11. Shipping and Navigation

11.1. Study Area Definition

This chapter of the Scoping Report describes the potential impacts arising from the construction, operation (including maintenance and repair) and decommissioning of the Eastern Green Link 3 (EGL 3) hereafter referred to as 'the Project' on shipping activity and key navigation features.

The Scoping Boundary for the Project extends from MHWS in England to MHWS in Scotland. It is nominally 1 km wide, 500 m either side of the centreline, however, it widens in areas where there is still optionality in the design e.g., to allow for micro-routeing around potential seabed features. It is anticipated that the Marine Licence application boundary will ultimately be 500 m following refinement and rationalisation as the marine environmental assessment (MEA) and design process evolves.

There are two proposed landfalls in England being considered at this stage of the environmental assessment process; Anderby Creek and Theddlethorpe. These options will be subject to further technical feasibility work and stakeholder consultation. It will be refined to one preferred option for inclusion in the subsequent Marine Licence application for the Project.

The Study Area assessed for shipping and navigation includes the Scoping Boundary plus an additional 5 Nautical Miles (NM) either side to ensure that all shipping patterns and navigational features are captured.

Kilometre Points (KPs) are used throughout this Chapter to provide context as to where within the Study Area a feature lies. KP 0 is defined at the Anderby Creek Landfall. As there are still alternative Landfalls being considered, KPs have been created along the longest route from the proposed English Landfall at Anderby Creek, around the Holderness Offshore Marine Conservation Zone (MCZ) to the proposed Scottish Landfall at Sandford Bay. The KPs for this route are referenced as KP 0 – KP 575.3. Alternative options, which branch off this longest route, are routed from the proposed English Landfall at Theddlethorpe to the point where it converges with the longest route (referenced as T_KP 0 to T_KP18); and through Holderness Offshore MCZ, which is referenced as KP 0 to H_KP 40.

11.2. Data Sources

Data sources for the baseline characterisation will be presented in accordance with relevant guidance for the topic. The datasets that will be used to inform the description of the baseline environment for the MEA are detailed in Table 11-1 and described in the following sub-sections.

Table 11-1: Shipping and navigation data sources

Data Source	Description	Coverage	
		English Study Area	Scottish Study Area
MariTrace AIS Vessel Data	5-minute time series data of shipping activities from 01/03/2022 to 28/02/2023 (12 months of data). Purchased from MariTrace.	✓	✓
Royal Yachting Association (RYA) UK Coastal Atlas of Recreational Boating 2.1	AIS dataset of recreational vessels. Purchased from RYA.	✓	✓
European Marine Observation and Data Network (EMODnet) vessel density maps of European waters	Coarse-grained vessel density maps. Publicly available at https://www.emodnet-humanactivities.eu/view-data.php	✓	✓
Marine Management Organisation (MMO) Fishing Data Marine Traffic	UK sea fisheries annual statistics from 2022. Publicly available at https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2022	✓	✓
Royal National Lifeboat Institution (RNLI) Incidents Data	RNLI 2008-2022 datasets including Returns of Service, lifeboat stations, and support centres. Publicly available at https://data-rnli.opendata.arcgis.com/ (note	✓	✓

Data Source	Description	Coverage	
		English Study Area	Scottish Study Area
	that Returns of Service is currently not available online as of November 2023).		
Marine Accident Investigation Branch (MAIB) annual reports	MAIB incident reports, covering a ten-year period from 2013 to 2023. Publicly available at https://www.gov.uk/maib-reports	✓	✓
Marine Themes Vector Data	Marine Themes Vector data tiles including anchorage areas, marine use areas, aquaculture, navigational lines, navigational routes, beacons and buoys. Purchased from FIND Mapping.	✓	✓
Admiralty Charts	Admiralty charts via a Web Mapping Service (WMS) feed. Purchased from MarineFind.	✓	✓

11.2.1. Site-Specific Survey Data

The Applicants hold AIS data purchased from MariTrace for the entire area (1 March 2022 – 28 February 2023, 12 months of data). This data will be used to inform the MEA. This 5-minute time series data, supplemented by publicly available EMODnet data, will be used to create vessel density maps. The AIS data extends past the 5 NM Study Area to cover previously identified potential Project routes and provide a characterisation of general vessel behaviour in the area.

