Offshore Wind Power Limited

West of Orkney Windfarm Offshore EIA Report

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West of Orkney Windfarm

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CONTENTS

15 SHIPPING AND NAVIGATION

Chapter summary

This chapter of the Offshore Environmental Impact Assessment (EIA) Report assesses the potential effects from the offshore Project on shipping and navigation receptors. This includes direct, indirect, whole Project assessment, cumulative, inter-related effects, inter-relationships, and transboundary effects. The chapter is supported by a Navigational Risk Assessment (NRA), which provides a formal safety assessment in line with the Maritime Coastguard Agency's (MCA) guidance.

The shipping and navigation study area encompasses a 10 nautical mile (nm) (18.5 kilometre (km)) buffer around the Option Agreement Area (OAA) and a 2 nm (3.7 km) buffer around the offshore Export Cable Corridor (ECC). A wider study area was also applied around Sule Skerry to capture the area offshore of the island to ensure baseline routeing in this area was included in the assessment. Key navigational features in the area include the nearby Area to be Avoided (ATBA) surrounding Orkney and the local rock / shallow features notably Sule Skerry and Sule Stack. The closest port or harbour is Stromness Harbour, located approximately 20 nm (37 km) to the east, on the mainland Orkney coast.

The shipping and navigation activity within the study area was characterised by 28 days of site-specific vessel traffic survey data (split between summer and winter 2022), stakeholder consultation and desk-based studies, including analysis of long-term shipping track data. From the vessel traffic survey in August and December 2022 within the offshore study area, there was an average of 23 unique vessels per day recorded during the summer survey period, with an average of six to seven unique vessels recorded within the OAA. During the winter survey period, an average of 18 unique vessels were recorded within the offshore study area per day with an average of five to six within the OAA. Approximately 28% of all vessel traffic across the 28 days intersected the OAA. The main vessel types within the offshore study area during the summer survey period were cargo vessels (54%) and fishing vessels (15%). The main vessel types within the offshore study area during the winter survey period were also cargo vessels (47%) and fishing vessels (29%).

A total of 12 main commercial routes were identified from the vessel traffic survey data. The highest use main commercial routes were between Belfast and Baltic ports; between Canadian ports and Hamburg; between Mersey ports and Danish ports; between Reykjavik and Humber ports; and between Belfast and Kattegat – each of these routes with an average of four unique vessels per week.

The impacts of the offshore Project construction, operation and maintenance and decommissioning were assessed. The impacts assessed include vessel displacement, increased vessel collision risk (including between third party vessels and between third Party and Project vessels), vessel to structure allision risk, changes in under keel clearance, interaction with subsea cables (e.g. snagging of fishing gear and anchor strikes), adverse weather routing (e.g. the impact of the offshore Project on the routing taken by third party vessels during periods of poor weather), and reduction of emergency response provision.

All impacts assessed were determined to be broadly acceptable or at tolerable risk levels with the implementation of embedded mitigation measures, such as the application and implementation of safety zones during construction and major maintenance works, the establishment of construction buoyage areas and compliance with relevant industry best practice guidelines. Outline navigational plans have been submitted with the application providing more detail. Once site constraints are further understood, additional post-consent consultation will be undertaken with key stakeholders as part of the Development Specification and Layout Plan (DSLP) process to ensure the overarching spatial area covered by the Wind Turbine Generator (WTG) layout is appropriate and that all impacts are reduced to acceptable levels. With the consideration of this secondary mitigation, all effects for the offshore Project alone and cumulatively with other plans and developments are assessed as being As Low As Reasonably Practicable (ALARP) and not significant. The assessment has been conducted irrespective of vessel nationality, and therefore, the assessment of non-significance also applies to transboundary effects. No specific monitoring for shipping and navigation is proposed.

15.1 Introduction

This chapter of the Offshore Environmental Impact Assessment (EIA) Report presents the shipping and navigation receptors of relevance to the offshore Project and assesses the potential impacts from the construction (including pre-construction), operation and maintenance and decommissioning of the offshore Project on these receptors. Where required, mitigation is proposed, and the residual impacts and their significance are assessed. Potential cumulative and transboundary impacts are also considered. Details of the refinement of the offshore Project can be found in chapter 4: Offshore site selection and alternatives.

Table 15-1 below provides a list of all the supporting studies which relate to and should be read in conjunction with the shipping and navigation impact assessment. The key supporting study is the Navigational Risk Assessment (NRA), which is a requirement of the Maritime and Coastguard Agency (MCA) under Marine Guidance Note (MGN) 654 (MCA, 2021). All supporting studies are appended to this Offshore EIA Report and issued on the accompanying Universal Serial Bus (USB).

Table 15-1 Supporting studies

DETAILS OF STUDY	LOCATIONS OF SUPPORTING STUDY
Navigational Risk Assessment	Offshore EIA Report, Supporting Study (SS) 13: Navigational risk assessment.

The impact assessment presented herein draws upon information presented within other impact assessments within this Offshore EIA Report, including chapter 14: Commercial fisheries, chapter 17: Military and aviation, and chapter 20: Other sea users.

Equally, the shipping and navigation impact assessment also informs other impact assessments. This interaction between the impacts assessed within different topic-specific chapters on a receptor is defined as an 'Inter-relationship'. The chapters and impacts related to the assessment of potential effects on shipping and navigation are provided in Table 15-2.

Where information is used to inform the impact assessment, reference to the relevant Offshore EIA Report chapter is given. It is noted that this chapter focuses on navigational safety impacts to vessels in transit. Impacts relating to fishing gear are discussed in chapter 14: Commercial fisheries. An assessment of potential major accidents and disasters in relation to vessel collision or allision was assessed in a separate report in SS2: Major accidents and disasters.

Table 15-2 Shipping and navigation inter-relationships

CHAPTER	IMPACT	DESCRIPTION
Marine physical and coastal processes (chapter 8, Offshore EIA Report)	Under-keel clearance	Changes to seabed levels can result in changes to under keel clearance with direct consequences to shipping and navigation receptors. Changes to seabed levels, sediment properties and suspended sediment concentrations are considered in chapter 8: Marine physical and coastal processes. Any changes in seabed levels from sediment deposits that change water depths by more than 5% will be discussed with the MCA to ensure that suitable navigable depths are maintained (see chapter 8: Marine physical and coastal processes).
Commercial fisheries (chapter 14, Offshore EIA Report)	Impacts to commercial fishing vessel movements	The impact on commercial fishing vessel movements, including safety issues for fishing vessels.
Other sea users (chapter 18, Offshore EIA Report)	Impacts to other marine users including recreational and tourism activities, and other offshore infrastructure	The impact on the use of the marine environment by other marine users including temporary and permanent obstruction to marine vessels movements, including Space Hub Sutherland.
Socio-economics (chapter 19, Offshore EIA Report)	Impacts on tourism, recreation, and the economy	Both positive and negative socio-economic impacts associated with tourism, recreation, and amenities. Socio-economic impacts (either positive or negative) have the potential to impact shipping and navigation receptors, and these are assessed in chapter 19: Socio-economics.

The following specialists have contributed to the assessment:

- Anatec Ltd. – baseline description, impact assessment, NRA and Offshore EIA Report chapter write up.

15.2 Legislation, policy and guidance

Over and above the legislation presented in chapter 3: Planning policy and legislative context, the following legislation, policy and guidance are relevant to the assessment of impacts from the offshore Project on shipping and navigation:

- Legislation:
  - Convention on the International Regulations for Preventing Collisions at Sea (COLREGS) (International Maritime Organization (IMO), 1972/77);
  - International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974); and
  - United Nations Convention on the Law of the Sea (UNCLOS) (United Nations (UN), 1982).

- Policy:
  - United Kingdom (UK) Marine Policy Statement (HM Government, 2011): Sets out how marine plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law; and
  - Scotland's National Marine Plan (Scottish Government, 2015): Sets out how navigational safety in relevant areas used by shipping now and in the future should be protected. Relevant provisions are detailed below and have been considered in production of the Offshore EIA Report:
    - TRANSPORT 1 "Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in the United Nations Convention on the Law of the Sea. The following factors will be taken into account when reaching decisions regarding development and use:
      - The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports.
      - Where interference is likely, whether reasonable alternatives can be identified.
      - Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the IMO can be achieved at no significant cost to the shipping or ports sector."
    - TRANSPORT 2 "Marine development and use should not be permitted where it will restrict access to, or future expansion of, major commercial ports or existing or proposed ports and harbours."
    - TRANSPORT 3 "Ferry routes and maritime transport to island and remote mainland areas provide essential connections and should be safeguarded from inappropriate marine development. Developments will not be consented where they will unacceptably interfere with lifeline ferry services."
    - TRANSPORT 6 "Developers should ensure displacement of shipping is avoided where possible to mitigate against potential increased journey lengths (and associated fuel costs, emissions and impact on journey frequency)."
  - Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020): Identifies the Plan Options (POs) for the development of commercial-scale offshore wind in Scotland;
  - National Islands Plan (Scottish Government, 2019): Sets out 13 objectives to address crucial sectors within island communities. Under Strategic Objective 3: to improve transport services, there are commitments to improve ferry services for island communities; and
  - Orkney Islands Regional Marine Plan: Consultation Draft (Orkney Islands Council, 2022): provides a statutory policy framework for public authorities to make decisions on sustainable development and activities in the Orkney Islands Scottish marine region, from Mean High Water Springs (MHWS) to the 12 nautical mile (nm) limit.
- Guidance:
  - MGN 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021);
  - Revised Guidelines for Formal Safety Assessment for Use in the International Maritime Organization Rule-Making Process (IMO, 2018);
  - MGN 372 Amendment 1 (Merchant and Fishing) Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2022);
  - International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Guideline G1162 Guidance on the Marking of Offshore Man-Made Structures (IALA, 2021a);

- IALA Recommendations O-139 on The Marking of Man-Made Offshore Structures (IALA, 2021b);
- The Royal Yachting Associations (RYA's) Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019a); and
- Standard Marking Schedule for Offshore Installations (Department of Energy and Climate Change (DECC), 2011).

Please note that in addition to the Section 36 Consent and Marine Licence applications, a declaration under Section 36A of the Electricity Act 1989 to extinguish public rights of navigation so far as they pass through those places within the Scottish Marine Area and the UK Marine Licensing Area where the Wind Turbine Generators (WTGs) will be located (and not the areas of sea between those structures) is also being made. Further details are included in chapter 3: Planning policy and legislative context.

15.3 Scoping and consultation

Stakeholder consultation has been ongoing throughout the EIA and has played an important part in ensuring the scope of the baseline characterisation and impact assessment are appropriate with respect to the offshore Project and the requirements of the regulators and their advisors.

The Scoping Report, which covered the onshore and offshore Project, was submitted to Scottish Ministers (via Marine Scotland - Licensing Operations Team (MS-LOT[1]), and The Highland Council (THC) on 1st March 2022[2]. MS-LOT circulated the Scoping Report to consultees relevant to the offshore Project and a Scoping Opinion was received on 29th June 2022. Relevant comments from the Scoping Opinion and other consultation specific to shipping and navigation are provided in Table 15-4 below, which provides a response on how these comments have been addressed within the Offshore EIA Report.

Further consultation has been undertaken throughout the pre-application stage. Table 15-3 below summarises the key consultation activities carried out relevant to shipping and navigation.

[1] *MS-LOT have since been renamed Marine Directorate - Licensing Operations Team (MD-LOT).*

[2] *The Scoping Report was also submitted to the Orkney Islands Council (OIC), as the scoping exercise included consideration of power export to the Flotta Hydrogen Hub, however, this scope is not covered in the Offshore or Onshore EIA Reports and will be subject to separate Marine Licence and onshore planning applications.*

Table 15-3 Consultation activities for shipping and navigation

CONSULTEE AND TYPE OF CONSULTATION	DATE	TOPIC	COMMENT RAISED	RESPONSES
MCA – meeting	15th June 2022	Proposed NRA methodology	MCA were content with the approach to extend the offshore study area for Automatic Identification System (AIS) data northwest by 15 nm (27.8 km) to cover traffic potentially re-routeing around the Sule Skerry and Sule Stack.	Study areas used are as per those agreed (see section 15.4.1).
UK Chamber of Shipping (UKCoS) – Email	29th June 2022	Study area	Content with the offshore study area proposed.	Study areas used are as per those agreed (see section 15.4.1).
MCA and Northern Lighthouse Board (NLB) – meeting	14th September 2022	Proposed vessel traffic survey methodology	NRA should consider deviations. Layout design will need considering.	Anticipated main commercial route deviations have been defined for the offshore Project in isolation scenario and the cumulative scenario in full in the NRA (Supporting Study (SS) 13: Navigational risk assessment), noting this includes consideration of adverse weather routeing. Associated impacts have been assessed in section 15.6.
Ocean Farm Services – Email	15th September 2022	Commercial route deviations	The development is situated where vessels routeing between Shetland and Orkney transit. In adverse weather conditions diversion of routes may be needed to avoid the Offshore Wind Farm (OWF). The decision as to whether or not to transit through will depend on the final layout. If no additional buoyage, then no additional risk when comparing floating to fixed installations.	Anticipated main commercial route deviations have been defined for the offshore Project in isolation scenario and the cumulative scenario. See SS13: Navigational risk assessment for adverse weather routeing.

CONSULTEE AND TYPE OF CONSULTATION	DATE	TOPIC	COMMENT RAISED	RESPONSES
BioFeeder – Email	17th September 2022	Commercial route deviations	Vessels may choose to transit through the OAA if visibility / wind conditions are favourable.	Anticipated main commercial route deviations have been defined for the offshore Project in isolation scenario and the cumulative scenario. See SS13: Navigational risk assessment and in section 15.6 for adverse weather routeing assessment.
Godby Shipping / DFDS – Email	22nd September 2022	Commercial route deviations	The OAA will lead to a deviation of the routeing between Belfast and Norway. Noted that there would be less time to address vessel issues due to the presence of structures. The presence of structures will also reduce routeing options during adverse weather.	Anticipated main commercial route deviations have been defined for the offshore Project in isolation scenario and the cumulative scenario. See SS13: Navigational risk assessment and in section 15.6 for adverse weather routeing assessment. Vessel drifting risk has been assessed in the NRA and in section 15.6.
Scotline – Email	26th September 2022	Commercial route deviations	Typical routeing means vessels will pass in proximity, however transit through the OAA unlikely. In adverse weather conditions, vessels "tack[3]" in the area meaning they pass further north than typical transits. Presence of work boats in the offshore ECC has potential to pose safety concerns for vessels.	Anticipated main commercial route deviations have been defined for the offshore Project in isolation scenario and the cumulative scenario. See SS13: Navigational risk assessment and in section 15.6 for adverse weather routeing assessment.
Migdale Transport – Email	26th September 2022	Commercial route deviations	It will be the master's decision as to whether to transit through the OAA. Array location will impact routeing of vessels as will	Anticipated main commercial route deviations have been defined for the offshore Project in isolation scenario and the cumulative scenario. See SS13: Navigational risk assessment and

[3] *Tack' to change course by turning a vessel's bow into and through the wind.*

CONSULTEE AND TYPE OF CONSULTATION	DATE	TOPIC	COMMENT RAISED	RESPONSES
			need to deviate depending on weather conditions. Deviations would lead to additional distance i.e., additional time and costs.	section 15.6 for adverse weather routeing assessment.
UKoS – meeting (Hazard Workshop)	27th October 2022	Hazard Workshop	Suggested NRA should include figure showing vessel direction / course.	Analysis of average vessel bearings has been included in the NRA (SS13: Navigational risk assessment).
Scottish White Fish Producers Association – meeting (Hazard Workshop)	27th October 2022	Hazard Workshop	Fishing vessels likely to be underrepresented in the AIS data sets.	Vessel Monitoring System (VMS) data has been included in the fishing vessel analysis for the offshore study area and offshore Export Cable Corridor (ECC) study area (see section 15.4.4.1.5). The vessel traffic surveys are inclusive of non-Automatic Identification System (AIS) traffic. The NRA (SS13: Navigational risk assessment) has also made use of fisheries statistics (as presented in chapter 14: Commercial fisheries) and feedback from the offshore Project Fisheries Working Group.
Scottish White Fish Producers Association – meeting (Hazard Workshop)	27th October 2022	Hazard Workshop	Indicated other OWFs including to the west should be considered in the NRA.	The NRA (SS13: Navigational risk assessment) includes a cumulative routeing assessment, and cumulative impacts have been assessed in section 15.7.
Cruising Association – meeting (Hazard Workshop)	27th October 2022	Hazard Workshop	Indicated limited concern with the offshore export cables.	Associated hazards assessed in the NRA (SS13: Navigational risk assessment) and in section 15.6.
MCA – meeting (Hazard Workshop)	27th October 2022	Hazard Workshop	Pentland Floating Offshore Wind Farm should be considered for route deviations in the NRA.	Pentland Floating Offshore Wind Farm (PFOWF) has been considered in the cumulative scenario (see section 15.7).
Orkney Islands Council Harbour Authority-	27th October 2022	Hazard Workshop	Cruise liner traffic during 2021 may be	Additional data sources have been considered to ensure appropriate modelling inputs

CONSULTEE AND TYPE OF CONSULTATION	DATE	TOPIC	COMMENT RAISED	RESPONSES
meeting (Hazard Workshop)			underrepresented due to COVID.	including Anatec's ShipRoutes database (Anatec 2023).
UKCoS – meeting	16th February 2023	Vessel type breakdown	Commercial route information should display a breakdown of vessel type numbers and other destinations.	Vessel type breakdown, and other less-frequently broadcast destinations, are highlighted in section 15.4.4.1.5.
NLB - Email	27th February 2023	Helicopter and vessel access to Sule Skerry lighthouse	Final layout will need to consider helicopter and vessel access to the lighthouse.	The final layout is yet to be determined and is subject to further engineering studies and site investigations. NLB will be consulted on the final layout as part of the DSLP. Details on the DSLP objective and process are included in section 15.11.1.
RYA Scotland – meeting	22nd March 2023	General	There is a substantial level of recreational traffic in Hoy Sound, of which collision risk could be heightened by Project vessels.	Vessel management mitigations will be in place to avoid disruptions to other activities from the Project vessels (see section 15.5.4).
RYA Scotland – meeting	22nd March 2023	General	Landfall areas do not raise any concerns as there is not much recreational activity close to shore by landfalls and locations are away from Thurso Bay.	Considered in impact assessment (see section 15.6).
NLB – meeting	12th May 2023	Helicopter transit time during maintenance of the Sule Skerry lighthouse	Agreed that the discussion will be closed during the Development Specification and Layout (DSLP) process post-consent.	Details on the DSLP objective and process are included in section 15.11.1.
UKCoS - Email	29th June 2023	NRA and DSLP	Response to draft NRA comments and clarifying that the UKCoS will be consulted on the DSLP.	Details on the DSLP objective and process are included in section 15.11.1.

Table 15-4 Comments from the Scoping Opinion response relevant to shipping and navigation

CONSULTEE	COMMENT	RESPONSE
Scottish Ministers (via MS-LOT)	The Scottish Ministers are broadly content with regards to the proposed study area identified in section 2.8 of the Scoping Report. However, the Scottish Ministers advise that the Developer must extend the routeing area beyond the 10 nautical mile (nm) (18.5-kilometre (km)) study area particularly at the Western extent to account for possible deviations around Skerry Rocks. This is a view supported by the UKCoS representation which must be addressed in full by the Developer. Additionally, in line with the representation from the RYA, the Scottish Ministers advise that the 10 nm (18.5 km) buffer zone should be amended and extend from Cape Wrath to Sule Skerry to a point 5 nm (9.3 km) of the northernmost point of the Option Agreement Area (OAA), to ensure that the European Marine Energy Centre (EMEC) Billia Croo site, the Sutherland Space Hub, and the Ministry of Defence (MoD) Cape Wrath Range are included and considered when assessing in-combination effects.	Based on UKCoS input, the NRA (SS13: Navigational risk assessment) includes consideration of a wider study area (see section 15.4.1). UKCoS. MCA and NLB confirmed their acceptance of this study area. The EMEC Billia Croo site and the MoD Cape Wrath Range have been captured within the Navigational Features (see section 15.4.4.1). The Sutherland Space Hub has then been captured via the cumulative screening process (see section 15.7.2).
Scottish Ministers (via MS-LOT)	With regards to the baseline data presented within table 2-47 of the Scoping Report, the Scottish Ministers direct the Developer to the representation from the UKCoS. The Scottish Ministers advise that the Marine Accident Investigation Branch ("MAIB") spatial accident data included within the EIA Report must be increased from 10 years to 20 years to fully assess trends and historic collision incidents.	A total of 20 years of data has been assessed (see section 15.4.4.3). The UKCoS has been consulted throughout the EIA process, as detailed in this chapter.
Scottish Ministers (via MS-LOT)	In line with the representation from the MCA, the Scottish Ministers are content that the two separate 14 day periods of AIS data set out in the Scoping Report meets the standard MGN 654, however highlight the advice from the UKCoS that an additional full 12 months of AIS data should be included in the EIA Report. The Scottish Ministers advise that the Developer must engage further with the MCA and UKCoS to reach a suitable agreement on the provision of AIS data and document the rationale for the final approach within the EIA Report. Only AIS data from either 2019 or 2021 must be utilised within the EIA Report due to the impact of the Covid-19 pandemic on shipping, and in particular cruise and passenger traffic, during 2020.	The NRA (SS13: Navigational risk assessment) has assessed an additional 12 months of AIS data from 2021. Consultation has been undertaken with the MCA and other shipping and navigation stakeholders to agree the data required to support the NRA.

