading model assumes that sound is spread geometrically away from the source with an additional frequency-dependent absorption loss; it therefore provides conservative estimates, representing a worst-case scenario. It also does not take into consideration the conditions within the area, such as detailed bathymetry, water column structure or sediment type and thickness.

The standard formula used for estimating the transmission loss from underwater sound sources is:

$$TL = A \log (r) + B r + C$$

Where:

TL is the transmission loss at a distance r from the source.

A is the wave mode coefficient. For spherical waves A=20, and cylindrical waves A=10.

B is an attenuation factor that is dependent on water depth and sea bottom conditions.

C is a fixed attenuation due to acoustic screening. In open water this will be 0.

Note that use of cylindrical spreading (A=10) is generally suited to shallow-to-mid water depths, and spherical spreading (A=20) is generally applicable to deep water depths. Although the definition of deep vs. shallow is somewhat dependent on wavelength, Richardson *et al*. (1995) suggests that depths <200 m are commonly regarded as “shallow” and >200 m are commonly regarded as “deep” regardless of source wavelength.

Cylindrical spreading (A=10) is more conservative (i.e., provides larger setback distances for a given source level). Richardson (1995) suggests using A=15 for underwater transmission in shallow water conditions where the depth is greater than five times the wavelength. For low frequency, longer wavelength sound this is going to tend toward A=20. For high frequency, shorter wavelength sound this is going to tend toward A=10.

For the purposes of this assessment and to provide a conservative but reasonably realistic estimate of sound propagation, an empirical wave mode coefficient A = 15 has been used to determine the distance at which SPL thresholds for PTS are met.

The dual-metric modelling approach has been used to identify impacts based on the peak sound pressure level (SPL_{peak}) and the sound exposure level (SEL) provided in **Table 11**. The SPL_{peak} criteria is defined as those peak SPLs above which tissue injury is predicted to occur, irrespective of exposure duration. The SEL represents the total energy produced by a noise-generating activity standardised to a one second interval. This enables a comparison of the total energy attributed to different pulsed sound sources with different time intervals. The SEL impact zones have been determined using the M-weightings that account for the specific hearing range of each of the functional hearing groups of marine mammals.

Table 11. Maximum estimated distances (m) from USBL at which the sound level will exceed the SPL_{peak} and SEL PTS injury threshold

Survey activity	Cetacean hearing group	SPL_{peak}	SEL
USBL	LF	<10	<10
	HF	<10	<10
	VHF	<10	<10
	PW	<10	<10

Survey activity	Cetacean hearing group	SPL_{peak}	SEL
Note: SPL_{peak} units are dB re 1 µPa and SEL are dB re 1 μPa^2-s			

5.3 Impact Assessment – UXO Geophysical Survey Sound Sources

USBL, an underwater acoustic positioning system, will be used in the UXO geophysical survey and will produce an acoustic sound source with the potential to result in impacts to marine mammals.

5.3.1 Lethal effect and physical injury

Evidence of direct lethal effects and physical injury in marine mammals, as a result of anthropogenic sound sources, is limited to animals in very close proximity to impulsive sound sources of very high intensity such as explosions and military sonar (Southall *et al.,* 2007). There is no evidence to indicate lethal effects and physical injury in cetaceans would result from the sound sources produced by vessel movements. There is also very limited evidence of lethal effects caused by sound sources associated with the geophysical survey equipment being employed by the Project and therefore lethal effects to cetaceans from this activity, even indirectly, are not predicted to occur.

5.3.2 Auditory Injury Impacts

The predicted injury impact zone from USBL sound, based on both the SPL_{peak} and SEL thresholds indicates that injury is only likely to occur for any animal that is in very close proximity to the sound source. In effect, for injury to occur a marine mammal would need to be within a few metres of the acoustic equipment. Considering the highly mobile nature of marine mammals, the low density of all species identified in the vicinity of the Marine Installation Corridor, and the constant movement of the survey vessels, the presence of animals this close to the acoustic equipment is highly unlikely. Therefore, injury from the operation of the USBL is considered highly unlikely, and no marine mammal mitigation is required for this equipment.

Whilst the potential for injury from the use of USBL in cetaceans and seals potentially present within UXO geophysical survey area is considered to be very low, as additional mitigation, the survey will adopt the industry standard JNCC guidelines in relation to the operation of this equipment (JNCC, 2017) (as outlined in **Section 7**).

5.3.3 Behavioural Disturbance

Behavioural disturbance may occur from the use of USBL. 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[6]. To account for the directionality of the acoustic sound source[7] (Landrø & Amundsen, 2010) a conservative reduction in source level of 20 dB SPL_{rms} has been assumed for behavioural disturbance, which takes place at some distance from the source. The disturbance range for USBL, estimated using non-weighted geometric spreading formula as described above, is 63 m.

The most common species in the study area, is the harbour porpoise, occurring at a density estimated between 0.599 and 0.888 individuals/km^2 (**Table 6**). The harbour porpoise is also the species with the highest sensitivity to sound and is a designated feature of the Southern North Sea SAC, approximately 19 km away to the east / southeast. Harbour porpoise are highly mobile and found throughout the North Sea with extensive foraging grounds and alternative feeding locations readily available. If individuals

[6] See: https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/esa-section-7-consultation-tools-marine-mammals-west

[7] Sound pressure is released in all directions, but not in a symmetrical and uniform way. Sound levels are highest directly below the source by design, to provide optimal energy. In addition, high frequencies are more directional than low frequencies. In the horizontal plane sound levels can be between 12 and 48 dB lower, depending on the nature of the sound source (Landrø & Amundsen, 2010). Each underwater sound source has its own specific radiation pattern depending on frequency and tow depth and the source pulse attenuation varies depending on the angle from the vertical.

are disturbed temporarily, alterative areas suitable for foraging and socialising, exist to move into. Given the very small distance over which behavioural disturbance may occur from USBL operations, any impact on foraging or other behaviours is expected to be negligible.

