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Volume 2 Proposed Development (Offshore) Appendices

Chapter 9 Shipping and Navigation

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Volume 2 Chapter 9 Shipping and Navigation

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Acronyms and Abbreviations

AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
CAA	Civil Aviation Authority
CaP	Cable Plan
CBRA	Cable Burial Risk Assessment
CIA	Cumulative Impact Assessment
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
DE	Design Envelope
DGC	Defence Geographic Centre
DSLP	Development Specification and Layout Plan
EEA	European Economic Area
EIA	Environmental Impact Assessment
ERCoP	Emergency Response Co-operation Plan
FLO	Fisheries Liaison Officer
FMMS	Fisheries Management and Mitigation Strategy
FSA	Formal Safety Assessment
GPS	Global Positioning System
HSE	Health and Safety Executive
HVDC	High-Voltage Direct Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IHO	International Hydrographic Organisation
IMO	International Maritime Organization

LMP	Lighting and Marking Plan
MD-LOT	Marine Directorate - Licensing Operations Team
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MoD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
NLB	Northern Lighthouse Board
nm	Nautical Mile
NRA	Navigational Risk Assessment
NSP	Navigational Safety Plan
NUC	Not Under Command
O&M	Operation and Maintenance
OECC	Offshore Export Cable Corridor
OREI	Offshore Renewable Energy Installation
OWF	Offshore Wind Farm
PEMP	Project Environmental Monitoring Programme
PLL	Potential Loss of Life
RAM	Restricted in Ability to Manoeuvre
RNLI	Royal National Lifeboat Institution
RoPax	Roll-on/Roll-off Passenger
RoRo	Roll-on/Roll-off Cargo
RYA	Royal Yachting Association

SAR	Search and Rescue
SEZ	Structure Exclusion Zone
SOLAS	Safety of Life at Sea
TPV	Third-party verification
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
UXO	Unexploded Ordnance
VHF	Very High Frequency
VMP	Vessel Management Plan
WETREP	Western European Tanker Reporting System
WTG	Wind Turbine Generator

Executive Summary

This chapter of the Caledonia Offshore Wind Farm Environmental Impact Assessment Report assesses impacts of the Proposed Development (Offshore) on shipping and navigation receptors, and summarises project parameters pertinent to this assessment. Additionally, this chapter sets out the key guidance documentation and output of stakeholder consultation which have informed the assessment, as well as highlighting the baseline environment surrounding the Proposed Development (Offshore) considered relevant to shipping and navigation users.

Various datasets were analysed in order to evaluate the shipping and navigation baseline associated with the Proposed Development (Offshore). These included key navigational features as shown on Admiralty Charts and in the Sailing Directions (United Kingdom Hydrographic Office, 2024), seasonally-weighted vessel traffic data in alignment with Marine Guidance Note 654 (Maritime and Coastguard Agency, 2021), as well as marine incident data provided by the Marine Accident Investigation Branch and the Royal National Lifeboat Institution. A future baseline associated with the Proposed Development (Offshore) was also evaluated, including the consideration of external vessel re-routeing, as well as cumulative effects in conjunction with other planned offshore wind projects.

Following this, an impact assessment for shipping and navigation receptors was undertaken as per the Formal Safety Assessment methodology (International Maritime Organization, 2018). This assessment considered the baseline and future environments as well as relevant consultation output, project parameters, and embedded mitigation within the Design Envelope associated with the Proposed Development (Offshore).

Multiple potential impacts on shipping and navigation receptors due to the Proposed Development (Offshore) were identified. No impact was assessed as an unacceptable significance of risk, with the highest significance of risk assessed being tolerable with mitigation. The majority of impacts were concluded to be As Low As Reasonably Practicable (ALARP) and not significant in Environmental Impact Assessment (EIA) terms when embedded mitigation measures are considered. Several impacts were concluded to be ALARP and not significant in EIA terms when additional secondary mitigation measures are considered.

Secondary mitigation measures proposed include liaison with Whitehills, Banff, and Macduff harbour authorities to mitigate the impact of reduced access to local ports during the construction and decommissioning phases of the Proposed Development (Offshore), and the implementation of a Structure Exclusion Zone to manage impacts to adverse weather routeing.

9 Shipping and Navigation

9.1 Introduction

9.1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) identifies the potential effects on Shipping and Navigation associated with the construction, operation and maintenance (O&M) and decommissioning of the Proposed Development (Offshore). This includes the Caledonia Offshore Wind Farm (OWF) (Array Area) and Caledonia Offshore Export Cable Corridor (OECC) seaward of Mean High Water Spring (MHWS).

9.1.1.2 This chapter is supported by the following Technical Appendix:

- Volume 7B, Appendix 9-1: Navigational Risk Assessment (NRA).

9.1.1.3 The following supporting chapters relate to and should be read in conjunction with this chapter:

- Volume 1, Chapter 3: Proposed Development Description (Offshore);
- Volume 2, Chapter 8: Commercial Fisheries;
- Volume 2, Chapter 13: Other Human Activities; and
- Volume 6, Chapter 2: Socioeconomics, Tourism and Recreation.

9.2 Legislation, Policy and Guidance

9.2.1.1 Volume 1, Chapter 2: Legislation and Policy, of this EIAR sets out the policy and legislation associated with the Proposed Development (Offshore).

9.2.1.2 Legislation, Policy and Guidance that relate to the Shipping and Navigation assessment are identified and described in Table 9–1.

Table 9–1: Legislation Policy and Guidance.

Relevant Legislation, Policy and Guidance	Description
Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) (International Maritime Organization (IMO), 1972/77[1])	Governs the conduct of vessels to minimize the risk of collisions.
International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974[2])	Specifies minimum requirements for the construction, equipment and operation of vessels, compatible with their safety.
United Nations Convention on the Law of the Sea (UNCLOS) (United Nations (UN), 1982[3])	Sets out legal framework for the seas and oceans, and regulates the use of marine resources.

Relevant Legislation, Policy and Guidance	Description
United Kingdom (UK) Marine Policy Statement (HM Government, 2011[4])	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.
Scotland's National Marine Plan (Scottish Government, 2015[5])	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 EIAR: ▪ 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: o 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. o Where interference is likely, whether reasonable alternatives can be identified. o 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[6])	Aims to identify sustainable plan options for the future development of commercial-scale offshore wind energy in Scotland, including deep water wind technologies, and covers both Scottish inshore and offshore waters.
Marine Guidance Note (MGN) 654 (Merchant and Fishing)	Highlights issues that shall be considered when assessing the potential effect on navigational safety from offshore

Relevant Legislation, Policy and Guidance	Description
Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response and its annexes (Maritime and Coastguard Agency (MCA), 2021[7])	renewable energy developments proposed in UK internal waters, territorial sea or Renewable Energy Zones.
Revised Guidelines for Formal Safety Assessment (FSA) for Use in the Rule-Making Process (IMO, 2018[8]).	A rational and systematic process for assessing the risks associated with shipping activity and for evaluating the costs and benefits of IMO's options for reducing these risks.
MGN 372 Amendment 1 (Merchant and Fishing) Offshore Renewable Energy Installations (OREI): Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2022[9])	Highlights the issues to be considered when planning and undertaking voyages in the vicinity of OREIs in UK waters.
International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation O-139 on The Marking of Man-Made Offshore Structures (IALA, 2021[10])	Gives recommendations on the marking requirement for manmade structures in the marine environment. This includes subsea, surface piercing, floating, and fixed structures as well as those placed above navigable channels so as to ensure the safety of marine traffic.
IALA Guidance G1162 The Marking of Offshore Man-Made Structures Edition 1.1 (IALA, 2022[11])	Guidance defining the marking of structures considered a minimum requirements to ensure the safety of navigation in the vicinity of the structures.
The Royal Yachting Association's (RYA) Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019[12])	Sets out recreational boating concerns in relation to offshore renewable wind energy.
Regulatory expectations on moorings for floating wind and marine devices. (Health and Safety Executive (HSE) and MCA, 2017[13])	Provides expectations for ensuring the health and safety of persons and affected parties in the presence of a floating device

9.3 Stakeholder Engagement

9.3.1 Overview

9.3.1.1 The Offshore Scoping Report (Volume 7, Appendix 2) was submitted to Marine Directorate - Licensing Operations Team (MD-LOT)[i] in September 2022, who then circulated the report to relevant consultees. A Scoping Opinion (Volume 7, Appendix 3) was received from MD-LOT on 13 January 2023. Relevant comments from the Scoping Opinion specific to Shipping and Navigation are provided in Table 9–2.

9.3.1.2 Further consultation has been undertaken throughout the pre-application stage. Table 9–3 summarises the consultation activities carried out relevant to Shipping and Navigation.

[i] In 2023, Marine Scotland was renamed Marine Directorate, and thus the marine licensing and consents team is now referred to as Marine Directorate - Licensing Operations Team (MD-LOT).

Table 9–2: Scoping Opinion Response.

Consultee	Comment	Response
MD-LOT	The Scottish Ministers are content with the study area identified in section 13.2 of the Scoping Report. With regards to baseline data listed in table 13.1 of the Scoping Report, the Scottish Ministers direct the Developer to the representation to the United Kingdom Chamber of Shipping (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 incidents.	The NRA in Volume 7B, Appendix 9-1: Navigational Risk Assessment has assessed 20 years of MAIB data (see Section 9.4)
MD-LOT	In line with the representation from the MCA, the Scottish Ministers are content that the two separate 14-day periods of Automatic Identification System (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 on cruise and passenger traffic during 2020.	The NRA has assessed 12 months of AIS data from November 2022 to October 2023 (see Volume 7B, Appendix 9-1: Navigational Risk Assessment). The vessel traffic datasets and study areas used have been shared with the MCA and UKCoS at the Hazard Workshop.
MD-LOT	Table 13.2 of the Scoping Report summarises the potential impacts to shipping and navigation for each phase of the Proposed Development which the Developer proposes to scope into and out of the EIA Report. The Scottish Ministers broadly agreed with the impacts scoped in and out however, advise that cumulative and transboundary effects must also be scoped into the EIA Report. This is in line with the UKCoS, MCA and RYA representations.	See Sections 9.8 and 9.10 for cumulative and transboundary impacts respectively.
MD-LOT	With regards to cabling routes and cable burial, the Scottish Ministers advise that a Burial Protection Index should be completed	As per Section 9.5.6, there will be MGN 654 (MCA, 2021) compliance including in relation

Consultee	Comment	Response
	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 Chart Datum if cable protection measures are required and in particular where depths are decreasing towards shore.	to anchor studies and water depth reductions. A Cable Burial Risk Assessment (CBRA) will be undertaken post consent.
MD-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 Current (HVDC) transmission infrastructure be installed. For completeness, the Scottish Minsters highlight the advice from the MCA regarding the maximum deviation from the cable route.	HVDC is not being considered within the Design Envelope (DE).
MD-LOT	The Scottish Ministers also highlight the MCA representation regarding Search and Rescue (SAR), Emergency Response Co-operation Plan (ERCoP), levels of radar surveillance, AIS and shore-based Very High Frequency (VHF) radio coverage. The Scottish Ministers advise that the MCA representation must be fully addressed in the EIA Report and that a SAR checklist must be completed by the Developer in consultation with the MCA. In relation to the proposed embedded mitigation measures, the Scottish Ministers highlight the representations from the MCA, UKCoS and Northern Lighthouse Board (NLB) which must be fully addressed by the Developer.	As per Section 9.5.6, there will be full compliance with MGN 654 (MCA, 2021[7]) including the completion of a SAR Checklist.
MD-LOT	For completeness, the Developer should note, if floating foundations are selected the MCA confirmed that compliance with regulatory expectations for floating infrastructure is required and Third-Party Verification (TPV) of the mooring arrangements will be required. The MCA highlighted that the IALA recommendations O-139 Marking of Man-Made Offshore Structures has been replaced by G1162 ED1.0.	As per Section 9.2, the most up-to-date guidance has been considered, including in relation to floating infrastructure.

Consultee	Comment	Response
MD-LOT	The Scottish Ministers also agree with The Highland Council that, should the Developer plan to use any ports within the Highland Council area for construction or supply chain components, this must be assessed within the EIA Report.	Impacts to local businesses and supply chain such as ports and harbours are assessed in Volume 6; Chapter 2, Socioeconomics, tourism and recreation.
MD-LOT	The Developer identifies the Proposed Development (Offshore) will be located within Danger Area D809 South in Section 15.2.3.1 of the Scoping Report. In line with the Ministry of Defence (MoD) representation, The Developer must ensure that no infrastructure related to the Proposed Development (Offshore) is installed within the boundary identified in the MoD representation. Military training activities are conducted in this Danger Area and the EIA Report should consider the effects of vessels, barges, platforms and associated traffic present during the construction of the Proposed Development (Offshore) to ensure it does not interfere with these activities.	Impact on Danger Area (D809 South) is considered within Volume 2: Chapter 11:, Military and Civil Aviation.
MCA	The EIA 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 risk to drifting recreational craft in adverse weather or tidal conditions ▪ The likely squeeze of small craft into the routes of larger commercial vessels.	The listed hazards have been assessed in the NRA in Volume 7B, Appendix 9-1: Navigational Risk Assessment and in Section 9.7.
MCA	The development area carries a significant amount of through traffic to major ports, with a number of important shipping routes in close	As per Section 9.7, displacement, deviation, adverse weather routeing, and collision risk

Consultee	Comment	Response
	proximity, and attention needs to be paid to routeing, 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 wind farm boundaries and shipping routes as per MGN 654.	have been assessed as well as within the NRA in Volume 7B, Appendix 9-1: 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 9.2). A completed MGN 654 checklist is provided within the NRA in Volume 7B, Appendix 9-1: Navigational Risk Assessment.
MCA	Noted in paragraph 13.8.1.1 of the Scoping Report 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 14-day surveys) collected from a vessel-based survey using AIS, Radar, and visual observations to capture all vessels navigating in the study area, and we note this survey will be conducted within 2-years of application submission.	Vessel traffic methodology is agreed and in line with MGN requirements as detailed within the NRA in Volume 7B, Appendix 9-1: Navigational Risk Assessment.
MCA	The turbine layout design will require MCA approval prior to construction to minimise the risks to surface vessels, including rescue boats, and 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.	As per Section 9.5.6, there will be full compliance with MGN 654 (MCA, 2021[7]) including the approval of a layout with the MCA.
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	As per Section 9.5.6 there will be full MGN 654 (MCA, 2021[7]) compliance including in relation to anchor studies and water depth reductions. A CBRA will be undertaken post consent.