Furthermore, the Project Fisheries Liaison Officer (FLO) will be consulted to validate desk-based fishing data and identify any fishing hotspots which need to be captured in the Project Navigational Risk Assessment (NRA).

11.2.2. Publicly Available Data

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

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

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

11.2.3. Additional Studies

11.2.3.1. Navigational Risk Assessment (NRA)

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

- MAIB and RNLI maritime incident data in the area (10 years)
- Incident data from Peterhead Port and ABP Humber
- Additional fishing vessel activity data (e.g., Vessel Monitoring System (VMS) satellite data)
- Port statistics

The NRA will be carried out using a Formal Safety Assessment (FSA) compliant with IMO Revised Guidelines for FSA for Use in the IMO Rule-Making Process (IMO, 2018). The assessment approach is described in Section 11.5.

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

11.2.3.2. Commercial Fishing Activity

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

11.3. Consultation

Consultation will be undertaken with the relevant stakeholders to supplement the desktop review and studies and the Project has already undertaken stakeholder consultation as an ongoing process since the early stages of development. Consultations will be used to agree the planned approach for the NRA, verify the desk-based data sources and fill in any information gaps. The following, non-exhaustive list of bodies will be consulted to ensure that the most up-to-date information is collated:

Table 11-2: List of stakeholders to be consulted

England	Scotland
Maritime and Coastguard Agency (MCA)	Maritime and Coastguard Agency (MCA)
Chamber of Shipping	Chamber of Shipping
Trinity House	Northern Lighthouse Board (NLB)
RYA	RYA
Local sailing clubs	Local sailing clubs
National Federation of Fisheries Organisations (NFFO)	Scottish Fishermen's Federation
Inshore Fisheries and Conservation Authority (IFCA) - Eastern, North-Eastern and Northumberland.	Scottish Creel Fisherman's Association
ABP Humber Port	Peterhead Port Authority
Port of Tyne	Forth Ports
Port of Sunderland	Port of Aberdeen
Seaham Harbour	Morven OWF
Tees and Hartlepool Port Authority	Ossian OWF
Port of Blyth	Bowdun OWF
Triton Knoll Offshore Wind Farm (OWF)	Thistle Wind Partners Cluaran OWF
Lincs OWF	North Sea Transition Authority (NSTA)
North Sea Transition Authority (NSTA)	

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

11.4. Baseline Characterisation

11.4.1. Introduction

This section has been split into the following sub-sections to provide an overview of the baseline characterisation:

- Overview;
- English baseline characterisation; and
- Scottish baseline characterisation.

11.4.2. Overview

For the Project, AIS data has been used to determine the size and quantity of vessels which operate in the vicinity of the proposed submarine cable corridor. AIS provides information on the type of vessel (see Table 11-3 below). It should be noted that in England vessels under 12m are not required to carry AIS equipment, In Scotland this requirement is for vessels under 15 m therefore, there will be a gap in data for these smaller vessels.

The number of AIS vessel data points within the dataset totals 825. Table 11-3 displays the distribution of vessels of each vessel type, categorised by vessel type; the output of all vessels is illustrated in Figure 11-2 and Figure 11-3.

Table 11-3: Number of AIS data points by each vessel type

Vessel Type	English % of Total AIS Data	Scottish % of Total AIS Data
Cargo	17.7%	51.0%
Dredging or Underwater Operations	0.7%	1.0%
Fishing	44.2%	5.0%
High-Speed Craft	2.0%	1.5%
Military And Law Enforcement	0.7%	1.2%
Other	13.6%	5.0%
Passenger	2.7%	0.4%
Pleasure Craft	0.7%	1.9%
Sailing	0.7%	4.9%
Service	7.5%	1.3%
Tanker	2.0%	24.3%
Tug or Towing	4.1%	1.6%
Unknown	3.4%	0.7%
Total Number of AIS Data Points	*678*	*147*

400000 600000 800000

6200000

6000000

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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Export Date: 22 November 2023

nationalgrid intertek Scottish & Southern Electricity Networks TRANSMISSION

AIS Vessel Density

C01494-EGL3-SHIP-001-B

12 NM Limit
EGL3 Study Area
EGL3 Scoping Boundary

Vessel Density 2022-2023 (Hours Per Year)