The closest seal haul-out location to the Marine Installation Corridor is the Ythan Estuary (grey seal), 25 km to the south of the Scottish landfall, also significantly beyond the distance of any potential impacts. Grey seals in particular forage over extensive distances and so there may be individuals in the vicinity of the Marine Installation Corridor, particularly in area closest to the Farne Islands where there is a very high density of seals. However, any disturbance would be short-term, temporary, and limited to very few individuals. As the vessels are continuously moving and interactions with seals will be of short duration. Disturbance to seals foraging offshore will be limited and is not considered likely to have an adverse impact on foraging ability, with alternative areas for foraging widely available.

The estimated number of individuals which may experience disturbance during USBL operations, based on the worst-case scenario of a 1 km radius disturbance zone (this is highly precautionary given that disturbance has been calculated to occur over 63 m), has been calculated in **Table 12**, based on the estimated population data in **Table 6**. In these calculations, the impact range results in a potential disturbance area, centred around the survey vessel, of 3.14 km^2. The calculations assume the same disturbance zone for all species, recognising this is an overestimate of effect, likely in all other marine mammal species, but particularly in relation to the high frequency dolphin species and seals.

For cetaceans, the proportion of animals potentially disturbed by the USBL is less than 1% of the total populations estimated to present in the SCANS III survey blocks to which the density estimates apply (**Section 5**). The percentage of cetaceans as a proportion of the total MU population will be even lower, less than 0.01% (**Table 12**).

The proportion of the four key cetacean species populations that could be present in the survey area and potentially subject to behavioural disturbance is low. Across the survey region, accounting for the density of animals reported by SCANS-III, it is estimated that less than 0.01 % of the total harbour porpoise population within each SCANS III Block R and Block O would potentially experience observable disturbance (**Table 12**).

Proportions for the other species populations are similar. However, the same indicative impact zone (a 1 km radius) has been used even though these species are likely to exhibit much lower levels of response and therefore the proportions are likely to be an overestimate.

Although some individuals will be disturbed, only a small proportion of the local population is likely to be affected, and for a relatively short period of time. Thus, **the potential impact of the UXO geophysical survey activities on EPS, in both Scottish and English waters is low.**

To conclude, there is no potential for injury to marine mammals as a result of underwater sound generated by the USBL operations, given the adoption of the JNCC guidelines. Furthermore, behavioural disturbance is considered to be negligible given the small distances over which this may occur. As the vessels are continuously moving, any impacts are transient, whilst the duration is considered to be short-term, intermittent, and temporary. Any effects are limited in terms of the number of individuals disturbed as a proportion of the total MU population and the level of behavioural response. Therefore, the effect to marine mammals (including EPS) from underwater sound is **not significant**.

Table 12. Estimated maximum number of individuals within 1 km radius of survey vessel.

SCANS-III Survey Block	Species	Density (individuals/km^2)	No. of Individuals within 1 km radius (3.14 km^2)	Proportion of management unit population (%)
Scotland SCANS III Block R	Harbour porpoise	0.888	2.788	<0.01
	Bottlenose dolphin	0	0	<0.01
	White-beaked dolphin	0.002	0.006	<0.01
	Minke whale	0.010	0.031	<0.01

SCANS-III Survey Block	Species	Density (individuals/km^2)	No. of Individuals within 1 km radius (3.14 km^2)	Proportion of management unit population (%)
England SCANS III Block O	Harbour porpoise	0.599	1.881	<0.01
	Bottlenose dolphin	0.030	0.094	<0.01
	White-beaked dolphin	0.243	0.763	<0.01
	Minke whale	0.039	0.122	<0.01

5.3.4 Assessment of Potential Offence

The assessment of potential effects for underwater sound from geophysical survey equipment as part of the UXO geophysical survey concluded that there is no potential for the sounds emitted to cause auditory injury in marine mammals, particularly given the adoption of the proposed mitigation measures. Furthermore, any behavioural disturbance is considered to be minor. Therefore:

- Disturbance from operation of geophysical and positioning equipment during the UXO geophysical survey work can be considered to be minor and unlikely to be detrimental to the maintenance of the range of cetacean populations at a Favourable Conservation Status (FCS) in their natural range, as defined in the Offshore Regulations 2017.
- Following the 2014 guidance published by Marine Scotland for territorial waters, there is the potential for disturbance of animals, from the use of the geophysical positioning system, USBL, associated with the proposed survey. However, the estimated proportion of the cetacean population in the total survey area is low and this disturbance will not be sufficient to cause any population level effects therefore it is considered that an **EPS licence** (in Scottish waters) and **Marine Licence exemption notification** (in English waters) can be issued.

5.4 Impact Assessment – Collison Risk

Moving vessels as part of the UXO geophysical survey have the potential to collide with marine megafauna (i.e., marine mammals, turtles, and basking sharks). This may result in physical injury, such as propeller injuries, and in the worst-case, mortality (Schoeman, Patterson-Abrolat, & Plon, 2020). The surveys will be completed using vessels which are all considered to be small (<50 m). It is assumed that two vessels will be required; two to deliver the nearshore works and at least one to deliver the offshore survey works. The exact size and number of vessels is subject to the appointment of the survey contractor.