CONSULTEE	COMMENT	RESPONSE
Scottish Ministers (via MS-LOT)	The Developer is also directed to the representation from the RYA regarding impacts of construction activities should a cable landfall route through Hoy Sound be chosen. The Scottish Ministers advise the Developer that the EIA Report and NRA must detail how the volume of traffic and timing of construction activities have been considered to avoid adverse tidal flows.	The referenced cable route has been considered cumulatively (see section 15.7.2). Associated impacts are assessed in this chapter and the NRA (see section 15.6 and SS13: Navigational risk assessment). The comment in relation to tidal flows was made by RYA Scotland in relation to the Hoy Sound cable routeing which is no longer included as part of this consent application.
Scottish Ministers (via MS-LOT)	Table 2-50 of the Scoping Report summarises the potential impacts to shipping and navigation for each stage of the Proposed Development which the Developer proposes to scope into the EIA Report. The Scottish Ministers agree with the impacts scoped into the EIA Report, however, advise that in line with the representation from Orkney Islands Council Harbour Authority, impacts to ferry routes should be scoped into the EIA Report.	No regular passenger ferry routes were captured within the study areas assessed for the NRA (see section 15.4.1 and SS13: Navigational risk assessment), noting that the Serco Northlink ferry route between Scrabster and Orkney passes in excess of 12 nm to the east of the study area. Regardless Serco Northlink attended and inputted into the hazard workshop process. Vessel routes identified are shown (see section 15.4.4.1.5). This includes any passenger vessels recorded in the area. Associated impacts are assessed in this chapter and the NRA (see section 15.6 and SS13: Navigational risk assessment).
Scottish Ministers (via MS-LOT)	With regards to cabling routes and cable burial, the Scottish Ministers advise that a Burial Protection Index should be completed and, subject to the traffic volumes, an anchor penetration study may be necessary. The Scottish Ministers advise that this should be fully addressed in the EIA Report and highlight the MCA advice on a maximum 5% reduction in surrounding depth referenced to CD if cable protection measures are required and in particular where depths are decreasing towards shore.	There will be full MGN 654 (MCA, 2021) compliance including in relation to anchor studies and water depth reductions (see section 15.5.4). The cable burial risk assessment and anchor penetration study (if required) will be undertaken once geotechnical survey data is available.
Scottish Ministers (via MS-LOT)	The Scottish Ministers advise the Developer must give consideration within the EIA Report for the potential effect of electromagnetic deviation on ships' compasses should High-Voltage Direct	The effects of Electromagnetic Fields (EMF) have been fully assessed within the NRA (SS13: Navigational risk assessment),

CONSULTEE	COMMENT	RESPONSE
	Current transmission infrastructure be installed. For completeness, the Scottish Ministers highlight the advice from MCA regarding maximum deviation from the cable route.	noting that High Voltage Directional Current (HVDC) is no longer included in the current Project Design Envelope (PDE).
Scottish Ministers (via MS-LOT)	The Scottish Ministers also highlight the MCA representation regarding SAR, ERCoPs, levels of radar surveillance, AIS and shore-based VHF radio coverage. The Scottish Ministers advise that the MCA representation must be fully addressed within the EIA Report and that a SAR checklist must be completed by the Developer in consultation with the MCA.	There will be full MGN 654 (MCA, 2021) compliance including in relation to MCA Search and Rescue (SAR) requirements (see section 15.5.4).
Scottish Ministers (via MS-LOT)	The Developer has summarised potential cumulative effects in section 2.8.7 of the Scoping Report. The Scottish Ministers advise that the Developer must assess the potential cumulative and in combination effects on shipping routes due to the significant through traffic in the area of the Proposed Development, in line with the MCA representation.	See section 15.7. Anticipated main commercial route deviations have been defined for the Project in isolation scenario and the cumulative scenario in full in SS13: Navigational risk assessment, noting this includes consideration of adverse weather routeing. Cumulative impacts due to vessel displacement and increased third party vessel to vessel collision risk impacts have been assessed in section 15.7.
MCA	The Environmental Statement [now known as EIA report], should supply detail on the possible impact on navigational issues for both commercial and recreational craft, specifically: • Collision Risk. • Navigational Safety. • Visual intrusion and noise. • Risk Management and Emergency response. • Marking and lighting of site and information to mariners. • Effect on small craft navigational and communication equipment.	The listed hazards have been assessed in section 15.6 and in SS13: Navigational risk assessment.

CONSULTEE	COMMENT	RESPONSE
	• The risk to drifting recreational craft in adverse weather or tidal conditions. The likely squeeze of small craft into the routes of larger commercial vessels.	
MCA	The development area carries a significant amount of through traffic to major ports, with a number of important shipping routes in close proximity, and attention needs to be paid to routing, particularly in heavy weather ensuring shipping can continue to make safe passage without large-scale deviations. The likely cumulative and in combination effects on shipping routes should also be considered, the impact on navigable sea room and include an appropriate assessment of the distances between OWF boundaries and shipping routes as per MGN 654.	Anticipated main commercial route deviations have been defined for the offshore Project in isolation scenario and the cumulative scenario in full in the NRA (SS13: Navigational risk assessment), noting this includes consideration of adverse weather routeing. Associated impacts have been assessed in section 15.6. A completed MGN 654 checklist is provided in the NRA (SS13: Navigational risk assessment).
MCA	An NRA will need to be submitted in accordance with MGN 654 and the MCA Methodology for assessing the Marine Navigation Safety & Emergency Response Risks of OREIs. This NRA should be accompanied by a detailed MGN 654 Checklist.	The relevant MCA guidance has been considered (see section 15.2). A completed MGN 654 checklist is provided in the NRA (SS13: Navigational risk assessment).
MCA	I note, in paragraph 2.8.3.1, that vessel traffic surveys will be undertaken to the standard of MGN 654 i.e., at least 28 days which is to include seasonal data (two x 14-day surveys) collected from a vessel-based survey using Automatic Identification System (AIS), radar and visual observations to capture all vessels navigating in the study area.	Vessel traffic methodology was agreed with the MCA and in line with MGN 654 requirements (see section 15.4.2). Two 14-day AIS, radar, and visual observation surveys undertaken in summer 2022 (17th to 31st August 2022) and winter 2022 (1st to 15th November 2022).
MCA	The turbine layout design will require MCA approval prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue (SAR) aircraft operating within the site. Any additional navigation safety and/or SAR requirements, as per MGN 654 Annex 5, will be agreed at the approval stage.	All impacts assessed were determined to be As Low As Reasonably Practicable (ALARP) under the Formal Safety Assessment (FSA) assuming the implementation of additional mitigation in the form of additional post consent consultation with the MCA in advance of the DSLP process to ensure the

CONSULTEE	COMMENT	RESPONSE
		overarching spatial area covered by the layout is appropriate, as per section 15.5.4.
MCA	Attention should be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection measures are required e.g. rock bags or concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum (CD). This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase, such as at the Horizontal Directional Drilling (HDD) location.	As per section 15.5.4, there will be full MGN 654 (MCA, 2021) compliance including in relation to anchor studies and water depth reductions. A Cable Burial Risk Assessment (CBRA) will be undertaken post consent.
MCA	Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plans (ERCoP). Attention should be paid to the level of radar surveillance, AIS and shore-based Very High Frequency (VHF) radio coverage and give due consideration for appropriate mitigation such as radar, AIS receivers and in-field, Marine Band VHF radio communications aerial(s) (VHF voice with Digital Selective Calling (DSC)) that can cover the entire OWF sites and their surrounding areas. A SAR Checklist will also need to be completed in consultation with MCA.	As per section 15.5.4, there will be full MGN 654 (MCA, 2021) compliance including in relation to MCA SAR requirements.
MCA	MGN 654 Annex 4 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. Failure to report the survey or conduct it to Order 1a might invalidate the Navigational Risk Assessment if it was deemed not fit for purpose.	As per section 15.5.4, there will be full MGN 654 (MCA, 2021) compliance including in relation to hydrographic surveys.
MCA	It is noted that HVDC transmission infrastructure may be installed therefore consideration must be given to electromagnetic deviation on ships' compasses. The MCA would be willing to accept a three-degree deviation for 95% of the cable route. For the remaining 5% of the cable route no more than five degrees will be attained. The MCA would however expect a deviation survey post	EMF impacts have been assessed in the NRA (SS13: Navigational risk assessment), noting that HVDC is no longer under consideration in the current PDE.

CONSULTEE	COMMENT	RESPONSE
	the cable being laid; this will confirm conformity with the consent condition. The developer should then provide this data to United Kingdom Hydrography Office (UKHO) via a hydrographic note (H102), as they may want a precautionary notation on the appropriate Admiralty Charts.	
MCA	Paragraph 2.8.10 asks some scoping questions to which our responses are as follows: • Do you agree with the proposed study area (incorporating a 10 nm buffer around the array area)? Yes • Do you agree with the proposed approach to survey data collection? Yes • Do you agree the embedded mitigation is appropriate, or are there other measures that should be included? The full list of risk controls will be identified during the NRA process of consultation with navigation stakeholders and hazard analysis. • Do you agree with the list of scoped impacts? Yes, in combination with comments above. • Are there any additional shipping and navigation organisations that you would recommend be consulted? The list under paragraph 2.8.9.1 is appropriate. • Do you agree with the proposed assessment approach? Yes"	Methodology is as per set out in Scoping Report. Mitigations are detailed in section 15.5.4 and 15.11.
MCA	On the understanding that the Shipping and Navigation aspects are undertaken in accordance with MGN 654, its annexes and the above comments, MCA is likely to be content with the approach.	A completed MGN 654 checklist is included in the NRA to demonstrate MGN 654 compliance (see SS13: Navigational risk assessment).
NLB	NLB note the inclusion of section 2.8 (Shipping and Navigation) within the Scoping Report, and will continue to engage with the developer in all aspects of navigational safety with regard to the project. NLB will provide specific lighting and marking recommendations for both the offshore and landfall sites as the project develops.	As per section 15.5.4, lighting and marking will be agreed with the NLB.

CONSULTEE	COMMENT	RESPONSE
NLB	NLB have no objection to the content of the Scoping Report.	Methodology is as per that set out in Scoping Report.
Orkney Islands Council Harbour Authority	2.8.9 Approach to Analysis and Assessment Orkney Harbour Authority should be identified as the Statutory Harbour Authority for Scapa Flow."	Captured in baseline (section 15.4.4).
Orkney Islands Council Harbour Authority	Table 2-67 Summary of Key Datasets and Reports Include Orkney Islands Marine Region: State of the Environment Assessment 2020"	See section 15.4.2 – report has been used to inform establishment of baseline.
Orkney Islands Council Harbour Authority	Table 2-73 Summary of Key Datasets and Reports Include: • Orkney Harbours Masterplan – Phase 1 https://www.orkneyharbours.com/documents/orkney-harbours-masterplan-phase-1 • Scotland's Aquaculture | Home • Clyde Cruising Club Sailing Directions and Anchorages: Orkney and Shetland Islands including North and Northeast Scotland: https://www.clyde.org/publications/ • The Kingfisher Information Service – Offshore Renewable and Cable Awareness (KIS-ORCA) http://www.kis-orca.eu/"	The referenced literature has been considered where appropriate in the NRA process.
Orkney Islands Council Harbour Authority	The Orkney Harbour Authority should be consulted to determine whether there are any wider Harbour Area operational issues to be considered over and above STS and the Flotta Oil Terminal in Scapa Flow.	Orkney Islands Council Harbour Authority attended the hazard workshop.
RYA Scotland	Local ports and harbours are mentioned. For Orkney the contacts should be the Orkney Islands Council Harbour Authority, Orkney Marinas and the Orkney Marine Planning Partnership. Sail	The listed organisations have been consulted with during the EIA process and/or participated in (or invited to participate in)

CONSULTEE	COMMENT	RESPONSE
	Scotland should also be added to the list as the organisation promoting recreational boat cruising. There are several mentions of possible impacts on passengers on cruise vessels so it would also be appropriate to consult the industry body, Cruise Scotland.	the hazard workshop. Letters have been written to the Orkney Marinas, Sail Scotland and Cruise Scotland organisations to ensure they have the opportunity to raise comments. Letters have been to ensure they have the opportunity to raise comments
RYA Scotland	The approach follows best practice. In relation to the cable landfall routes, the potential impact during construction will be much higher if a route through Hoy Sound is chosen due to the amount of traffic and the importance of correct timing to avoid adverse tidal flows and the EIA and NRA will need to be structured to make that clear.	The offshore export cables to the Flotta Hydrogen Hub are not part of this consent application and not considered within this Offshore EIA Report. The connection to the Flotta Hydrogen Hub will be the subject of a separate application.
RYA Scotland	*Do you agree with the proposed study area (incorporating a 10 nm buffer around the array area)?* RYA Scotland has no objection to the proposed study area but considers it would be better for the buffer zone to go from Cape Wrath to Sule Skerry, to a point 5 nm of the northernmost point of the options area, to Bay of Skaill, to Dunnet Head following the coast of Hoy before following the coast back to Cape Wrath. This new area would include the EMEC Billia Croo site, the Sutherland Space Hub and the MoD Cape Wrath Range, all of which should be considered in terms of potential in combination effects.	The listed developments are all captured either within the baseline (section 15.4.4) or on a cumulative basis (section 15.7).
RYA Scotland	*Do you agree with the proposed approach to survey data collection?* I agree with the proposed collection of data on recreational boats but consider that there are already sufficient data on the routes taken by recreational craft in these waters. Note that Orkney islands Council on behalf of the Orkney Marine Planning Partnership is currently carrying out a survey of the use of the Orkney waters for recreation (mentioned in section 2.12). Note also that the location of recreational anchorages in Scapa Flow are shown in the OIC Supplementary Guidance for aquaculture and are held by the Orkney Marine Planning Partnership.	RYA Scotland confirmed content with data considered in NRA in meeting on 22nd March 2023. The connection to the Flotta Hydrogen Hub will be the subject of a separate application.

CONSULTEE	COMMENT	RESPONSE
RYA Scotland	*Do you agree the embedded mitigation is appropriate, or are there other measures that should be included?* I agree with the list of embedded mitigations, some of which are in any case legal requirements.	Embedded mitigations are detailed in section 15.5.4.
UKCoS	Recognising the considerable length to the Scoping Report, the Chamber has limited its consultation response to that within the Shipping and Navigation chapter of the report."	Noted.
UKCoS	The Chamber is aware that the MAIB have spatial accident data extending back to 1992 and is of the view that for long term projects such as OWFs, examining 10 years of accident data is not truly representative of trends and historic incidents. As such the Chamber recommends that 20 years of MAIB spatial accident data be included in the EIA baseline. This request the Chamber is making to all prospective developments and is being met with general agreement."	A total of 20 years of data has been assessed (see section 15.4.2). The UKCoS has been consulted throughout the EIA process, as detailed in this chapter.
UKCoS	Given the large area of the proposed development the Chamber would strongly recommend a full 12 months AIS data be acquired in addition to the two – 14 days periods as required. This will fully factor in seasonal variation and occasional traffic. The Chamber would recommend either 2019 or 2021 as preferable years for this data, in recognition of the impact of Covid-19 on shipping, in particular cruise and passenger traffic."	The NRA (see SS13: Navigational risk assessment) has assessed 12 months of AIS data (from 2021). Consultation has been undertaken with the MCA and other shipping and navigation stakeholders to agree the data required to support the NRA. In addition to the required two 14-day periods of radar and visual observation surveys were undertaken in summer 2022 (17th to 31st August 2022) and winter 2022 (1st to 15th November 2022).
UKCoS	Serco Northlink are members of the UK Chamber and as such the Chamber represents them, however recognising the repeated references to the Hamnavoe ferry operated by them in the Scoping Report, the Chamber recommends that direct engagement with Serco Northlink be sought promptly."	Serco Northlink were invited to and subsequently attended the hazard workshop. However it should be noted that due to the fact this current application is for the export of power to a grid connection in Caithness, and the Flotta power export option will be the subject of a future sperate application, Serco

CONSULTEE	COMMENT	RESPONSE
		Northlink ferry route do not overlap the shipping and navigation Study area.
UKCoS	The Chamber would like to see an extended routeing area considered more widely than the 10 nm (18.5 km) study area, in particular at the Western extent where the edge of the proposed development comes into close proximity with Skerry rocks as required deviations may have significant routeing implications given proximity to the rocks."	Based on UKCoS input, the NRA includes consideration of a wider study area. UKCoS. MCA and NLB confirmed content with this study area (see section 15.4.1 and SS13: Navigational risk assessment).
UKCoS	The Chamber otherwise finds the Scoping Report to contain what it would hope for and expect in terms of the data and methodology employed. The Chamber looks forward to early engagement with the development as the planning and consenting process continues."	Noted. The UKCoS has been consulted throughout the EIA process, as detailed in this chapter.

15.4 Baseline characterisation

This section outlines the current baseline for shipping and navigation within the shipping and navigation offshore study area and covers both on-site surveying, as well as desk-based sources.

15.4.1 Study area

The shipping and navigation offshore study area is defined as a 10 nm (18.5 kilometre (km)) buffer of the OAA, as presented in Figure 15-1. Using a buffer of 10 nm (18.5 km) is standard practice for defining the shipping and navigation assessment offshore study area and has been used in the majority of UK OWF shipping and navigation assessments as it captures relevant routeing in the area that may be affected while still remaining site-specific.

Based on consultation input (see section 15.3) and as agreed with the MCA, NLB, and UKCoS, in addition to the 10 nm (18.5 km) study area, a wider study area has been considered for vessel routeing (hereafter referred to as the 'routeing study area'). The routeing study area was defined to capture traffic passing offshore of the Sule Skerry.

A 2 nm (3.7 km) buffer has been applied around the offshore ECC (hereafter the 'shipping and navigation offshore ECC study area') as shown in Figure 15-1. As with the shipping and navigation study area, this study area has been defined to capture relevant users and their movements within, and near, the offshore ECC.

The three study areas used for the shipping and navigation aspect of the offshore Project are then as follows:

- Shipping and navigation offshore study area – 10 nm (18.5 km) buffer of the OAA;
- Routeing study area – the shipping and navigation study area extended to the north and west; and
- Shipping and navigation offshore ECC study area – 2 nm (3.7 km) buffer of the offshore ECC.

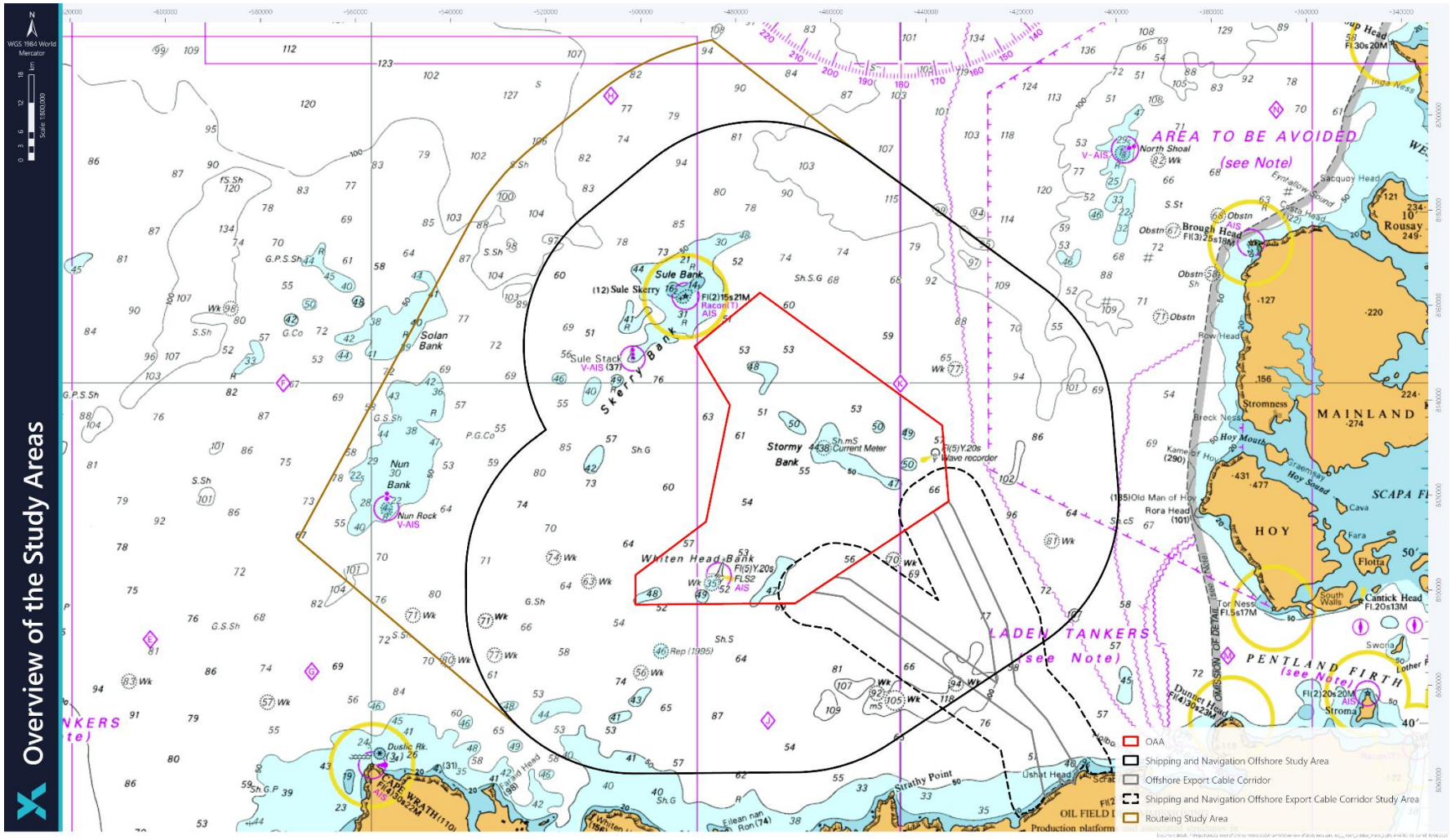

Figure 15-1 Overview of the shipping and navigation study areas

15.4.2 Data sources

The data sets and literature with relevant coverage to the offshore Project, which have been used to inform the baseline characterisation for shipping and navigation are outlined in Table 15-5.

Table 15-5 Summary of key datasets and reports

TITLE	SOURCE	YEAR	AUTHOR
ShipRoutes database	Anatec	2023	Anatec
Marine incidents data	Marine Accident Investigation Branch (MAIB)	2000-2019	MAIB
Marine incidents data	Royal National Lifeboat Institution (RNLI)	2010-2019	RNLI
Helicopter tasking data	Department for Transport (DfT)	2015-2022	DfT
Admiralty charts	UKHO	2022	UKHO
RYA coastal atlas	RYA	2019b	RYA
VMS data	Marine Scotland	2022	Marine Scotland
Ports arrivals data	DfT	2017-2022	DfT
Admiralty Sailing Directions North Sea (West) Pilot NP54	UKHO	2022	UKHO
Military exercise and danger areas	Marine Scotland	2019	Marine Scotland
State of the Environment Assessment - A baseline assessment of the Orkney Islands Marine Region	Orkney Islands Council Harbour Authority	2020	Orkney Islands Council Harbour Authority

15.4.3 Project site-specific surveys

The vessel traffic surveys were undertaken using methodology agreed with the MCA and NLB and comply with the associated guidance requirements of MGN 654. Two 14-day AIS, radar, and visual observation surveys undertaken in summer 2022 (17th to 31st August 2022) and winter 2022 (1st to 15th November 2022) have been considered within the baseline for a total of 28 full days.

A number of vessel tracks recorded during the survey periods were classified as temporary (non-routine), such as the tracks of the survey vessel and other non-routeing survey vessels. These have therefore been excluded from the analysis. During the summer vessel traffic survey period, a Project site-specific geophysical survey was also ongoing in the OAA. It is therefore likely that fishing vessel activity in the OAA is underrepresented in the associated data set. Full details of the vessel traffic survey methodology and associated limitations are provided in SS13: Navigational risk assessment.

15.4.4 Existing baseline

A review of literature and available data sources (see section 15.4.2), augmented by consultation (section 15.3) and Project site-specific surveys (section 15.4.3) has been undertaken to describe the current baseline environment for shipping and navigation. It is noted that planned developments are not considered baseline and have been considered separately in section 15.7.

It should be noted that the marine spatial planning process undertaken by the Scottish Government to inform selection of the PO areas offered by Crown Estate Scotland in the ScotWind leasing round, considered shipping and navigational constraints. Specifically, the N1 PO avoids and is located to the north of the main shipping route around the north coast of Scotland and is set back 2.4 nm (4.4 km) from the ATBA around Orkney.

15.4.4.1 Navigational features

The baseline navigational features within, and in proximity to, the OAA and offshore ECC are presented in Figure 15-2.

15.4.4.1.1 Shallow waters and rocks

Sule Skerry is located approximately 2.5 nm (4.6 km) northwest of the OAA and is described by the Admiralty Sailing Directions (UKHO, 2022) as being "a grassy islet, 12 metres (m) in height", which is marked with "a light fitted with AIS and a racon[4]." The area in immediate proximity to Sule Skerry is also referenced – "Rocky patches, with depths of less than 20 metres (m), lie on a bank extending more than one mile NE from the islet; in W gales the sea breaks over this bank. On the W side of the islet a more dangerous reef, over which the sea breaks in a moderate swell, extends 3 cables W".

[4] *radar responders or radar transponder beacons - used as a navigation aid.*

Sule Stack is located approximately 3.6 nm (6.7 km) west of the OAA. Marked by virtual AIS, according to the Admiralty Sailing Directions (UKHO, 2022), the Stack is "37 m high, rises from Skerry Bank and is steep-to. Viewed from S the stack resembles a vessel under sail; from W it appears as a double rock."