- < 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- 100 - 150
- 150 - 200
- 200 - 500
- > 500

0 10 20 30 NM

0 20 40 60 80 KM

Date	22 November 2023
Coordinate System	ETRS 1989 UTM Zone 30N
Projection	Transverse Mercator
Unit	Meters
Scale at A3	1:1,900,000
Created	Joseph Frean
Reviewed	Oliver Bula
Authorised	Andrew Page

11.4.3. English Baseline Characterisation KP 0 – KP 431.4

The key navigational features found in this area are:

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

There are three main shipping lanes or areas within the Study Area identified by AIS data as shown in Figure 11-1 (Drawing:C01494-EGL3-SHIP-001.). Most vessel traffic exists around the English Landfall area between KP 0 to KP 68, numerous shipping lanes leave the Port of Hull harbour (Humber Estuary). To a lesser extent between KP 83 to KP 140, there are shipping lanes out of Bridlington, Scarborough and Whitby, which mostly comprise of fishing vessels. Between KP 217 and KP 225, a shipping lane is visible leaving Middlesbrough orientated in a North East – South West direction; the Scoping Boundary crosses perpendicular to this lane.

High vessel activity (over 500 vessel hours per year in certain locations) is found in English waters within and in close vicinity to the Humber estuary. Vessels travelling to/from the Associated British Ports (ABP) Humber ports transect the Scoping Boundary offshore of Lincolnshire in multiple locations at KP 15, KP 26 and KP 35. Another shipping channel heading northwest transects the Scoping Boundary at KP 54.

Vessels to the north of East Anglia can be shown to traverse around the existing OWF developments (e.g., Triton Knoll, Hornsea Projects, Race Bank) and those under development (e.g. Outer Dowsing), seen in Figure 11-4 (Drawing C01494-EGL3-SHIP-002).

There is a deep-water anchorage at Sand Hole approximately 8-10 km to the West of KP 30-40, partly inside the Study Area. This anchorage is 2.5 km to the East of the Humber Gateway OWF, which is fully commissioned.

As shown in Figure 11-2, cargo vessels comprise the highest proportion of vessel types identified within the English Study Area, with 346 cargo vessels (51.0% of the total vessels). Cargo vessels are seen within the AIS dataset traversing over the Scoping Bounding in the shipping lanes between the Humber Estuary, East Anglia and the North, with the greatest intensity of cargo vessels between KP 30-40. Tankers (24.3% of the total vessels) follow a similar pattern to the cargo vessels.