Marine mammals, particularly cetaceans, are considered to be fast swimming, agile species, with rapid reflexes and good sensory capabilities (Hoelzel, 2002). The most lethal and serious injuries to marine mammals (and other marine megafauna) are believed to be caused by large ships, typically 80 m and longer, as well as vessels travelling faster than 14 knots (Laist, Knowlton, Mead, Collet, & Podesta, 2001). Vessels required for Project Activities will be less than 50 m in length and slow moving (i.e., survey speeds of 4 knots and 10 – 15 knots whilst in transit).

Turtles are not fast or agile species and cannot be relied upon to avoid vessels travelling faster than approximately 2 knots. Individuals are most vulnerable when foraging or swimming in water depths which are insufficient to allow the draft of the vessel and propellers to pass over. Individuals that bask, mate, or breathe close to the sea surface are also vulnerable to vessel collisions or being struck by propellers. Turtles are small in size and possess a hard carapace that can reduce the likelihood and severity of impacts from collisions with marine vessels. However, injuries may result in individuals becoming vulnerable to secondary infections or predation.

Basking sharks are considered to exhibit a general lack of awareness of vessel traffic making them more susceptible to vessel strikes, particularly during the summer months when individuals spend a large proportion of time at the surface feeding.

Marine mammals are reasonably resilient to minor strikes and collisions (Wilson, Batty, Daunt, & Carter, 2007). However, a direct strike from a sharp object such as rotating propeller blades has potential to cause lethal injury to marine mammals. Cases of seal injuries thought to be caused by propellers and thrusters (for dynamic positioning of vessels) have been recorded in the UK (Bexton, Thompson, Brownlow, Milne, & Bidewell, 2012). However, evidence suggests that a large proportion of these injuries can be attributed to alternative, natural mechanism for injury such as grey seal infanticide and cannibalism, which may also cause 'spiral/corkscrew' lacerations comparable to those produced by ship propellors (Brownlow, Onoufriou, Bishop, Davison, & Thompson, 2016). Marine mammals and to a lesser extent basking sharks, possess a thick subdermal layer of blubber or fat deposits which provides a level of protection to their vital organs meaning they are reasonably resilient to minor strikes and collisions.

Overall, the likelihood of the survey vessel colliding with marine megafauna is predicted to be low. The addition of the survey vessels within the offshore and nearshore survey areas will not result in a significant increase in vessel traffic. In addition, the vessels will be slow moving, meaning that individuals (particularly marine mammals) can easily avoid the vessel, greatly reducing the risk of collision. Basking sharks are not expected to occur in nearshore areas. The density of most marine mammals as well as turtles and basking sharks within the proposed survey areas is estimated to be low (**Table 6**), further reducing any remaining risk. In UK waters, the issue of injury through collision is not currently thought to be of major concern and so there are no specific mitigation measures recommended by the JNCC (JNCC, Natural England, & Countryside Council for Wales, 2010).

Therefore, effects to marine megafauna from collisions with survey vessels are predicted to be **not significant**.

5.4.1 Assessment of Potential Offence

It can be concluded that the risk of collision with marine vessels associated with the UXO geophysical survey work is very low and is therefore unlikely to result in the harassment, disturbance, injuring or killing of an EPS in territorial and offshore waters and other MPS, as defined in the regulations. Therefore, **an EPS licence (in Scottish waters) will not be required** because of collision risk from survey vessel movements, whilst a **Marine Licence exemption notification** (in English waters) can be issued.

6. Consideration of Designated Sites and Priority Marine Features Legislative Context

This section is intended to inform both the EPS Licensing process and the Marine Licencing exemption notification to MS-LOT and the MMO respectively, and therefore covers all survey activities which have the potential to impact European designated sites, and their designating features.

6.1 Impact Pathways

The proposed survey equipment outlined in **Table 3** have the potential to impact designated sites and their qualifying features or priority marine habitat and species via a number of impact pathways including:

- Direct or indirect (via changes in prey resource) disturbance to habitats and species from changes in marine water quality arising from the accidental release of fuel and chemicals (e.g., oil) from vessels;
- Airborne sound disturbance to seabirds and seals hauled out or surfaced;
- Underwater sound disturbance to marine mammals (cetaceans and seals) and migratory fish;
- Visual disturbance (including artificial lighting) to fish, marine mammals (cetaceans and seals) and seabirds due to the presence of survey vessels;
- Collison risk between marine vessels and marine mammals (cetaceans and seals), turtles and basking sharks.

6.2 Relevant Designated Sites

There are 34 designated sites (i.e., Special Protection Areas (SPAs), SACs, Ramsar sites, Marine Protected Areas (MPAs), and Marine Conservation Zones (MCZs)), which fall within the screening distance of 50 km[8] of the survey area for the proposed Marine Installation Corridor. Details of these designated sites including their proposed or designated features and distance to the Marine Installation Corridor can be found in **Appendix A**.

The proposed Project's Marine Installation Corridor aligns through two designated sites including:

- Buchan Ness to Collieston Coast SPA; and
- Firth of Forth Banks Complex MPA (30 m beyond the Marine Installation Corridor).

Key sites designated for the protection of marine mammals (**Figure 1)** have been screened in using the relevant MUs defined by IAMMWG (2022) for each species, MUs indicate the spatial scales suited to each species in which impacts should be assessed.

For cetaceans, the designated sites which have been considered within the MUs are restricted to a distance of approximately 50 km from the Marine Installation Corridor. This reflects a buffer of 50 km which is recommended by the JNCC for disturbance from underwater sound in harbour porpoise[9] (see MMO (2019)). However, given the mobile nature of cetaceans, consideration has also been made for known seasonal movements of some cetacean populations between designated sites. For example, the population of bottlenose dolphin protected by the Moray Firth SAC are known to undertake southwards migration to the Firth of Forth and Berwick-upon-Tweed (Hague, Sinclair, & Sparling, 2020; 2021).