Consultee	Comment	Response
	Datum. 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 location.	
MCA	Under Section 13.4.1.2 - M-31 regulatory mooring expectations is identified as a potential mitigation for floating infrastructure, and I can confirm this guidance should be followed and that a Third-Party Verification of mooring arrangements will be required. Also identified in 13.4.1.2 M-30 is the IALA recommendations O-139 Marking of Man-Made Offshore Structures, however this was replaced by G1162 ED1.0 The Marking of Man-Made Offshore Structures.	As per Section 9.2, the NRA considers the most up-to-date guidance including in relation to floating infrastructure.
MCA	Particular consideration will need to be given to the implications of the site size and location on SAR resources and ERCoP. Attention should be paid to the level of Radar surveillance, AIS and shore-based 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) that can cover the entire wind farm sites and their surrounding areas. A SAR Checklist will also need to be completed in consultation with MCA.	As per Section 9.5.6, there will be full MGN 654 (MCA, 2021[7]) 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 NRA if it was deemed not fit for purpose.	As per Section 9.5.6 there will be full MGN 654 (MCA, 2021[7]) compliance including in relation to hydrographic surveys.
MCA	It is noted that High Voltage Alternative Current transmission infrastructure maybe installed. If HVDC is being considered, consideration must be given to electromagnetic deviation on ships' compasses. The MCA would be willing to accept a three-degree	As per Volume 1 Chapter 3: Proposed Development Description (Offshore) HVDC is

Consultee	Comment	Response
	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 the cable being laid; this will confirm conformity with the consent condition. The developer should then provide this data to UK Hydrographic Office (UKHO) via a hydrographic note (H102), as they may want a precautionary notation on the appropriate Admiralty Charts.	no longer under consideration for the current application.
MCA	Do you agree with the data sources, including project specific surveys, to be used to characterise the Shipping and Navigation baseline within the NRA and the Offshore EIA? Yes	Data sources are as per the Offshore Scoping Report (Volume 7, Appendix 2; see Section 9.4.2).
MCA	Do you agree that all potential impacts (hazards and associated risks) have been identified for Shipping and Navigation? The full list of risk controls will be identified during the NRA process of consultation with navigation stakeholders and hazard analysis.	Risk assessment including consideration of risk control options is provided in Section 9.7.
MCA	Do you agree with the project impacts (hazards and associated risks) which have been scoped out of the EIA for Shipping and Navigation? As per above.	Risk assessment including consideration of risk control options is provided in Section 9.7.
MCA	Do you agree that cumulative impacts and transboundary impacts (hazards and associated risks) for Shipping and Navigation may be scoped out of the Offshore EIA? We believe the cumulative and transboundary impacts (specific to shipping and navigation) should be a part of the EIA process and should be addressed in the NRA and offshore EIA.	See Sections 9.8 and 9.10 for cumulative and transboundary impacts respectively.

Consultee	Comment	Response
MCA	Do you agree with the proposed approach to assessment? Yes.	Methodology is as per the Offshore Scoping Report (Volume 7, Appendix 2; see Section 9.5).
MCA	Do you agree on the suitability of proposed embedded mitigation of relevance to Shipping and Navigation that have been identified for the Proposed Development? The full list of risk controls and associated mitigation measures will be identified during the NRA process of consultation with navigation stakeholders and hazard analysis.	Risk assessment including consideration of risk control options is provided in Section 9.7.
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 provided within the NRA in Volume 7, Appendix 9-1: Navigational Risk Assessment.
MoD	The principal development zone for the offshore windfarm outlined in the submission will be located within MoD Danger Area D809 South. The extent of MoD Practise and Exercise Areas in the locality have been accurately identified in the Scoping Report (ref. Section 15.2.3.1) and the need to take account of defence activities has also been recognised. However, it will be necessary for defence maritime navigational interests to be specifically taken into account in the preparation of any application for this development proposal. The eastern extent of the development zone, in which offshore turbine structures are to be located, extends over an area containing a highly surveyed route that is retained to maintain national defence requirements. To prevent this route from being obstructed it will be necessary to ensure that any wind turbines or other offshore structures (including associated offshore safety zones) deployed within the project boundary defined are not located eastward of a line connecting the points 580 22.171N 0020 38.83W and 580 07.171N 0020 19.00W.	Impact on Danger Area (D809 South) and other military activities is considered within Volume 2, Chapter 11: Military and Civil Aviation.

Consultee	Comment	Response
NLB	NLB have no objection to the content of the Scoping Report, and are satisfied with the elements to be included within the Shipping and Navigation section of the EIA.	Methodology is as per that set out in the Offshore Scoping Report (Volume 7, Appendix 2; Section 9.5).
NLB	It should be noted that within Section 13.4.1.2 – M-30, the latest IALA guidelines for the lighting and marking of offshore structures is no longer contained within IALA document O-139. This guidance is now found within IALA document G-1162.	As per Section 9.2 the most up-to-date guidance has been used to inform the NRA and this chapter in Volume 7, Appendix 9-1: Navigational Risk Assessment.
RYA	Do you agree with the data sources, including project specific surveys, to be used to characterise the Shipping and Navigation baseline within the NRA and the Offshore EIA? The coverage of the UK Coastal Atlas of Recreational Boating is incomplete in the area of the proposed wind farm and it is quite possible that the two 14-day survey periods may not capture any recreational vessels as I expect most recreational traffic to take place near the beginning and end of the sailing season. I estimate that about a quarter of recreational vessels in these waters transmit an AIS signal. Nevertheless I do not feel that additional data need to be collected beyond that planned. I expect that some vessels pass through the wind farm site en route from Rattray Head to Wick or the Northern Isles and vice versa. It is not yet clear what the impact of the Beatrice and Moray East wind farms has been on the routeing of recreational craft on passage.	Data sources are as per the Offshore Scoping Report (Volume 7, Appendix 2; see Section 9.4.2). RYA Scotland have also been consulted directly.
RYA	Do you agree that all potential impacts (hazards and associated risks) have been identified for Shipping and Navigation? Yes.	Risk assessment including consideration of risk control options is provided in Section 9.7.
RYA	Do you agree with the project impacts (hazards and associated risks) which have been scoped out of the EIA for Shipping and Navigation? None appear to have been scoped out.	Risk assessment including consideration of risk control options is provided in Section 9.7.

Consultee	Comment	Response
RYA	Do you agree that cumulative impacts and transboundary impacts (hazards and associated risks) for Shipping and Navigation may be scoped out of the Offshore EIA? The cumulative impacts with other OWFs, particularly Beatrice and Moray East must be scoped in. Transboundary impacts for recreational boating can be scoped out. Recreational vessels from continental Europe may pass through the wind farm site but there are unlikely to be any additional impacts.	See Sections 9.8 and 9.10 for cumulative and transboundary impacts respectively.
RYA	Do you agree with the proposed approach to assessment? Yes.	Methodology is as per that set out in the Offshore Scoping Report (Volume 7, Appendix 2; Section 9.5).
RYA	Do you agree on the suitability of proposed embedded mitigation of relevance to Shipping and Navigation that have been identified for the Proposed Development? Yes.	Risk assessment including consideration of risk control options is provided in Section 9.7.
UKCoS	Under section 3.1.3 the approach to consider development under a wide design envelope is understood and understandable given the early stage of planning. It is however difficult for stakeholders, particularly in shipping and navigation to provide substantive feedback and input when the design envelope is so wide and so the Chamber recommends that it be narrowed and areas confirmed as early as possible so substantive feedback can be offered.	Relevant design details are provided in Volume 1, Chapter 3: Proposed Development Description (Offshore) as well as within the NRA in Volume 7B, Appendix 9-1: Navigational Risk Assessment.
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.	As per Section 9.4, a total of 20 years of MAIB spatial accident data has been assessed.

Consultee	Comment	Response
UKCoS	Given the large area of the proposed development the Chamber would strongly recommend at 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 has assessed 12 months of AIS data from 2022 to 2023 in Volume 7B, Appendix 9-1: Navigational Risk Assessment.
UKCoS	Whilst only at the Scoping stage, the Chamber has some elevated concerns about the potential unique risk profile from a development with a mixture of fixed and floating turbines, in particular the importance of clear charting and marking and looks forward to engagement in these areas via the NRA process. The Chamber also notes with greater concern the southern extent and in particular isolated structures that may be proposed as the planning process proceeds.	Risk assessment including consideration of risk control options is provided in Section 9.7. This includes consideration of the use of floating infrastructure and the southern extent of the Caledonia OWF.
UKCoS	The Chamber does not agree that cumulative impacts and transboundary impacts (hazards and associated risks) for Shipping and Navigation may be scoped out of the Offshore EIA and from what it has read of the Scoping Report, does not understand the rationale for its potential scoping out. Clarification accordingly would be welcomed.	As per Section 9.8 and 9.10, cumulative and transboundary impacts have been assessed, as well as within the NRA in Volume 7B, Appendix 9-1: 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.	The UKCoS were invited to and attended the Hazard Workshop.

Table 9–3: Stakeholder Engagement Activities.

Date	Consultee and Type of Consultation	Summary
02/11/2023	MCA and NLB (consultation meeting)	The MCA and NLB confirmed content with the approach being taken for the NRA.
19/02/2024	Smyril Line (consultation email)	No concerns over the Proposed Development (Offshore).
07/03/2024	Serco NorthLink Ferries (consultation meeting)	Noted concern over additional journey length of roughly 40nm if adverse weather required vessels to route inshore of the Moray Firth OWFs, and reiterated that adverse weather transits are key concern. Noted that vessels carrying livestock would be required to pass further inshore during adverse conditions to limit risk of harm to the animals. Highlighted the concern of a vessel breaking down in the vicinity of the Caledonia OWF.
13/03/2024	Tidal Transit (Regular Operator email correspondence)	No concern regarding the Proposed Development (Offshore).
14/03/2024	Thun Tankers (Regular operator email correspondence)	No concerns regarding the Proposed Development (Offshore) as long as construction activities are appropriately and accurately announced, as well as updating the relevant nautical charts in a timely manner. Indicated that it would be unlikely for a vessel to transit through the Caledonia OWF.
22/04/2024	Serco NorthLink Ferries (consultation meeting)	Expressed that deviated inshore routes occur roughly once or twice a year and depends on weather conditions as well as passage planning for daylight. Not a big concern if it occurs infrequently for passenger vessels. Concerned over the large route increases especially for freight vessels which could mean large delays, particularly in winter. There may be a knock-on effect if sailings have to be delayed. The biggest concern is potential for cancelled sailings with a number of adverse weather sailings failing to go ahead.

Date	Consultee and Type of Consultation	Summary
13/05/2024	RYA Scotland (post-Hazard Workshop consultation meeting)	Noted the importance of publicising location of the Proposed Development (Offshore) well in advance and to provide suggestions of alternative routeing options for vessels heading north-south through the Moray Firth. Indicated that vessels may not choose to pass offshore of the Caledonia OWF as it would be an uncomfortable journey, thus transits may be made through the Caledonia OWF. Though this would depend on a variety of conditions alongside the individuals choice. Also noted that vessels which currently transit offshore of Moray East would not require a large deviation due to the Proposed Development (Offshore) and will likely transit further offshore.
07/05/2024	NLB (Hazard Workshop)	Queried the potential for Caledonia South to be built first with a gap before Caledonia North. UKHO will need to consider how large-scale floating developments are charted. Important to consider lighting and marking in the scenario where a floating WTG with a marine aid to navigation (AtoN) is towed from site.
07/05/2024	Scottish White Fish Producers (Hazard Workshop)	Noted the importance of a Vessel Management Plan (VMP). Fishing vessels would perhaps deviate around the floating structures but may undertake fishing amongst the fixed structures.
07/05/2024	UKCoS (Hazard Workshop)	Noted the potential for loss of station during construction/decommissioning, and would be interesting to know how wet storage is taken into account. Highlighted the importance of lifeline routes to coastal communities and Scotland's Marine Plan.
07/05/2024	Serco NorthLink Ferries (Hazard Workshop)	Noted that adverse weather routeing is not frequent but sometimes required to facilitate the journey. Stated that there is an ongoing dialogue with the project. Noted a possible alternative of routeing inshore of Moray West OWF but this would increase the distance.
12/08/2024	Serco NorthLink Ferries (consultation meeting)	Discussions around adverse weather routeing of NorthLink ferries. In particular, the Applicant provided a proposal for the implementation of a Structure Exclusion Zone (SEZ) to increase the available sea room for adverse weather routeing. Serco NorthLink confirmed the SEZ was viewed as a positive for both adverse weather routeing and shipping and navigation in general.
27/08/2024	Serco NorthLink Ferries and Transport Scotland	Presentation of SEZ to Transport Scotland.