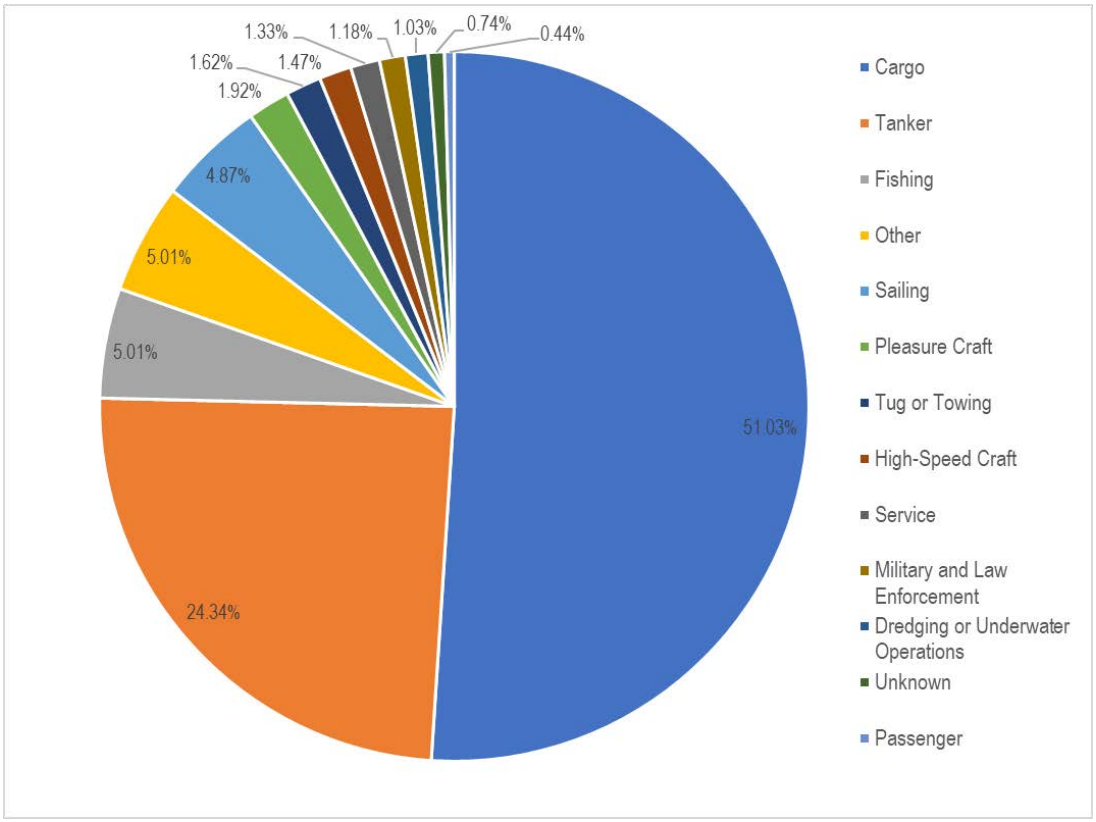

Figure 11-2: Pie chart showing distribution of different vessel types in English waters

11.4.4. Scottish Baseline Characterisation KP 431.4 to KP 575.3

The key navigational features found in this area are:

- Peterhead Port Authority
- Port Erroll (Cruden Bay)
- Boddham Harbour
- Pilotage station (2.5 km to East of Boddam)
- OWFs (Morvan, Ossian, Thistle Wind, Hywind)
- Military Practice Area - Areas of Intense Aerial Activity

From KP 477 to the Scottish Landfall, there is an increase in marine traffic nearshore due to higher vessel activity related to the Aberdeen and Peterhead ports, particularly to service oil and gas infrastructure in the North Sea, where hotspots can be identified on Figure 11-4 (Drawing C01494-EGL3-SHIP-002).

AIS data from 2022/2023 to the east of the Scottish Landfall is characterised by vessels servicing oil and gas infrastructure, in addition to constructing and servicing multiple OWFs in the North Sea. This has resulted in hotspots and associated vessel track lines to the OWFs and oil and gas infrastructure in Scottish waters.

As displayed in Figure 11-4 (Drawing C01494-EGL3-SHIP-002), the Scoping Boundary navigates between areas that are proposed for two new wind farms (BP Morven and Ossian OWFs) between KP 399 to KP 460. The current levels of marine traffic in this area are low; these windfarms are not yet constructed but are currently in development. Over the coming years, this area is likely to have significantly higher levels of marine traffic, particularly with the increasing spatial pressures off the East coast of the UK (The Crown Estate, 2021).

Shipping risk is concentrated just south of Peterhead (Aberdeenshire, Scotland) in Sandford Bay, both in terms of vessel traffic density and also size of associated vessels. Cargo vessels and vessels categorised as Other are active at the Peterhead port at approximately 80-280 average vessel hours per km^2 and 180-1470 average vessel hours per km^2 respectively. The traffic in the nearshore areas of Sandford Bay is comprised mainly of smaller vessels below 30,000 tonnes.

Although just outside the Study Area and not represented in Figure 11-3, it is noted that vessels are present in a high concentration by the peninsula near Fraserburgh. Figure 11-3 illustrates a high ratio of fishing vessels in Scottish waters with 65 fishing AIS data points (44.2% of total vessels), with a higher number of fishing vessels at the Peterhead port which are approximately 0.7 km North of the Scoping Boundary at KP 542-543. Cargo vessels make up a smaller proportion (17.7% of total vessels) and mostly transit the Study Area between Peterhead and the peninsula. There is additionally a higher number of vessels categorised as Other moored in Peterhead, which include some trawlers, and safety and supply vessels working on offshore projects.