For pinnipeds, screening distances have been selected based on accepted foraging ranges (see MMO (2019)). For harbour seals, a screening distance of 50 km is considered appropriate as this species forages close to their haul-out sites (Thompson, Mackay, Tollit, Enderby, & Hammond, 1998). Grey

[8]Consideration has also been given to sites up to 135 km away for grey seals, and to the Moray Firth SAC which is designated for bottlenose dolphin

[9] Harbour porpoise is the cetacean species with the highest sensitivity to underwater sound and this distance has been used as a reasonable worst-case scenario.

seals are known to forage over much larger distances up to 135 km from their haul-out sites (SCOS, 2021). Therefore, a screening distance of 135 km is considered appropriate for this species.

Table 13 below presents the relevant designated sites for marine mammals and their proximity to the Marine Installation Corridor. Marine mammal species named as designated biodiversity features are highlighted in green.

Table 13. Relevant designated sites for marine mammals.

Site Name (Country)	Designation	Relevant Qualifying Biodiversity Features	Approximate Distance from Marine Installation Corridor (km)
Southern Trench (Scotland)	MPA	Designated for the protection of the **minke whale**, amongst other features	1.96 km
Southern North Sea (England)	SAC	Annex II species that are a primary reason for site selection: • **harbour porpoise.**	18.78 km
Berwickshire and North Northumberland Coast (Scotland and England)	SAC	Annex I habitats that are a primary reason for site selection: • mudflats and sandflats not covered by seawater at low tide; and, • large shallow inlets and bays. Annex II species that are a primary reason for site selection: • **grey seal**	36.43 km
Humber Estuary	SAC	The **grey seal** is a qualifying feature, but not the primary reason for designation	34.69 km
Isle of May (Scotland)	SAC	Annex II species that are a primary reason for site selection: • **grey seal**	88.38 km
Moray Firth (Scotland)	SAC	Designated for the protection of **bottlenose dolphin.**	92.51 km

A screening assessment has identified 34 designated sites that may potentially be impacted via the pathways described above. The screening matrix can be found in **Appendix B** whilst a summary is presented in **Table 14** below.

Table 14. Summary of screening assessment

Impact pathway	Number of designated sites screened in
Disturbance due to changes in marine water quality	14
Airborne sound disturbance to seabirds and seals hauled out or surfaced	12
Underwater sound disturbance to marine mammals	6
Visual disturbance (including artificial lighting) to fish, marine mammals, and seabirds due to the presence of survey vessels	14
Collison risk between marine vessels and marine mammals	4

6.2.1 Direct or indirect (via changes in prey resource) disturbance to habitats and species from changes in marine water quality

The accidental release of fuel and chemicals (e.g., oil) from survey vessels could also lead to deteriorations in marine water quality with direct effects to marine habitats and species as well as indirect effects to seabirds via a loss of prey resource.

The screening assessment identified a total of 14 designated sites as having the potential to be impacted via this pathway. This is based on the worst-case assumption that any accidental spill from a vessel could extend up to 30 km from the source. These sites, which are listed in **Appendix B**, are designated for a range of receptors including intertidal and subtidal habitats, subtidal benthic species, seabirds, and marine mammals.

Survey vessels shall be required to comply with all relevant health, safety, and environmental legislation. This includes compliance with the International Regulations for Preventing Collisions at Sea (1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) with the aim of preventing and minimising pollution from ships. Most critically, all vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan). Pollution prevention strategies would also be expected to be developed and implemented in accordance with the relevant Guidance for Pollution Prevention to reduce the potential for, and the scale of any environmental impacts. This includes development and implementation of an Emergency Spill Response Plan and a Waste Management Plan.

With consideration of this good practice mitigation, the likelihood of an accidental spillage occurring from any of the survey vessels is considered to be very low. However, should a spill occur, the impact would be of very small magnitude and short-term.

Mobile receptors such as some fish species and life stages (including migratory species) and marine mammals would be able to move away from adverse water quality conditions and therefore they are considered to have low sensitivity and effects to these receptors would be limited. Although habitats and less mobile species and life stages would be expected to be more vulnerable to potential deteriorations in marine water quality, given the nature of the impact (e.g., acute, short-term and of very small magnitude), it is unlikely that there would be any discernible effect to the abundance, distribution or functioning of habitats and species populations, even at the local level. As such, the impact on to any designated site or species which is a qualifying feature via a deterioration in water quality, is considered to be **not significant**.

6.2.2 Airborne sound disturbance to seabirds and seals hauled out or surfaced

The temporary presence of marine vessels and survey activities can generate airborne sound which has the potential to disturb breeding and foraging seabirds as well as seals hauled out or surfaced. Disturbance effects to seabirds might include cessation of foraging or nesting, whilst effects to seals might include cessation of feeding, resting, travelling and / or socialising.

The screening assessment identified 12 designated sites which fall within 50 km of the UXO geophysical survey area. The vast majority of these are SPAs designated for breeding seabird populations as well as migratory and waterfowl species (see **Appendix B**).

This includes Buchan Ness to Collieston Coast SPA which overlaps with the proposed Marine Installation Corridor as it approaches landfall at Peterhead in Scotland. The total distance where the survey corridor overlaps with the SPA is 2.3 km and accounts for an area that is equivalent to 1.2% of the total SPA. The geophysical line spacing within the corridor is anticipated be approximately 50 m for nearshore and 100 m for offshore vessels. Accounting for the total run distance (including turning circles between lines) and the speed of the vessel the total time required to undertake the UXO geophysical survey in the vicinity of the SPA will be a maximum of 10 hours.