15.4.4.1.2 Ports and related services

The closest port or harbour to the OAA is Stromness Harbour, located approximately 20 nm (37.0 km) to the east of the OAA, on the mainland Orkney coast. The Admiralty Sailing Directions describe Stromness as "a fishing and ferry terminal port, important to the local economy" (UKHO, 2022) and, along with Kirkwall Harbour, serves as one of two locations in Orkney that berth cruise liners. In addition, Stromness Harbour serves as the service port for the EMEC wave test site. It is noted that the Orkney Harbour Authority are the Statutory Harbour Authority for the Scapa Flow.

Scrabster Harbour is located approximately 22 nm (40.7 km) to the southeast of the OAA on the northern mainland Scotland coast and is described by the Admiralty Sailing Directions as "an important fishing port at which catches from both UK and foreign registered vessels are landed". It is also "frequently used by cruise ships and is a support base for supply and survey vessels" as well as "a busy Roll-on/Roll-off cargo (RoRo) terminal for ferries to the Orkney Islands".

DfT port arrivals data was available for Scrabster Harbour (DfT, 2022). Vessel traffic arrival numbers have steadily increased from 2017 to 2021 at the Harbour, with a high of 934 vessel arrivals in 2021.

Flotta Oil Terminal is located approximately 25 nm (46.3 km) to the east of the OAA on the island of Flotta. As described by the Admiralty Sailing Directions, it "receives crude oil by pipeline from the North Sea and discharges it into tankers for onward shipment; liquid gases are also shipped by tanker from the terminal".

Kirkwall Harbour is located approximately 30 nm (55.6 km) to the east of the OAA on the Orkney mainland and is described by the Admiralty Sailing Directions as "an important local commercial centre and port" used by "Ferries, RoRo and container vessels, bulk carriers and cruise ships".

15.4.4.1.3 Area to be Avoided

The closest distance of the ATBA around Orkney, to the OAA is 2.4 nm (4.4 km). According to the Admiralty Sailing Directions (UKHO, 2022) and a note on charts, "Ships of more than 5,000 Gross Tonnes (GT) carrying oil or hazardous cargoes in bulk should avoid this area."

15.4.4.1.4 Key aids to navigation

The Sule Skerry lighthouse is located approximately 2.5 nm (4.6 km) northwest of the OAA, with the virtual aid to navigation at Sule Stack located approximately 3.5 nm (6.5 km) to the west. A cluster of aids to navigation denoting the EMEC test site is located approximately 16 nm (29.6 km) east of the OAA. There are no key aids to navigation located within either the OAA or offshore ECC.

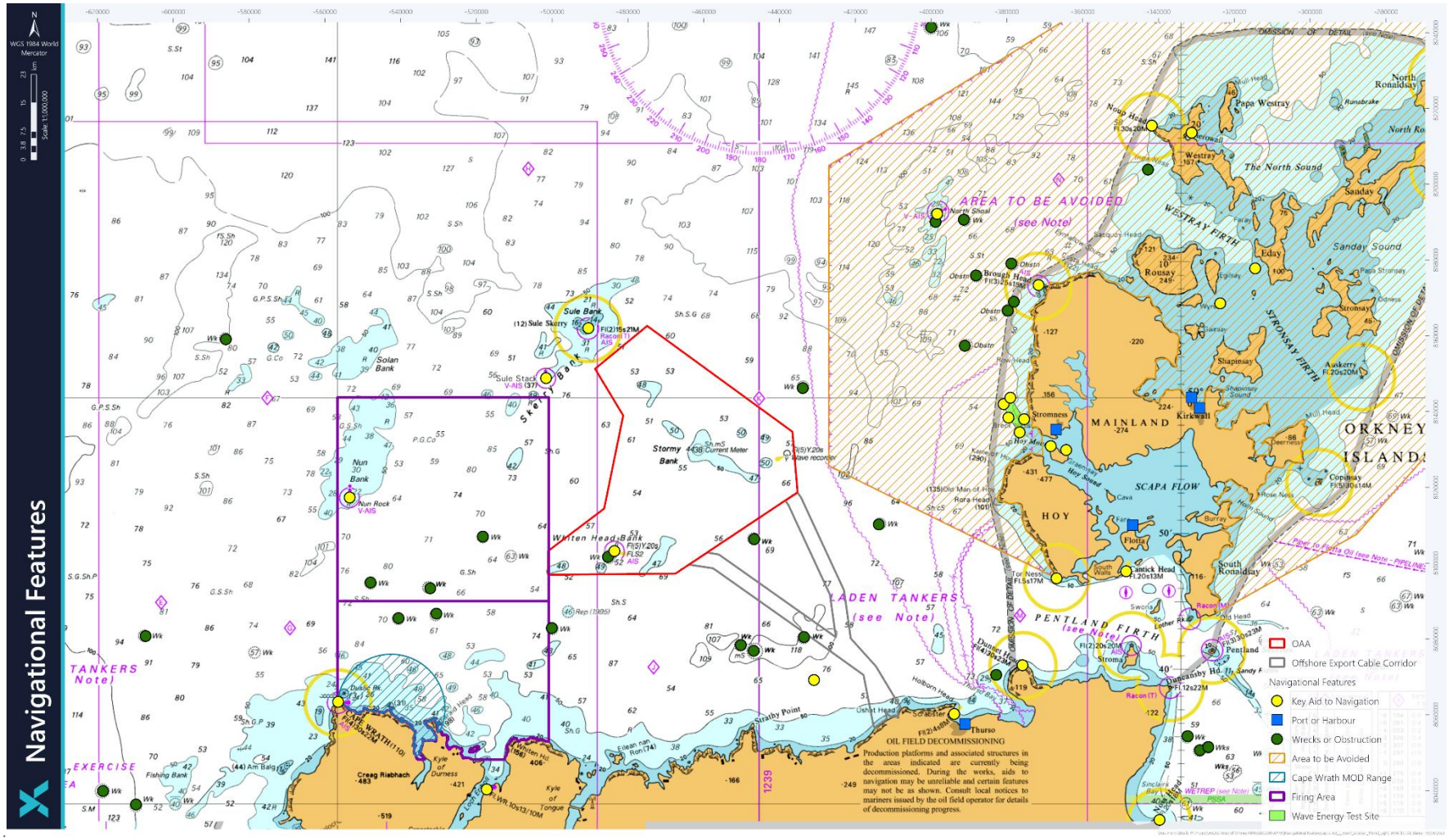

Figure 15-2 Navigational features in proximity to West of Orkney

15.4.4.1.5 Military exercise areas

Two military firing areas are located immediately west of the OAA. The Cape Wrath MoD range is located within the southern of these. According to the Admiralty Sailing Directions, "firing takes place from time to time involving use of live ammunition by ships and aircraft." During these practices "vessels may only pass through the area in the ordinary course of navigation, but for their own safety are advised to keep well clear; pleasure craft should not cruise in the area; anchoring and fishing are prohibited when the range is in use." In their response to the Scoping report, the MoD indicated that the Cape Wrath Training Area provides opportunities for a wide range of field fire and dry training exercises and is the only range in Europe where land, air, and sea training activities can be conducted simultaneously and heavy ordnance, including live 1,000 lb bombs, can be used.

15.4.4.1.6 Subsea cables

The Scottish Hydro Electric Transmission Limited (SHET-L) Caithness to Orkney High Voltage Alternating Current (HVAC) link runs from the existing connection site at Dounreay, Caithness to Warebeth on the west coast of Orkney mainland. The Marine Licence for the development expired in 2021 and has since been extended to cover a period between 2022 and 2027.

The one existing subsea cable within the offshore study area is the FARICE-1 cable, a telecommunications cable that connects Scotland, the Faroe Islands and Iceland, approximately 1.9 nm (3.52 km) east of the OAA and 2.8 nm (5.19 km) east of the offshore ECC.

15.4.4.1.7 Preferred anchorages

There are, according to the Admiralty Sailing Directions (UKHO, 2022), a number of preferred anchorages located to the south of the OAA, on the north coast of the Scottish mainland. These include anchorages at Cape Wrath, Sango Bay, Achininiver Bay, Skerray Bay, Torrisdale Bay, Farr Bay, Kirtomy Bay, and Armadale Bay. The closest of these to the offshore ECC is Armadale Bay, approximately 11 nm (20.4 km) to the west.

15.4.4.2 Vessel traffic movements

The Sectoral Marine Plan specifically considered navigation and shipping movements in the identification of POs. As such the N1 PO, within which the OAA is located, avoids the main transit route around the north coast of Scotland.

15.4.4.2.1 OAA

Plots of the vessel traffic recorded via AIS and radar over the summer and winter survey periods within the shipping and navigation study area are colour-coded by vessel type and presented in Figure 15-3 and Figure 15-4 respectively.

Throughout the summer survey, over 99% of vessel tracks were recorded via AIS with the remaining less than 1% recorded via Radar. Throughout the winter survey, approximately 99% of vessel tracks were recorded via AIS with the remaining 1% recorded via Radar. As per section 15.4.3, fishing vessel numbers within the shipping and navigation offshore study area during the summer survey period may be underrepresented due to the presence of geophysical survey work within the OAA at the time.

For the 14 days analysed in summer, there was an average of 23 unique vessels per day recorded within the shipping and navigation offshore study area, and six to seven unique vessels per day recorded intersecting the OAA itself. For the 14 days analysed in winter, there was an average of 18 unique vessels per day recorded within the shipping and navigation offshore study area, and five to six vessels per day recorded intersecting the OAA itself. The main vessel types recorded within the shipping and navigation offshore study area were cargo vessels (51%), fishing vessels (21%), and tankers (8%). Number and location of recreational and fishing vessels corresponded well with the available data from the RYA Coastal Atlas and VMS datasets respectively.

Vessel length was available for approximately 99% of vessels recorded throughout the two 14-day survey periods for the shipping and navigation offshore study area and ranged from 10 m for recreational vessels to 332 m for a container cargo vessel. Excluding the proportion of vessels for which length was not available, the average length of vessels within the shipping and navigation offshore study area throughout the summer and winter survey periods was 121 m and 93 m respectively.

Vessel draught was available for approximately 93% of vessels recorded throughout the two 14-day survey periods for the shipping and navigation offshore study area and ranged from 2.4 m for a tug to 15.2 m for a bulk carrier. Excluding the proportion of vessels for which draught was not available, the average draught of vessels within the shipping and navigation offshore study area throughout the summer and winter survey periods was 6.2 m and 5.7 m respectively.

No vessels were deemed to be at anchor within the offshore study area. Full details of the methodology applied to ascertain this are provided in SS13: Navigational risk assessment.

Main commercial routes have been identified using the principles set out in MGN 654 (MCA, 2021). A total of 12 main commercial routes were identified within the routeing study area. A plot of the main commercial routes and corresponding 90th percentiles is presented in Figure 15-5. Descriptions for each of the main commercial routes are provided in Table 15-6.

15.4.4.2.2 Offshore ECC

For the 14 days analysed in summer, there was an average of 15 unique vessels per day recorded within the shipping and navigation offshore ECC study area, and 14 to 15 unique vessels per day recorded intersecting the offshore ECC itself. For the 14 days analysed in winter, there was an average of 13 unique vessels per day recorded within the shipping and navigation offshore ECC study area, and 12 to 13 vessels per day recorded intersecting the offshore ECC itself. The main vessel types recorded within the shipping and navigation offshore ECC study area were cargo vessels (62%), fishing vessels (11%), and tankers (9%).

Vessel length was available for over 99% of vessels recorded throughout the two 14-day survey periods for the shipping and navigation offshore ECC study area and ranged from 9 m for a fishing vessel to 316 m for a cruise liner. Excluding the proportion of vessels for which length was not available, the average length of vessels within the shipping and navigation offshore ECC study area throughout the summer and winter survey periods was 167 m and 134 m respectively.

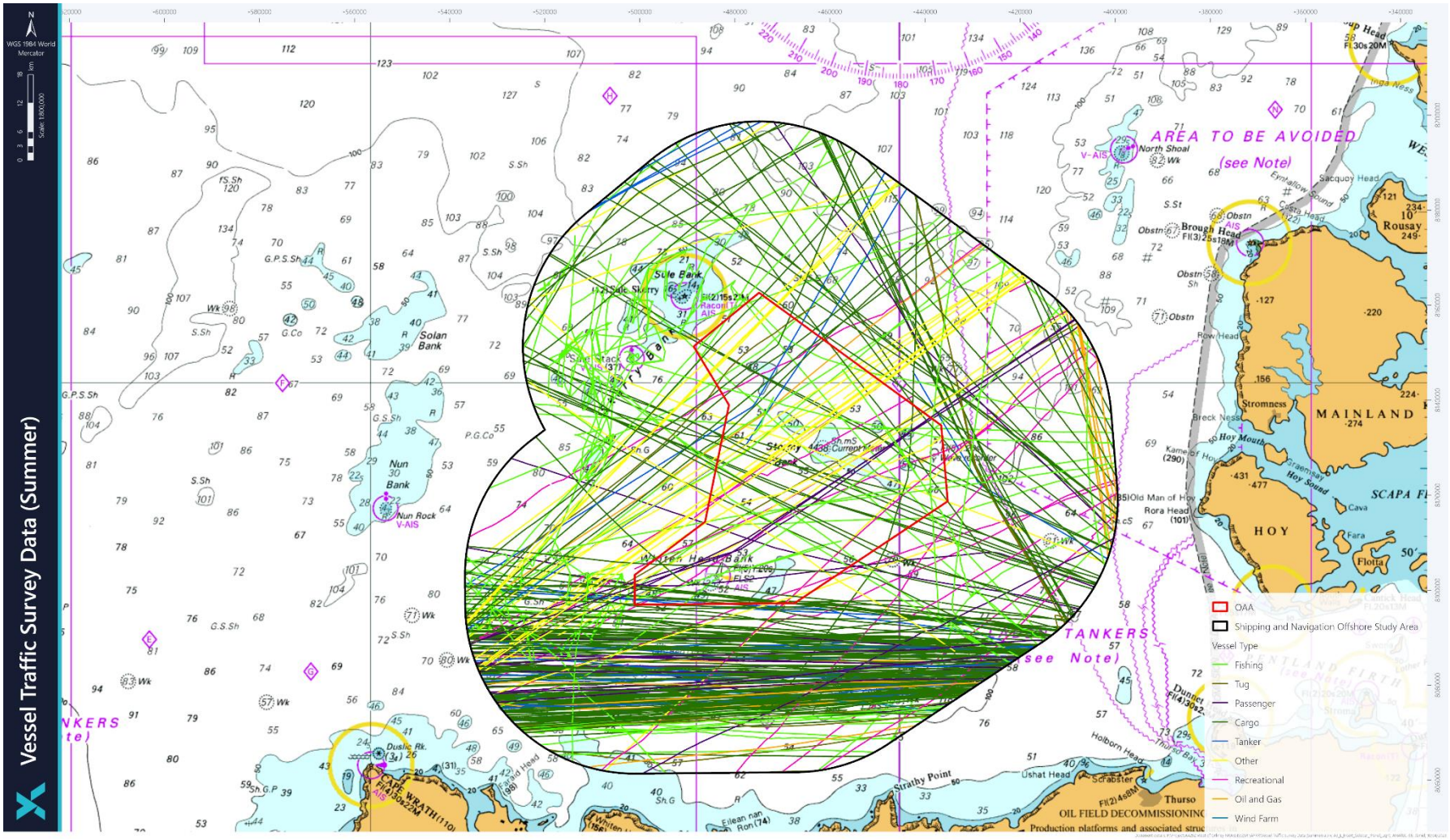

Figure 15-3 Vessel traffic survey data within the Shipping and Navigation Study Area by vessel type (14-days summer 2022).

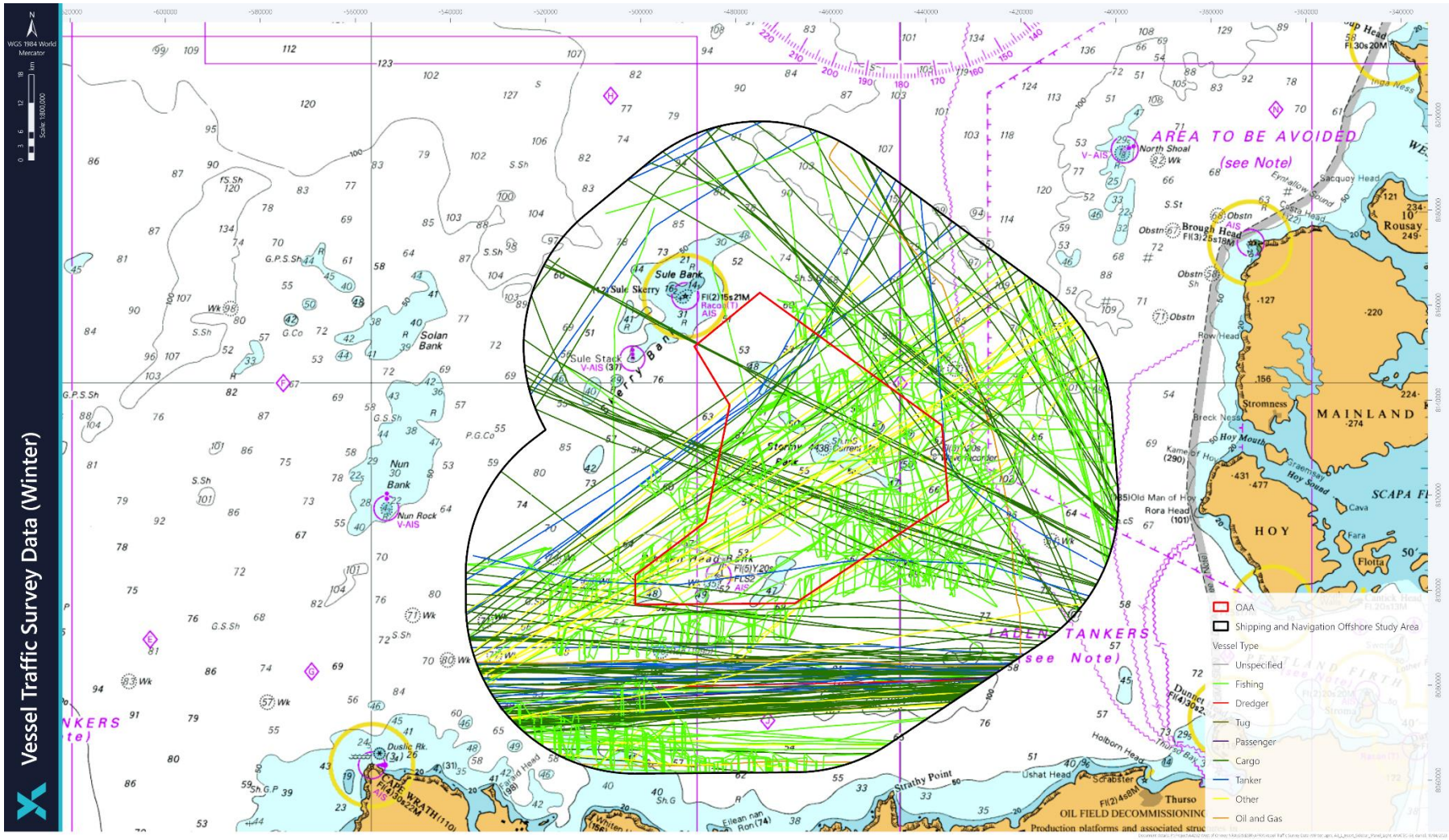

Figure 15-4 Vessel traffic survey data within the Shipping and Navigation Study Area by vessel type (14-days winter 2022)

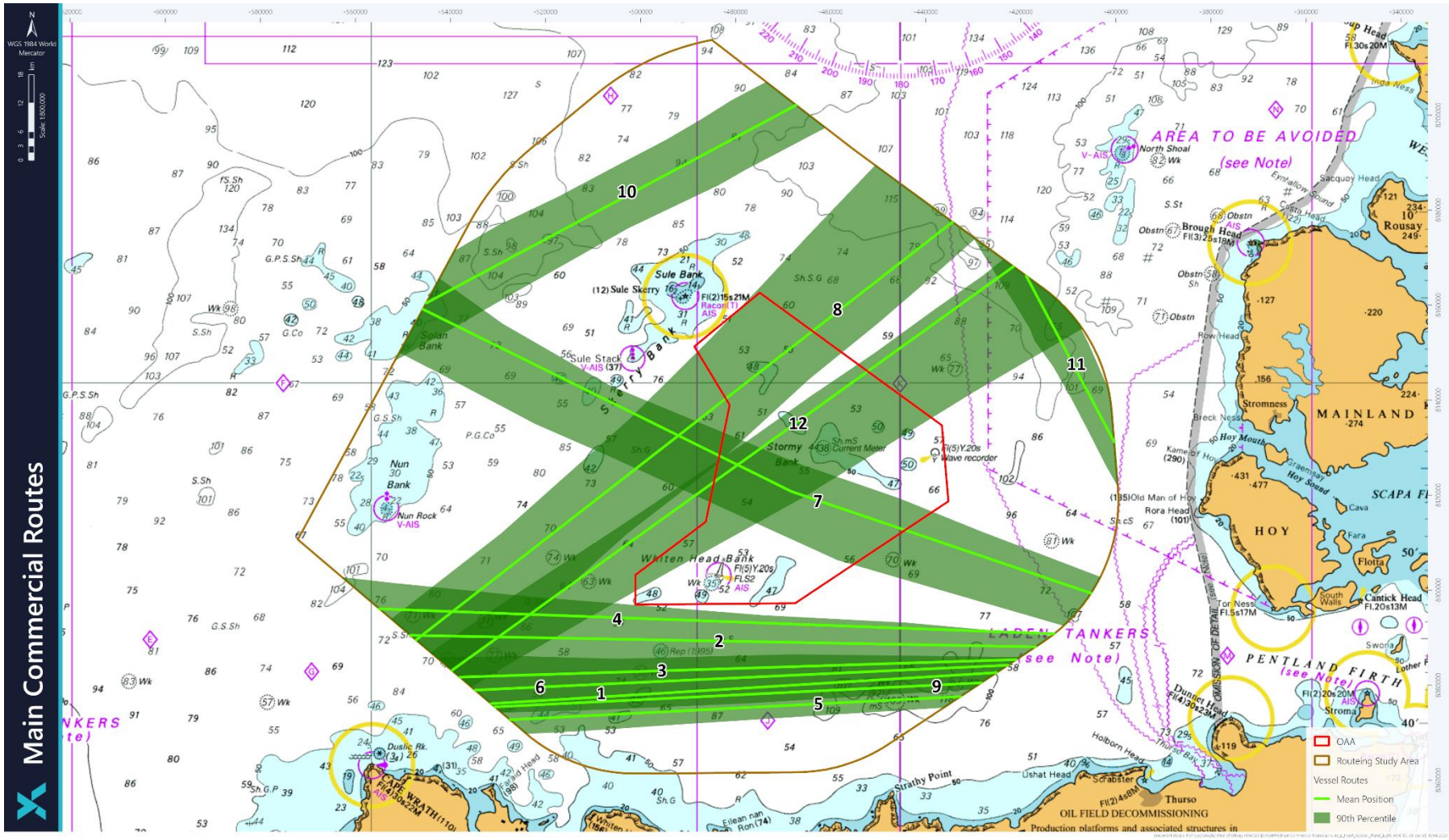

Figure 15-5 Main commercial routes and 90th percentiles within the routeing study area

Table 15-6 Details of main commercial routes

ROUTE NO.	AVG. VESSELS PER WEEK	AVG. VESSELS PER DAY[5]	DEFINITION
1	4	1	Belfast (UK) – Baltic Sea Ports. Mainly cargo vessels.
2	4	1	Canadian Ports – Hamburg (GER). Mainly cargo vessels.
3	4	1	Mersey Ports (UK) – Danish Ports (DEN). Mainly cargo vessels.
4	4	1	Reykjavik (ICE) – Humber Ports (UK). Mainly cargo vessels and tankers.
5	4	1	Belfast (UK) – Kattegat. Mainly cargo vessels.
6	3	< 1	Kyle of Lochalsh (UK) – Humber Ports (UK). Mainly cargo vessels and tankers.
7	2-3	< 1	Reykjavik (ICE) – Rotterdam (NLD). Mainly cargo vessels. Includes the Smyril Line-operated RoRo route between Reykavik and Rotterdam.
8	2	< 1	Belfast (UK) – Northern Norwegian/Russian Ports. Mainly cargo vessels, with tankers also present. Includes the DFDS Seaways-operated RoRo route between Belfast and Skogn.
9	2	< 1	Glensanda (UK) – Amsterdam (NLD). Mainly cargo vessels.
10	1-2	< 1	Mersey Ports (UK) – Mongstad (NOR). Mainly tankers and cargo vessels.
11	1	< 1	Torshavn (FAR) – Humber Ports (UK). Mainly cargo vessels.
12	1	< 1	Ullapool (UK) – Scalloway (UK). Mainly cargo vessels, with tankers also present.