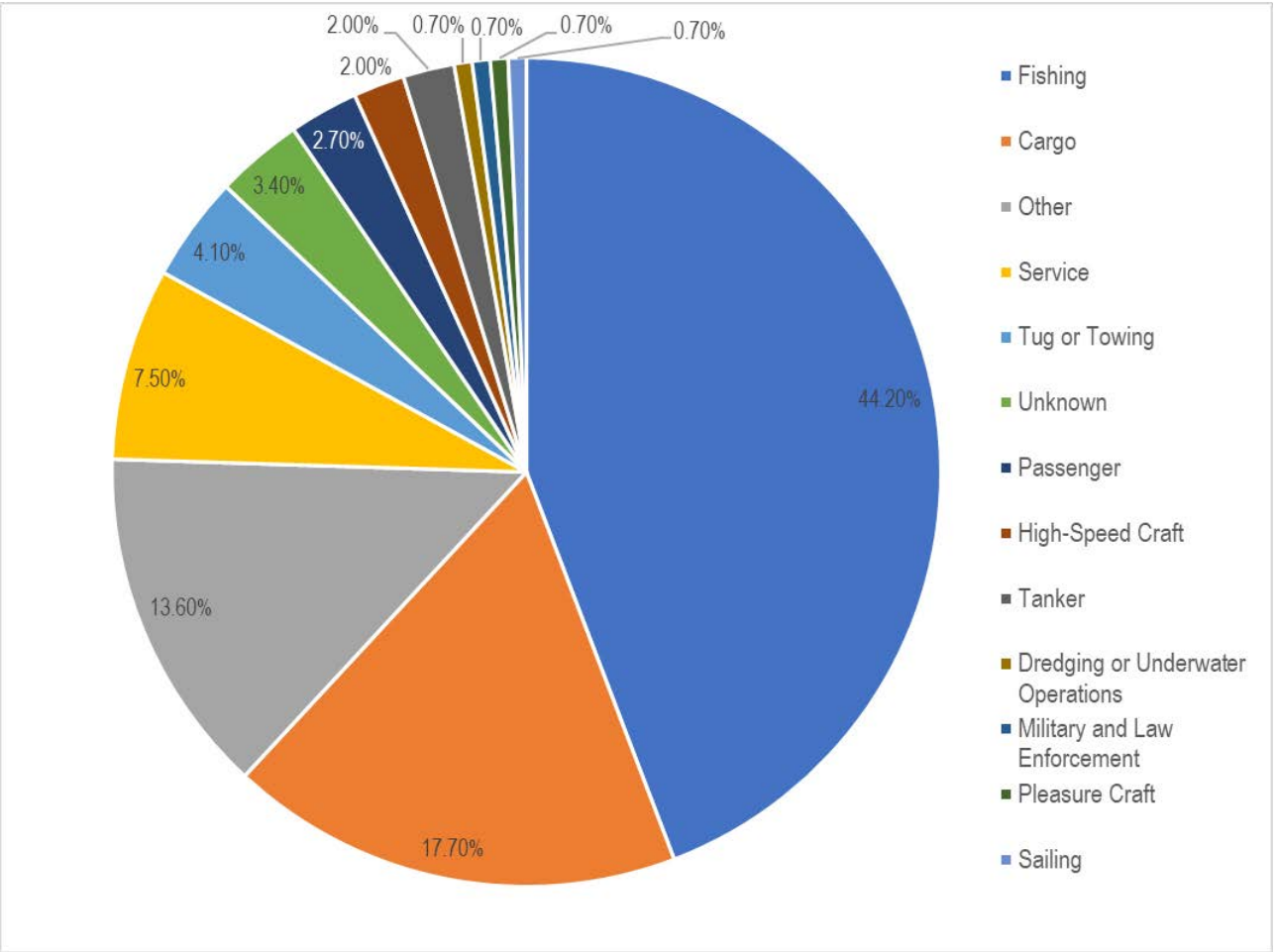

Figure 11-3: Pie chart showing distribution of different vessel types in Scottish waters

OWF Developments

C01494-EGL3-SHIP-002-B

450000 600000 750000

6300000

6150000

6000000

CampionWind Limited

Thistle Wind Partners Cluaran

Gemini Offshore Wind Farm

Ossian Offshore Windfarm

Morven Offshore Wind Limited

Berwick Bank

0 10 20 KM

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

12 NM Limit

Exclusive Ecomonic Zone (EEZ) Limit

EGL3 Study Area

EGL3 Scoping Boundary

Offshore Windfarm Status

- Active/In Operation
- Consented
- Earlier Stages of Development
- Government Support on Offer
- In Planning
- Inactive/Decommissioned
- Pre Planning
- Preferred Project – Subject to HRA
- Under Construction