Considering the very short-term nature, and hence small magnitude of the impact, airborne sound from vessel operations and survey activities is not predicted to have a significant effect on the designating features of the Buchan Ness to Collieston Coast SPA.

However, it has been noted that during the nesting season there may be seabirds, such as guillemot, for which the SPA is designated, to be rafting on the sea surface and less able to undertake avoidance behaviour. Thus, to minimise disturbance to such groups of birds during the peak breeding season, April to June, the survey works in the SPA will only take place in daylight hours and the marine mammal observers on board will also check for rafting seabirds. The survey vessel will undertake avoidance measures, such as reorientation or slowing down, as necessary to avoid areas where there are high numbers of rafting birds.

Also included is the Berwickshire and North Northumberland Coast SAC, Isle of May SAC and Humber SAC which are designated for grey seals. The magnitude of impact depends on the scale, intensity, and duration of the survey activities. Surveying will be undertaken 24-hours a day, seven days a week, and survey vessels will be progressing along the proposed Marine Installation Corridor and therefore any airborne sound disturbance to foraging seabirds or seals will be short-term and transient. The spatial extent of the survey area is considered to represent a very small proportion of available foraging grounds for seabirds and seals and so any behavioural disturbance (e.g., displacement) of individuals is unlikely to have any discernible impact on foraging success.

The Protection of Seals (Designated Sea Haul-out Sites) (Scotland) Order 2014 introduced additional protection for seals at 194 designated haul-out sites across Scotland: locations on land where seals come ashore to rest, moult, or breed. For an activity at sea to impact a seal haul-out site, it would need to occur very close to that haul-out site, within approximately 2 km. There are no designated haul-out sites located within 20 km[10] of the Marine Installation Corridor and therefore potential reckless harassment, as per the Conservation of Seals under the Marine (Scotland) Act 2010 is not expected to occur, and no further assessment is required.

Overall, considering the nature of the impact (short-term, intermittent and of small magnitude), airborne sound effects from vessel operations and survey activities to any designated site or species which is a qualifying feature, is considered to be **not significant**.

6.2.3 Underwater sound disturbance to marine mammals

A total of six sites designated for marine mammal species including harbour porpoise, minke whale, grey and harbour seal are located within 50 km of the survey area for the Marine Installation Corridor and were screened in for potential impacts from underwater sound disturbance (**Table 13**). These include the Berwickshire and North Northumberland Coast SAC, Humber Estuary SAC, Southern North Sea SAC, and Southern Trench MPA which are designated for grey seal, harbour porpoise and minke whale and which are located in close proximity to the proposed Marine Installation Corridor. The remaining sites include the Isle of May SAC, and Moray Firth SAC, designated for grey seal and bottlenose dolphin respectively.

As outlined in **Sections 5.3**, underwater sound disturbance from the geophysical survey equipment used as part of the UXO geophysical survey is not predicted to have a significant impact on cetacean or pinniped species. As such, there is predicted to be no significant effect to any designated site for which cetaceans and pinnipeds are a qualifying feature. As part of this assessment, industry standard JNCC guidelines in relation to the operation of these equipment (JNCC, 2017) have been adopted (as outlined in **Section 7**).

Thus, underwater sound effects from the UXO geophysical survey activities to any designated site or species which is a qualifying feature, is considered to be **not significant**.

6.2.4 Visual disturbance (including artificial lighting) to fish, marine mammals, and seabirds due to the presence of survey vessels

Increased visual stimuli (including artificial light) from the presence of marine vessels can lead to attraction or avoidance behaviour in fish, marine mammals and seabirds which could affect breeding or foraging activities, with potential for wider implications for populations. A total of 14 sites designated for fish, marine mammals and seabirds were screened in as falling within 50 km of the survey area for

[10] There is no standard distance at which seals may react negatively to disturbance (Marine Scotland, 2014). Therefore, 20 km has been defined as a precautionary distance.

either of the proposed Marine Installation Corridor and having the potential to be impacted by visual disturbance (see **Appendix B**).

Survey works vessels are expected to require usual night-time operational lighting. As good practice, this will be directional and hooded / shaded as required to minimise unnecessary light spill.

Given the low number of vessels which are required to undertake the surveys and the good practice mitigation, any change in visual stimuli is predicted to be of low magnitude. Disturbance effects would also be short-term and within the nearshore area, intermittent. As such, there is not predicted to be any significant impacts to fish, marine mammals, and seabirds from visual disturbance due to the survey operations. As such, the effect to any designated site or species which is a qualifying feature, is predicted to be **not significant**.

6.2.5 Collison risk between marine vessels and marine mammals

A total of four sites designated or proposed for marine mammal species including harbour porpoise, minke whale, grey and harbour seal are located within 50 km of the survey (**Table 13**) for the proposed Marine Installation Corridor and were screened in for collision risk (see **Appendix B**).

As outlined in **Section 5.4**, the risk of collisions between survey vessels and marine mammals (cetaceans and seals), turtles and basking sharks is predicted to be negligible. Thus, the effect to any designated site for which marine mammals are a qualifying feature, is predicted to be **not significant**.

6.3 Priority Marine Habitats and Species

There are several Priority Marine Features in Scottish waters as well as Habitats and Species of Principal Importance in English waters (as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006) which have the potential to be present within the survey area and may be vulnerable to effects via the impact pathways identified above.

Based on the information presented in **Sections 5** and **6** above, the survey works are also **not predicted to have a significant impact on priority marine habitats and species** via the impact pathways considered, including disturbance from changes in marine water quality from accidental spills, airborne sound disturbance, underwater sound disturbance, visual disturbance and collision risk.