Vessel draught was available for approximately 95% of vessels recorded throughout the two 14-day survey periods for the shipping and navigation offshore ECC study area and ranged from 1.2 m for an OWF vessel to 15.2 m for a bulk carrier. Excluding the proportion of vessels for which draught was not available, the average draught of vessels

[5] *Noted that an average of greater than 0.5 vessels per day rounded up to 1 per day.*

within the shipping and navigation offshore ECC study area throughout the summer and winter survey periods was 7.8 m and 6.7 m respectively.

No vessels were identified as being at anchor within the shipping and navigation offshore ECC study area within the survey period (full details are provided in SS13: Navigational risk assessment).

15.4.4.3 Historical maritime incidents

A total of 11 incidents were responded to by the RNLI within the shipping and navigation offshore study area between 2010 and 2019. This corresponds to an average of approximately one incident per year. The most frequent station for incident response was Stromness (50%), with Thurso (42%) and Longhope (8%) also used. The most common incident types recorded were "machinery failure" (27%) and "person in danger" (18%), with incident types of "other" comprising 27% of incidents. The most common vessel types recorded were fishing vessels (64%) followed by recreational vessels (18%). One incident was responded to by the RNLI within the OAA itself – a fishing vessel with a fouled propellor.

A total of nine incidents were responded to by the RNLI within the shipping and navigation offshore ECC study area between 2010 and 2019. This corresponds to an average of one incident per year, with the majority of incidents occurring close to shore. All incidents were responded to by the Thurso station. The most common incident types recorded were "machinery failure" (67%) and "person in danger" (22%), with incident types of "other" comprising the remaining 11% of incidents. The most common vessel types recorded were fishing vessels (33%) followed by personal craft (22%) and person in danger (22%). Three incidents were responded to by the RNLI within the offshore ECC itself.

A total of 15 unique incidents were recorded by the MAIB within the shipping and navigation offshore study area between 2010 and 2019, which corresponds to an average of one to two incidents per year. The most common incident types recorded were "machinery failure" (40%), "accident to person" (13%), and "loss of control" (13%), with incident types of "other" comprising 27% of incidents. The most common vessel types recorded were fishing vessels (67%) followed by cargo vessels (13%) and other commercial vessels (13%). Three incidents were recorded by the MAIB within the OAA itself – two instances of machinery failure, and one accident to person.

A total of four incidents were recorded by the MAIB within the shipping and navigation offshore ECC study area between 2010 and 2019, which corresponds to an average of one incident every two to three years. These comprised two accidents to person, one instance of grounding, and one of machinery failure. All four incidents involved fishing vessels. There was one incident within the offshore ECC itself – an accident to person involving a fishing vessel.

A review of older MAIB incident data within the shipping and navigation offshore study area between 2000 and 2009 indicates that the number of incidents has generally decreased in proximity to the OAA, with a total of 21 incidents within the shipping and navigation offshore study area, and six incidents within the shipping and navigation offshore ECC study area recorded. Two incidents occurred within the OAA, and one within the offshore ECC.

15.4.5 Future baseline

An assessment of future baseline conditions for shipping and navigation has been carried out and is described within this section.

There is uncertainty associated with long-term predictions of vessel traffic growth including the potential for any other new developments in UK (including local developments such as the PFOWF) or transboundary ports and the long-term effects of Brexit. Therefore, two independent scenarios of potential growth in commercial vessel movements of 10% and 20% have been estimated throughout the lifetime of the offshore Project. These scenarios have been included in the pre OWF modelling undertaken in the NRA (SS13: Navigational risk assessment).

There is similar uncertainty associated with long-term predictions for commercial fishing vessel and recreational vessel transits given the limited reliable information on future trends upon which any firm assumption could be made. There are no known major developments which would increase commercial fishing or recreational vessel activity in the region. Therefore, in line with assumptions for commercial vessels, a conservative potential growth in commercial fishing vessel and recreational vessel movements of 10% and 20% has been estimated throughout the lifetime of the offshore Project. Changes in fishing activity are considered further in chapter 14: Commercial fisheries.

It is possible that climate change and measures taken to slow the effects of climate change could have an effect on shipping and navigation receptors. However, given the temporal nature of climate change, any effects are expected to develop in the long-term (post operational life of the offshore Project) rather than the short- or medium-term. Therefore, it is not possible to suitably consider the future baseline for shipping and navigation accounting fully for climate change.

15.4.6 Summary and key issues

The key shipping and navigation users as identified via the baseline assessment are presented in Table 15-7.

Table 15-7 Summary and key issues for shipping and navigation

SUMMARY AND KEY ISSUES	OFFSHORE PROJECT AREA
	• Commercial vessels (cargo, tanker, and passenger); • Recreational vessels; and • Fishing vessels.

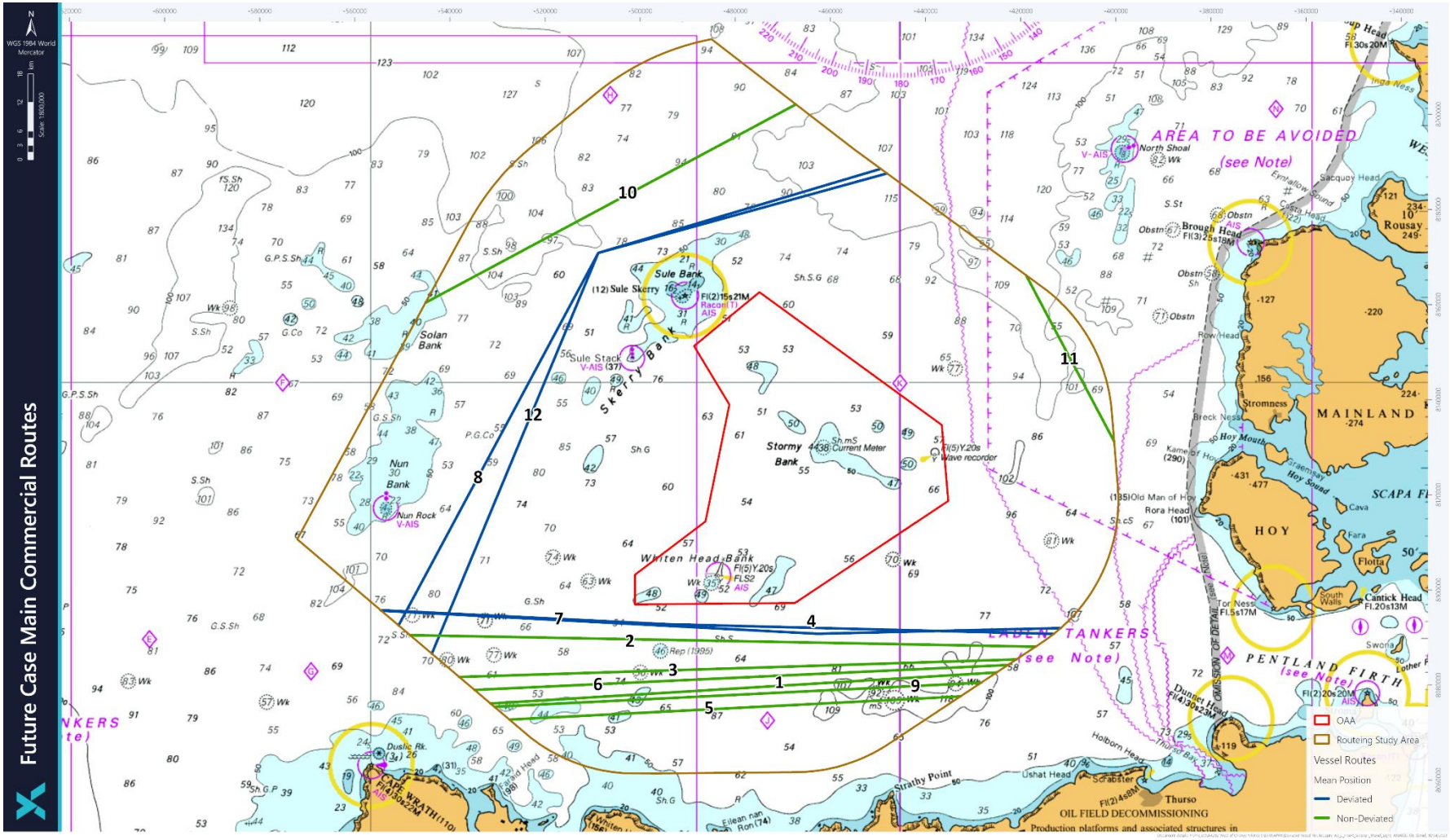

Figure 15-6 Future case main commercial routes

15.4.7 Data limitations and uncertainties

This section discusses key data limitations and uncertainties associated with the data sources used to inform the assessment of this chapter. The use of multiple data sources and consultation (in line with MGN 654 requirements) means that these limitations and uncertainties do not compromise the chapter assessment.

15.4.7.1 Automatic Identification System data

The carriage of AIS is required on board all vessels of greater than 300 GT engaged on international voyages, cargo vessels of more than 500 GT not engaged on international voyages, passenger vessels irrespective of size built on or after 1st July 2002, and fishing vessels over 15 m length overall. It should therefore be considered that certain vessel types (in particular fishing vessels of less than 15 m in length and recreational vessels) may be underrepresented in the AIS only datasets such as the data for the offshore ECC and 12 months long-term data. However, additional data sources including the RYA Coastal Atlas and VMS data have also been considered. Further details are presented in SS13: Navigational risk assessment.

It has been assumed that vessels under a legal obligation to broadcast via AIS will do so and that the details broadcast via AIS are accurate (e.g. vessel type, dimensions) unless there is clear evidence to the contrary.

During the summer period, geophysical surveying of the offshore Project area was being undertaken, which may have influenced fishing activity in both the OAA and offshore ECC.

15.4.7.2 Historical incident data

Although all UK commercial vessels are required to report accidents to the MAIB, this is not mandatory for non-UK vessels unless they are in a UK port, within 12 nm (22.2 km) of territorial waters (noting that the OAA is located approximately 2-3 nm (3.7-5.6 km) offshore at the closest point) or carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB.

The RNLI incident data cannot be considered comprehensive of all incidents in the offshore study area. Although hoaxes and false alarms are excluded, any incident to which an RNLI resource was not mobilised has not been accounted for in this dataset.

15.4.7.3 United Kingdom Hydrographic Office admiralty charts

The UKHO Admiralty Charts are updated periodically, and therefore the information shown may not reflect the real-time features within the region with total accuracy. For aids to navigation, only those charted and considered key to establishing the shipping and navigation baseline are shown.

During consultation, input has been sought from relevant stakeholders regarding the navigational features baseline. Navigational features are based upon the most recently available UKHO Admiralty Charts and Sailing Directions at the time of writing.

15.5 Impact assessment methodology

15.5.1 Impacts requiring assessment

The impacts identified as requiring consideration for shipping and navigation are listed in Table 15-8. Information on the nature of impact (i.e., direct or indirect) is also described. This list of impacts has been identified through the NRA process which considers various inputs including consultation (including a hazard workshop), quantitative modelling, and the baseline assessment.

Table 15-8 Impacts requiring assessment for shipping and navigation

POTENTIAL IMPACT	NATURE OF IMPACT
Construction (including pre-construction) and decommissioning	
Vessel displacement and increased third-party vessel to vessel collision risk	Indirect
Increased third-party to Project vessel collision risk	Direct
Adverse weather routeing	Direct
Creation of vessel to structure allision risk	Direct
Reduced access to local ports and harbours	Direct
Operation and maintenance	
Vessel displacement and increased third-party vessel to vessel collision risk	Indirect
Increased third-party to Project vessel collision risk	Direct
Creation of vessel to structure allision risk	Direct
Changes in under keel clearance	Direct
Increased interaction with sub-sea cables	Direct
Adverse weather routeing	Direct
Reduced access to local ports and harbours	Direct

POTENTIAL IMPACT	NATURE OF IMPACT
Reduction of emergency response provision	Direct

15.5.2 Impacts scoped out of the assessment

No impacts have been scoped out of the assessment.

15.5.3 Assessment methodology

An assessment of potential impacts is provided separately for the construction, operation and maintenance and decommissioning stages.

The criteria for the assessment for shipping and navigation differ from those set out in chapter 7: EIA methodology, noting that the required MCA methodology for shipping and navigation has been applied. Impact(s) on shipping and navigation are assessed in terms of the IMO FSA methodology – which is the internationally recognised approach for assessing shipping and navigation impacts – and is required to be used for shipping and navigation assessments under MGN 654.

For each potential impact, the assessment identifies receptors sensitive to that impact and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors based on two key factors – the frequency of occurrence and severity of consequence. The definitions of frequency of occurrence and severity of consequence for the purpose of the shipping and navigation assessment are provided in Table 15-9.

Table 15-9 Frequency criteria

FREQUENCY OF OCCURRENCE	DEFINITION
Frequent	Yearly.
Reasonably Probable	One occurrence per 1 to 10 years.
Remote	One occurrence per 10 to 100 years.
Extremely Unlikely	One occurrence per 100 to 10,000 years.
Negligible	Less than one occurrence per 10,000 years.

Table 15-10 Consequence criteria

SEVERITY OF CONSEQUENCE	DEFINITION
Major	More than one fatality, total loss of property, tier 3 national assistance required and international reputational effects.
Serious	Multiple serious injuries or single fatality, damage resulting in critical impact on operations, tier 2 regional assistance required, and national reputational effects.
Moderate	Multiple minor or single serious injury, damage not critical to operations, tier 2 limited external assistance required, and local reputational effects.
Minor	Slight injury to people, minor damage to property, tier 1 local assistance required, and minor reputational effects limited to receptors.
Negligible	No perceptible effect.

The significance of effect is then determined using the matrix provided in Table 15-11.

Table 15-11 Shipping and Navigation significance of effect matrix

		FREQUENCY OF OCCURRENCE				
		Frequent	***Reasonably Probable***	***Remote***	***Extremely Unlikely***	***Negligible***
SEVERITY OF CONSEQUENCE	***Major***	Unacceptable	Unacceptable	Unacceptable	Tolerable	Tolerable
	Serious	Unacceptable	Unacceptable	Tolerable	Tolerable	Broadly Acceptable
	Moderate	Unacceptable	Tolerable	Tolerable	Broadly Acceptable	Broadly Acceptable
	Minor	Tolerable	Tolerable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable
	Negligible	Tolerable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable

15.5.4 Embedded mitigation

As described in chapter 7: EIA methodology, certain measures have been adopted as part of the offshore Project development process in order to reduce the potential for impacts to the environment, as presented in Table 15-12.

These have been accounted for in the assessment presented below. The requirement for additional mitigation measures (secondary mitigation) will be dependent on the significance of the effects on shipping and navigation receptors.

Table 15-12 Embedded mitigation measures relevant to shipping and navigation

MITIGATION MEASURE	FORM (PRIMARY OR TERTIARY)	DESCRIPTION	HOW MITIGATION WILL BE SECURED
Application for and implementation of safety zones	Primary	Application for safety zones of up to 500 m around structures during construction and periods of major maintenance, and 50 m around structures pre-commissioning.	An application for safety zones will be made in accordance with Section 95 of the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations. Details will be included within the NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan. The outline NSVMP details the process and approach for the application of statutory safety zones.
Buoyed construction area	Primary	Buoyage to mark construction area of the OAA during the construction stage, as directed by NLB. The buoys will alert vessels to the construction area, they will not act to exclude vessels from the area.	Required under Section 36 Consent and/or Marine Licence conditions. Requirements will be detailed within the LMP and NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An Aids to Navigation Management Plan (ANMP) will also be produced post-consent. Outline LMP, NSVMP and ANMP are provided as part of the offshore application in OP6: Outline Lighting and Marking plan, OP4: Outline Navigational Safety and Vessel Management Plan and OP5: Aids to Navigation Management Plan. The outline NSVMP and outline LMP include details on the implementation of construction buoyage during the construction stage.

MITIGATION MEASURE	FORM (PRIMARY OR TERTIARY)	DESCRIPTION	HOW MITIGATION WILL BE SECURED
Cable protection	Primary	Suitable implementation and monitoring of cable protection (via burial or external protection). The cable will be buried as the first choice of protection. External cable protection will only be used where adequate burial cannot be achieved and this will be minimised as far as is practicable. This will be informed by a CBRA, undertaken post-consent following results of the geotechnical survey.	Final cable design will be informed by the CBRA and detailed within the Cable Plan (CaP), required under Section 36 Consent and/or Marine Licence conditions.
Compliance with MGN 654	Tertiary	Compliance with MGN 654 and its annexes, including completion of a SAR checklist and Emergency Response Co-operation Plans (ERCoP).	MGN 654 compliance required under standard Section 36 Consent and/or Marine Licence conditions. Details will be included within the NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An outline of this plan has been provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan. The MGN 654 checklist is included within the outline NSVMP and compliance with this checklist will be monitored post-consent.
The use of guard vessels, where required	Primary	Use of guard vessels where appropriate (as required by Project risk assessment of hazards / activities).	Consideration of use of "guard vessels where appropriate" is required under MGN 654. Details will be included within the NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An outline of this plan has been provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan. The outline NSVMP includes details on the use of guard vessels.

MITIGATION MEASURE	FORM (PRIMARY OR TERTIARY)	DESCRIPTION	HOW MITIGATION WILL BE SECURED
Layout approval via DSLP process	Tertiary	Layout to be approved by Scottish Ministers, following consultation with MCA and NLB (and other relevant stakeholders), as part of DSLP process. Minimum spacing of 944 m between WTGs to reduce the likelihood of vessel collision and allision risk.	The layout will be detailed within the DSLP, required under Section 36 Consent and/or Marine Licence conditions.
Lighting and marking as appropriate for the final agreed layout	Primary	Marking and lighting of the site in agreement with NLB and in line with IALA Guideline G1162 and Recommendation O-139 (IALA, 2021a & b).	Requirements will be detailed in the LMP, required under Section 36 Consent and/or Marine Licence conditions. An outline LMP is provided as part of the offshore application in OP6: Outline Lighting and Marking Plan.
Marine coordination	Primary	Marine coordination and communication to manage Project vessel movements.	NSVMP required under Section 36 Consent and/or Marine Licence conditions. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan. The outline NSVMP includes details on the communication and information dissemination to other mariners.
EMP	Tertiary	The development of, and adherence to, an EMP covering pollution prevention, biosecurity and waste management. A Marine Pollution Contingency Plan (MPCP) will be included within the EMP.	The production and approval of an EMP, including the MPCP and Invasive Non-Native Species (INNS) management plan, will be required under Section 36 Consent and/or Marine Licence conditions.

MITIGATION MEASURE	FORM (PRIMARY OR TERTIARY)	DESCRIPTION	HOW MITIGATION WILL BE SECURED
			An outline EMP is provided as part of the offshore application in OP1: Outline Environmental Management Plan. The outline MPCP is contained within the outline EMP.
Charting of installed infrastructure	Tertiary	Notification to the UKHO / Kingfisher of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical / admiralty charts and publications.	Charting requirements will be secured as a Section 36 Consent and/or Marine Licence condition. Details will be included within the NSVMP and FMMS. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety Vessel Management Plan and an outline FMMS is provided as part of the offshore application in OP3: Outline Fisheries Management and Mitigation Strategy.
Minimum blade clearance	Primary	Blade clearance of 27.05 (above Mean Sea Level) which is in excess of the minimum requirement of 22 m above MHWS.	Secured through the description of the offshore Project within the Section 36 Consent and/or Marine Licence.
Project vessel AIS transmission	Primary	All Project vessels will broadcast via AIS.	Requirements will be detailed within the NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan.

MITIGATION MEASURE	FORM (PRIMARY OR TERTIARY)	DESCRIPTION	HOW MITIGATION WILL BE SECURED
COLREGs and SOLAS	Tertiary	All vessels will comply with the provisions of the COLREGs and SOLAS, including the display of appropriate lights and shapes such as when vessels are restricted in their ability to manoeuvre.	Legislative requirement that will be detailed within the NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan.
Promulgation of information, such as Notice to Mariners, Kingfisher notifications and other navigational warnings on the location, duration and nature of works	Tertiary	Promulgation of information, including timely and efficient distribution of Notice to Mariners (NtMs), Kingfisher notifications and other navigational warning on the location, duration and nature of works, including, statutory and advisory safety zones.	Secured through Section 36 Consent and/or Marine Licence conditions. Requirements will be detailed within the NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan.
NSVMP	Tertiary	Development and adherence to a NSVMP that sets out Project vessel management procedures and navigational safety measures.	The production and approval of a NSVMP will be required under Section 36 Consent and/or Marine Licence conditions. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan.
ANMP	Tertiary	Development and adherence to an ANMP that sets out details of the AtoN, including maintenance and repair of AtoN, associated with the offshore Project, in	Alongside the LMP and NSVMP that are required under Section 36 Consent and/or Marine Licence conditions, an ANMP will be produced post-consent.

MITIGATION MEASURE	FORM (PRIMARY OR TERTIARY)	DESCRIPTION	HOW MITIGATION WILL BE SECURED
		accordance with relevant guidance, during construction and operation and maintenance.	An outline ANMP is provided as part of the offshore application in OP5: Outline Aids to Navigation Management Plan.
FMMS	Tertiary	Development and adherence to a FMMS, covering: communication, Developers MMC, safety zones, guard vessels, dropped objects, transit plans, monitoring and cooperation agreements.	Production and approval of FMMS will be required under Section 36 Consent and/or Marine Licence conditions. An outline FMMS is provided as part of the offshore application in OP3: Fisheries management and mitigation strategy.
Fisheries Liaison Officer (FLO)	Tertiary	The Project has already engaged a FLO to engage in proactive consultation with the fishing industry with adherence to best practice guidance with support from Fishing Industry Representatives (FIRs) (e.g. Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW), 2014; 2015 or equivalent at the time). Use of an FLO and Offshore FLO (OFLO) (as appropriate) will continue throughout the construction and decommissioning stages. An OFLO will also be appointed, as needed. The OFLO will be stationed on construction vessels, as required, and will act as an on-site point of communication for fishing vessels.	Appointment of an FLO will be required under Section 36 Consent and/or Marine Licence conditions. Details on the fisheries liaison for the offshore Project, including the roles and responsibilities of the OFLO will be detailed in the FMMS. An outline FMMS is provided as part of the offshore application OP3: Outline Fisheries Management and Mitigation Strategy. The outline FMMS contains details on the proposed approach for fisheries liaison.