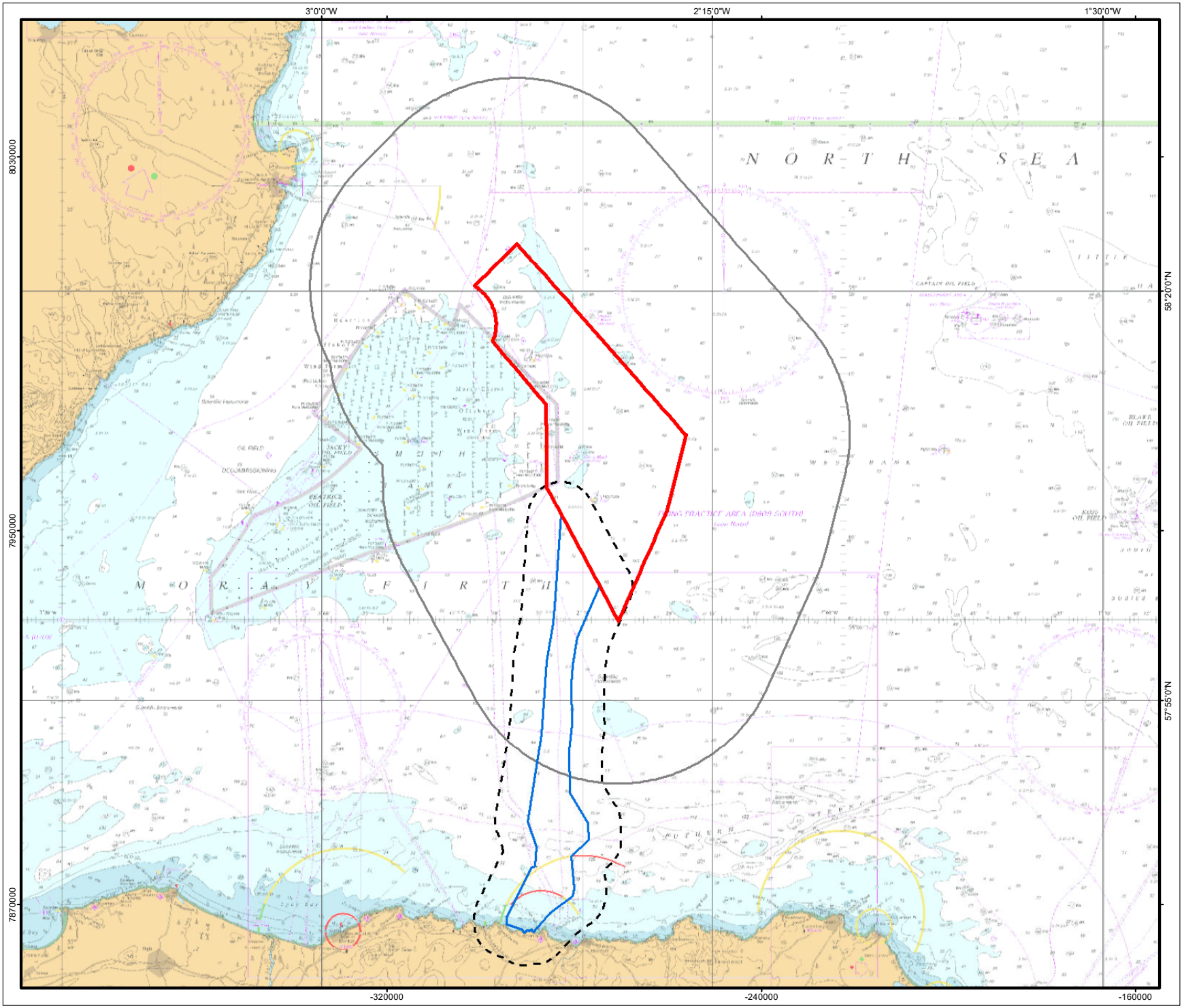
Date	Consultee and Type of Consultation	Summary
	(consultation meeting)	
12/09/2024	MCA (consultation meeting)	Summary of NRA process provided to MCA. Included presentation of the SEZ to MCA, who stated they were positive about its implementation.
25/09/2024	NLB and CoS (consultation meeting)	Summary of NRA process provided to NLB and CoS. Included presentation of the SEZ to NLB and CoS.

9.4 Baseline Characterisation

9.4.1 Study Area

9.4.1.1 A 10 nautical mile (nm) buffer of the Caledonia OWF (the 'Shipping and Navigation study area') has been considered for assessment of baseline vessel traffic within and in proximity to the Caledonia OWF, shown in Figure 9-1. This is standard industry practice and is considered sufficient to capture relevant vessel routeing within the area whilst remaining site-specific, and has also been presented to key maritime stakeholders including at the Hazard Workshop.

9.4.1.2 The Caledonia OECC has also been considered for assessment of vessel traffic within a 2nm buffer (the 'OECC study area'), including up to MHWS, shown in Figure 9-1.



- Caledonia OWF
- Shipping and Navigation Study Area
- Offshore Export Cable Corridor
- Offshore Export Cable Corridor Study Area

0 8 16 24 32 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
02	05/11/2024	For Review	RR	DS	AF
01	02/08/2024	For Review	DS	LA	AF

CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_StudyAreaOverview
CONTRACTOR REV: 02

GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)

DRAWING TITLE

Figure 9-1: Shipping and Navigation Study Area Overview

STATUS: Approved
SCALE: 1:1,100,000
DRAWING NUMBER: N/A
SHEET NO: 01 of 01
REV: 02

9.4.2 Data Sources

Desk Study

9.4.2.1 The data sources that have been used to inform this Shipping and Navigation chapter of the EIAR are presented within Table 9–4.

Table 9–4: Summary of key publicly available datasets for Shipping and Navigation.

Title	Author	Year
ShipRoutes database	Anatec[14]	2024
Admiralty Charts	UKHO[15]	2024
Vessel Monitoring System data	Marine Scotland[16]	2023
Admiralty Sailing Directions North Coast of Scotland Pilot NP52	UKHO[17]	2022
RYA Coastal Atlas	RYA[18]	2019
Helicopter tasking data	Department for Transport[19]	2015-2023
Marine incidents data	Royal National Lifeboat Institution (RNLI)[20]	2010-2022
Marine incidents data	MAIB[21]	2003-2022

Site-specific Surveys

9.4.2.2 Vessel traffic surveys were undertaken using the methodology within the associated guidance requirements of MGN 654 (MCA, 2021[7]). On this basis two 14-day AIS, Radar, and visual observation surveys undertaken in winter 2023 (25 January 2023 to 9 February 2023) and summer 2023 (22 July 2023 to 5 August 2023) have been considered within the baseline for a total of 28 full days.

9.4.2.3 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, and included vessels carrying out survey or guard work, as well as those involved in pre-construction activities at Moray West OWF.

9.4.2.4 Full details of the vessel traffic survey methodology and associated limitations are provided in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment). The findings of the surveys have been considered against

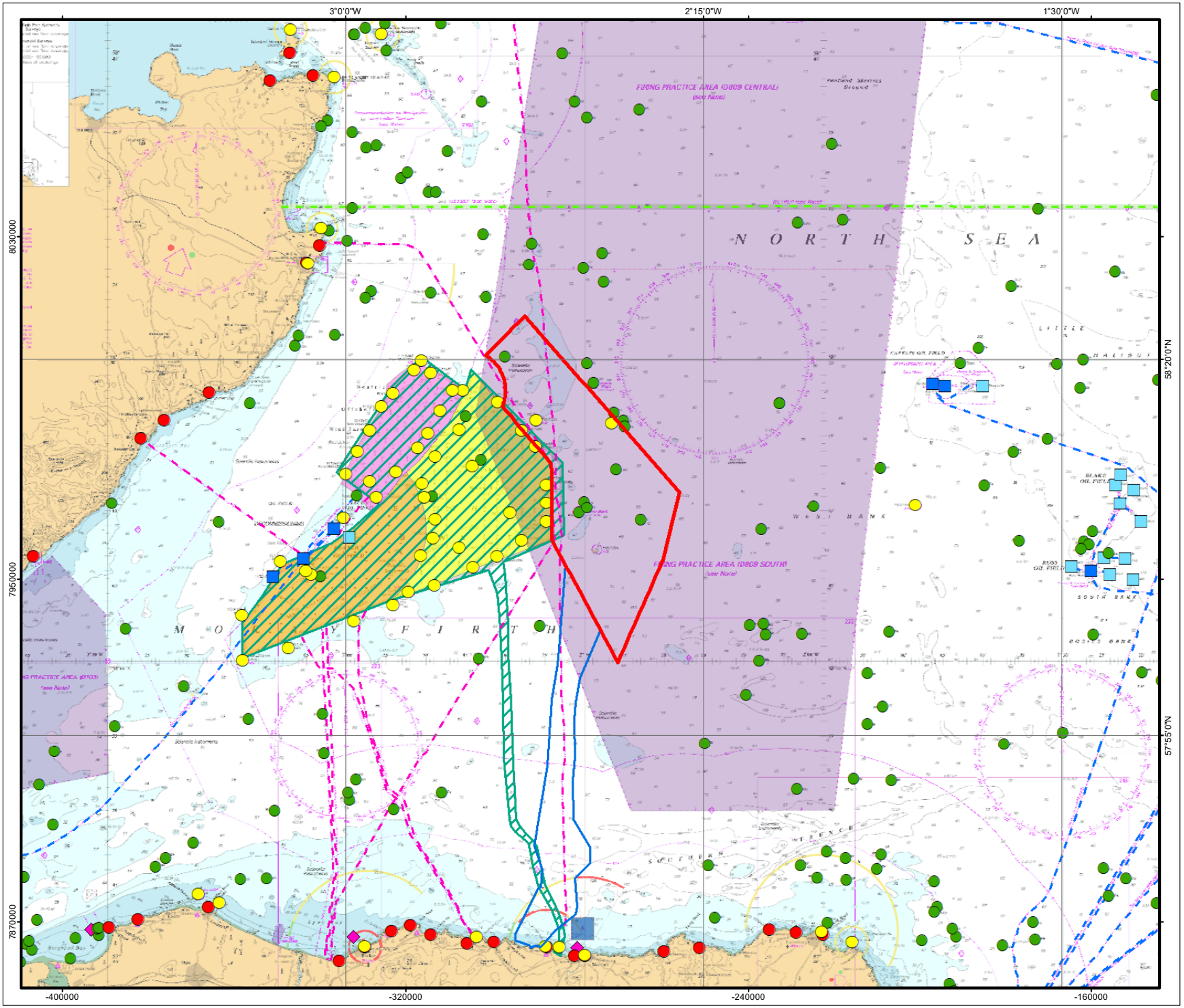
analysis of 12 months of AIS data to ensure the NRA includes long term vessel traffic assessment.

9.4.3 Baseline Description

9.4.3.1 Consultation and site-specific surveys have been undertaken, alongside a review of available literature and data sources, 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 9.8.

Navigational Features

9.4.3.2 The baseline navigational features within, and in proximity to, the Caledonia OWF and Caledonia OECC are presented in Figure 9-2.



- Caledonia OWF
- Offshore Export Cable

Navigational Features

- Key Aid to Navigation
- Port or Harbour
- Wreck or Obstruction
- Pilot Boarding Station
- Platform
- Well or Manifold
- Subsea Cable
- Subsea Pipeline
- WETREP
- Anchorage
- Cable Area
- Military Practice Area

Other Wind Farms

- Beatrice
- Moray East
- Moray West

0 8 16 24 32 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
02	05/11/2024	For Review	RR	DS	AF
01	02/08/2024	For Review	DS	LA	AF

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CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_NavigationalFeatures	CONTRACTOR REV: 02
GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)	

DRAWING TITLE

Figure 9-2: Key Navigational Features

STATUS: Approved	SCALE: 1:1,200,000	
DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: 02

Ports and Related Services

9.4.3.3 The closest port or harbour to the Caledonia OWF is Wick Harbour, situated approximately 13.2nm northwest at its closest point. The Admiralty Sailing Directions describes Wick Harbour as accommodating to fishing, recreational and commercial traffic. Wick Harbour is also the base for wind farm activities at Beatrice OWF. The nearest port or harbour south of the Caledonia OWF is located at Macduff, which hosts commercial activity including tankers and fishing vessels, and lies roughly 19.7nm south at its closest point.

9.4.3.4 The closest port or harbour to the Caledonia OECC is Whitehills Harbour and Marina, which is situated 0.5nm east of the Landfall Site. The harbour is primarily a leisure marina and hosts a variety of recreational vessels. Banff Harbour and Marina and Macduff Harbour are also situated close to the Landfall Site at 2.4nm and 3.2nm east, respectively.