7. Survey Execution and Mitigation Measures

7.1 Mitigation Measures

The operation of USBL during the UXO geophysical survey work has the potential to cause physical and / or auditory injury to marine mammals, but only at very close range (<10 m). Some minor behavioural disturbance is possible in the vicinity of the survey (geometric spreading calculations indicate a zone of influence of 64 m). As a precautionary measure, the mitigation measures recommended in the industry standard 2017 JNCC guidelines (JNCC, 2017) for minimising the risk of injury to marine mammals from geophysical surveys will be adopted, as described below:

- ***Sound source*** - the lowest practicable sound source level will be used to meet data collection requirements;
- ***Soft-start*** – a 20-minute soft start will be employed for acoustic sound sources, with a gradual build-up of power/sound level before the full sound source level is reached at the start of geophysical survey operations, and after a break of more than 10 minutes in sound generating activities;
- **Nearshore vessel marine mammal observation** - a suitably trained member of the vessel crew, on each of the inshore and the offshore vessels, will undertake marine mammal observations prior to the commencement of any sound generating activities (including after any break in survey activities of more than 10 minutes). The JNCC guidelines (JNCC, 2017) note that typically, a non-dedicated MMO can be used. Geophysical survey activities can only commence after a 30-minute period where no marine mammals have been observed in a 500 m observation zone around the vessel. Where relevant observers will also refer to the guidelines in the Scottish Marine Wildlife Watching Code (SNH, 2017);
- ***Marine mammal observation*** - a suitably trained member of the vessel crew, on each of the vessels, will undertake marine mammal observations prior to the commencement of any sound generating activities (including after any break in survey activities of more than 10 minutes). The JNCC guidelines (JNCC, 2017) note that typically, a non-dedicated MMO can be used. Geophysical survey activities can only commence after a 30-minute period where no marine mammals have been observed in a 500 m observation zone around the vessel. Where relevant observers will also refer to the guidelines in the Scottish Marine Wildlife Watching Code;
- ***Offshore Passive Acoustic Monitoring (PAM)*** - where an interruption of more than 10 minutes occurs in the hours of darkness or when conditions reduce observer visibility, a PAM pre-watch will be required (or the survey will wait until daylight or suitable weather conditions when a new visual observation can take place before commencing a soft-start). The PAM equipment will be specifically set to monitor in the frequency range of harbour porpoise vocalisations as this is the cetacean species most at risk and present in the highest density;
- ***Offshore vessel marine mammal observations –*** a JNCC certified Marine Mammal Observer, and a PAMs operator to undertake observations in the event of a break in operations in hours of darkness, will be present during the offshore survey;
- ***Nearshore daylight only operations*** - there will be no sound generating survey activity in nearshore waters (up to water depth of 10 m) during hours of darkness and there is, therefore, no requirement for PAMs operations on the inshore vessel;
- If several pieces of high-resolution survey equipment are to be started sequentially or interchanged during the operation, only one pre-activity search is required prior to the start of acoustic output, only if there are no gaps in data acquisition of greater than 10 minutes.

Whilst occasional cetacean visitors to UK waters are not considered specifically in this assessment due to their low likelihood of occurrence, any assessment of, or mitigation measures put in place for, the four key species assessed are considered to be appropriate / relevant for other less commonly occurring species of cetacean in the survey area. These mitigation measures for cetacean EPS (JNCC, 2017) are also deemed to be appropriate for seals and will be applied.

7.2 Mitigation Measures for Designated Sites and Priority Marine Habitats and Species

To minimise the potential disturbance to designated sites, their qualifying features and priority marine habitats and species for England and Scotland, the following mitigation measures are also proposed in support of the Marine Licencing applications:

- Project vessels shall comply with all relevant health, safety, and environmental legislation. This includes compliance with the International Regulations for Preventing Collisions at Sea (1972) and regulations relating to International Convention for the Prevention of Pollution from Ships (the MARPOL Convention 73/78) with the aim of preventing and minimising pollution from ships. Most critically, all vessels shall have a contingency plan for marine oil pollution (Shipboard Oil Pollution Emergency Plan). Pollution prevention strategies would also be expected to be developed and implemented in accordance with the relevant Guidance for Pollution Prevention to reduce the potential for, and the scale of any environmental impacts. This includes development and implementation of an Emergency Spill Response Plan and a Waste Management Plan.
- Project vessels shall adopt directional and hooded / shaded lighting as required to minimise unnecessary light spill.
- If survey activities in the vicinity of the Buchan Ness to Collieston Coast SPA take place in the period April to June, during the peak seabird breeding, the survey works will only take place in daylight hours (as referenced in **Section 6.2**). In addition, the marine mammal observers on board will also check for rafting seabirds and the vessel will undertake avoidance measures, such as reorientation or slowing down, as necessary to avoid areas where there are high numbers of rafting birds. Where relevant observers will also refer to the guidelines in the Scottish Marine Wildlife Watching Code (SNH, 2017).

7.3 Reporting

The UXO geophysical survey operations will be logged, as will the observation effort which will be kept using the JNCC Marine Mammal Recording Forms (these forms can be downloaded from http://jncc.defra.gov.uk/).

A report will be submitted to Marine Scotland and JNCC following the completion of the survey work. This report will include the following information:

- Complete Marine Mammal Recording Forms;
- The dates, locations and details of sound generating activity;
- Details of all MMO operator effort including information about any marine mammals detected; and
- Details of any technical problems encountered, and actions taken.