MITIGATION MEASURE	FORM (PRIMARY OR TERTIARY)	DESCRIPTION	HOW MITIGATION WILL BE SECURED
Decommissioning Programme	Tertiary	The development of, and adherence to, a Decommissioning Programme approved by Scottish Ministers prior to construction and updated throughout the Project lifespan.	The production and approval of a Decommissioning Programme will be required under Section 105 of the Energy Act 2004 (as amended).
Application for and implementation of safety zones	Primary	Application for safety zones of up to 500 m around structures during construction and periods of major maintenance, and 50 m around structures pre-commissioning.	An application for safety zones will be made in accordance with Section 95 of the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations. Details will be included within the NSVMP, required under Section 36 Consent and/or Marine Licence conditions. An outline NSVMP is provided as part of the offshore application in OP4: Outline Navigational Safety and Vessel Management Plan. The outline NSVMP details the process and approach for the application of statutory safety zones.

15.5.5 Worst case scenario

As detailed in chapter 7: EIA methodology, this assessment considers the worst case scenario for the offshore Project parameters which are predicted to result in the greatest environmental impact, known as the 'worst case scenario'. The worst case scenario represents, for any given receptor and potential impact, the design option (or combination of options), that would result in the greatest potential for change.

Given that the worst case scenario is based on the design option (or combination of options) that represents the greatest potential for change, the development of any alternative options within the design parameters will give rise to no worse effects than assessed in this impact assessment. Table 15-13 presents the worst case scenario for potential impacts on shipping and navigation during construction, operation and maintenance, and decommissioning.

Table 15-13 Worst case scenario specific to shipping and navigation receptor impact assessment

POTENTIAL IMPACT	WORST CASE SCENARIO	JUSTIFICATION
Construction		
Vessel displacement and increased third-party vessel to vessel collision risk	• Construction of up to four years (with an additional one year of pre-construction activities e.g. Unexploded Ordnance (UXO) and boulder clearance); • WTGs located across the entire OAA; • Buoyed construction / decommissioning area encompassing the maximum extent of the OAA; • Presence of 500 m construction safety zones; • Temporary ancillary equipment within buoyed construction area (e.g. mooring buoys); • Up to five offshore export cables of combined 173 nm (320 km) length; • Indicative separation of 170 m between offshore export cables; and • Up to 30 construction / decommissioning vessels on-site simultaneously.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel displacement and subsequent vessel to vessel collision risk.
Increased vessel to vessel collision risk between a third-party vessel and a Project vessel		Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel to vessel collision risk involving a third-party vessel and a Project vessel.
Adverse weather routeing		Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on adverse weather routeing.
Vessel to structure allision risk	• Construction of up to four years (with an additional one year of pre-construction activities e.g. UXO and boulder clearance); • WTGs located across the entire OAA; • Minimum spacing of 944 m between WTGs;	Largest possible extent of surface infrastructure, greatest number of surface structures and greatest duration resulting in the maximum spatial and temporal effect on vessel to structure allision risk.

POTENTIAL IMPACT	WORST CASE SCENARIO	JUSTIFICATION
	• Temporary ancillary equipment within buoyed construction area (e.g., mooring buoys); • Up to 125 WTGs on four-legged jackets with sea surface dimensions of 20×20 m; and • Up to five Offshore Substation Platforms (OSPs) with topside dimensions of 66×45 m.	
Reduced access to local ports and harbours	• Construction of up to four years (with an additional one year of pre-construction activities e.g. UXO and boulder clearance); • WTGs located across the entire OAA; • Buoyed construction / decommissioning area encompassing the maximum extent of the OAA; • Presence of 500 m construction safety zones; • Up to five offshore export cables of combined 173 nm (320 km) length; • Indicative separation of 170 m between offshore export cables; and • Up to 30 construction / decommissioning vessels on-site simultaneously.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on access to local ports and harbours.
Operation and maintenance		
Vessel displacement and increased third-party vessel to vessel collision risk	• Maximum operational life of 30 years; • WTGs located across the entire OAA; • Presence of 500 m safety zones during major maintenance; and • Up to 19 operation and maintenance vessels on-site simultaneously and up to 468 annual round trips to port.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel displacement and subsequent vessel to vessel collision risk.
Increased vessel to vessel collision risk between a		Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on

POTENTIAL IMPACT	WORST CASE SCENARIO	JUSTIFICATION
third-party vessel and a Project vessel		vessel to vessel collision risk involving a third-party vessel and a Project vessel.
Vessel to structure allision risk	• Maximum operational life of 30 years; • WTGs located across the entire OAA; • Presence of 500 m safety zones during major maintenance; and • Up to 19 operation and maintenance vessels on-site simultaneously and up to 468 annual round trips to port; • Minimum spacing of 944 m between WTGs; • Up to 125 WTGs on four-legged jackets with sea surface dimensions of 20×20 m; and • Up to five OSPs with topside dimensions of 66×45 m.	Largest possible extent of surface infrastructure, greatest number of surface structures and greatest duration resulting in the maximum spatial and temporal effect on vessel to structure allision risk.
Reduction of under keel clearance due to cable protection	• Maximum operational life of 30 years; • Up to 270 nm (500 km) of inter-array cables; • Up to six interconnector cables with combined 81 nm (150 km) length; • Up to five offshore export cables of combined 173 nm (320 km) length; • Indicative separation of 170 m between offshore export cables; • Indicative maximum proportion of inter-array cable protection requirement of 20% (100 km); • Indicative maximum proportion of interconnector cable protection requirement of 66% (99 km); • Indicative maximum proportion of offshore export cable protection requirement of 29% (93.5 km);	Largest possible extent of sub-sea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on under keel clearance.
Anchor interaction with sub-sea cables		Largest possible extent of sub-sea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on anchor interaction with sub-sea cables.

POTENTIAL IMPACT	WORST CASE SCENARIO	JUSTIFICATION
	• Up to five crossings in total for the inter-array cables and interconnector cables; • Up to five crossings in total for the offshore export cables; • Indicative height of protection for inter-array cables (including crossings) of 4.0 m; • Indicative height of protection for interconnector cables (including crossings) of 4.0 m; and • Indicative height of protection for offshore export cables (including crossings) of 4.0 m.	
Reduced access to local ports and harbours	• Maximum operational life of 30 years; • WTGs located across the entire OAA; • Presence of 500 m safety zones during major maintenance; and • Up to 19 operation and maintenance vessels on-site simultaneously and up to 468 annual round trips to port.	Largest possible extent, greatest number of surface structures, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on adverse weather routeing.
Adverse weather routeing		Largest possible extent, greatest number of surface structures, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on access to local ports and harbours.
Reduction of emergency response capability (including SAR access)	• Maximum operational life of 30 years; • WTGs located across the entire OAA; • Presence of 500 m safety zones during major maintenance; and • Up to 19 operation and maintenance vessels on-site simultaneously and up to 468 annual round trips to port; • Minimum spacing of 944 m between WTGs; • Up to 125 WTGs on four-legged jackets with sea surface dimensions of 20×20 m; and	Largest possible extent, greatest number of surface structures, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on emergency response capability.

POTENTIAL IMPACT	WORST CASE SCENARIO	JUSTIFICATION
	• Up to five OSPs with topside dimensions of 66×45 m.	
Decommissioning		
In the absence of detailed information regarding decommissioning works, the implications for shipping and navigation are considered analogous to the construction stage. Therefore, the worst case parameters defined for the construction stage also apply to decommissioning. The decommissioning approach is set out in chapter 5: Project description.		

15.6 Assessment of potential effects

15.6.1 Potential effects during construction (including pre-construction)

15.6.1.1 Vessel displacement and increased third-party vessel to vessel collision risk

Construction activities associated with the installation of structures and cables may displace existing routes / activity and increase encounters and collision risk with other third-party vessels.

Each element is considered in turn in terms of frequency of occurrence and severity of consequence, with the resulting significance of the residual risk across the various elements summarised at the end of the assessment. The elements considered include:

- Vessel displacement; and
- Increased third-party to third-party vessel collision risk.

15.6.1.1.1 Vessel displacement

Qualification of risk

The volume of vessel traffic passing within or in proximity to the OAA has been established using vessel traffic data collected during dedicated surveys (28 days over winter and summer 2022) and from coastal receivers (12 months, 2021) as well as Anatec's ShipRoutes database. These datasets were interrogated to identify main routes using the principles set out in MGN 654 (MCA, 2021) (see section 15.4.4).

Although there will be no restrictions on entry into the buoyed construction area, other than through active safety zones, based on experience at previously under construction OWFs and consultation, it is anticipated that the majority of commercial vessels will choose not to navigate internally within the buoyed construction area and therefore some main route deviations will be required (noting this aligns with feedback provided at the hazard workshop). It is noted that operators associated with the aquaculture industry (BioFeeder, Ocean Farm Services, and Migdale) responded to the regular operators outreach (see section 15.3) stating that their vessels may consider transiting through depending on various factors notably the final layout and sea conditions. On this basis, smaller commercial vessel operators may choose to transit through on an infrequent basis, however it is likely that the majority of commercial vessels will deviate.

The full methodology for main route deviations is provided in SS13: Navigational risk assessment, with deviations established in line with MGN 654 (MCA, 2021). A deviation will be required for four of the 12 main routes identified within the routeing study area, with details as follows:

- Route 4 (Reykjavik to Humber ports) – four vessels per week, deviation of 0.01 nm (0.02 km) (<0.01%). Likely these vessels will pass further south to increase passing distance from the OAA leading to a minor deviation;
- Route 7 (Reykjavik to Rotterdam) – two to three vessels per week, deviation of 9.62 nm (17.82 km) (0.95%) (deviations for this route include worst case assumptions on local rock and shallows features, further details are provided in SS13: Navigational risk assessment);

- Route 8 (Belfast to northern Norwegian/Russian ports) – two vessels per week, deviation of 4.49 nm (8.32 km) (0.61%). Likely these vessels will pass north of the Sule Skerry; and
- Route 12 (Ullapool to Scalloway) – one vessel per week, deviation of 5.31nm (9.83 km) (2.84%) Likely these vessels will pass north of the Sule Skerry.

The deviations are illustrated in Figure 15-6.

Regular routeing involving RoRo vessels was recorded by one vessel operated by Smyril Line on route 7, transiting through the shipping and navigation offshore study area approximately twice per week between Rotterdam and Þorlákshöfn (Iceland). DFDS Seaways-operated RoRo routeing was also noted between Belfast and Skogn approximately two to three times per month.

Vessels deviating will be required to account for the presence of the Sule Skerry and Sule Stack, noting this is of particular relevance to vessels on Routes 8 and 12. It is considered unlikely that vessels would choose to pass between either Sule Skerry / Sule Stack and the OAA, and therefore any vessels choosing to pass north of the OAA are likely to pass north of the rocks.

It is also noted that certain vessels will need to account for the presence of the ATBA around Orkney (any vessel of greater than 5,000 GT and carrying potentially pollutant cargo). The minimum distance between the ATBA and the OAA is 2.4 nm (4.4 km), and while there would be no restriction on such vessels transiting through this gap, they may have preference to avoid this area given it would be bounded by WTGs on one side and the ATBA on the other, leading to a potentially large deviation depending on terminus ports.

Based on experience at previously under construction OWFs, it is anticipated that fishing vessels and recreational vessels will choose not to routinely navigate internally within the buoyed construction area, noting there would be no restriction on transit other than through active safety zones. There is considered to be sufficient sea room outside of the OAA for transits from such vessel to be accommodated. It is noted that displacement of active commercial fishing is assessed separately in chapter 14: Commercial fisheries.

Given the available searoom, it is considered unlikely that cable installation will lead to any notable displacement or disruption, noting any impact would be localised to the spatial area immediately around the vessel and would be temporary in nature.

The main consequence of vessel displacement will be increased journey times and distances for affected third-party vessels, over a large spatial extent, particularly as it is assumed that the buoyed construction area will be deployed around the maximum extent of the OAA. Vessels are expected to comply with international and flag state regulations (including COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974) and will be able to passage plan in advance given the promulgation of information relating to the offshore Project and relevant nautical charts.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- DSLP approval;
- LMP;

- Marking on charts; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to displacement of vessel traffic is considered frequent.

Severity of consequence

The severity of consequence in relation to displacement of vessel traffic is considered negligible in terms of navigational safety.

15.6.1.1.2 Increased third-party vessel to vessel collision risk

Qualification and quantification of risk

It is anticipated that four of the 12 main routes identified will deviate as a result of the construction of the offshore Project. This could lead to increased vessel densities within the area, which could in turn lead to an increase in vessel to vessel encounters and therefore increased collision risk.

Based on the pre OWF modelling, the baseline collision risk levels within the study area are low, with an estimated vessel to vessel collision frequency of one every 658 years. The low level of collision risk is due to the volume of traffic in the area relative to the available sea space. Based on the post OWF scenario, the collision frequency was estimated at one in 491 years, with the change associated with the vessels displaced from the OAA either south or offshore of the Sule Skerry. This represents an increase of 34%, however is still considered a low level of collision risk. This aligns with the findings of the incident data assessment (see section 15.4.4.3), which showed no recorded collisions in the shipping and navigation offshore study area over the periods studied.

The promulgation of information relating to construction activities, deployment of the buoyed construction area, and charting of infrastructure will allow vessel Masters to passage plan in advance, minimising any displacement and hence collision risk. Appropriate lighting and marking during construction including the buoyed construction area will be agreed with the NLB. These navigational aids will further maximise mariner awareness when in proximity. Additionally, information for fishing vessels will be promulgated through ongoing liaison with fishing fleets via an appointed FLO.

The minimum spacing between WTGs (944 m) is sufficient to ensure the view of other vessels will not be blocked or hindered, again reducing the likelihood of an encounter occurring in proximity to the offshore Project.

In the event that an encounter does occur, it is likely to be localised and occur for only a short duration, with collision avoidance action implemented by the vessels involved, in line with the COLREGs, thus ensuring that the situation does not develop into a collision incident. This is supported by experience at previous under construction OWFs, where no collision incidents involving two third-party vessels have been reported.

Historical collision incident data (see SS13: Navigational risk assessment) also indicates that the most likely consequences will be low should a collision occur, with minor contact between the vessels resulting in minor damage

and no injuries to persons, with both vessels able to resume their respective passages and undertake a full inspection at the next port. As an unlikely worst case, one or more of the vessels could be foundered resulting in a Potential Loss of Life (PLL) and pollution.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Buoyed construction area;
- DSLP approval;
- LMP;
- FLO and FMMS;
- Marking on charts; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to encounters and collision risk is considered extremely unlikely.

Severity of consequence

The severity of consequence in relation to encounters and collision risk is considered serious.

15.6.1.1.3 Significance of risk

Hazard component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Vessel displacement	Frequent	Negligible	Tolerable
Third party vessel to vessel collision risk	Extremely Unlikely	Serious	Tolerable
Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.			

Overall, it is predicted that the significance of risk due to vessel displacement leading to increased vessel to vessel collision risk is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation, the risk is considered ALARP.

15.6.1.2 Third-party to Project vessel collision risk

Vessels associated with construction activities may increase encounters and collision risk for other vessels already operating in the area.

15.6.1.2.1 Qualification of risk

Up to 1,722 return trips by construction vessels may be made throughout the construction stage, noting this will include Restricted in Ability to Manoeuvre (RAM) vessels. It is assumed that construction vessels will be on-site throughout the duration of the construction stage.

Encounter and collision risk involving Project vessels will be managed by marine coordination including the application of traffic management procedures such as the designation of entry and exit points to and from the OAA and routes to and from construction ports. These measures will be set out in the NSVMP. Additionally, Project vessels will carry AIS and be compliant with Flag State regulations including IMO conventions such as the COLREGs, and information for fishing vessels will also be promulgated through ongoing liaison with fishing fleets via an appointed FLO.

An application for safety zones of 500 m will be sought during the construction stage around structures where construction activity is ongoing (i.e., where a construction vessel is present). These will serve to protect Project vessels engaged in construction activities. Minimum advisory passing distances (advisory safety zones), as defined by risk assessment, may also be applied where statutory safety zones do not apply (e.g. around cable installation vessels), with advanced warning and details of both safety zones and any minimum advisory safe passing distances provided by NtMs and Kingfisher Bulletins.

Appropriate marine lighting and marking during construction including the buoyed construction area will be agreed with the NLB. These navigational aids will further maximise mariner awareness when in proximity to ongoing construction works in the OAA.

Third-party vessels may experience restrictions on visually identifying Project vessels entering and exiting the OAA during reduced visibility; however, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and Project vessels mandatorily will carry AIS regardless of size. It is noted that the likelihood of a collision is likely to be greater in reduced visibility when the identification of Project vessels entering and exiting the OAA may be encumbered. However, again the COLREGs regulate vessel movements in adverse weather conditions and require all vessels operating in reduced visibility to reduce speed to allow more time for reacting to encounters, thus minimising the collision risk.

Based on historical incident data, there have been two instances of a third-party vessel colliding with Project vessels in the UK (see SS13: Navigational risk assessment for further details). In both incidents moderate vessel damage was reported with no harm to persons. It is noted that the two incidents occurred in 2011 and 2012, respectively, and awareness of offshore wind developments and application of the measures outlined above has improved and been refined considerably in the interim, with no further collision incidents reported since.

As for third party to Project vessel collision risk (see section 15.6.1.1.2), if an encounter occurs between a third-party vessel and a Project vessel, the encounter is likely to be localised and occur for only a short duration. With collision avoidance action implemented in line with the COLREGs, the vessels involved will likely be able to resume their respective passages and/or activities with no long-term consequences.

Should a collision occur, the most likely consequences will be similar to that outlined for the case of a collision between two third-party vessels (see section 15.6.1.1.2), namely minor contact between the vessels resulting in minor damage

and no injuries to persons with both vessels able safely to make their next port to undertake a full inspection. As an unlikely worst case, one or more of the vessels could be foundered resulting in a PLL and pollution. If pollution were to occur in proximity to the offshore Project or involving a Project vessel, then the MPCP will be implemented to minimise the environmental risks.

15.6.1.2.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Application for safety zones;
- Buoyed construction area;
- Guard Vessel(s) as required by risk assessment;
- DSLP approval;
- LMP;
- Marine coordination;
- MPCP;
- Marking on charts;
- Project vessel AIS transmission;
- Project vessel compliance with international marine regulations;
- Promulgation of information; and
- NSVMP.

15.6.1.2.3 Frequency of occurrence

The frequency of occurrence is considered to be extremely unlikely.

15.6.1.2.4 Severity of consequence

The severity of consequence is considered to be serious.

15.6.1.2.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Extremely unlikely	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to increased third-party to Project vessel collision risk is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.1.3 Adverse weather routeing

15.6.1.3.1 Qualification of risk

Adverse weather includes wind, wave, and tidal conditions as well as reduced visibility due to fog. Adverse weather can hinder a vessel's standard route, its speed of navigation and/or its ability to enter the destination port. Adverse weather routes are assessed to be significant course adjustments to mitigate vessel motion in adverse weather conditions. When transiting in adverse weather conditions, a vessel is likely to encounter various types of weather and tidal phenomena, which may lead to severe roll motions, potentially causing damage to cargo, equipment and/or discomfort and danger to persons on board. The sensitivity of a vessel to these phenomena will depend on the actual stability parameters, hull geometry, vessel type, vessel size and speed.

The need to consider routeing in adverse weather conditions was highlighted by the MCA during consultation, and certain vessel operators indicated that the presence of the buoyed construction area may limit routeing options in adverse conditions (see section 15.3). Based on review of the input received, it is likely that no commercial vessels would choose to make transit through the buoyed construction area during adverse weather conditions and will instead choose to pass either offshore of the OAA i.e., north of the Sule Skerry, or inshore to the south depending on destination. Larger deviations may be required than during more favourable conditions (e.g. vessels may choose to increase passing distance from the OAA or the Sule Skerry), however there is considered to be sufficient searoom to safely accommodate the chosen transits.

Input from Scotline was that their vessels may tack through the area under adverse conditions, noting one example of this behaviour was identified in the long term AIS. Post OWF there will be less searoom available for this behaviour, however there is considered to be sufficient searoom to safely accommodate shorter more frequent tacks.

It is noted that during periods of adverse weather, some Project vessels during the construction stage may depart the buoyed construction area.

The promulgation of information relating to construction activities, deployment of the buoyed construction area, and charting of infrastructure will allow vessel Masters to passage plan in advance accounting for forecast adverse weather conditions.

15.6.1.3.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Buoyed construction area;
- DSLP approval;
- LMP;
- Marking on charts; and
- Promulgation of information.

15.6.1.3.3 Frequency of occurrence

The frequency of occurrence related to adverse weather routeing is considered to be remote.

15.6.1.3.4 Severity of consequence

The severity of consequence related to adverse weather routeing is considered to be serious due to potential safety concerns if vessels routeing options during adverse weather are restricted.

15.6.1.3.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Remote	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to adverse weather routeing is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.1.4 Creation of vessel to structure allision risk

Presence of structures (including partially constructed) within the buoyed construction area will lead to creation of powered, drifting and internal allision risk for vessels.

The spatial extent of the hazard is small given that a vessel must be in close proximity to an OWF structure for an allision incident to occur. Each allision element is considered in turn in terms of frequency of occurrence and severity of consequence, with the resulting significance of the residual risk across the various elements summarised at the end of the assessment. The forms of allision considered include:

- Powered allision risk;
- Drifting allision risk; and
- Internal allision risk.

15.6.1.4.1 Powered allision risk

Qualification and quantification of risk

Based on quantitative assessment undertaken in the NRA (see SS13: Navigational risk assessment), the base case annual powered vessel to structure allision frequency was estimated to be 7.79×10^{-4}, corresponding to a return period of approximately one in 1,283 years. This is a low return period compared to that estimated for other UK OWF developments and is reflective of the relatively low volume of vessel traffic intersecting or passing in close proximity to the OAA.

Based on historical incident data, there have been two reported instances of a third-party vessel alliding with an operational OWF structure in the UK (in the Irish Sea and Southern North Sea). Both of these incidents involved a fishing vessel.

Operational lighting and marking will not yet be in place, however temporary marine lighting and marking will be implemented including the buoyed construction area in agreement with the NLB. Promulgation of information and display on charts will ensure vessels can passage plan to minimise risk. Pre-commissioning safety zones of 50 m in radius will also be applied for around structures.

Should an allision occur, the consequences will depend on multiple factors including the energy of the impact, structural integrity of the vessel and sea state at the time of the impact. Fishing vessels and recreational vessels are considered most vulnerable to the impact given the potential for a non-steel construction and possible internal navigation within the OAA by such vessels. In such cases, the most likely consequences will be minor damage with the vessel able to resume passage and undertake a full inspection at the next port. As an unlikely worst case, the vessel could be foundered resulting in a PLL and pollution. If pollution were to occur, then the MPCP will be implemented to minimise the environmental risk.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Application for safety zones;
- Buoyed construction area;
- DSLP approval;
- LMP;
- FLO and FMMS;
- MPCP;
- Marking on charts; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to powered allision risk is considered to be extremely unlikely.

Severity of consequence

The severity of consequence in relation to powered allision risk is considered to be moderate.

15.6.1.4.2 Drifting allision risk

Qualification and quantification of risk

Based on quantitative assessment undertaken in the NRA (see SS13: Navigational risk assessment), the base case annual drifting vessel to structure allision frequency was estimated to be 1.51×10^{-4}, corresponding to a return period of approximately one in 6,647 years. This is a low return period compared to that estimated for other UK OWF developments and is reflective of the relatively low volume of vessel traffic passing in proximity to or within the OAA.