9.4.3.5 Other major ports or harbours in proximity to the Proposed Development (Offshore) include Buckie Harbour and Fraserburgh Harbour, in addition to ports in the Cromarty Firth.

9.4.3.6 Buckie Harbour is located approximately 25.5nm southwest of the Caledonia OWF. It has four basins available for berthing and is described in the Admiralty Sailing Directions to have "a considerable coastal trade, chiefly in timber and agricultural commodities and has good facilities for repair and servicing". It also serves as an operational base for activities at Moray West OWF.

9.4.3.7 Fraserburgh Harbour is situated on the northeast coast of Scotland roughly 23nm southeast the Caledonia OWF. It consists of inter-connected basins and harbours of varying depths, with outer anchoring available in Fraserburgh Bay, where vessels can also receive pilotage. The Admiralty Sailing Directions describe Fraserburgh Harbour as "mainly a fishing port with a large locally-based fishing fleet. There is also commercial traffic". Fraserburgh serves as an operational base for Moray East OWF.

9.4.3.8 The Cromarty Firth is located roughly 54nm southwest of the Caledonia OWF, and is host to the Port of Cromarty Firth, situated at Invergordon. Nigg Energy Park is a facility within the Cromarty Firth Port Authority limits. It is described in the Admiralty Sailing Directions as "the largest open port in the Moray Firth area" as well as a "major centre of large offshore energy projects". Cromarty Harbour lies near the entrance to the Cromarty Firth and hosts fishing vessels as well as a ferry which transits to and from Nigg Ferry Pier.

Key Aids to Navigation

9.4.3.9 Two aids to navigation are located within the Caledonia OWF which mark areas of shallower water, as well as the presence of wrecks. Additionally, turbines with marine AtoNs are present along the periphery of Moray East and

Beatrice OWFs. The nearest lighthouse is situated at Wick, approximately 13.2nm northwest of the Caledonia OWF.

Offshore Wind Farms

9.4.3.10 The Caledonia OWF lies adjacent to the easternmost border of Moray East OWF, over a distance of approximately 10nm. Moray East OWF began construction in May 2019 and was commissioned in May 2022. It covers an area of 86 square nautical miles (nm^2) and consists of 100 wind turbine generators (WTGs). Wind farm vessels servicing Moray East OWF generally operate out of Buckie and Fraserburgh.

9.4.3.11 Additionally, at its closest point, Beatrice OWF is located roughly 2.6nm west of the Caledonia OWF. Construction activities for Beatrice OWF began in February 2017 and it was commissioned in May 2019. It is approximately $38nm^2$ with 84 WTGs in place. Wind farm vessels servicing Beatrice OWF operate out of Wick.

9.4.3.12 Moray West OWF, which is currently under construction, is located 7.7nm southwest of the Caledonia OWF. Construction for Moray West OWF began in February 2023 and, at the time of writing (October 2024), has completed installation of all monopile foundations, all transition pieces, 51 WTGs, and two Offshore Substation Platforms (OSPs) (Moray West, 2024[22]).

Charted Wrecks

9.4.3.13 Numerous charted wrecks are in proximity to the Proposed Development (Offshore) and can be seen in Figure 9-2. Six charted wrecks can be found within the Caledonia OWF, one of which has been classed as a historic wreck.

Subsea Cables and Pipelines

9.4.3.14 Excluding export and inter-array cables associated with nearby OWFs, two subsea cables intersect the Proposed Development (Offshore) and are shown in Figure 9-2. These are the Caithness Moray HVDC cable, and the SHEFA-2 communications cable which connects Scotland and the Faroe Islands, and runs between Banff and Manse Bay (Orkney).

9.4.3.15 Nearby pipelines include those at the decommissioned Jacky and Beatrice Oil Fields approximately 14nm west of the Caledonia OWF, as well as those at the Captain Oil Field located roughly 22nm east.

Military Practice and Exercise Areas

9.4.3.16 There are four military firing areas located in proximity to the Proposed Development (Offshore). All firing areas operate under a clear range procedure (i.e., exercises only take place when areas are considered clear of all shipping).

9.4.3.17 Firing practice area D703 is situated near the coast between the Dornoch Firth and Helmsdale, and covers an area of approximately $187nm^2$.

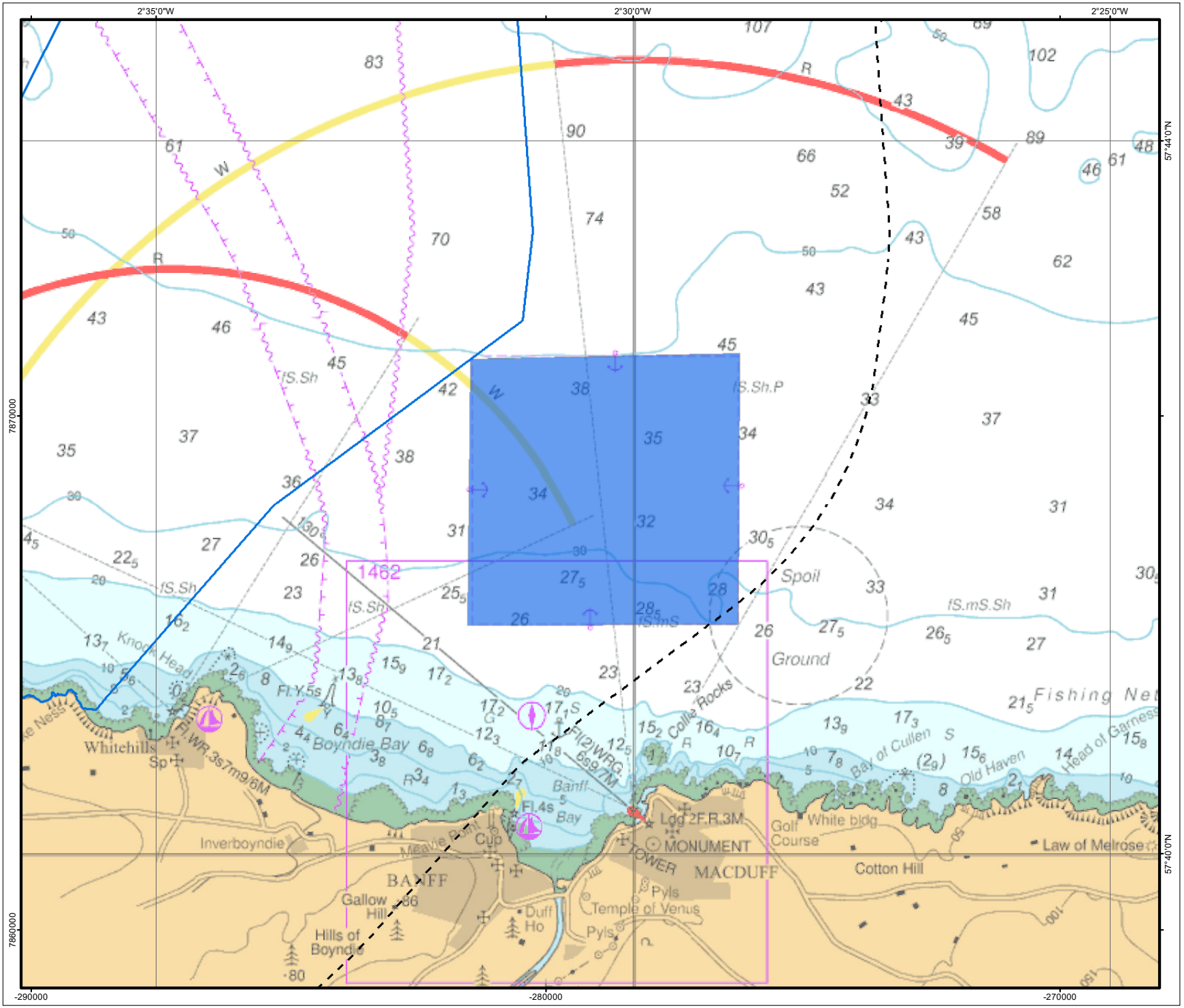
9.4.3.18 Firing practice area D809 Central lies roughly 3nm north of the Caledonia OWF, and covers an area of approximately $616nm^2$. Firing practice area D809

South sits directly south of area D809 Central, and encompasses the Caledonia OWF with an area of around 792nm^2.

9.4.3.19 Firing practice area X5702 covers an area of 0.8nm^2 and extends roughly 1.4nm from the coast between Buckie and Lossiemouth at Binn Hill Rifle Range.

Anchorage Areas

9.4.3.20 A charted anchorage area can be found approximately 1.75nm from the coast north of Macduff, in Boyndie Bay, covering an area of 2.3nm^2, with water depths between 25 metres (m) to 40m, as shown in Figure 9-3. This anchorage is adjacent to the Caledonia OECC. Preferred anchorages can also be found at numerous bays along the northeast coast as well as at Wick.



Offshore Export Cable Corridor

Offshore Export Cable Corridor Study Area

Anchorage Area

0 1 2 3 4 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
02	05/11/2024	For Review	RR	DS	AF
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CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_MacduffAnchorage	CONTRACTOR REV: 02
GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)	
DRAWING TITLE: Figure 9-3: Macduff Anchorage Overview	
STATUS: Approved	SCALE: 1:100,000
DRAWING NUMBER: N/A	SHEET NO: 01 of 01 / REV: 02

Spoil Grounds

9.4.3.21 Many spoil grounds are located along the northeast coast of Scotland. The closest one to the Caledonia OWF lies 11.4nm northwest at Wick. The nearest spoil ground to the south is 18.2nm south at Macduff.

Other Navigational Features

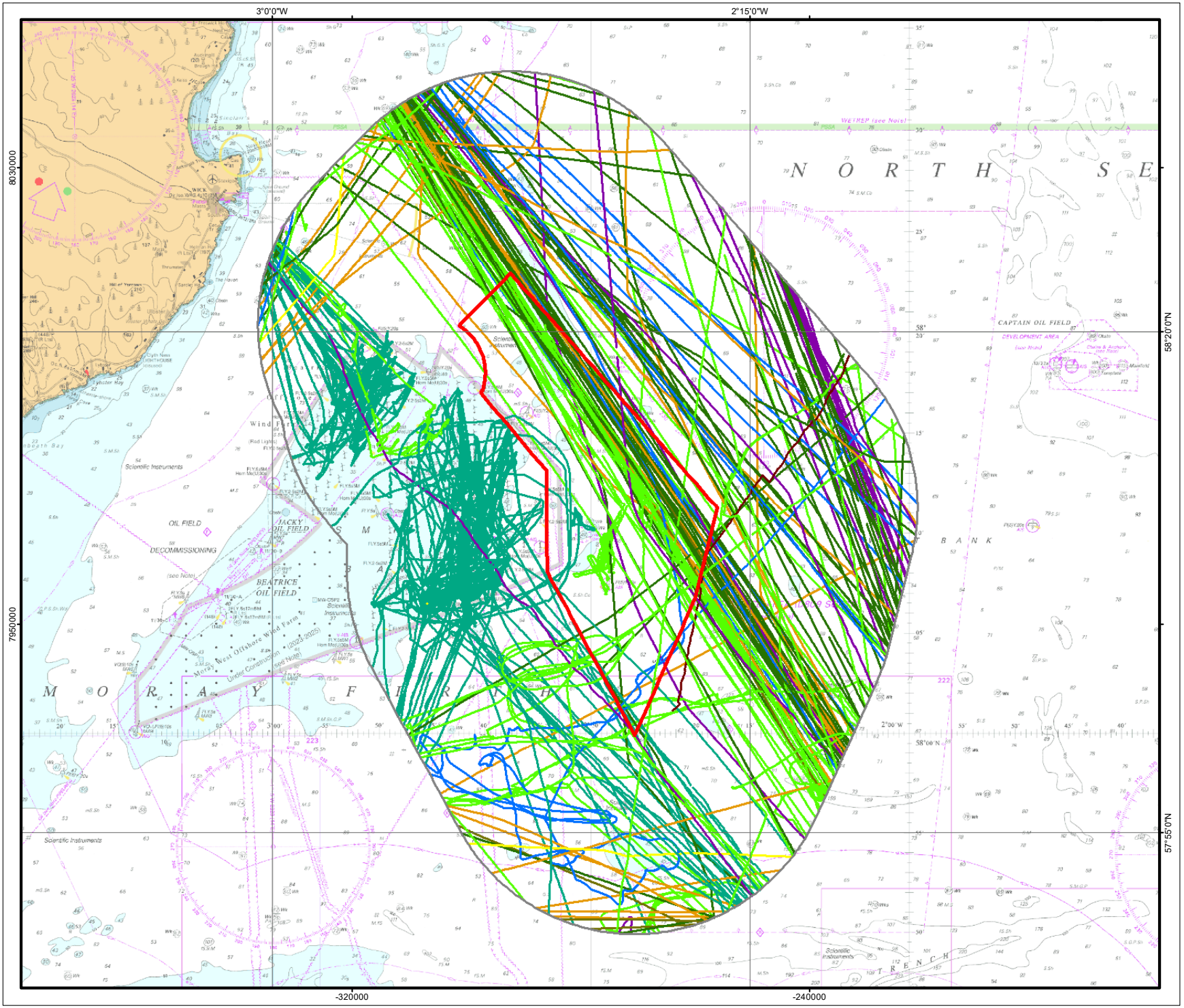
9.4.3.22 Several platforms are noted within the vicinity of the Proposed Development (Offshore), the closest being at the Jacky and Beatrice oil fields. These fields are in the process of being decommissioned within the near future.