EMODnet Vessel Density (hours per km²)

- < 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 200
- 200 - 500
- > 500

0 10 20 30 NM

0 20 40 60 80 KM

Date	22 November 2023
Coordinate System	ETRS 1989 UTM Zone 30N
Projection	Transverse Mercator
Unit	Meters
Scale at A3	1:1,900,000
Created	Alice Gymer
Reviewed	Oliver Bula
Authorised	Andrew Page

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Export Date: 22 November 2023

11.5. Proposed Assessment Methodology

11.5.1. Methodology Overview

The assessment process involves the following main steps presented in Figure 11-5. The NRA will be undertaken based on IMO standards (IMO, 2018) and using Marine Guidance Notes (MGNs; MGN, 2021). In carrying out these assessments, as far as reasonably possible, all three phases of the Project's life will be addressed, i.e., construction, operation and maintenance, and decommissioning. The methodology for accomplishing each step is described below.

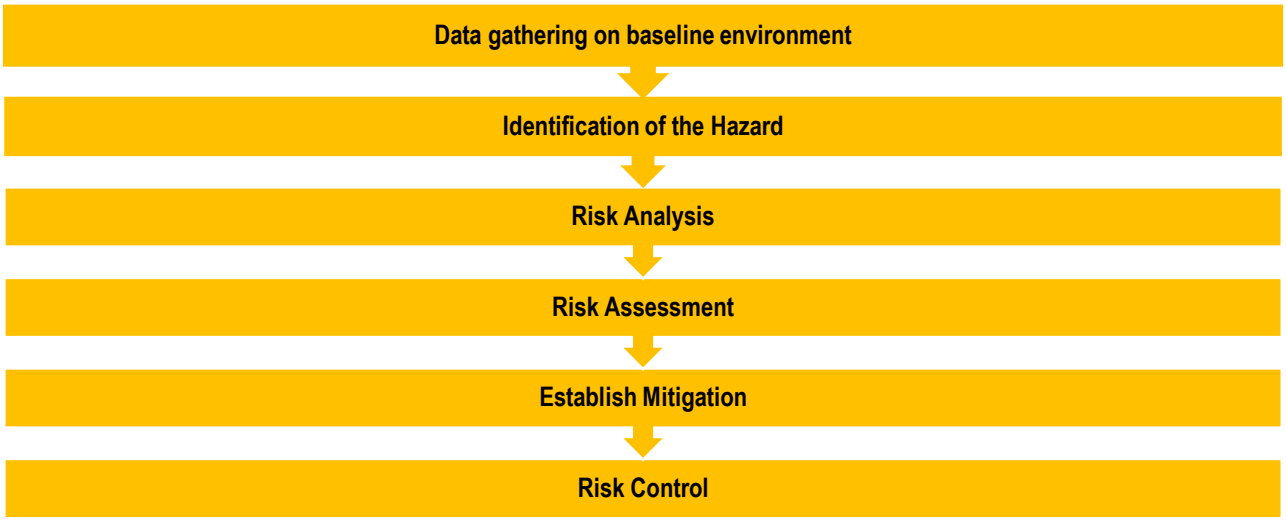

Figure 11-5: Assessment steps

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

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

Below, Table 11-4 illustrates a high-level summary of each step of the NRA. Further information on the steps is detailed below in Sections 11.5.2. to 11.5.7.

Table 11-4: Overview of NRA methodology

Data Requirement	Method	Data Sources
Baseline Assessment	Establish current shipping conditions and features that exist within the study area. A specialist study to provide data on maritime activity, shipping intensity and density in the study area and a risk assessment of potential shipping hazards such as collision risk and anchoring risks. A 5 NM buffer will be applied around the proposed Marine Licence Application Boundary to ensure that all shipping patterns and navigational features are captured.	EMODnet vessel density maps of European waters AIS datasets (01/03/2022 – 28/02/2023) Admiralty charts Royal Yachting Association (RYA) UK Coastal Atlas of Recreational Boating Marine Management Organisation (MMO) Fishing Data Marine Traffic Royal National Lifeboat Institution (RNLI) Incidents Data Marine Accident Investigation Branch (MAIB) annual reports Port Authority Information as required (Peterhead ports pilotage service etc.) Sailing and Pilot books Project-specific reports and studies (e.g., AIS data, fisheries study, EMF study)