Based on historical incident data, there have been no instances of a third-party vessel alliding with an operational OWF structure whilst Not Under Command (NUC). However, there is considered to be potential for a vessel to be

adrift; this is reflected in the MAIB incident data reviewed in proximity to the offshore Project which indicates that machinery failure is the most common incident type in both the 2010-2019 (approximately 40%) and 2000-2009 (approximately 60%) datasets. A vessel adrift may only develop into an allision situation if in proximity to a OWF structure. This is only the case where the adrift vessel is located internally within or in close proximity to the OAA and the direction of the wind and/or tide directs the vessel towards a structure.

In circumstances where a vessel drifts towards a structure in the OAA, there are actions which the vessel may take to prevent the drift incident developing into an allision situation. Powered vessels may be able to regain power prior to reaching the OAA (i.e., by rectifying any fault). Failing this, the vessel's emergency response procedures would be implemented which may include an emergency anchoring event following a check of the relevant nautical charts to ensure the deployment of the anchor will not lead to other risks (such as anchor snagging on a subsea cable), or the use of thrusters (depending on availability and power supply).

Where the deployment of the anchor is not possible (e.g. for small craft), any Project vessels on-site may be able to render assistance in liaison with the MCA and in line with SOLAS obligations (IMO, 1974). This response will be managed via the coastguard and marine coordination, and depends on the type and capability of vessels on site. This would be particularly relevant for sailing vessels relying on metocean conditions for propulsion, noting if the vessel becomes adrift in proximity to a structure there may be limited time to render assistance.

It is noted that design of the OAA, the boundary of which avoids the south-east corner of the N1 PO area, has considered the specific recreational vessel risk for these vessels sailing between Cape Wrath or the west coast to Stromness (due to tidal restrictions approaching Stromness).

Should an allision occur, the consequences will be similar to those noted for the case of a powered allision including the unlikely worst case of foundering and pollution; in the highly unlikely scenario of a drifting allision incident resulting in pollution, the implementation of the MPCP will minimise the environmental risk. Additionally, a drifting vessel is likely to transit at a reduced speed compared to a powered vessel, thus reducing the energy of the impact, including in the case of a recreational vessel under sail.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- MPCP;
- Marking on charts;
- Project vessel compliance with international marine regulations; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to drifting allision risk is considered to be extremely unlikely.

Severity of consequence

The severity of consequence in relation to drifting allision risk are considered to be moderate.

15.6.1.4.3 Internal allision risk

Qualification and quantification of risk

As noted previously, based on experience at existing operational OWFs, it is anticipated that commercial vessels will be unlikely to navigate internally within the OAA. Fishing and recreational vessels may be more likely to transit through noting they may be less likely to do so while the buoyed construction area is in place.

The base case annual fishing vessel to structure allision frequency is estimated to be 1.01×10^{-1}, corresponding to a return period of approximately one in 9.6 years. This return period is reflective of the volume of fishing vessel traffic in the area, both in transit and engaged in fishing activities, and the conservative assumptions made within the modelling process, in particular that baseline activity in terms of proximity to WTGs will not change. This is a very conservative assumption, and in reality, fishing vessels will account for the presence of the WTGs. Further, as per the NRA (SS13: Navigational risk assessment), the worst consequences reported for vessels involved in an allision incident involving a UK offshore wind farm development has been flooding, with no life-threatening injuries to persons reported (the model is calibrated against known reported incidents). It is also noted that the result aligns with that of other publicly available NRAs, for example the NRA for the now consented Moray West OWF (Anatec, 2018) estimated a fishing vessel allision return period of one in seven years.

The minimum spacing between structures of 944 m is considered sufficient for safe internal navigation i.e. for vessels to keep clear of the OWF structures within the buoyed construction area. It is noted that this spacing is greater than that associated with many other operational OWFs in the UK. Further, the final layout will be agreed with the MCA and NLB to ensure it is safe from a surface navigation perspective.

As with any passage, any vessel navigating within the OAA is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974) and promulgation of information including through ongoing liaison with fishing fleets via an appointed FLO to ensure that such vessels have good awareness of the offshore Project. Pre-commissioning safety zones of 50m in radius will also be applied for around structures. Operational lighting and marking will not yet be in place, however temporary marine lighting and marking will be implemented in agreement with the NLB.

Should a recreational vessel under sail enter the proximity of a WTG, there is also potential for effects such as wind shear, masking and turbulence to occur. From previous studies of offshore wind developments, it has been concluded that WTGs do reduce wind velocity downwind of a WTG (MCA, 2008) but that no negative effects on recreational craft have been reported on the basis of the limited spatial extent of the effect and its similarity to that experienced when passing a large vessel or close to other large structures (such as bridges) or the coastline. In addition, no practical issues have been raised by recreational users to date when operating in proximity to existing offshore wind developments. For recreational vessels with a mast there is an additional allision risk when navigating internally within the OAA associated with the WTG blades. However, the minimum blade tip clearance exceeds 22 m above MHWS which is aligned with the minimum clearance the RYA recommend for minimising allision risk (RYA, 2019a) and which is also noted in MGN 654.

As per section 15.6.1.4.2, it is also noted that design of the OAA has considered the specific recreational vessel risk for these vessels sailing between Cape Wrath or the west coast to Stromness (due to tidal restrictions approaching Stromness).

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Application for safety zones;
- Buoyed construction area;
- Compliance with MGN 654;
- DSLP approval;
- LMP;
- FLO and FMMS;
- Marking on charts;
- Minimum blade clearance; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to internal allision risk is considered to be remote.

Severity of consequence

The severity of consequence in relation to internal allision risk is considered to be moderate.

15.6.1.4.4 Significance of risk

Component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Powered allision risk	Extremely unlikely	Moderate	Broadly Acceptable
Drifting allision risk	Extremely unlikely	Moderate	Broadly Acceptable
Internal allision risk	Remote	Moderate	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to creation of vessel to structure allision risk is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.1.5 Reduced access to local ports and harbours

15.6.1.5.1 Qualification of risk

Up to 1,722 return trips by construction vessels (excluding site preparation activities) may be made throughout the construction stage and will include vessels which are RAM. Project vessels will be managed by marine coordination, including the use of traffic management procedures such as the designation of entry and exit points to and from the

buoyed construction area, and designated routes to and from construction ports. Project vessels will also carry AIS and be compliant with Flag State regulations including the COLREGs.

The closest port or harbour to the OAA is Stromness Harbour, located approximately 20 nm (37.0 km) to the east, on the Orkney coast. Scrabster Harbour is located approximately 22 nm (40.7 km) to the southeast on the northern mainland Scotland coast. Given the relative distance to ports in the area and the anticipated deviations for the main commercial routes, it is not anticipated that there will be any substantial effect on vessel approaches to and from the local ports beyond the deviations already outlined for impacts on vessel displacement (see section 15.6.1.1). This aligns with feedback received during the hazard workshop.

The closest port / harbour to the offshore ECC is Scrabster, located 5 nm (9.3 km) to the east of the landfall. On this basis it is considered unlikely that cable installation would have any impact on port access, again beyond what has already been assessed in terms of general vessel displacement (see section 15.6.1.1).

The most likely consequences of the impact are increased journey times and distances due to the presence of the buoyed construction area and Project vessels, as per the vessel displacement impact. No effect is anticipated on port related services such as pilotage.

15.6.1.5.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Buoyed construction area;
- LMP;
- Marine coordination;
- Marking on charts;
- Project vessel compliance with international marine regulations; and
- Promulgation of information.

15.6.1.5.3 Frequency of occurrence

The frequency of occurrence for reduced access to local ports and harbours is considered to be frequent.

15.6.1.5.4 Severity of consequence

The severity of consequence for reduced access to local ports and harbours is considered to be negligible.

15.6.1.5.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Frequent	Negligible	Tolerable

Impact significance - NOT SIGNIFICANT

Overall, it is predicted that the significance of risk due to changes in access to local ports is of Tolerable significance.

15.6.2 Potential effects during operations and maintenance

15.6.2.1 Vessel displacement and increased third-party vessel to vessel collision risk

Presence of structures may displace existing routes / activity, increase encounters and collision risk with other third-party vessels.

As with the construction stage version of this hazard, each element is considered in turn in terms of frequency of occurrence and severity of consequence, with the resulting significance of the residual risk across the various elements summarised at the end of the assessment. The elements considered include:

- Vessel displacement; and
- Increased third-party to third-party vessel collision risk.

15.6.2.1.1 Vessel displacement

Qualification of risk

Based on experience at existing operational OWFs, it is anticipated that commercial vessels will choose not to navigate internally within the OAA and therefore the main route deviations established for the equivalent construction stage hazard in line with MGN 654 (MCA, 2021) are again considered (see section 15.6.1.1.1).

A deviation will be required for four of the 12 main routes identified within the routeing study area as discussed in section 15.6.1.1.1.

As for the construction stage, vessels deviating will be required to account for the presence of the Sule Skerry, noting this is of particular relevance to vessels on Routes 8 and 12. It is considered unlikely that vessels would choose to pass between the Sule Skerry and the OAA, and therefore any vessels choosing to pass north of the OAA are likely to pass north of the rocks.

It is also noted that certain vessels will need to account for the presence of the ATBA (any vessel of greater than 5,000 GT and carrying potentially pollutant cargo). The minimum distance between the ATBA and the OAA is 2.4 nm (4.45 km), and while there would be no restriction on such vessels transiting through this gap, they may have preference to avoid this area given it would be bounded by WTGs on one side and the ATBA on the other, leading to a potentially large deviation depending on terminus ports.

It is noted that vessel behaviours and routeing in relation between the OAA and the ATBA and Sule Skerry will likely be well established by the time of the operational stage, based on experience during the construction stage of the offshore Project.

Minimum spacing in the OAA of 944 m is considered sufficient to accommodate transits of any smaller vessels that chose to transit through, noting there will be no restrictions on entry into the OAA for any vessel other than through any active 500 m major maintenance safety zones.

With the main route deviations matching those established for the equivalent construction stage hazard (see section 15.6.1.1.1), the main consequences of vessel displacement during the operational stage are also considered to be equivalent, in particular potential for increased journey times and distances. As for the construction stage, promulgation of information relating to the offshore Project and relevant nautical charts will allow vessels to passage plan in advance.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- DSLP approval;
- LMP;
- Marking on charts; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to displacement of vessel traffic is considered frequent.

Severity of consequence

The severity of consequence in relation to displacement of vessel traffic is considered negligible in terms of navigational safety.

15.6.2.1.2 Increased third-party vessel to vessel collision risk

Qualification and quantification of risk

Given the main route deviations are anticipated to remain as per those established for the equivalent construction stage hazard (15.6.1.1.1), the likelihood of an encounter occurring are also likely to be similar. As discussed in section 15.6.1.1.2, the annual collision frequency for the post OWF scenario (one in 491 years) represents a 34% increase compared to the pre OWF base scenario. This relatively low level of estimated collision risk aligns well with the incident datasets assessed (see section 15.4.4.3)

In the event that an encounter or collision does occur, the respective consequences are expected to be the same as for the equivalent construction stage hazard, with the most likely consequences of a collision being minor damage incurred. The worst case consequences could include the foundering of one of the vessels resulting in a PLL and pollution.

As with the equivalent construction stage hazard, for all vessels the risk will be present throughout the operation and maintenance stage, but the promulgation of information relating to maintenance activities and charting of

infrastructure will allow vessel Masters to passage plan in advance, minimising disruption. Additionally, as with the construction stage, mariner awareness will be further maximised by promulgation of information to fishing vessels via an FLO and deployment of lighting and marking.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- DSLP approval;
- LMP;
- Marking on charts; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to encounters and collision risk is considered extremely unlikely.

Severity of consequence

The severity of consequence in relation to encounters and collision risk is considered serious.

15.6.2.1.3 Significance of risk

Hazard component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Vessel displacement	Frequent	Negligible	Tolerable
Third party vessel to vessel collision risk	Extremely Unlikely	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to vessel displacement is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.2.2 Third-party to Project vessel collision risk

15.6.2.2.1 Qualification of risk

Up to 468 return trips per year by operation and maintenance vessels may be made throughout the operation and maintenance stage, including RAM vessels. It is assumed that operation and maintenance vessels will be on-site

throughout the operation and maintenance stage, with likely seasonal differences present – it is estimated that there will be more vessel movements in summer months. It is noted that the movement of Project vessels during the operation and maintenance stage represents a decrease in movements in comparison to the construction stage.

As with the equivalent construction stage hazard, encounter and collision risk involving Project vessels will be well mitigated, including through marine coordination, carriage of AIS and compliance with Flag State regulations by Project vessels, and promulgation of information to fishing fleets via an appointed FLO.

Furthermore, an application for safety zones of 500 m radius will be sought during the operation and maintenance stage around structures where major maintenance is ongoing. These will serve to protect Project vessels engaged in major maintenance activities. Minimum advisory passing distances (advisory safety zones), as defined by risk assessment, may also be implemented where safety zones do not apply, with advanced warning and accurate locations of both safety zones and any minimum advisory safe passing distances provided by Notifications to Mariners and Kingfisher Bulletins.

As with the equivalent construction stage hazard, third party vessels may experience restrictions on visually identifying Project vessels entering and exiting the OAA during reduced visibility; however, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and Project vessels mandatorily will carry AIS regardless of size.

As stated for the equivalent construction stage hazard, based on historical incident data, there have been two instances of a third-party vessel colliding with a Project vessel in the UK (see SS13: Navigational risk assessment for full details). In both incidents moderate vessel damage was reported with no harm to persons. It is noted that the two incidents occurred in 2011 and 2012, respectively, and awareness of offshore wind developments and application of the measures outlined above (and in section 15.5.4) has improved and been refined considerably in the interim, with no further collision incidents reported since.

The structures within the OAA will exhibit lights, marks, sounds, signals, and other aids to navigation as required by NLB and the MCA, maximising mariner awareness to the potential for Project vessel presence when in proximity, both in day and night conditions including in poor visibility.

Should an encounter or collision occur between a third-party vessel and a Project vessel, the consequences are expected to be as for the equivalent construction stage hazard, with the most likely consequences being moderate damage incurred and no injuries to persons based on historical incident data (see SS13: Navigational risk assessment). The worst case consequences could include the foundering of one of the vessels resulting in a PLL and pollution, with the environmental risk of the latter minimised by the implementation of the MPCP.

15.6.2.2.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Application for safety zones;
- Guard vessel(s) as required by risk assessment;
- DSLP approval;
- LMP;
- Marine coordination;
- MPCP;
- Marking on charts;
- Project vessel AIS transmission;

- Project vessel compliance with international marine regulations;
- Promulgation of information; and
- NSVMP.

15.6.2.2.3 Frequency of occurrence

The frequency of occurrence in relation to increased third-party to Project vessel collision risk is considered to be extremely unlikely.

15.6.2.2.4 Severity of consequence

The severity of consequence in relation to increased third-party to Project vessel collision risk is considered to be serious.

15.6.2.2.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Extremely unlikely	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to increased third-party to Project vessel collision risk is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.2.3 Creation of vessel to structure allision risk

Presence of structures within the OAA will lead to creation of powered, drifting, and internal allision risk for vessels.

The spatial extent of the hazard is small given that a vessel must be in close proximity to an OWF structure for an allision incident to occur. Each allision element is considered in turn in terms of frequency of occurrence and severity of consequence, with the resulting significance of the residual risk across the various elements summarised at the end of the assessment. The forms of allision considered include:

- Powered allision risk;
- Drifting allision risk; and
- Internal allision risk.

15.6.2.3.1 Powered allision risk

Qualification and quantification of risk

Based on quantitative assessment undertaken in the NRA (SS13: Navigational risk assessment), the base case annual powered vessel to structure allision frequency was estimated to be 7.79×10^{-4}, corresponding to a return period of approximately one in 1,283 years. This is a low return period compared to that estimated for other UK OWF developments and is reflective of the relatively low volume of vessel traffic intersecting or passing in close proximity to the OAA. Based on historical incident data, there have been two reported instances of a third-party vessel alliding with an operational OWF structure in the UK (in the Irish Sea and Southern North Sea). Both of these incidents involved a fishing vessel, with a RNLI lifeboat attending on both occasions and a helicopter deployed in one case.

Vessels are expected to comply with national and international flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan a route which minimises risk given the promulgation of information relating to the offshore Project, including the charting of infrastructure on relevant nautical charts. On approach, the operational marine lighting and marking on the structures (which will be agreed with the MCA and NLB) will also assist in maximising awareness. Further, the final layout will be agreed with the MCA and NLB to ensure it is safe from a surface navigation perspective.

Should an allision occur, the consequences will depend on multiple factors including the energy of the impact, structural integrity of the vessel and sea state at the time of the impact. Fishing vessels and recreational vessels are considered most vulnerable to the impact given the potential for a non-steel construction and possible internal navigation within the OAA by such vessels. In such cases, the most likely consequences will be minor damage with the vessel able to resume passage and undertake a full inspection at the next port. As an unlikely worst case, the vessel could be foundered resulting in a PLL and pollution. If pollution were to occur, then the MPCP will be implemented to minimise the environmental risk.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- DSLP approval;
- LMP;
- MPCP;
- Marking on charts; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to powered allision risk is considered to be extremely unlikely.

Severity of consequence

The severity of consequence in relation to powered allision risk is considered to be moderate.

15.6.2.3.2 Drifting allision risk

Qualification and quantification of risk

Based on quantitative assessment undertaken in the NRA (SS13: Navigational risk assessment), the base case annual drifting vessel to structure allision frequency was estimated to be 1.51×10^{-4}, corresponding to a return period of approximately one in 6,647 years. This is a low return period compared to that estimated for other UK OWF developments and is reflective of the relatively low volume of vessel traffic passing in proximity to or within the OAA.

Based on historical incident data, there have been no instances of a third-party vessel alliding with an operational OWF structure whilst NUC. However, there is considered to be potential for a vessel to be adrift in the area; this is reflected in the MAIB incident data reviewed in proximity to the offshore Project which indicates that machinery failure is the most common incident type (approximately 40%). A vessel adrift may only develop into an allision situation if in proximity to an OWF structure. This is only the case where the adrift vessel is located internally within or in close proximity to the OAA and the direction of the wind and/or tide directs the vessel towards a structure.

In circumstances where a vessel drifts towards a structure in the OAA, there are actions which the vessel may take to prevent the drift incident developing into an allision situation. Powered vessels may be able to regain power prior to reaching the OAA (i.e., by rectifying any fault). Failing this, the vessel's emergency response procedures would be implemented which may include an emergency anchoring event following a check of the relevant nautical charts to ensure the deployment of the anchor will not lead to other risks (such as anchor snagging on a subsea cable), or the use of thrusters (depending on availability and power supply).

Where the deployment of the anchor is not possible (e.g. for small craft), any Project vessels on-site may be able to render assistance in liaison with the MCA and in line with SOLAS obligations (IMO, 1974). This response will be managed via the coastguard and marine coordination, and depends on the type and capability of vessels on site. This would be particularly relevant for sailing vessels relying on metocean conditions for propulsion, noting if the vessel becomes adrift in proximity to a structure there may be limited time to render assistance.

It is noted that design of the OAA has considered the specific recreational vessel risk for these vessels sailing between Cape Wrath or the west coast to Stromness (due to tidal restrictions approaching Stromness).

Should an allision occur, the consequences will be similar to those noted for the case of a powered allision including the unlikely worst case of foundering and pollution; in the highly unlikely scenario of a drifting allision incident resulting in pollution, the implementation of the MPCP will minimise the environmental risk. Additionally, a drifting vessel is likely to transit at a reduced speed compared to a powered vessel, thus reducing the energy of the impact, including in the case of a recreational vessel under sail.

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Guard Vessel(s) as required by risk assessment;
- MPCP;
- Marking on charts;

- Project vessel compliance with international marine regulations; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to drifting allision risk is considered to be extremely unlikely.

Severity of consequence

The severity of consequence in relation to drifting allision risk are considered to be moderate.

15.6.2.3.3 Internal allision risk

Qualification and quantification of risk

As noted previously, based on experience at existing operational OWFs, it is anticipated that commercial vessels will be unlikely to navigate internally within the OAA. Fishing and recreational vessels may be more likely to transit through noting they may be less likely to do so while the buoyed construction area is in place.

The base case annual fishing vessel to structure allision frequency is estimated to be 1.01×10-1, corresponding to a return period of approximately one in 9.6 years. This return period is reflective of the volume of fishing vessel traffic in the area, both in transit and engaged in fishing activities, and the conservative assumptions made within the modelling process, in particular that baseline activity in terms of proximity to WTGs will not change. This is a very conservative assumption, and in reality, fishing vessels will account for the presence of the WTGs. Further, as per the NRA (SS13: Navigational risk assessment), the worst consequences reported for vessels involved in an allision incident involving a UK offshore wind farm development has been flooding, with no life-threatening injuries to persons reported (the model is calibrated against known reported incidents). It is also noted that the result aligns with that of other publicly available NRAs, for example the NRA for the now consented Moray West OWF (Anatec, 2018) estimated a fishing vessel allision return period of one in seven years.

The minimum spacing between structures of 944 m is considered sufficient for safe internal navigation i.e., for vessels to keep clear of the OWF structures within the OAA. It is noted that this spacing is greater than that associated with many other operational OWFs in the UK. Further, the final layout will be agreed with the MCA and NLB to ensure it is safe from a surface navigation perspective.

As with any passage, any vessel navigating within the OAA is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974) and promulgation of information including through ongoing liaison with fishing fleets via an appointed FLO to ensure that such vessels have good awareness. Operational marine lighting and marking will be in place as required by and agreed with the NLB.

This will include unique identification marking of each OWF structure in an easily understandable pattern to minimise the risk of a mariner navigating internally within the OAA becoming disoriented.

Should a recreational vessel under sail enter the proximity of a WTG, there is also potential for effects such as wind shear, masking and turbulence to occur. From previous studies of offshore wind developments, it has been concluded

that WTGs do reduce wind velocity downwind of a WTG (MCA, 2008) but that no negative effects on recreational craft have been reported on the basis of the limited spatial extent of the effect and its similarity to that experienced when passing a large vessel or close to other large structures (such as bridges) or the coastline. In addition, no practical issues have been raised by recreational users to date when operating in proximity to existing offshore wind developments. For recreational vessels with a mast there is an additional allision risk when navigating internally within the OAA associated with the WTG blades. However, the minimum blade tip clearance exceeds the minimum clearance the RYA recommend (22 m) for minimising allision risk (RYA, 2019a) and which is also noted in MGN 654.As per section 15.6.2.3.2, it is also noted that design of the OAA has considered the specific recreational vessel risk for these vessels sailing between Cape Wrath or the west coast to Stromness (due to tidal restrictions approaching Stromness).

Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Application for safety zones;
- Compliance with MGN 654;
- DSLP approval;
- LMP;
- FLO and FMMS;
- Marking on charts;
- Minimum blade clearance; and
- Promulgation of information.

Frequency of occurrence

The frequency of occurrence in relation to internal allision risk is considered to be remote.

Severity of consequence

The severity of consequence in relation to internal allision risk is considered to be moderate.