9.4.3.23 The Western European Tanker Reporting System (WETREP) runs east/west approximately 7.2nm north of the Caledonia OWF. This is a mandatory ship reporting system which applies to all oil tankers over 600 Deadweight Tonnage carrying a cargo of heavy crude oil, heavy fuel oils, or bitumen and tar.

Vessel Traffic Movements

Caledonia OWF

9.4.3.24 Figure 9-4 and Figure 9-5 present the vessel traffic data recorded within the Shipping and Navigation study area during the winter and summer 2023 surveys respectively, colour-coded by vessel type.



Caledonia OWF

Shipping and Navigation Study Area

Vessel Type

- Fishing
- Military
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Oil and Gas
- Wind Farm

0 8 16 24 32 km

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02	05/11/2024	For Review	RR	DS	AF
01	02/08/2024	For Review	DS	LA	AF

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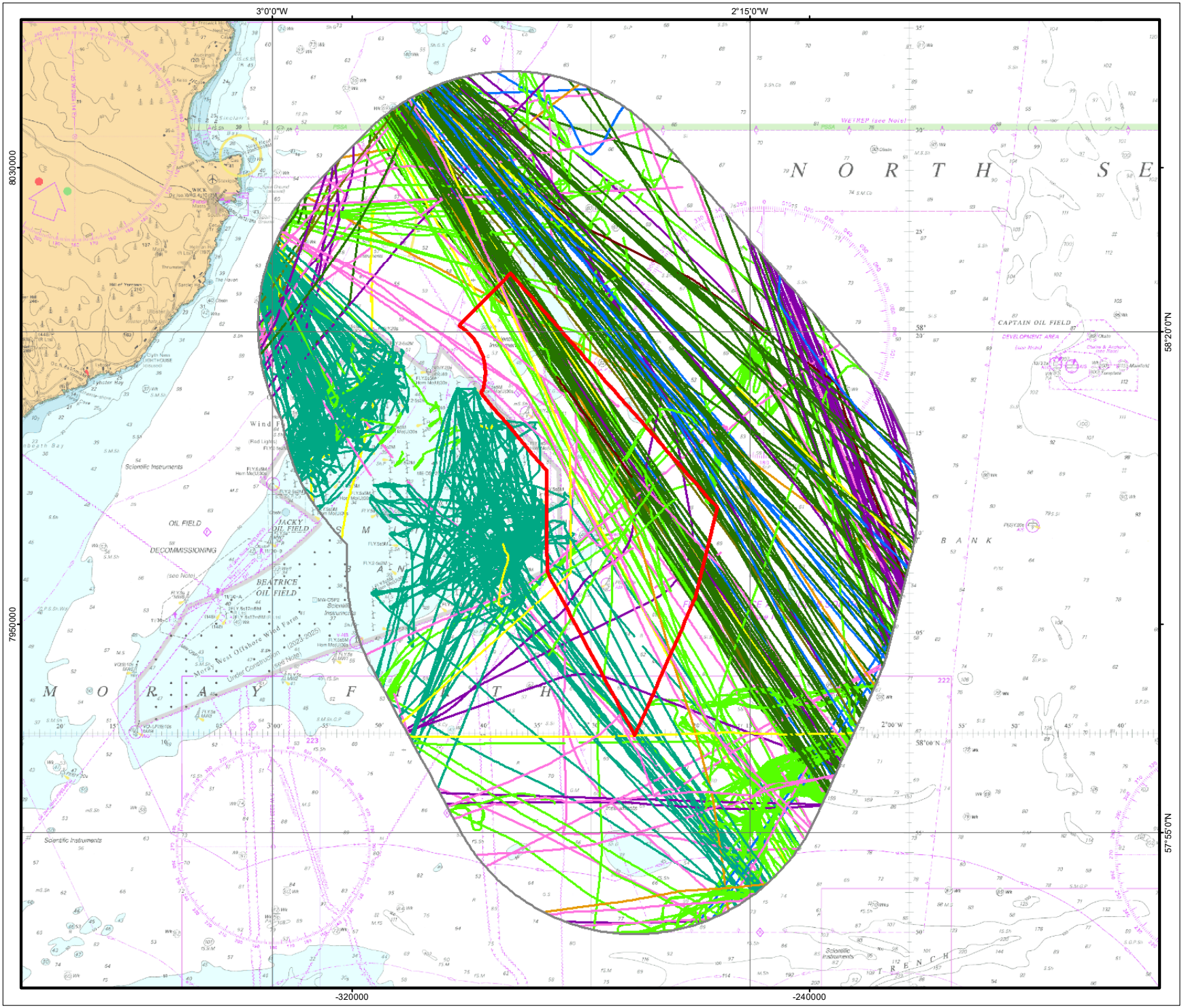
CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_14DaysWinter	CONTRACTOR REV: 02
GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)	

DRAWING TITLE

Figure 9-4: Vessel Traffic Data within Shipping and Navigation Study Area (14 Days Winter 2023)

STATUS: Approved	SCALE: 1:900,000	
DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: 02



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02	05/11/2024	For Review	RR	DS	AF
01	02/08/2024	For Review	DS	LA	AF

CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_14DaysSummer
CONTRACTOR REV: 02

GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)

DRAWING TITLE

Figure 9-5: Vessel Traffic Data within Shipping and Navigation Study Area (14 Days Summer 2023)

STATUS	SCALE	
Approved	1:900,000	
DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: 02

9.4.3.25 During the winter 2023 survey period, there was an average of 17 unique vessels recorded per day within the Shipping and Navigation study area, and between six and seven unique vessels per day intersecting the Caledonia OWF itself. Vessel counts were higher during the summer 2023 survey period, rising to an average of 29 to 30 unique vessels recorded per day within the Shipping and Navigation study area, and between seven and eight unique vessels per day recorded within the Caledonia OWF itself.

9.4.3.26 The main vessel types recorded within the Shipping and Navigation study area during the winter 2023 survey period were fishing vessels (28%) and cargo vessels (24%). During the summer 2023 survey period, the most common vessel types recorded within the Shipping and Navigation study area were cargo vessels (25%) and wind farm vessels (23%).

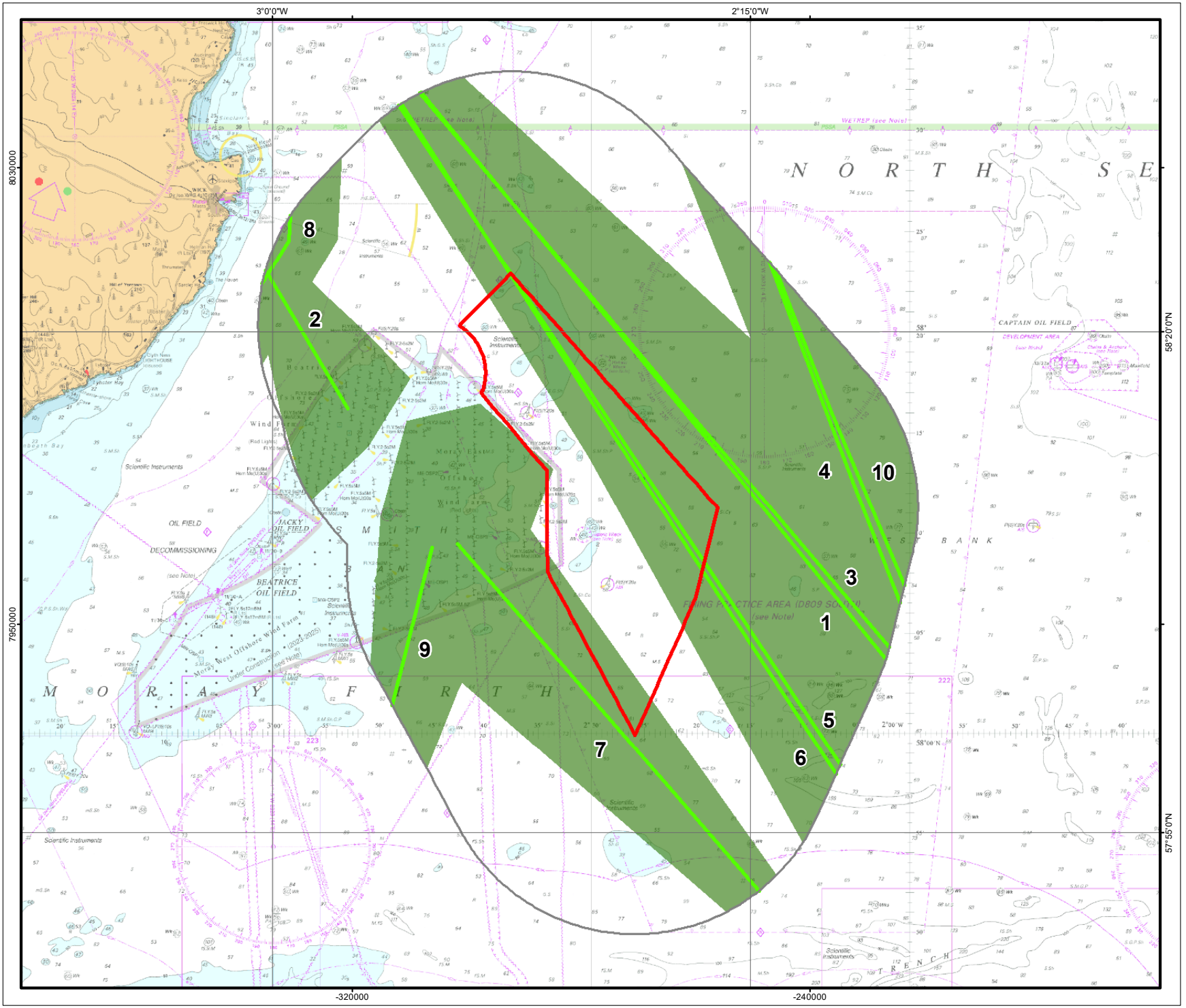
9.4.3.27 Vessel length information was available for 99% of all vessels recorded within the Shipping and Navigation study area throughout the combined winter and summer survey periods. Vessel length ranged from an 8m search and rescue vessel to a 333m cruise liner. Overall vessel length was on average 74m during the winter survey period, and 80m for the summer survey period when excluding vessels that did not broadcast a vessel length.

9.4.3.28 Vessel draught information was available for 86% of all vessels recorded within the Shipping and Navigation study area throughout the combined summer and winter survey periods. Vessel draught ranged from 1m for a wind farm vessel and 14.6m for a container carrier. After excluding vessels which did not broadcast a valid draught, the overall average draught for vessels recorded during the winter and summer survey periods was 4.1m and 4.3m respectively.

9.4.3.29 Roll-on/Roll-off (RoRo) cargo routes were identified within the vessel traffic data, including vessels operated by Smyril Line and Serco NorthLink Ferries. Tracks of the former were noted to intersect the Caledonia OWF to and from the Pentland Firth, whilst those of the latter were most predominant on the route between Kirkwall and Aberdeen to the east. Data assessment in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment) showed a proportion of tracks from NorthLink Ferries were noted further inshore including intersecting the Caledonia OWF, with consultation (see Section 9.3) indicating that these transits were used during periods of adverse weather.

9.4.3.30 No vessels were identified as being at anchor within the Shipping and Navigation study area during either of the winter or summer survey periods. Full details of the methodology applied are provided in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment).

9.4.3.31 Main commercial routes have been identified using the principles set out in MGN 654 (MCA, 2021[7]). A total of 10 main routes were identified within the Shipping and Navigation study area. Figure 9-6 presents these main routes and their corresponding 90th percentiles. Descriptions of each of the main commercial routes are provided in Table 9–5.