Data Requirement	Method	Data Sources
		Inshore Fisheries and Conservation Authority (IFCA) - Eastern, North-Eastern and Northumberland, Scottish Creel Fisherman's Association.
Consultation	Proactive consultation with key ports authorities (e.g., Peterhead, ABP Humber) and the Maritime and Coastguard Agency (MCA), alongside other maritime stakeholders (e.g. local sailing clubs, RYA, Trinity House, Northern Lighthouse Board, Chamber of Shipping).	Stakeholder consultation meetings.
Hazard Identification	Identify known hazards expected to be encountered as a result of the offshore operations and presence of project vessels.	Data gathered from the baseline assessment. Potential hazards raised by stakeholders during consultation.
Risk Analysis	Determine the impact of hazards on navigational safety, displacement of vessels, and human safety in terms of frequency and consequence, developed using International Maritime Organisation (IMO) guidelines.	Hazard identification phase IMO Guidelines (IMO, 2018).
Risk Assessment	Risks are examined using a risk matrix, which illustrates the combination of the frequency and the consequence of the hazard to establish the potential impact.	Frequency & consequences from the risk analysis phase.
Mitigation	Mitigation measures for each hazard is established to (in preferential order): prevent/avoid, reduce, or offset the potential risk. Gaps in existing procedures and areas in which mitigation may need to be enhanced will also be considered. Care to be taken to ensure that any new hazards created as a result are themselves identified and managed.	International Regulations for Preventing Collisions at Sea (COLREGs) IMO Guidelines UK Standards European Subsea Cable Association Guidance
Risk Control	Reduce risks on the existing shipping baseline to As Low As Reasonably Practicable (ALARP) using mitigation measures. Additional analysis, consultation and enhanced mitigation measures are normally needed for risks that are assessed as Major after reducing risks to ALARP. Where further mitigation is not possible a residual hazard may remain.	Stakeholder consultation if required

11.5.2. Baseline Assessment

To assess the potential effects resulting from the Project it is necessary to establish the current shipping conditions and features that exist along and near the Project. A 5 NM buffer has been applied around the Project to ensure that all shipping patterns and navigational features are captured.

The analysis would include:

- Potential accidents resulting from navigation activities (MAIB & RLNI);
- Navigation activities affected by the Project;
- Project structures that could affect navigation activities;
- Project phases that could affect navigation activities;
- Other structures and features that could affect navigation activities;
- Vessel types involved in navigation activities;

- Conditions affecting navigation activities; and
- Human actions related to navigation activities for use in hazard identification (if possible).

11.5.3. Hazard Identification

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

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

The approach for hazard identification would comprise a combination of both qualitative and analytical techniques, the aim being to identify all relevant hazards. Where relevant, consultation would be undertaken with stakeholders to help to identify and discuss hazards. In addition, the exercise will be undertaken with the Peterhead Port Authority where the cable route transects a port jurisdiction to coordinate the identification of hazards specific to the activities associated with the port.

11.5.4. Risk Analysis

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

Risk is the combination of frequency and consequence which are defined in Table 11-5 and Table 11-6 below. The definitions below, developed using the IMO guidelines, would be used and examine effects on human safety and ships as well as displacement of existing vessels (as this is the most likely consequence of the Project).

Table 11-5: Frequency of a Hazard

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

Table 11-6: Consequence of a Hazard

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

11.5.5. Risk Assessment

To undertake the risk assessment, a risk matrix approach would be utilised that has been adapted from the guidance, which examines the frequency and consequence of a hazard to determine the combined risk. The risk matrix contains risk ratings based on both the

consequence and the frequency of the hazard. Risk ratings are calculated using Table 11-7, which can be interpreted using Table 11-8.