15.6.2.3.4 Significance of risk

Component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Powered allision risk	Extremely unlikely	Moderate	Broadly Acceptable
Drifting allision risk	Extremely unlikely	Moderate	Broadly Acceptable
Internal allision risk	Remote	Moderate	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to creation of vessel to structure allision risk is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.2.4 Changes in under-keel clearance

15.6.2.4.1 Qualification of risk

The presence of protection over subsea cables may reduce charted water depths leading to increased risk of under keel interaction for passing vessels. For all subsea cables relating to the offshore Project, the target burial depth is 1.0 – 3.0 m, noting actual burial depths will be determined via the cable burial risk assessment process which will be undertaken post consent once geotechnical survey data is available. Any changes in seabed levels from sediment deposits that change water depths by more than 5% will be discussed with the MCA to ensure that suitable navigable depths are maintained (see chapter 8: Marine physical and coastal processes).

Where cable burial is not possible, alternative cable protection methods may be deployed which will again be determined within the cable burial risk assessment. The requirements of MGN 654 in relation to cable protection will apply, namely cable protection will not change the charted water depth by more than 5% unless appropriate mitigation is agreed with the MCA. This aligns with the RYA's recommendation that the "minimum safe under keel clearance over submerged structures and associated infrastructure should be determined in accordance with the methodology set out in MGN 543 [since superseded by MGN 654]" (RYA, 2019a).

Should an underwater allision occur, minor damage incurred is the most likely consequence, and foundering of the vessel resulting in a PLL and pollution the unlikely worst case consequences, with the environmental risks of the latter minimised by the implementation of the MPCP.

It is noted that based on intended landfall locations it is not anticipated that there will be any notable changes in navigable depths (water depths in the OAA are between 45-100m and the landfall point is in depths of 40 m below Lowest Astronomical Tide (LAT)). This will be confirmed once cable routes are finalised. Further, RYA Scotland indicated during consultation recreational activity in the vicinity of the landfall was likely to be limited.

15.6.2.4.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Cable burial risk assessment;
- Compliance with MGN 654;
- MPCP;
- FLO and FMMS;
- Marking on charts; and
- Promulgation of information.

15.6.2.4.3 Frequency of occurrence

The frequency of occurrence for changes in under keel clearance is considered to be negligible.

15.6.2.4.4 Severity of consequence

The severity of consequence for changes in under keel clearance is considered to be moderate.

15.6.2.4.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Negligible	Moderate	Broadly Acceptable
Impact significance – NOT SIGNIFICANT		

Overall, it is predicted that the significance of risk due to changes in under keel clearance is of Broadly Acceptable significance.

15.6.2.5 Increased interaction with sub-sea cables

15.6.2.5.1 Qualification of risk

Presence of export cables, array cables and interconnector cables may increase the potential for interaction with sub-sea cables.

The spatial extent of the hazard is small given that a vessel must be in close proximity to an export cable, array cable or interconnector cable for an interaction to occur.

There are three anchoring scenarios which are considered for this hazard:

- Planned anchoring – most likely as a vessel awaits a berth to enter port but may also result from adverse weather conditions, machinery failure or sub-sea operations;
- Unplanned anchoring – generally resulting from an emergency situation where the vessel has experienced steering failure; and
- Anchor dragging – caused by anchor failure.

Although the second of these scenarios may involve limited decision-making time if drifting towards a hazard, in all three scenarios it is anticipated that the charting of infrastructure including the sub-sea cables will inform the decision to anchor, as per Regulation 34 of SOLAS (IMO, 1974).

No anchored vessels were identified within the vessel traffic survey data assessed, and no anchorages (preferred or charted) were identified in immediate proximity to the offshore Project. Risk of interaction on a planned anchoring or dragged anchoring basis is therefore anticipated to be low. In terms of emergency anchoring, any areas of high traffic volume are likely to represent the areas of highest risk, particularly where there are hazards nearby (e.g. structures, rocks, shallows).

The likelihood of anchor interaction with a subsea cable is further minimised by the burial of the cables and use of external cable protection where required, which will be informed by the CBRA process, which will account for traffic volumes and sizes. It is noted that the MCA indicated limited concerns with the export cables from a recreational perspective during the hazard workshop.

Should an anchor interaction incident occur, the most likely consequences will be low based on historical anchor interaction incidents, with no damage incurred to the cable or the vessel. As an unlikely worst case, a snagging incident could occur and/or the vessel's anchor and the cable could be damaged, and lead to risk of loss of stability of a small vessel. However, with the mitigation measures above in place, this risk will be minimised.

15.6.2.5.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- CBRA;
- Compliance with MGN 654;
- Marking on charts; and
- Promulgation of information.

15.6.2.5.3 Frequency of occurrence

The frequency of occurrence is considered to be negligible.

15.6.2.5.4 Severity of consequence

The severity of consequence is considered to be minor.

15.6.2.5.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Negligible	Minor	Broadly Acceptable

Impact significance – NOT SIGNIFICANT

Overall, it is predicted that the significance of risk due to increased interaction with subsea cables is of Broadly Acceptable significance.

15.6.2.6 Adverse weather routeing

15.6.2.6.1 Qualification of risk

The need to consider routeing in adverse weather conditions was highlighted by the MCA during consultation, and certain vessel operators indicated that the presence of the OAA may limit routeing options in adverse conditions (see section 15.3). Based on review of the input received, it is likely that no commercial vessels would choose to make transit through the OAA during adverse weather conditions and will instead choose to pass either offshore of the OAA i.e., north of the Sule Skerry, or inshore to the south depending on destination. Larger deviations may be required than during more favourable conditions (e.g. vessels may choose to increase passing distance from the OAA or the Sule Skerry), however there is considered to be sufficient searoom to safely accommodate the chosen transits.

Further, it is noted that any adverse weather routeing preferences accounting for the OAA are likely to be established during the construction stage.

Input from Scotline was that their vessels may tack through the area under adverse conditions, noting one example of this behaviour was identified in the long term AIS. Post OWF there will be less searoom available for this behaviour, however there is considered to be sufficient searoom to safely accommodate shorter more frequent tacks.

The promulgation of information relating to construction activities, lighting and marking, and charting of infrastructure will allow vessel Masters to passage plan in advance accounting for forecast adverse weather conditions.

15.6.2.6.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- DSLP approval;
- LMP;
- Marking on charts; and
- Promulgation of information.

15.6.2.6.3 Frequency of occurrence

The frequency of occurrence is considered to be remote.

15.6.2.6.4 Severity of consequence

The severity of consequence is considered to be serious due to potential safety concerns if vessels routeing options during adverse weather are restricted.

15.6.2.6.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Remote	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to adverse weather routeing is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.2.7 Reduced access to local ports and harbours

15.6.2.7.1 Qualification of risk

Up to 468 return trips per year by operation and maintenance vessels may be made throughout the operation and maintenance stage and will include vessels which are RAM. As per the construction stage, Project vessels will be managed by marine coordination, carry AIS and be compliant with relevant Flag State regulations.

Based on experience at existing operational OWFs, it is anticipated that commercial vessels will generally choose not to navigate internally within the OAA. Therefore, the anticipated deviations for the main commercial routes defined for the construction stage (around the buoyed construction area) are directly applicable for the operation and maintenance stage.

As noted for the equivalent construction stage impact, the closest port or harbour to the OAA is Stromness Harbour (20 nm) (37 km), with Scrabster harbour 22 nm (40.7 km) from the OAA. Again, given the relative distance to ports in the area and the anticipated deviations for the main commercial routes, it is not anticipated that there will be any substantial effect on vessel approaches to and from local ports above and beyond the deviations outlined for the vessel displacement impact. This aligns with feedback received during the hazard workshop.

The closest port / harbour to the offshore ECC is Scrabster, located 5 nm (9.3 km) to the east of the landfall. On this basis it is considered unlikely that cable maintenance activities would have any impact on port access, noting any such activity would be infrequent.

The most likely consequences of the impact are as per the equivalent construction stage impact, namely increased journey times and distances. No effect is anticipated on port related services such as pilotage.

15.6.2.7.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- LMP;
- Marine coordination;
- Marking on charts;
- Project vessel compliance with international marine regulations; and
- Promulgation of information.

15.6.2.7.3 Frequency of occurrence

The frequency of occurrence for reduced access to local ports and harbours is considered to be frequent.

15.6.2.7.4 Severity of consequence

The severity of consequence for reduced access to local ports and harbours is considered to be negligible.

15.6.2.7.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Frequent	Negligible	Tolerable
Impact significance – NOT SIGNIFICANT		

Overall, it is predicted that the significance of risk due to impacts on port access is of Tolerable significance.

15.6.2.8 Reduction of emergency response provision including SAR capability

15.6.2.8.1 Qualification of risk

Presence of structures, increased vessel activity and personnel numbers may reduce emergency response capability by increasing the number of incidents, increase consequences or reducing access for the responders.

Given the distances that may be covered by air-based SAR support (the SAR helicopter base at Stornoway is located approximately 67 nm (124 km) from the OAA), the spatial extent of this hazard is considered reasonably large. The OAA covers approximately 192 nm^2 (657 km^2) which represents a large area to search compared to other OWFs. However, it is unlikely that a SAR operation will require the entire OAA to be searched; it is much more likely that a search could be restricted to a smaller area within which a casualty is known to be located (noting account of assumptions on any potential drift of the casualty).

Up to 468 return trips per year by operation and maintenance vessels may be made throughout the operation and maintenance stage. It is assumed that operation and maintenance vessels will be on-site throughout the majority of the operation and maintenance stage, although it is noted that there may be instances of severe weather conditions where they may be withdrawn. The presence of such vessels will increase the likelihood of an incident and subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability. As an unlikely worst case, the consequences of such a situation could include a failure of emergency response to an incident, resulting in a PLL and pollution.

However, with Project vessels to be managed through marine coordination and compliance with Flag State regulations, the likelihood of an incident is minimised. Additionally, should an incident occur, Project vessels would likely be well equipped to assist, either through self-help capability or through SOLAS obligations (IMO, 1974), noting this would be undertaken in liaison with the MCA. The MPCP will also be implemented to minimise the environmental risks of any incident involving pollution.

From recent SAR helicopter taskings data, the frequency of SAR operations in proximity to the offshore Project is low, with no SAR helicopter incidents occurring within the OAA. The frequency of SAR operations in proximity to the OAA is not anticipated to change markedly from the current level given the measures noted above which will be in place. The layout will be agreed with the MCA and in line with MGN 654 requirements to ensure any SAR operations that do occur within the OAA are facilitated. Additionally, an ERCoP will be submitted to the MCA in line with the requirements of MGN 654 (MCA, 2021), and a SAR checklist will be completed and agreed with the MCA.

15.6.2.8.2 Relevant embedded mitigation measures

The embedded mitigation measures which have been identified as relevant to reducing risk are as follows:

- Compliance with MGN 654;
- Guard vessel(s) as required by risk assessment;
- DSLP approval;
- Marine coordination;
- MPCP; and
- Project vessel compliance with international marine regulations.

15.6.2.8.3 Frequency of occurrence

The frequency of occurrence is considered extremely unlikely.

15.6.2.8.4 Severity of consequence

The severity of consequence is considered moderate.

15.6.2.8.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Extremely unlikely	Moderate	Broadly Acceptable
Impact significance – NOT SIGNIFICANT		

Overall, it is predicted that the significance of risk due to reduction of emergency response provision including SAR capability is of Broadly Acceptable significance.

15.6.3 Potential effects during decommissioning

15.6.3.1 Vessel displacement and increased third-party vessel to vessel collision risk

15.6.3.1.1 Qualification and quantification of risk

Decommissioning activities associated with the removal of structures and cables may displace existing routes / activity and increase encounters and collision risk with other third-party vessels.

Since the methods used to remove structures and subsea cables are expected to be similar to those used to install them, this hazard is expected to be similar in nature to the equivalent construction stage hazard (see section 15.6.1.1). It is noted that in the case of subsea cables sections may be left in situ to avoid unnecessarily disturbing the seabed. This would be confirmed through consultation and assessment to ensure the most suitable approach was taken. But

for the purposes of this assessment (as a worst case) it has been assumed that all subsea cables will be removed during decommissioning with only cable protection left in situ.

The use of a buoyed decommissioning area analogous to the buoyed construction area is assumed and will result in similar main route deviations to those established for the equivalent construction stage hazard.

15.6.3.1.2 Relevant embedded mitigation measures

Analogous to construction stage (see section 15.6.1.1).

15.6.3.1.3 Frequency of occurrence

The frequency of occurrence is considered to be **frequent** for vessel displacement, and **extremely unlikely** for third party vessel to vessel collision risk.

15.6.3.1.4 Severity of consequence

The severity of consequence is considered to be **negligible** for vessel displacement and **serious** for third party vessel to vessel collision risk.

15.6.3.1.5 Significance of risk

Hazard component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Vessel displacement	Frequent	Negligible	Tolerable
Third party vessel to vessel collision risk	Extremely Unlikely	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to vessel displacement is of **Tolerable** significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.3.2 Third-party to Project vessel collision risk

15.6.3.2.1 Qualification of risk

Vessels associated with decommissioning activities may increase encounters and collision risk for other vessels already operating in the area.

Since the methods used to remove structures and subsea cables are expected to be similar to those used to install them, including the vessels involved, this hazard is expected to be similar in nature to the equivalent construction stage hazard (see section 15.6.1.2), including the number of return trips by decommissioning vessels. It is noted that in the case of sub-sea cables it is expected that they will be left in situ but for the purposes of this assessment (as a worst case) it has been assumed that all cables will be removed during decommissioning, with only cable protection left in situ.

15.6.3.2.2 Relevant embedded mitigation measures

Analogous to construction stage (see section 15.6.1.2).

15.6.3.2.3 Frequency of occurrence

The frequency of occurrence is considered to be extremely unlikely.

15.6.3.2.4 Severity of consequence

The severity of consequence is considered to be serious.

15.6.3.2.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Extremely unlikely	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to increased third-party to Project vessel collision risk is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.3.3 Creation of vessel to structure allision risk

15.6.3.3.1 Qualification of risk

It is likely that allision risk during decommissioning will be similar to that observed for the construction stage (section 15.6.1.4), noting similar scenarios on-site, including partially removed structures within a buoyed decommissioning area.

15.6.3.3.2 Frequency of occurrence

As per section 15.6.1.4, worst case frequency of occurrence is remote.

15.6.3.3.3 Severity of consequence

As per section 15.6.1.4, worst case severity of consequence is moderate.

15.6.3.3.4 Significance of risk

Component	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Powered allision risk	Extremely unlikely	Moderate	Broadly Acceptable
Drifting allision risk	Extremely unlikely	Moderate	Broadly Acceptable
Internal allision risk	Remote	Moderate	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to creation of vessel to structure allision risk is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.3.4 Adverse weather routeing

15.6.3.4.1 Qualification of risk

As with the construction and operations and maintenance stages, it is likely that no commercial vessels would choose to make transit through the OAA during adverse weather conditions and will instead choose to pass either offshore of the OAA i.e., north of the Sule Skerry, or inshore to the south depending on destination. This impact is therefore considered analogous to the construction stage impact.

15.6.3.4.2 Relevant embedded mitigation measures

Analogous to construction stage (see section 15.6.1.3).

15.6.3.4.3 Frequency of occurrence

The frequency of occurrence is considered to be remote.

15.6.3.4.4 Severity of consequence

The severity of consequence is considered to be serious.

15.6.3.4.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Remote	Serious	Tolerable

Impact significance - NOT SIGNIFICANT assuming implementation of additional mitigation as detailed below.

Overall, it is predicted that the significance of risk due to adverse weather routeing is of Tolerable significance. As per section 15.5.4, embedded mitigation includes layout approval via the DSLP process, however it considered that once site constraints are further understood, additional post consent consultation is required with the MCA in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate. Assuming this mitigation the risk is considered ALARP.

15.6.3.5 Reduced access to local ports and harbours

15.6.3.5.1 Qualification of risk

Decommissioning activities associated with the removal of structures and cables may displace existing routes/activity restricting access to ports / harbours.

Since the methods used to remove structures and subsea cables are expected to be similar to those used to install them, this hazard is expected to be similar in nature to the equivalent construction stage hazard, including the number of return trips by decommissioning vessels. It is noted that in the case of sub-sea cables it is expected that they will be left in situ but for the purposes of this assessment (as a worst case) it has been assumed that all cables will be removed during decommissioning, with only cable protection left in situ.

As with the construction stage, it is not yet known from which port(s) decommissioning activity will be based for the offshore Project.

15.6.3.5.2 Relevant embedded mitigation measures

Analogous to construction stage (see section 15.6.1.5).

15.6.3.5.3 Frequency of occurrence

The frequency of occurrence for reduced access to local ports and harbours is considered to be frequent.

15.6.3.5.4 Severity of consequence

The severity of consequence for reduced access to local ports and harbours is considered to be negligible.

15.6.3.5.5 Significance of risk

Frequency of Occurrence	Severity of Consequence	Significance of Risk
Frequent	Negligible	Tolerable
Impact significance - NOT SIGNIFICANT		

Overall, it is predicted that the significance of risk due to reduced access to local ports is of Tolerable significance.

15.6.4 Summary of potential effects

A summary of the outcomes of the assessment of potential effects from the construction, operation and maintenance and decommissioning of the offshore Project is provided in Table 15-14.

Table 15-14 Summary of potential effects

POTENTIAL EFFECT		RECEPTOR	FREQUENCY OF OCCURRENCE	SEVERITY OF CONSEQUENCE	SIGNIFICANCE OF RISK	ADDITIONAL MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Construction and decommissioning							
Vessel displacement and increased third-party vessel to vessel collision risk	Vessel displacement	Commercial, fishing, and recreational vessels	Frequent	Negligible	Tolerable	Additional MCA consultation in advance of formal DSLP process.	Tolerable and ALARP (not significant)
	Third part vessel to vessel collision risk		Extremely Unlikely	Serious	Tolerable		Tolerable and ALARP (not significant)
Third-party to Project vessel collision risk		Commercial, fishing, and recreational vessels	Extremely Unlikely	Serious	Tolerable	Additional MCA consultation in advance of formal DSLP process.	Tolerable and ALARP (not significant)
Adverse weather routeing		Commercial vessels	Remote	Serious	Tolerable	Additional MCA consultation in advance of formal DSLP process.	Tolerable and ALARP (not significant)

POTENTIAL EFFECT		RECEPTOR	FREQUENCY OF OCCURRENCE	SEVERITY OF CONSEQUENCE	SIGNIFICANCE OF RISK	ADDITIONAL MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Vessel to structure allision risk	Powered allision risk	Commercial, fishing, and recreational vessels	Extremely unlikely	Moderate	Broadly Acceptable	Additional MCA consultation in advance of formal DSLP process.	Broadly Acceptable (not significant)
	Drifting allision risk		Extremely unlikely	Moderate	Broadly Acceptable		Broadly Acceptable (not significant)
	Internal allision risk		Remote	Moderate	Tolerable		Tolerable and ALARP (not significant)
Reduced access to local ports and harbours		Commercial, fishing, and recreational vessels	Frequent	Negligible	Tolerable	None required above embedded mitigation measures.	Tolerable and ALARP (not significant)
Operation and maintenance							
Vessel displacement and increased third-party vessel to vessel collision risk	Vessel displacement	Commercial, fishing, and recreational vessels	Frequent	Negligible	Tolerable	Additional MCA consultation in advance of formal DSLP process.	Tolerable and ALARP (not significant)
	Third-party vessel to vessel collision risk		Extremely Unlikely	Serious	Tolerable		Tolerable and ALARP (not significant)

POTENTIAL EFFECT		RECEPTOR	FREQUENCY OF OCCURRENCE	SEVERITY OF CONSEQUENCE	SIGNIFICANCE OF RISK	ADDITIONAL MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Third-party to Project vessel collision risk		Commercial, fishing, and recreational vessels	Extremely Unlikely	Serious	Tolerable	Additional MCA consultation in advance of formal DSLP process.	Tolerable and ALARP (not significant)
Vessel to structure allision risk	Powered allision risk	Commercial, fishing, and recreational vessels	Extremely unlikely	Moderate	Broadly Acceptable	Additional MCA consultation in advance of formal DSLP process.	Broadly Acceptable (not significant)
	Drifting allision risk		Extremely unlikely	Moderate	Broadly Acceptable		Broadly Acceptable (not significant)
	Internal allision risk		Remote	Moderate	Tolerable		Tolerable and ALARP (not significant)
Changes in under-keel clearance		Commercial, fishing, and recreational vessels	Negligible	Moderate	Broadly Acceptable	None required above embedded mitigation measures.	Broadly Acceptable (not significant)
Interaction with subsea cables		Commercial, fishing, and recreational vessels	Negligible	Minor	Broadly Acceptable	None required above embedded mitigation measures.	Broadly Acceptable (not significant)

POTENTIAL EFFECT	RECEPTOR	FREQUENCY OF OCCURRENCE	SEVERITY OF CONSEQUENCE	SIGNIFICANCE OF RISK	ADDITIONAL MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Adverse weather routeing	Commercial, fishing, and recreational vessels	Remote	Serious	Tolerable	Additional MCA consultation in advance of formal DSLP process.	Tolerable and ALARP (not significant)
Reduced access to local ports and harbours	Commercial, fishing, and recreational vessels	Frequent	Negligible	Tolerable	None required above embedded mitigation measures.	Tolerable and ALARP (not significant)
Reduction of emergency response provision	Emergency response vessels	Extremely Unlikely	Moderate	Broadly Acceptable	None required above embedded mitigation measures.	Broadly Acceptable (not significant)

15.7 Assessment of cumulative effects

15.7.1 Introduction

Potential impacts from the offshore Project have the potential to interact with those from other projects (developments), plans and activities, resulting in cumulative impacts on shipping and navigation receptors. The general approach to the cumulative effects assessment is described in chapter 7: EIA methodology and further detail is provided below.

The list of relevant developments for inclusion within the cumulative effects assessment is outlined in Table 15-15. This has been informed by a screening exercise, undertaken to identify relevant developments for consideration within the cumulative effects assessments for each EIA topic, based on defined Zones of Influence (ZoI). The ZoI considered for shipping and navigation was 50 nm.

The developments and plans selected as relevant to the cumulative effects assessment presented within this chapter are based upon the results of a screening exercise undertaken in the NRA (SS13: Navigational risk assessment). Each development or plan has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

In undertaking the cumulative effects assessment for the offshore Project, it is important to bear in mind that other developments and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside the offshore Project. Therefore, a tiered approach has been adopted. This provides a framework for placing relative weight upon the potential for each development / plan to be included in the cumulative effects assessment to ultimately be realised, based upon the development / plan's current stage of maturity and certainty in the developments' parameters. The overarching tiered approach utilised within the offshore Project cumulative effects assessment employs the following tiers, noting as above the NRA applies a bespoke tiering system for shipping and navigation for the purposes of the assessment of vessel routeing (see SS13: Navigational risk assessment for full details):

- Tier 1 assessment – offshore Project;
- Tier 2 assessment – All plans / developments assessed under Tier 1, plus developments which became operational since baseline characterisation, those under construction, those with consent and submitted but not yet determined;
- Tier 3 assessment – All plans / developments assessed under Tier 2, plus those developments with a Scoping Report; and
- Tier 4 assessment – All plans / developments assessed under Tier 3, which are reasonably foreseeable, plus those developments likely to come forward where an Agreement for Lease (AfL) has been granted.

The specific developments scoped into the cumulative effects assessment for shipping and navigation are presented in Figure 15-7 and outlined in Table 15-15, with this scoping based upon data confidence, effect-receptor pathways, surface piercing infrastructure and the spatial / temporal scales involved. As above, the NRA (SS13: Navigational risk assessment) has assumed a separate tiering system which includes consideration of developments that are not scoped, but that may have an impact on vessel routes that also interact with the OAA. This process has fed into the screening of developments detailed in Table 15-15.