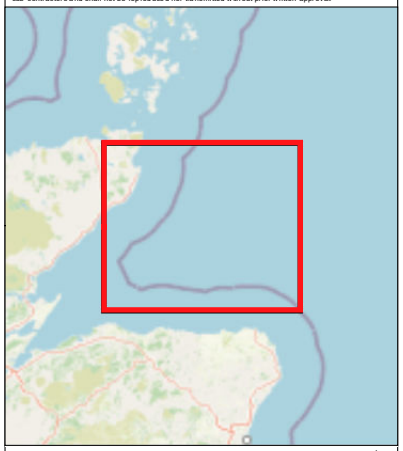
Caledonia OWF

Shipping and Navigation Study Area

Main Commercial Route

Mean Position

90th Percentile



0 8 16 24 32 km

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CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_MainCommercialRoutes	CONTRACTOR REV: 02
GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)	

DRAWING TITLE

Figure 9-6: Main Commercial Routes and 90th Percentiles

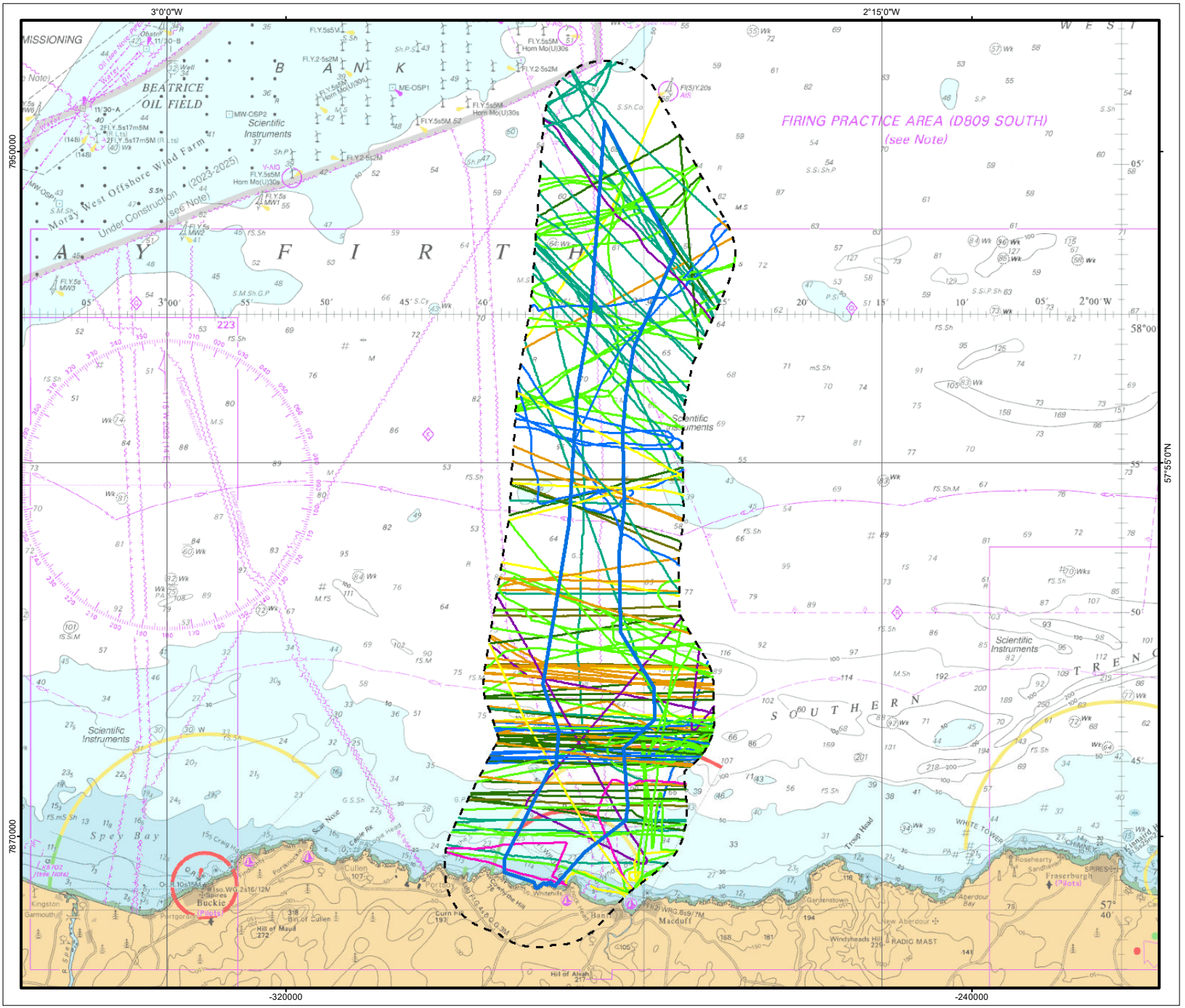
STATUS: Approved	SCALE: 1:900,000	
DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: 02

Table 9–5: Details of Main Commercial Routes.

Route No.	Avg. Vessels per Week	Avg. Vessels per Day	Definition
1	22	3	Rotterdam to Pentland Firth. Mainly cargo vessels including Smyril Line RoRo vessels intersecting the Caledonia OWF.
2	14	2	Wick – Beatrice OWF. Wind farm vessels.
3	11	2	Pentland Firth to Rotterdam. Mainly cargo vessels including Smyril Line RoRo vessels.
4	8	1	Aberdeen – Kirkwall. NorthLink cargo and passenger vessels.
5	8	1	Pentland Firth to East England. Mainly cargo vessels.
6	6	1	Pentland Firth to East Scotland. Mainly oil and gas vessels and cargo vessels.
7	6	1	Fraserburgh – Moray East OWF. Wind farm vessels
8	5	1	Inverness – Scrabster. Mainly cargo vessels.
9	4	1	Buckie – Moray East OWF. Wind farm vessels.
10	3	<1	East Scotland – Kirkwall. Mainly passenger and cargo vessels.

Caledonia OECC

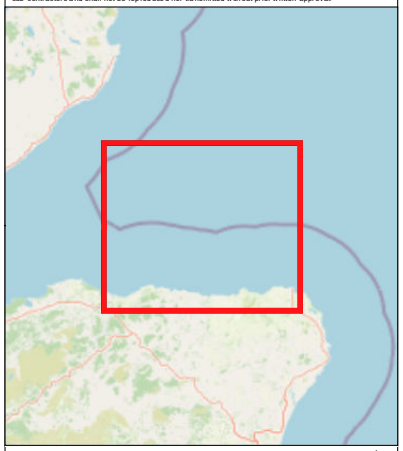
9.4.3.32 Figure 9-7 and Figure 9-8 present the vessel traffic data recorded within the OECC study area during the winter and summer 2023 surveys respectively, colour-coded by vessel type.



- Offshore Export Cable Corridor
- Offshore Export Cable Corridor Study Area

Vessel Type

- Fishing
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm



0 6 12 18 24 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
02	05/11/2024	For Review	RR	DS	AF
01	02/08/2024	For Review	DS	LA	AF

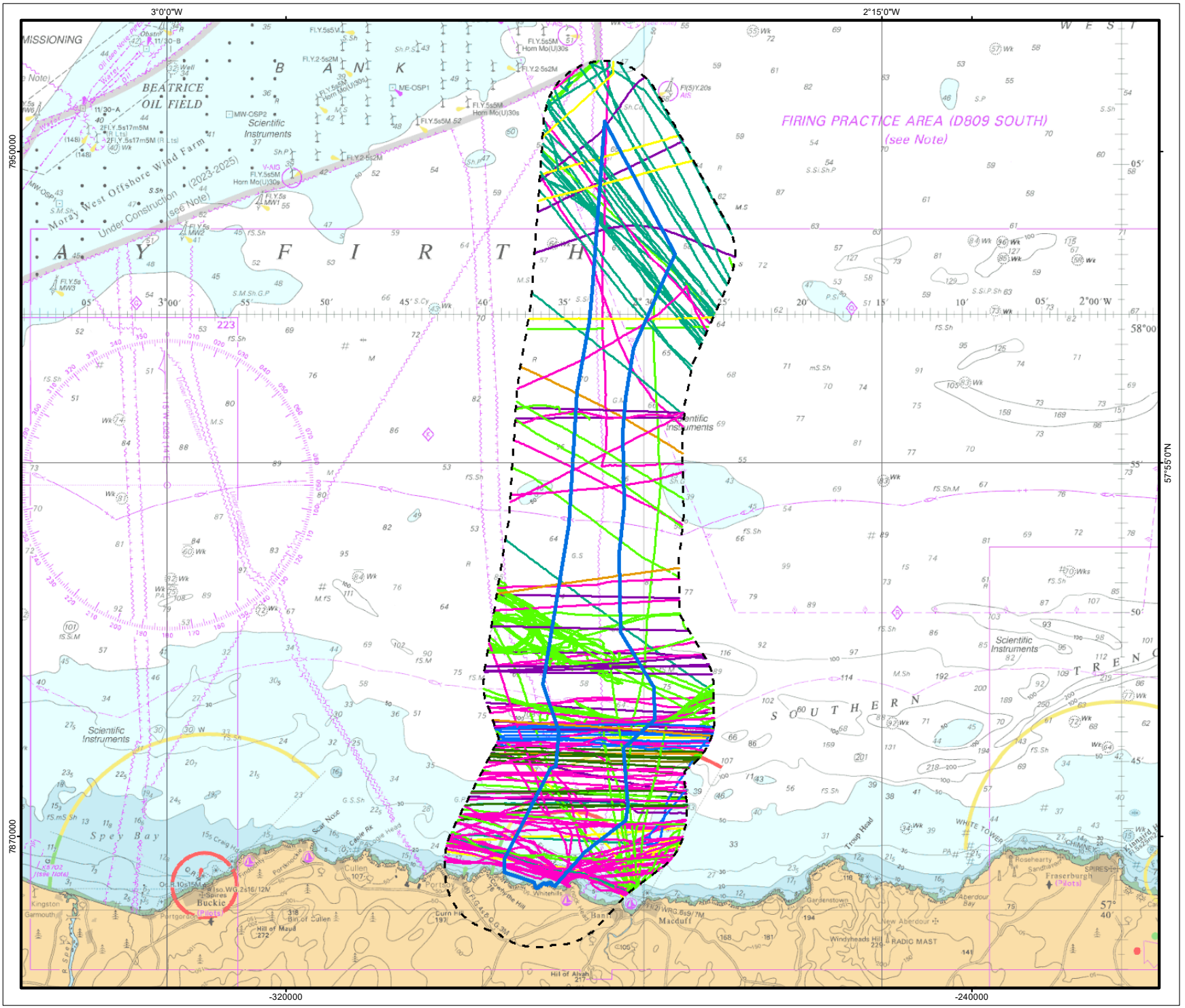
CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_14DaysAISECCWinter
CONTRACTOR REV: 02

GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)

DRAWING TITLE

Figure 9-7: Vessel Traffic Data within OECC Study Area (14 Days AIS Winter 2023)

STATUS	SCALE	
Approved	1:600,000	
DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: 02

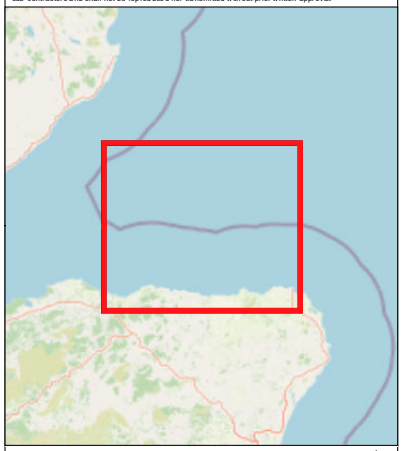


Offshore Export Cable Corridor

Offshore Export Cable Corridor Study Area

Vessel Type

- Fishing
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm



0 6 12 18 24 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
02	05/11/2024	For Review	RR	DS	AF
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CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_14DaysAISECCSummer	CONTRACTOR REV: 02
GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)	

DRAWING TITLE

Figure 9-8: Vessel Traffic Data within OECC Study Area (14 Days AIS Summer 2023)

STATUS: Approved	SCALE: 1:600,000	
DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: 02

9.4.3.33 During the winter 2023 survey period, there was an average of 11 unique vessels recorded per day within the OECC study area, and approximately nine unique vessels per day intersecting the Caledonia OECC itself. During the summer 2023 survey period, there was an increase in vessel numbers compared to winter, with an average of 14 unique vessels recorded per day within the OECC study area, and 11 unique vessels per day recorded within the Caledonia OECC itself.

9.4.3.34 The main vessel types recorded within the OECC study area during the winter 2023 survey period were fishing vessels (26%), oil and gas vessels (19%), and cargo vessels (18%). During the summer 2023 survey period, the most common vessel types recorded within the OECC study area were recreational vessels (42%) and fishing vessels (23%).

9.4.3.35 Vessel length information was available for 97% of all vessels recorded within the OECC study area throughout the combined winter and summer survey periods. Vessel length ranged from an 5m unmanned vessel to a 333m cruise liner. Overall vessel length was on average 62m during the winter survey period, and 47m for the summer survey period when excluding vessels that did not broadcast a vessel length.

9.4.3.36 Vessel draught information was available for 71% of all vessels recorded within the OECC study area throughout the combined summer and winter survey periods. Vessel draught ranged from 1m for a wind farm vessel and 15m for an oil and gas platform under tow. After excluding vessels which did not broadcast a valid draught, the overall average draught for vessels recorded during the winter and summer survey periods was 4.8m and 5m respectively.

9.4.3.37 Over the winter and summer survey periods combined, two tankers were considered to be at anchor within the OECC study area in the designated anchorage north of Macduff, at Boyndie Bay. Full details of methodology applied to identify anchored vessels are presented in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment).

Historical Maritime Incidents

DfT Helicopters

9.4.3.38 There were nine SAR taskings within the Shipping and Navigation study area between April 2015 and March 2023, corresponding to an average of one SAR tasking per year. Five were rescue/recovery, with two search operations, one support operation, and one prearranged transfer. All but one were responded to by the Inverness base, the other was responded to by Sumburgh.

9.4.3.39 There was 14 SAR taskings within the OECC study area between April 2015 and March 2023, mostly located along the coast. There was one tasking within the Caledonia OECC itself which was a search operation responded to by the Inverness base.