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

Table 11-7: Risk rating matrix based on the consequence and frequency of the risk

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

Table 11-8: Definition of risk levels

Score	Classification	Definition
1-2	Negligible	A hazard which causes noticeable changes in the navigation environment but without effecting its sensitivities. Generally considered as insignificant.
3-4	Minor	A hazard that alters the character of the navigation environment in a manner that is consistent with existing baseline. Hazards are generally considered as minor and adequately controlled by best practice and legal controls. Opportunities to reduce hazards further through mitigation may be limited and are unlikely to be cost effective.
5-9	Moderate	A hazard which, by its frequency and consequence alters the aspect of the navigation environment. Generally considered as Moderate but effects are those, considered to be tolerable. However, it is expected that the hazard has been subject to feasible and cost-effective mitigation and has been reduced to As Low As Reasonably Practicable (ALARP) and that no further measures are feasible.
10-14	Major	An effect which, by its frequency and consequence alters most of the aspects of the navigation environment. Generally regarded as unacceptable prior to any mitigation measures being considered.
15-25	Intolerable	Regarded as unacceptable prior to any mitigation measures being considered.

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

11.5.6. Mitigation

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

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

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

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

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

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

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

11.5.7. Risk Control

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

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

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

11.6. Scope of Assessment

A range of potential impacts on shipping and navigational features have been identified which may occur during the construction, operation & maintenance, and decommissioning phases of the Project. Table 11-9 describes the potential impacts identified and provides justification as to whether they will be scoped in or out of the NRA and MEA. A precautionary approach has been taken and where there is no strong evidence base, or the risk is uncertain at this stage the impact has been scoped 'in' to the NRA/MEA. Where there is a clear evidence base that the risk from the impact will not be significant, either alone or in combination with other plans and projects, the impact has been scoped out of the NRA as part of the MEA.

Table 11-9: Scoping assessment of impacts on Shipping and Navigation

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

Potential Impacts	Possible Hazards	Project Activities	Sensitive Receptors	Scoping Justification		
				Construction	Operation (including repair and maintenance)	Decommissioning
Impact on Human Activities	Fishing gear snagging	Post-installation	Fishing vessels & Fisheries	**IN** – The risk of fishing gear snagging is extremely low in the construction phase due to notices and presence of project vessels.	**IN** – The risk of fishing gear snagging, especially bottom towed gear, is highest in the operational phase once fishing vessels resume activities in the area.	**IN** – The risk of fishing gear snagging is extremely low in the decommissioning phase. However, until a full decommissioning plan is written it cannot be scoped out at this stage.
Displacement of Vessels	Project vessels blocking navigational features	Mobilising project vessels	Vessels travelling to/from anchorages and port approaches	**IN** – There is a high risk of project vessels blocking navigational features during construction, such as anchorages or approaches to ports, causing some displacement of other marine users.	**IN** – There is a small risk of project vessels blocking navigational features during operation, such as anchorages or approaches to ports, causing some minor displacement of other marine users at a small-scale.	**IN** – There is a small risk of project vessels blocking navigational features during decommissioning, such as anchorages or approaches to ports, causing some minor displacement of other marine users at a small-scale.
Displacement of Vessels	Disturbance to existing shipping patterns	Mobilising project vessels	Vessels	**IN** – The risk of disturbing existing shipping patterns during construction is highest, as vessels may have to re-route around or reduce speed on approach to the project vessels which may lead to a temporary disturbance.	**IN** – The risk of disturbing existing shipping patterns during the operational phase is low, as there a few vessels required to undertake repairs and maintenance which results in a minor temporary disturbance to existing shipping patterns.	**IN** – The risk of disturbing existing shipping patterns during the decommissioning phase is low, as there a few vessels required which results in a minor temporary disturbance to existing shipping patterns.
Impact on Human Activities	Reduction in under-keel clearance	Post-installation	Vessels	**IN** - There is a low risk of reduction in under-keel clearance during construction only associated with project vessels.	**IN** – The risk of reduction in under-keel clearance is highest during the operational phase due to the presence of cable protection measures that reduce the navigable water depth for vessels.	**IN** - There is a low risk of reduction in under-keel clearance during decommissioning only associated with project vessels.
Impact on Human Activities	Interference with marine navigation equipment	Post-installation	Vessels	**OUT -** There is no risk of electromagnetic forces from the cable causing magnetic compass deviations in the construction phase.	**IN –** The risk of electromagnetic forces from the cable causing deviations in magnetic compasses is highest in the operational phase once the cable is in place and other marine users can traverse the marine corridor, potentially disrupting navigation	**OUT -** There is no risk of electromagnetic forces from the cable causing magnetic compass deviations in the decommissioning phase.

11.7. References

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