The Marine Noise Registry (MNR) (https://mnr.jncc.gov.uk/) has been developed by JNCC to record human activities in UK seas that produce loud, low to medium frequency impulsive noise. The only activities that should be recorded on the MNR are:

  - Seismic surveys
  - Sub bottom profiling (≤10 kHz)
  - Impact pile driving
  - Explosive detonation
  - Acoustic deterrent devices
  - Multibeam echo-sounders (≤12 kHz)

Therefore, no MNR data entry is required for UXO geophysical survey operations.

Where required by the regulator, reporting of any work carried out under licence will also be submitted within the specified period after of the expiry of the licence.

8. Conclusions

8.1 EPS Licencing (Marine Scotland Licensing Operations Team)

This assessment of the potential for impacts on EPS from activities associated with the UXO geophysical survey work for the project concluded that, after adopting mitigation and the industry standard JNCC guidelines (JNCC, 2017):

- There was negligible potential for lethal effects to marine EPS;
- The potential for physical or auditory injury was considered to be negligible; and
- The potential for behavioural disturbance was considered to be low within the context of the wider populations of EPS.

For operations in Scottish waters, following 2014 Marine Scotland and SNH guidance, there is the potential for minor disturbance of animals, as defined in regulations 39 (1) (a) and (b) and 39 (2) of the Conservation of Habitats and Species Regulations 1994 (as amended in Scotland), from the geophysical systems on the vessels involved during the survey works. **Disturbance will be insufficient to cause any population level effects**, and thus an **EPS licence to disturb can be issued under Section 39 of The Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland).**

Furthermore, the assessment concludes, with the adoption of the recommended mitigation measures outlined in **Section 7**, that effects on designated sites and their qualifying features or any priority marine habitats and species in Scotland as a result of the proposed survey works are predicted to be **not significant**.

For operations in offshore waters, the assessment concludes, that any potential effects to marine protected species or MPAs and their qualifying features as a result of the UXO geophysical survey, would be **not significant** under The Conservation of Offshore Marine Habitats and Species Regulations 2017.

8.2 Marine Licence Exemption Notification (MMO)

In English waters, the assessment concluded that any potential effects to marine protected species or MPAs and their qualifying features as a result of the UXO geophysical survey, would be **not significant** under The Conservation of Habitats and Species Regulations 2017 and The Conservation of Offshore Marine Habitats and Species Regulations 2017. Therefore, **a marine licence exemption notification can be submitted to the MMO**. Furthermore, a **Marine Wildlife Licence** is not considered to be required.

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Appendix A – Relevant Designated Sites

Table A.1 Designated sites which fall within 50 km (135 km for grey seal and including Moray Firth SAC for bottlenose dolphin) of the survey area for the proposed Marine Installation Corridor.

Site name	Designation	Proposed or Designated Biodiversity Features	Distance to Marine Installation Corridor (km)
Buchan Ness to Collieston Coast	SPA	• Seabird assemblage	0
Firth of Forth Banks Complex	MPA	• Ocean quahog aggregations • Offshore subtidal sands and gravels • Shelf banks and mounds • Moraines representative of the Wee Bankie Key Geodiversity Area	0
Flamborough Head	SAC	• Reefs • Vegetated sea cliffs of the Atlantic and Baltic Coasts • Submerged or partially submerged sea caves	0.01
Greater Wash	SPA	Breeding populations of: • Sandwich tern • Common tern • Little tern Non-breeding populations of: • Red-throated diver • Common scoter • Little gull	1.3
Southern Trench	MPA	• Minke whale • Burrowed mud • Fronts • Shelf deeps	2.0
Northeast of Farnes Deep	MCZ	• Subtidal coarse sediment • Subtidal mixed sediments • Subtidal sand	2.9

Site name	Designation	Proposed or Designated Biodiversity Features	Distance to Marine Installation Corridor (km)
		• Subtidal mud • Ocean quahog	
Flamborough and Filey Coast	SPA	Breeding populations of: • Gannet • Guillemot • Kittiwake • Razorbill • Seabird assemblage	3.3
Farnes East	MCZ	• Moderate energy circalittoral rock • Subtidal coarse sediment • Subtidal mixed sediments • Subtidal sand • Subtidal mud • Sea-pen and burrowing megafauna communities • Ocean quahog	4.6
Holderness Offshore	MCZ	• North Sea glacial tunnel valleys • Ocean quahog • Subtidal coarse sediment • Subtidal mixed sediments • Subtidal mixed sediments	4.7
Holderness Inshore	MCZ	• 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)	5.6
Loch of Strathbeg	Ramsar, SPA	• Sandwich tern	14.0

Site name	Designation	Proposed or Designated Biodiversity Features	Distance to Marine Installation Corridor (km)
		• Barnacle goose • Whooper swan • Pink-footed goose • Greylag goose • Waterbird assemblage	
Ythan Estuary and Meikle Loch	SPA, Ramsar	• Common tern • Little tern • Sandwich tern • Pink-footed goose • Waterbird assemblage	15.2
Southern North Sea	SAC	• Harbour porpoise	18.8
Turbot Bank	MPA	• Sandeels	20.9
Troup, Pennan and Lion's Heads	SPA	• Guillemot • Seabird assemblage	30.6
Humber Estuary	SPA, SAC, Ramsar	• Little tern • Common tern • Sandwich tern • Little gull • Red-throated diver • Common scoter • Estuaries • Mudflats and sandflats not covered by seawater at low tide • Sandbanks which are slightly covered by sea water all the time • Coastal lagoons • Salicornia and other annuals colonizing mud and sand • Atlantic salt meadows • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila arenaria* • Fixed coastal dunes with herbaceous vegetation Priority feature	34.7