RNLI

9.4.3.40 The RNLI responded to a total of 14 incidents within the Shipping and Navigation study area between 2010 and 2022, equating roughly one incident per year. The most common incident types recorded were "machinery failure" (36%), "vessel may be in trouble" (21%), and "person in danger" (14%). The most common vessel types involved in incidents within the Shipping and Navigation study area were fishing vessels (43%) and recreational vessels (29%). Only one incident occurred within the Caledonia OWF itself. Within the OECC study area, a total of 63 incidents were responded to by the RNLI between 2010 and 2022, corresponding to four to five incidents per year. The most common incident types recorded were "machinery failure" (37%) and "person in danger" (22%). The most common vessel types recorded were recreational vessels (34%). Thirteen incidents occurred within the Caledonia OECC itself.

MAIB

9.4.3.41 Between 2013 and 2022 there has been a total of four incidents within the MAIB dataset that occurred within the Shipping and Navigation study area. The most common incident type recorded was "machinery failure" with two instances recorded. Three incidents were recorded within the Caledonia OWF itself. Fishing vessels and cargo vessels were most commonly involved in incidents within the Shipping and Navigation study area, with two instances each. Within the OECC study area, a total of four unique incidents were recorded between 2013 and 2022. The most common incident type was also "machinery failure", with two recorded instances. Recreational vessels were the most common vessel type involved in incidents within the OECC study area, with three recorded incidents. A review of older MAIB data within the Shipping and Navigation study area between 2003 and 2012 showed a total of 16 reported incidents within the Shipping and Navigation study area, and nine reported incidents within the OECC study area. However, no incidents were recorded within the Caledonia OWF or Caledonia OECC. This indicates reported incidents have generally decreased in proximity to the Caledonia OWF.

9.4.4 Do Nothing Baseline

9.4.4.1 If the Proposed Development (Offshore) does not come forward, an assessment of the future baseline conditions has also been carried out and is described within this section.

9.4.4.2 There is uncertainty associated with long-term predictions of vessel traffic growth including the potential for any other new developments in UK 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 Proposed Development (Offshore). These scenarios have been included in the pre OWF

modelling undertaken in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment).

9.4.4.3 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 Proposed Development (Offshore). Changes in fishing activity are considered further in Volume 2, Chapter 8: Commercial fisheries.

9.4.5 Data Gaps and Limitations

9.4.5.1 This section discusses key data gaps and limitations associated with the data sources used to inform the assessment of this chapter. These data limitations do not compromise the integrity of the assessment undertaken in this chapter due to the variety of sources that have been consulted and considered.

9.4.5.2 It has been assumed that vessels under an obligation to broadcast information via AIS have done so, both in the vessel traffic surveys and long-term vessel traffic data. It has also been assumed that the details broadcast via AIS (such as vessel type and dimensions) are accurate unless clear evidence to the contrary was identified during Anatec's thorough quality assurance of the data.

9.4.5.3 The methodology for vessel traffic data collection within the OECC study area was shared with stakeholders at the Hazard Workshop. This method used only the AIS dataset to characterise vessel movements within the OECC study area. Consequently, this dataset has limitations associated with non-AIS targets.

9.4.5.4 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 12nm of territorial waters or carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB.

9.4.5.5 The RNLI incident data cannot be considered comprehensive of all incidents in the 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.

9.4.5.6 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.

9.4.5.7 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.

9.5 EIA Approach and Methodology

9.5.1 Overview

9.5.1.1 This section outlines the methodology for assessing the likely significant effects on Shipping and Navigation from the construction, O&M and decommissioning of the Proposed Development (Offshore). Further details of the methodology can be found in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment).

9.5.2 Impacts Scoped in to the Assessment

9.5.2.1 The Offshore Scoping Report (Volume 7, Appendix 2) was submitted to MD-LOT in September 2022. The Offshore Scoping Report set out the overall approach to assessment and allowed for the refinement of the Proposed Development (Offshore) over the course of the assessment. The proposed scope of the assessment is set out in Table 9–6.

Table 9–6: Shipping and Navigation Scope of Assessment.

Potential Impact	Phase	Nature of Impact
Vessel displacement (including during adverse weather)	Construction, Operation, Decommissioning	Direct
Increased third party vessel to vessel collision risk	Construction, Operation, Decommissioning	Direct
Increased third party vessel to project vessel collision risk	Construction, Operation, Decommissioning	Direct
Vessel to structure allision risk	Construction, Operation, Decommissioning	Direct
Reduced access to local ports	Construction, Operation, Decommissioning	Direct
Reduction of under keel clearance	Construction, Operation	Direct
Loss of station	Construction, Operation, Decommissioning	Direct
Reduction of Search and Rescue (SAR) capability	Construction, Operation, Decommissioning	Direct

Potential Impact	Phase	Nature of Impact
Anchor interaction with subsea cables and mooring lines	Operation	Direct

9.5.3 Impacts Scoped out of the Assessment

9.5.3.1 The impacts scoped out of the assessment during EIA scoping, and the justification for this, are listed in Table 9–7.

Table 9–7: Impacts Scoped Out for Shipping and Navigation.

Potential Impact	Justification
Interference with navigation, communications and position fixing equipment from the development	This impact has been assessed within the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment). Based on the findings this has subsequently screened out of assessment in this chapter.

9.5.4 Assessment Methodology

9.5.4.1 The project-wide generic approach to assessment is set out in Volume 1, Chapter 7: EIA Methodology. The assessment methodology for Shipping and Navigation for the EIAR is consistent with that provided in the Offshore Scoping Report (Volume 7, Appendix 2). The methodology for the assessment of Shipping and Navigation is set out in full in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment). An overview is provided in the following sections.

9.5.4.2 As required under the MCA Methodology (Annex 1 to MGN 654) (MCA, 2021[7]), and in line with international marine risk assessment standards, the IMO FSA (IMO, 2018[8]) approach has been applied for impact assessment. The FSA methodology is centred on risk control, and assesses each impact in terms of its frequency of occurrence (see Table 9–8) and severity of consequence (see Table 9–9) in order that its significance can be determined as "broadly acceptable", "tolerable", or "unacceptable" via a risk matrix as shown in Table 9–10. Any impact assessed as "unacceptable" will require additional mitigation measures implemented beyond those considered embedded to reduce the impact to within "tolerable" or "broadly acceptable" parameters.

9.5.4.3 Impacts determined to be broadly acceptable or tolerable are not significant in EIA terms assuming the risks have been reduced to As Low As Reasonably Practicable (ALARP).

Table 9–8: 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 9–9: 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.

Table 9–10: IMO FSA Risk Matrix.

Frequency	Frequent	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
	Reasonably Probable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Remote	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Extremely Unlikely	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
		Negligible	Minor	Moderate	Serious	Major
		Severity				

9.5.5 Approach to Cumulative Effects

9.5.5.1 The Cumulative Impact Assessment (CIA) assesses the impact associated with the Proposed Development (Offshore) together with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development (Offshore) in combination with the effects from a number of different projects, on the same receptor or resource.

9.5.5.2 The approach to the CIA for Shipping and Navigation differs from the process outlined in Volume 1, Chapter 7: EIA Methodology. With respect to Shipping and Navigation, a bespoke tiering system is applied within the CIA for the purposes of the assessment of worst-case vessel routeing. The full CIA methodology applied for Shipping and Navigation is detailed in full within the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment).

9.5.5.3 The developments selected as relevant to the Shipping and Navigation CIA presented within this chapter are based upon the results of a screening exercise undertaken in the NRA. Each development has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence of the development parameters, effect-receptor pathways and the spatial/temporal scales involved. This screening process also takes into account the differing potential of developments to proceed to an operational stage and therefore present a cumulative effect on Shipping and Navigation receptors.

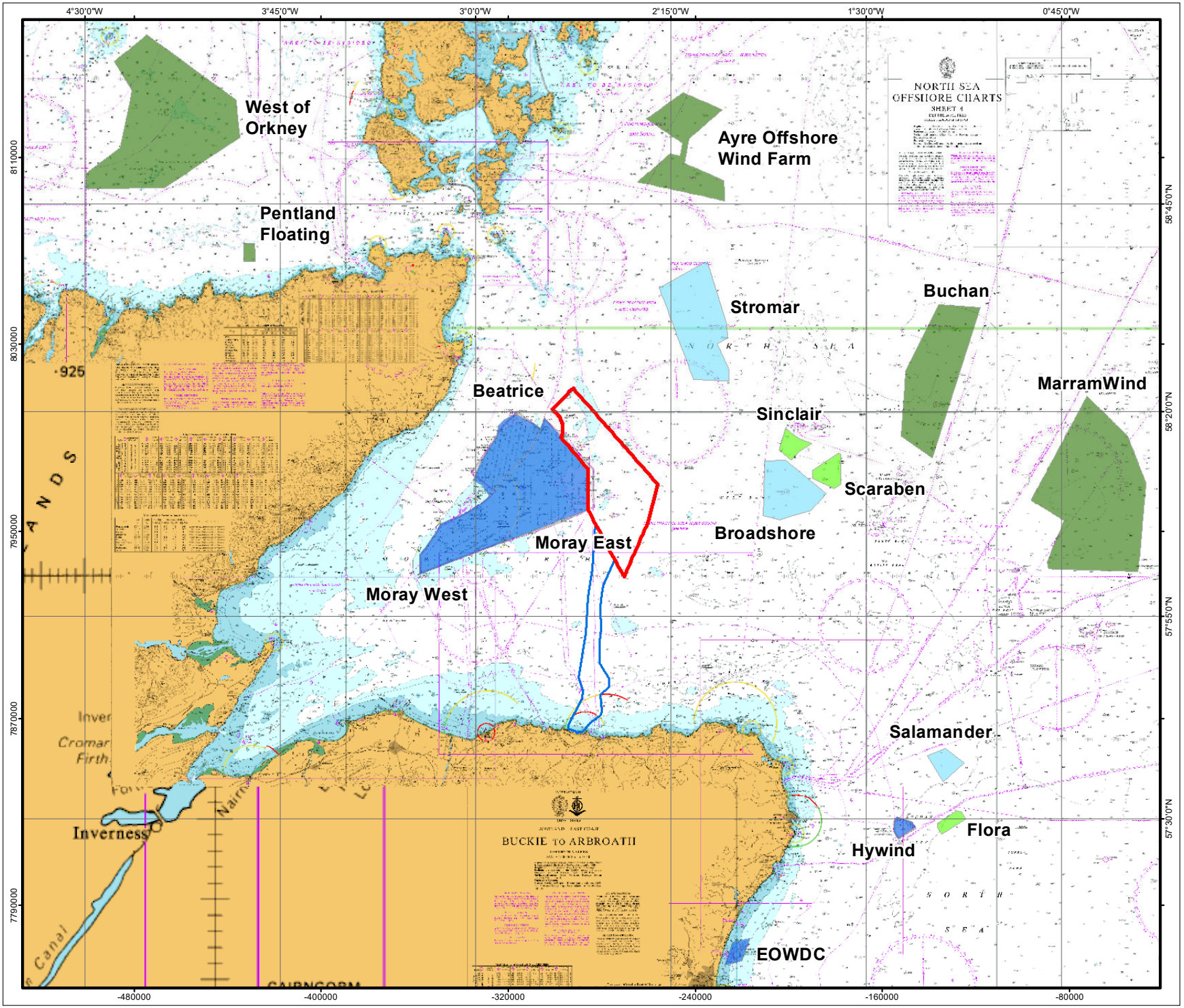
9.5.5.4 A tiered approach has thus been utilised to determine the level of which a development is expected to have a cumulative effect alongside the Proposed Development (Offshore) in the future, and allows a weighted assessment of cumulative effects. As above a bespoke tiering system has been applied for

Shipping and Navigation which considers the potential for cumulative displacement of vessel routeing. Full details are provided within the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment).

9.5.5.5 The list of relevant developments for inclusion within the CIA is outlined in Volume 7A, Appendix 7-1: Cumulative Impact Assessment Methodology.

9.5.5.6 Developments which are located within 50nm of the Shipping and Navigation study area are considered to have the potential to result in the highest cumulative effect. Developments which are either operational or in the decommissioning stage are considered to be part of the baseline and are not considered within the assessment.

9.5.5.7 Figure 9-9 presents the developments screened into the Shipping and Navigation CIA.



Caledonia OWF

Offshore Export Cable Corridor

Cumulative Wind Farm Tier

- Baseline
- 1
- 2
- 3

0 16 32 48 64 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
02	05/11/2024	For Review	RR	DS	AF
01	02/08/2024	For Review	DS	LA	AF

CONTRACTOR DRAWING NO: A4787_Caledonia_EIA_V2_CumulativeDevelopments

CONTRACTOR REV: 02

GEODETIC PARAMETERS: WGS 1984 World Mercator (EPSG: 3395)

DRAWING TITLE

Figure 9-9: Cumulative Developments

STATUS: Approved

SCALE: 1:2,200,000

DRAWING NUMBER: N/A

SHEET NO: 01 of 01

REV: 02

9.5.5.8 The list of relevant developments for inclusion within the Shipping and Navigation CIA is presented below in Table 9–11.

Table 9–11: Developments considered for the Shipping and Navigation CIA.