The range of potential cumulative impacts that are identified and included in section 15.7 is a subset of those considered for the offshore Project alone. This is because some of the potential impacts identified and assessed for the offshore Project alone, are localised and temporary in nature. It is considered therefore, that these potential impacts have limited or no potential to interact with similar changes associated with other plans or developments. These have therefore not been taken forward for detailed assessment.

Table 15-15 List of developments considered for the shipping and navigation cumulative impact assessment

LOCATION	DEVELOPMENT TYPE	DEVELOPMENT NAME	DISTANCE TO OAA (NM)	DISTANCE TO OFFSHORE ECC (NM)	STATUS	CONFIDENCE[6]	TIER
Northern Scotland	OWF (export cable)	West of Orkney Windfarm – transmission connection to the Flotta Hydrogen Hub	0	0	Pre-application	Medium	1
Northern Scotland	OWF	PFOWF[7]	11	1	Consented	High	3
Northern Scotland	Subsea Cable	SHET-L Caithness to Orkney HVAC Link	11	0	Consented	High	1
Sutherland	Space Hub	Sutherland Space Hub	20	24	Under construction	Medium	3
Northern Scotland	OWF	Northland Mhairi	26	37	Pre-application (Pre-scoping)	Medium	1
Northern Scotland	OWF	Cluaran Ear-Thuath	48	42	Pre-application	Medium	3

[6] *See SS13: Navigational risk assessment for the criteria for confidence ratings.*

[7] *Pentland Floating Offshore Wind Farm (PFOWF) will incorporate the currently consented Pentland Floating Offshore Wind Demonstrator turbine, and hence PFOWF only has been considered. The PFOWF Section 36 Consent and Marine Licence was granted for 10 years. However, the cumulative effects assessment has been based on the Project Design Envelope, as specified within the EIA, and therefore, an operational life of up to 30 years for the PFOWF has been considered. Since consent was granted in June 2023, PFOWF have submitted a Screening Report to MD-LOT with the intention to request a variation to the Section 36 Consent. This variation will incorporate refinements to the Project Design Envelope and to extend the operational life to 25 years.*

LOCATION	DEVELOPMENT TYPE	DEVELOPMENT NAME	DISTANCE TO OAA (NM)	DISTANCE TO OFFSHORE ECC (NM)	STATUS	CONFIDENCE[6]	TIER
					(Pre-scoping)		
Moray Firth	OWF	Caledonia	49	34	Pre-application	High	3
Moray Firth	OWF	Moray West	52	35	Under construction	High	3
Northern Scotland	OWF	Stromar	54	43	Pre-application (Pre-scoping)	Medium	3
Northern Scotland	OWF	Magnora	69	79	Pre-application (Pre-scoping)	Medium	3
Northern Scotland	OWF	Northland Sheena	74	61	Pre-application (Pre-scoping)	Medium	3
Northern Scotland	OWF	Broadshore	85	74	Pre-application (Pre-scoping)	Medium	3
Northern Scotland	OWF	Buchan	69	79	Pre- Pre-application (Pre-scoping)	Medium	3

15.7.2 Cumulative effects

15.7.2.1 Vessel displacement and increased third-party vessel to vessel collision risk

Based on the cumulative assessment of vessel routeing undertaken in the NRA (SS13: Navigational risk assessment), two routes are expected to deviate on a cumulative basis, namely Routes 4 and 7. It is anticipated that these routes will pass south of both Northland Mhairi and the OAA, leading to journey distance percentage increases of between 1 and 2% (noting these assumptions include worst case deviations accounting for local rock and shallow features as detailed in SS13: Navigational risk assessment). There is considered to be searoom available to safely accommodate

these deviations, noting that the PFOWF is located in excess of 10 nm (18.5 km) south of the OAA. Further the routes are used by a low number of vessels (0-1 per day).

Any cumulative displacement associated with simultaneous operations with the SHET-L Caithness to Orkney HVAC Link installation will be temporary and spatially limited to the areas around the works noting there will be available searoom to safely accommodate any such deviations.

Under the Space Industries Regulations 2021 and the Space Industry Act 2018, the Space Hub Sutherland developer will be required to implement exclusion zones during launches. Aviation and marine operators will be notified via Notice to Airmen (NOTAM) and NtM. The developer would not have powers under this legislation to formally prohibit vessels from entry into such exclusion zones, however entry before and during launches would be advised against. On this basis there may be some cumulative displacement associated with the Space Hub Sutherland. However, frequency of any such cumulative displacement is low, with only up to 12 launches a year anticipated. Further, the Space Hub Sutherland operator will be responsible for defining the exclusion zones extent with consideration for navigational impacts, and to notify mariners of the associated details. OWPL will develop internal procedures to ensure that personnel working within the offshore Project remain outside temporary exclusion zones, or take appropriate safety measures, during launch sequences (expected to be once a month).

In terms of collision risk, again given the low volume of traffic and available searoom to accommodate the deviations, there is not anticipated to be a large change in terms of third party to third party collision.

On this basis, accounting for the size of the overall cumulative area assessed, cumulative displacement is assessed as being of serious severity of consequence in terms of navigational safety given the potential for collision but of negligible frequency of occurrence, meaning significance is broadly acceptable.

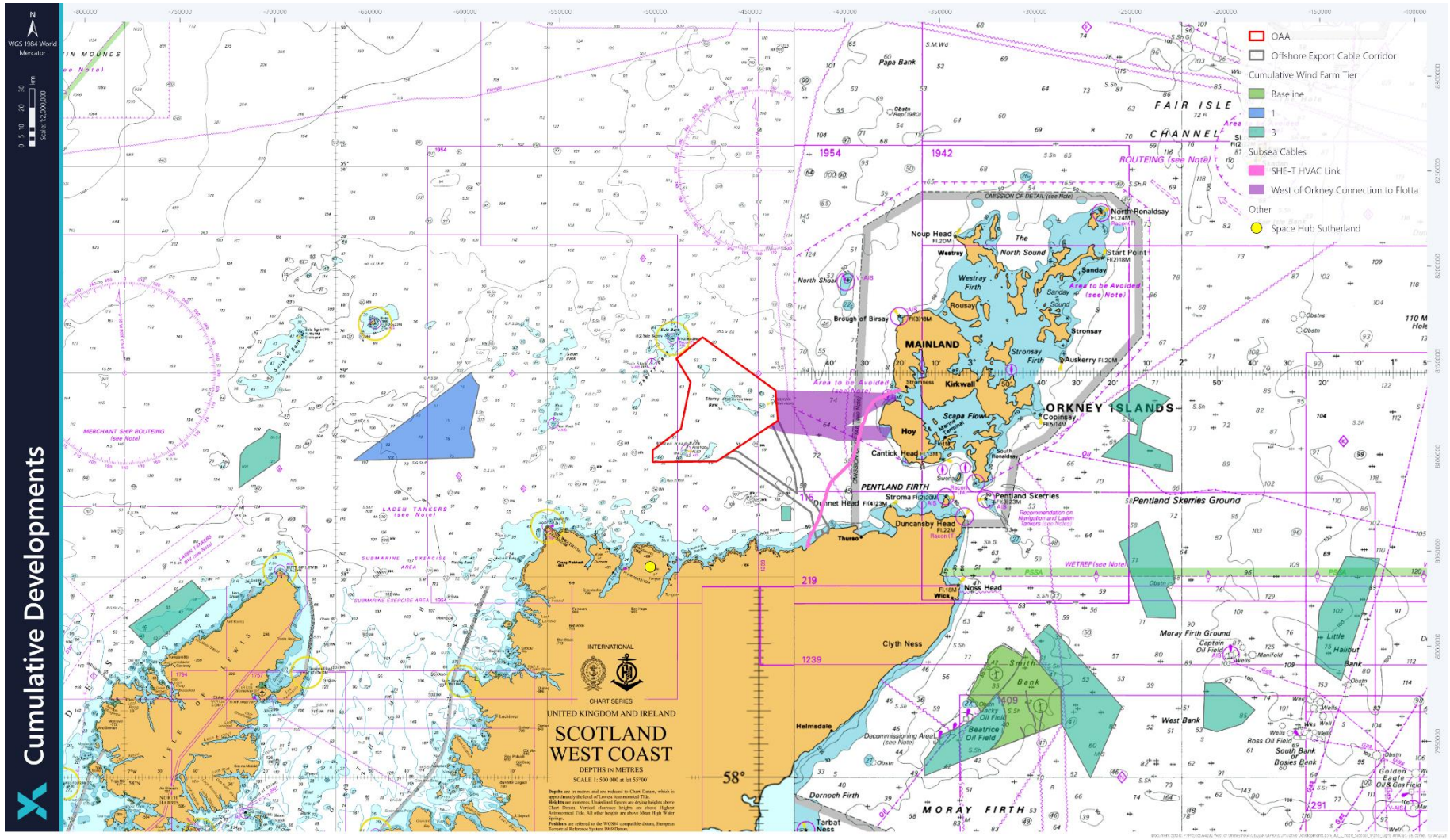

Figure 15-7 Cumulative developments

15.7.2.2 Increased third-party to Project vessel collision risk

There is the potential that the same ports or similarly located ports could be used by cumulative developments in terms of base ports for construction, maintenance vessels, and/or decommissioning vessels. On this basis, there may be an overall cumulative increase in Project vessel presence within the general area, and as such the potential for increased encounters and collision risk with third party traffic. However, all developers (including the SHET-L Caithness to Orkney Link) should be establishing appropriate vessel management systems including through marine coordination, and as such any encounters will be managed, including by COLREGS and SOLAS.

On this basis, when taking account of the size of the cumulative area assessed, the cumulative increase in collision risk (third party to Project vessel) is assessed as being of serious consequence in terms of navigational safety but of negligible occurrence, meaning significance is broadly acceptable.

15.7.2.3 Vessel to structure allision risk

The nearest screened in cumulative development is the PFOWF, located in excess of 10 nm (18.5 km) south of the OAA and 1 nm (1.9 km) southwest of the offshore ECC. All other screened in OWF developments are in excess of 25 nm (46.3 km) from the OAA. Given this available sea space between the OAA and the screened in developments, it is unlikely that vessels will experience increased allision risk beyond the localised risk when passing any given development.

All developments will be required to implement marine lighting and marking in agreement with NLB and in compliance with IALA G1162 (IALA, 2021), meaning the localised risk is managed.

On this basis, taking into account the size of the overall cumulative area assessed, cumulative increase in allision risk is assessed as being of serious consequence in terms of navigational safety but of negligible occurrence, meaning significance is broadly acceptable.

15.7.2.4 Reduction of under-keel clearance

On a cumulative basis, the Flotta Hydrogen Hub transmission connection and the SHET-L Caithness to Orkney Link have both been screened into the cumulative assessment noting close proximity to and crossing (respectively) of the offshore ECC.

Impacts associated with under keel clearance tend to be localised to individual cables, in particular in areas where water depths are low (e.g. landfalls). As per the in isolation assessment (see section 15.6.2.4), the localised risk from the offshore Project will be managed via MGN 654 compliance in terms of limiting any reductions in charted water depth to less than a 5% change unless agreed otherwise with the MCA. The same mitigations will apply for other subsea cable developments (including the SHET-L Caithness to Orkney Link).

On this basis, cumulative reduction in under-keel clearance is assessed as being of moderate consequence in terms of navigational safety but of negligible occurrence, meaning significance is broadly acceptable.

15.7.2.5 Interaction with subsea cables

As for the cumulative assessment of under-keel clearance reduction (see section 15.7.2.4), the risk of anchor interaction is considered localised to individual cables. The cable burial risk assessment undertaken by the offshore Project will ensure cable burial and protection is suitable including account of existing cables, with similar assessments being required to be undertaken by any other subsea cable developments.

Baseline anchoring activity is low in the area, and therefore any interaction is more likely to occur following an unplanned (emergency) anchoring event. Consideration of vessel traffic volumes and sizes will feed into the cable burial risk assessment processes to ensure burial / protection is suitable.

On this basis, cumulative anchor interaction risk is assessed as being of minor consequence in terms of navigational safety and of negligible occurrence, meaning significance is broadly acceptable.

15.7.2.6 Reduction of emergency response capability

Given baseline incident rates and noting the additional resources that would be available for the offshore Project and other cumulative developments, there is not considered likely to be a notable effect on emergency response resources on a cumulative level. This takes account of historical data showing that allisions and collisions caused by OWFs do not occur at a high frequency (further details are provided in SS13: Navigational risk assessment).

Under MGN 654, all OWF developments will be required to agree a layout with the MCA to ensure suitable SAR access is available. As such no cumulative impact on SAR access is anticipated noting SAR operations are likely to be localised to individual areas (i.e., unlikely to span both the offshore Project and other cumulative developments given the nearest screened in development is in excess of 10 nm (18.5 km) from the OAA).

On this basis, cumulative impacts on emergency response capability are assessed as being of moderate consequence and of extremely unlikely frequency of occurrence, meaning the significance is broadly acceptable.

15.7.3 Summary of cumulative effects

A summary of the outcomes of the assessment of cumulative effects is provided in Table 15-16.

Table 15-16 Summary of assessment of cumulative effects

POTENTIAL IMPACT	RECEPTOR	FREQUENCY OF OCCURRENCE	SEVERITY OF CONSEQUENCE	SIGNIFICANCE OF RISK	ADDITIONAL MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Vessel displacement and increased third-party vessel to vessel collision risk	Commercial, fishing, and recreational vessels	Negligible	Serious	Broadly Acceptable (not significant)	None required above embedded mitigation measures and findings of in isolation assessment.	Broadly Acceptable (not significant)
Third-party to Project vessel collision risk	Commercial, fishing, and recreational vessels	Negligible	Serious	Broadly Acceptable (not significant)	None required above embedded mitigation measures and findings of in isolation assessment.	Broadly Acceptable (not significant)
Vessel to structure allision risk	Commercial, fishing, and recreational vessels	Negligible	Serious	Broadly Acceptable (not significant)	None required above embedded mitigation measures and findings of in isolation assessment.	Broadly Acceptable (not significant)
Reduction in under-keel clearance	Commercial, fishing, and recreational vessels	Negligible	Moderate	Broadly Acceptable (not significant)	None required above embedded mitigation measures	Broadly Acceptable (not significant)

POTENTIAL IMPACT	RECEPTOR	FREQUENCY OF OCCURRENCE	SEVERITY OF CONSEQUENCE	SIGNIFICANCE OF RISK	ADDITIONAL MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
					and findings of in isolation assessment.	
Interaction with subsea cables	Commercial, fishing, and recreational vessels	Negligible	Minor	Broadly Acceptable (not significant)	None required above embedded mitigation measures and findings of in isolation assessment.	Broadly Acceptable (not significant)
Reduction of emergency response provision	Emergency response vessels	Extremely Unlikely	Moderate	Broadly Acceptable (not significant)	None required above embedded mitigation measures and findings of in isolation assessment.	Broadly Acceptable (not significant)

15.8 Inter-related effects

Inter-related effects are the potential effects of multiple impacts, affecting one receptor or a group of receptors. Inter-related effects include interactions between the impacts of the different stages of the offshore Project (i.e. interaction of impacts across construction, operation and maintenance and decommissioning), as well as the interaction between impacts on a receptor within an offshore Project stage. The potential inter-related effects for shipping and navigation receptors are described below.

15.8.1 Inter-related effects between offshore Project stages

No inter-related effects (Project lifetime effects) are predicted to arise between the construction, operation and maintenance stage, and decommissioning of the offshore Project for shipping and navigation given the risks during each are managed by the stage specific mitigations applied. For example, temporary lighting and the buoyed construction area during the construction stage are only removed once the operational marine lighting and marking implemented during the operational stage has been commissioned and approved by NLB.

15.8.2 Inter-related effects within an offshore Project stage

For shipping and navigation, it is not anticipated that any inter-related effects will be produced that are of greater significance than the assessments presented for each individual stage noting that all impacts are at most tolerable and ALARP under the FSA (IMO, 2018).

15.9 Whole Project assessment

The onshore Project is summarised in chapter 5: Project description and a summary of the effects of the onshore Project is provided in chapter 21: Onshore EIA summary. These onshore aspects of the Project have been considered in relation to the impacts assessed in section 15.6. There are considered to be no impacts arising from the onshore part of the Project to shipping and navigation receptors.

A number of options are currently being considered for the construction and assembly port(s). Once this / these locations are confirmed, logistics associated with the use of these port facilities and vessel movements will be considered. Project vessel movements will be managed from the marine coordination centre using the procedures presented within the NSVMP (see OP4: Outline Navigational Safety and Vessel Management Plan).

15.10 Transboundary effects

Transboundary effects arise when impacts from a development within one European Economic Area (EEA) state's territory affects the environment of another EEA state(s).

Given the international nature of routeing by commercial vessels – particularly in the region containing the offshore Project given the position between the North Sea and the Atlantic – a transboundary effect relating to the displacement of commercial vessels undertaking international voyages has been identified.

Since the use of AIS transceivers (the primary data source for characterisation of commercial vessel movements) is international, the characterisation of the existing environment is suitable for identifying relevant other EEAs. Other EEAs with port(s) which feature in the main commercial routes include the Netherlands, Scandinavian ports, Baltic ports, Iceland, and the Faroe Islands.

Since such international commercial routeing is captured in the existing environment, the environmental assessment for the offshore Project in isolation suitably considers this effect in transboundary terms.

15.11 Summary of mitigation and monitoring

As detailed in section 15.6, in addition to the embedded mitigation measures proposed in section 15.5.3, it considered that once site constraints are further understood, additional post consent consultation is required with the MCA, UKCoS and NLB in advance of the DSLP process to ensure the overarching spatial area covered by the layout is appropriate and all impacts are reduced to acceptable levels.

15.11.1 Objective of the DSLP

The overall objective of the DSLP process (as required by the Section 36 Consent) will be to set out the layout parameters associated with the final design of the offshore Project. The DSLP will confirm that the design and layout parameters of the offshore Project align with those consented.

Post-consent additional pre-construction surveys and site investigations will be completed (as per chapter 5: Project description). This will allow the development of the ground model and further engineering studies to progress. The results of the pre-construction surveys will be shared with Marine Directorate and relevant shipping and navigation stakeholders, and the implications on the Project design discussed, including the consideration of visual receptors. Following consultation, the final design of the offshore Project will be produced and secured within the DSLP. The process for the development of the DSLP is outlined in Figure 15-8. The DSLP will present information on:

- Layout and specification of WTGs– spacing, dimensions, identification/numbering, finishes, MW foundation type, bathymetry and seabed conditions, key constraints, generation output, a list of co-ordinates for each WTG;
- Inter-array cables length and arrangement;
- OSP layout and specification – finishes, foundation type, bathymetry and seabed conditions, key constraints;
- Interconnector cables length and arrangement; and
- Export cables length and proposed arrangement.

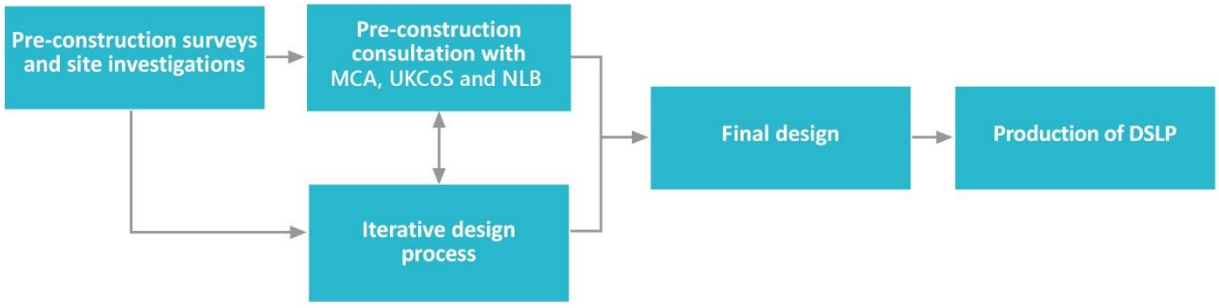

Figure 15-8 Outline development process for the DSLP

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15.13 Abbreviations

ACRONYM	DEFINITION
AfL	Agreement for Lease
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ANMP	Aids to Navigation Management Plan
ATBA	Area to be Avoided
AtoN	Aids to Navigation
CaP	Cable Plan
CBRA	Cable Burial Risk Assessment
CD	Chart Datum
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
DECC	Department of Energy and Climate Change
DEN	Denmark
DfT	Department for Transport
DSC	Digital Selective Calling
DSLP	Development Specification and Layout Plan
ECC	Export Cable Corridor
EEA	European Economic Area
EIA	Environmental Impact Assessment

ACRONYM	DEFINITION
EMEC	European Marine Energy Centre
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
ERCoP	Emergency Response Cooperation Plan
FIR	Fishing Industry Representative
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
FMMS	Fisheries Management and Mitigation Strategy
FSA	Formal Safety Assessment
GER	Germany
GT	Gross Tonnes
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Directional Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICE	Iceland
IHO	International Hydrographic Organisation
IMO	International Maritime Organization
INNS	Invasive Non-Native Species

ACRONYM	DEFINITION
km	Kilometre
LMP	Lighting and Marking Plan
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate - Licensing Operations Team
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MoD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
MS-LOT	Marine Scotland - Licensing Operations Team
NLB	Northern Lighthouse Board
NLD	Netherlands
nm	Nautical mile
NOR	Norway
NOTAM	Notice to Airmen
NRA	Navigational Risk Assessment
NSVMP	Navigational Safety and Vessel Management Plan
NtM	Notice to Mariners

ACRONYM	DEFINITION
NUC	Not Under Command
OAA	Option Agreement Area
OIC	Orkney Islands Council
OP	Outline Plan
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
PDE	Project Design Envelope
PFOWF	Pentland Floating Offshore Wind Farm
PLL	Potential Loss of Life
PO	Plan Option
RAM	Restricted in Ability to Manoeuvre
RNLI	Royal National Lifeboat Institution
RoRo	Roll-on/Roll-off Cargo
RYA	Royal Yachting Association
SAR	Search and Rescue
SHET-L	Scottish Hydro Electric Transmission Ltd
SOLAS	International Convention for the Safety of Life at Sea
SS	Supporting Study

ACRONYM	DEFINITION
THC	The Highland Council
UK	United Kingdom
UKCoS	United Kingdom Chamber of Shipping
UKHO	United Kingdom Hydrographic Office
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
USB	Universal Serial Bus
UXO	Unexploded Ordnance
VHF	Very High Frequency
VMS	Vessel Monitoring System
WTG	Wind Turbine Generator
ZoI	Zone of Influence

15.14 Glossary

TERM	DEFINITION
Allision	The act of striking or collision of a moving vessel against a stationary object.
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status, e.g. under power. Most commercial vessels and United Kingdom / European Union fishing vessels over 15 m length are required to carry AIS.
Baseline	The existing conditions as represented by the latest available survey and other data which is used as a benchmark for making comparisons to assess the impact.
Collision	The act or process of colliding (crashing) between two moving objects.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a development over and above the existing circumstances (or 'baseline').
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity.
Future case	The assessment of risk based on the predicted growth in future shipping densities and traffic types as well as foreseeable changes in the marine environment.
Main commercial route	Defined transit route (mean position) of commercial vessels.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Navigational Risk Assessment (NRA)	A document which assesses the hazards to shipping and navigation of a proposed Offshore Renewable Energy Installation based upon Formal Safety Assessment.
Radio Detection and Ranging (Radar)	An object-detection system which uses radio waves to determine the range, altitude, direction or speed of objects.

TERM	DEFINITION
Unique vessel	An individual vessel identified on any particular calendar day, irrespective of how many tracks were recorded for that vessel on that day. This prevents vessels being over counted. Individual vessels are identified using their Maritime Mobile Service Identity.