Site name	Designation	Proposed or Designated Biodiversity Features	Distance to Marine Installation Corridor (km)
		• Dunes with *Hippophae rhamnoides* • Sea lamprey • River lamprey • Grey seal	
Northumberland Marine	SPA	• Arctic tern • Common tern • Guillemot • Little tern • Puffin • Roseate tern • Sandwich tern • Seabird assemblage	35.1
Runswick Bay	MCZ	• Low energy intertidal rock • Moderate energy intertidal rock • High energy intertidal rock • Intertidal sand and muddy sand • Moderate energy infralittoral rock • Moderate energy circalittoral rock • Subtidal coarse sediment • Subtidal mixed sediments • Subtidal sand • Subtidal mud • Ocean quahog	35.7
Berwickshire and North Northumberland Coast	SAC	• Mudflats and sandflats not covered by seawater at low tide • Large shallow inlets and bays • Reefs • Submerged or partially submerged sea caves • Grey seal	36.4
Swallow Sand	MCZ	• Subtidal sand • Subtidal coarse sediment	37.3

Site name	Designation	Proposed or Designated Biodiversity Features	Distance to Marine Installation Corridor (km)
		• North Sea glacial tunnel valley	
Berwick to St Mary's	MCZ	• Eider	40.2
Farne Islands	SPA	• Arctic tern • Common tern • Guillemot • Roseate tern • Sandwich tern • Seabird assemblage	45.8
Coquet to St Mary's	MCZ	• Low energy intertidal rock • Moderate energy intertidal rock • High energy intertidal rock • Intertidal mixed sediments • Intertidal coarse sediment • Intertidal sand and muddy sand • Intertidal mud • Intertidal under-boulder communities • Peat and clay exposures • Moderate energy infralittoral rock • High energy infralittoral rock • Moderate energy circalittoral rock • Subtidal coarse sediment • Subtidal sand • Subtidal mixed sediments • Subtidal mud	48.6
Isle of May	SAC	• Reefs • Grey seal (*Halichoerus grypus*)	88.4
Moray Firth	SAC	• Sandbanks which are slightly covered by seawater all the time • Bottlenose dolphin	92.5

Appendix B – Designated Sites and Screening Matrix

Table B.2 Designated sites which fall within 50 km (135 km for grey seal, including Moray Firth SAC for bottlenose dolphin) of the survey area for the Marine Installation Corridor screening matrix

Site name	Designation	Disturbance due to changes in marine water quality	Airborne sound disturbance	Underwater sound disturbance	Visual disturbance (including artificial light)	Collison risk	Outcome
Buchan Ness to Collieston Coast	SPA	X	X		X		SCREENED IN
Firth of Forth	SPA, Ramsar	X	X		X		SCREENED IN
Flamborough Head	SAC	X					SCREENED IN
Southern Trench	MPA	X		X	X	X	SCREENED IN
Greater Wash	SPA	X	X		X		SCREENED IN
Northeast of Farnes Deep	MCZ	X					SCREENED IN
Flamborough and Filey Coast	SPA	X	X		X		SCREENED IN
Farnes East	MCZ	X					SCREENED IN
Holderness Offshore	MCZ	X					SCREENED IN
Holderness Inshore	MCZ	X					SCREENED IN
Loch of Strathbeg	Ramsar, SPA	X	X		X		SCREENED IN
Ythan Estuary and Meikle Loch	SPA, Ramsar	X	X		X		SCREENED IN
Southern North Sea	SAC	X		X	X	X	SCREENED IN
Turbot bank	MPA	X					SCREENED IN
Troup, Pennan and Lion's Heads	SPA		X		X		SCREENED IN
Humber Estuary	SPA, SAC, Ramsar		X	X	X	X	SCREENED IN

Site name	Designation	Disturbance due to changes in marine water quality	Airborne sound disturbance	Underwater sound disturbance	Visual disturbance (including artificial light)	Collison risk	Outcome
Northumberland Marine	SPA		X		X		SCREENED OUT
Runswick Bay	MCZ						SCREENED OUT
Berwickshire and North Northumberland Coast	SAC		X	X	X	X	SCREENED IN
Swallow Sand	MCZ						SCREENED OUT
Berwick to St Mary's	MCZ		X		X		SCREENED IN
Farne Islands	SPA		X		X		SCREENED IN
Coquet to St Mary's	MCZ						SCREENED OUT
Isle of May				X			SCREENED IN
Moray Firth	SAC			X			SCREENED IN

Appendix C – Fish Spawning and Nursery Areas

Table C.3 Fish spawning and nursery grounds which overlap with the proposed Marine Installation Corridor (Coull, Johnstone, & Rogers, 1998; Ellis, Milligan, Readdy, Taylor, & Brown, 2012).

Common name	Latin Name	Spawning areas	Nursery areas
Spurdog	*Squalus acanthias*	N	Y (L)
Tope	*Galeorhinus galeus*	N	Y (L)
Skate		N	Y (L)
Spotted ray	*Raja montagui*	N	Y (L)
Herring	*Clupea harengus*	Y	Y (H)
Cod	*Gadus morhua*	Y (L)	Y (L, H)
Whiting	*Merlangius merlangus*	Y (L)	Y (H)
Blue whiting	*Micromesistius poutassou*	N	Y (L)
Ling	*Molva molva*	N	Y (L)
Hake	*Merluccius merluccius*	N	Y (L)
Anglerfish	*Lophius piscatorius*	N	Y (L)
Sandeel	Ammodytidae	Y (L, H)	Y (L)
Mackerel	*Scomber scombrus*	N	Y (L)
Plaice	*Pleuronectes platessa*	Y (L)	Y (L)

Common name	Latin Name	Spawning areas	Nursery areas
Appendix A Key: Y = Yes; N = No; L = Low intensity; H = High intensity			