Development	Development Type	Status	Confidence	Tier
Ayre OWF	OWF	Pre Planning	Low	3
Broadshore OWF	OWF	Scoped	Medium	1
Buchan OWF	OWF	Scoped	Medium	3
Flora OWF	OWF	Pre Planning	Low	2
Marram OWF	OWF	Scoped	Medium	3
Pentland Floating OWF	OWF	Consented	High	3
Salamander OWF	OWF	Consent Application Submitted	Medium	1
Scaraben OWF	OWF	Pre Planning	Low	2
Sinclair OWF	OWF	Pre Planning	Low	2
Stromar OWF	OWF	Scoped	Medium	1
West of Orkney OWF	OWF	Consent Application Submitted	High	3

9.5.6 Embedded Mitigation

9.5.6.1 Where possible, mitigation measures have been embedded into the design of the Proposed Development (Offshore) applications, specifically Caledonia North and Caledonia South. Where embedded mitigation measures have been developed into the design with specific regard to Shipping and Navigation, these are described in Table 9–12. The impact assessment presented in Sections 9.7 to 9.10 take into account this embedded mitigation.

Table 9–12: Embedded Mitigation.

Code	Mitigation Measure	Securing Mechanism
M-1	Development of and adherence to a Cable Plan (CaP). The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-2	Development of and adherence to a Development Specification and Layout Plan (DSLP). The DSLP will confirm the layout and design parameters of the Proposed Development (Offshore).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-5	Where practicable, cable burial will be the preferred means of cable protection. Cable burial will be informed by the CBRA and detailed within the CaP.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-9	Development of and adherence to a Marine Pollution Contingency Plan (MPCP). The MPCP will identify potential sources of pollution and associated spill response and reporting procedures.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-12	Development of and adherence to a Project Environmental Monitoring Programme (PEMP). The PEMP will set out commitments to environmental monitoring in pre-, during and post-construction phases of the Proposed Development (Offshore).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-13	Development of and adherence to a Vessel Management Plan (VMP). The VMP will confirm the types and numbers of vessels that will be engaged on the Proposed Development (Offshore), and consider vessel coordination including indicative transit route planning.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

Code	Mitigation Measure	Securing Mechanism
M-14	Development of and adherence to a Lighting and Marking Plan (LMP). The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-15	Blade clearance of at least 35m above Mean Sea Level (minimum blade clearance of 35m will be maintained for floating WTGs due to tidal movements).	To be secured as a condition of the Generation Asset Marine Licence for both Caledonia North and Caledonia South.
M-17	Development of and adherence to a Fisheries Management and Mitigation Strategy (FMMS). The FMMS will set out the means of ongoing fisheries liaison through construction and O&M phases of the Proposed Development (Offshore) and detail any mitigation measures to be put in place to limit effects on commercial fisheries activity. This will include the following project policies: Fisheries Liaison Policy and Engagement Schedule, Conflict Avoidance Policy, Incident Response Policy.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-19	Development of and adherence to a Navigational Safety Plan (NSP). The NSP will describe measures put in place by the Proposed Development (Offshore) related to navigational safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Project activity to other sea users (e.g., via Notice to Mariners).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-21	Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-23	Application for and use of Safety Zones of up to 500m during construction, major maintenance and decommissioning phases. Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

Code	Mitigation Measure	Securing Mechanism
	phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards.	
M-25	Development of and adherence to an ERCoP. The ERCoP will be prepared in line with MCA guidance and confirms what measures the Proposed Development (Offshore) has in place to support any emergency response.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-26	Marine coordination and communication to manage project vessel movements.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-27	Compliance with MCA MGN 654 (MCA, 2021) and its annexes where applicable.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-28	Appropriate marking of the Proposed Development (Offshore) on Admiralty and aeronautical charts. This will include provision of the positions and heights of structures to the UKHO, Civil Aviation Authority (CAA), MoD and Defence Geographic Centre (DGC).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-29	The construction area will be buoyed, as described in the NSP. Buoyage will be defined in consultation with the NLB.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-30	Marine navigation marking and lighting of the Proposed Development (Offshore), as described in the LMP, will be defined in agreement with NLB and in line with IALA Recommendation G1162 Ed 1.1 (IALA, 2022).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

Code	Mitigation Measure	Securing Mechanism
M-31	Compliance with regulatory expectations on moorings for floating wind and marine devices (Health and Safety Executive (HSE) and MCA, 2017).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for Caledonia South.
M-104	The VMP will include consideration of towing operations for floating WTGs.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for Caledonia South.
M-105	The Applicant will liaise with the MCA and NLB pre-installation of mooring lines and dynamic cables to confirm available clearance and to determine if any additional mitigation is required.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for Caledonia South.

9.6 Key Parameters for Assessment

9.6.1.1 Volume 1, Chapter 3: Proposed Development Description (Offshore) details the parameters of the Proposed Development (Offshore) using the Rochdale Envelope approach. This section identifies those parameters during construction, O&M and decommissioning relevant to potential impacts on Shipping and Navigation.

9.6.1.2 The worst case assumptions with regard to Shipping and Navigation are summarised in Table 9–13.

9.6.1.3 Decommissioning is likely to occur over a similar timespan and utilise a similar number of vessels as that of the construction phase. Thus, the worst-case scenario presented for the construction phase in Table 9–13 is representative of the worst-case scenario considered for the Decommissioning phase.

Table 9–13: Worst Case Assessment Scenario Considered for Each Impact as Part of the Assessment of Likely Significant Effects.

Potential Impact	Assessment Parameter	Explanation
Construction		
Impact 1: Vessel displacement	Construction period of up to six years with a potential five year gap between phases (including one year of pre-construction activities; e.g., UXO and Boulder Clearance). **Construction of:** ▪ 140 WTGs; o 39 floating semi-submersible WTGs with sea surface dimensions of 102m × 96.7m; o 101 bottom-fixed WTGs with sea surface dimensions of 24m x 24m; ▪ Minimum spacing of 944m between WTGs; ▪ Four OSPs with topside dimensions of 55m x 45m. ▪ 140 inter-array cables of 353.7nm (655km) combined length; ▪ Two interconnector cables of 32.4nm (60km) combined length; ▪ Four offshore export cables of 178.2nm (330km) combined length; ▪ 500m safety zones during installation (50m safety zones around partially complete structures or complete structures); and ▪ 25 vessels on-site simultaneously and 3,992 vessel movements.	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, including during adverse weather.
Impact 2: Increased third party vessel to vessel collision risk	Construction period of up to six years with a potential five year gap between phases (including one year of pre-	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the

Potential Impact	Assessment Parameter	Explanation
	construction activities; e.g., Unexploded Ordnance (UXO) and Boulder Clearance). **Construction of:** ▪ 140 WTGs; o 39 floating semi-submersible WTGs with sea surface dimensions of 102m × 96.7m; o 101 bottom-fixed WTGs with sea surface dimensions of 24m x 24m; ▪ Four OSPs with topside dimensions of 55m x 45m; ▪ 140 inter-array cables of 353.8nm (655km) combined length; ▪ Two interconnector cables of 32.4nm (60km) combined length; ▪ Four offshore export cables of 178.2nm (330km) combined length; ▪ Buoyed construction area encompassing the maximum extent of the Caledonia OWF; ▪ 500m safety zones during installation (50m safety zones around partially complete structures or complete structures); ▪ Temporary ancillary equipment within buoyed construction area (e.g., mooring buoys); and ▪ 25 vessels on-site simultaneously and 3,992 vessel movements.	maximum spatial and temporal effect on vessel displacement and subsequent vessel to vessel collision risk.
Impact 3: Increased third party vessel to project vessel collision risk	Refer to Impact 2.	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

Potential Impact	Assessment Parameter	Explanation
		involving a third-party vessel and a project vessel.
Impact 4: Vessel to structure allision risk	Construction period of up to six years with a potential five year gap between phases (including one year of pre-construction activities; e.g., UXO and Boulder Clearance). **Construction of:** ▪ 140 WTGs; o 39 floating semi-submersible WTGs with sea surface dimensions of 102m × 96.7m; o 101 bottom-fixed WTGs with sea surface dimensions of 24m x 24m; ▪ Minimum spacing of 944m between WTGs; ▪ Four OSPs with topside dimensions of 55m x 45m; ▪ 500m safety zones during installation (50m safety zones around partially complete structures or complete structures); and ▪ 25 vessels on-site simultaneously with up to 3,992 vessel movements.	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.
Impact 5: Reduced access to local ports	Refer to Impact 2.	Greatest number of vessels on-site simultaneously, greatest extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on reduced access to local ports.
Impact 6: Reduction of under keel clearance	Construction period of six years with a potential five year gap between phases (including one year of pre-construction activities; e.g., UXO and Boulder Clearance).	Largest possible extent of sub-sea infrastructure and greatest duration resulting in the maximum spatial and

Potential Impact	Assessment Parameter	Explanation
	Construction of: ▪ 140 inter-array cables of 353.7nm (655km) combined length (this includes dynamic sections of inter-array cables for floating structures); ▪ Two interconnector cables of 32.4nm (60km) combined length; ▪ Four offshore export cables of 178.2nm (330km) combined length; ▪ Six mooring lines per floating WTG; ▪ 20 crossings for the inter-array cables; ▪ Four crossings for the interconnector cables; ▪ 16 crossings for the offshore export cables; and ▪ Protection for inter-array, interconnector and offshore export cables (including crossings) of 1.5m height.	temporal effect on under keel clearance.
Impact 7: Loss of station	Construction period of up to six years with a potential five year gap between phases. **Construction of:** ▪ 39 floating semi-submersible WTGs with sea surface dimensions of 102m × 96.7m; and ▪ Six mooring lines per floating WTG.	Largest possible extent of floating infrastructure and greatest duration resulting in the maximum spatial and temporal effect on loss of station.
Impact 8: Reduction of SAR capabilities	Refer to Impact 1.	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	Assessment Parameter	Explanation
Operation and Maintenance		
Impact 9: Vessel displacement	Maximum operational life of 35 years. **Operation of:** ▪ 140 WTGs; o 39 floating semi-submersible WTGs with sea surface dimensions of 102m × 96.7m; o 101 bottom-fixed WTGs with sea surface dimensions of 24m x 24m; ▪ Minimum spacing of 944m between WTGs; ▪ Four OSPs with topside dimensions of 55m x 45m; ▪ 500m safety zones during major maintenance; ▪ Three vessels on-site simultaneously during routine operations; ▪ 25 vessels on-site simultaneously during major works; and ▪ 938 vessel movements annually.	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, including during adverse weather.
Impact 10: Increased third party vessel to vessel collision risk	Maximum operational life of 35 years. **Operation of:** ▪ 140 WTGs: o 39 floating semi-submersible WTGs with sea surface dimensions of 102m × 96.7m; o 101 fixed WTGs with sea surface dimensions of 24m x 24m; ▪ Four OSPs with topside dimensions of 55m x 45m. ▪ 140 inter-array cables of 353.7nm (655km) combined length; ▪ Two interconnector cables of 32.4nm (655km) combined length;	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.

Potential Impact	Assessment Parameter	Explanation
	▪ Four offshore export cables of 178.2nm (330km) combined length; ▪ 500m safety zones during major maintenance; ▪ Three vessels on-site simultaneously during routine operations; ▪ 25 vessels on-site simultaneously during major works; and ▪ 938 vessel movements annually.	
Impact 11: Increased third party vessel to project vessel collision risk	Refer to Impact 10.	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.
Impact 12: Vessel to structure allision risk	Maximum operational life of 35 years. **Operation of:** ▪ 140 WTGs; o 39 floating semi-submersible WTGs with sea surface dimensions of 102m × 96.7m; o 101 fixed WTGs with sea surface dimensions of 24mx24m; ▪ Minimum spacing of 944m between WTGs; ▪ Four OSPs with topside dimensions of 55m x 45m; ▪ 500m safety zones during major maintenance; ▪ Three vessels on-site simultaneously during routine operations; ▪ 25 vessels on-site simultaneously during major works; and	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	Assessment Parameter	Explanation
	▪ 938 vessel movements annually.	
Impact 13: Reduced access to local ports	Refer to Impact 10.	Greatest number of vessels on-site simultaneously, greatest extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on reduced access to local ports.
Impact 14: Reduction of under keel clearance	Maximum operational life of 35 years. **Operation of:** ▪ 140 inter-array cables of 353.7nm (655km) combined length (this includes dynamic sections of inter-array cables for floating structures); ▪ Two interconnector cables of 32.4nm (60km) combined length; ▪ Four offshore export cables of 178.2nm (330km) combined length; ▪ Six mooring lines per floating WTG; ▪ 20 crossings for the inter-array cables; ▪ Four crossings for the interconnector cables; ▪ 16 crossings for the offshore export cables; and ▪ Protection for inter-array, interconnector and offshore export cables (including crossings) of 1.5m height.	Largest possible extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on under keel clearance.
Impact 15: Anchor interaction with sub-sea cables and mooring lines	Maximum operational life of 35 years. **Operation of:** ▪ Six mooring lines per floating WTG; ▪ 140 inter-array cables of 353.7nm (655km) combined length;	Largest possible extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on anchor interaction with subsea cables.

Potential Impact	Assessment Parameter	Explanation
	▪ Two interconnector cables of 32.4nm (60km) combined length; ▪ Four offshore export cables of 178.2nm (330km) combined length; ▪ 20 crossings for the inter-array cables; ▪ Four crossings for the interconnector cables; ▪ 16 crossings for the offshore export cables; and ▪ Protection for inter-array, interconnector and offshore export cables (including crossings) of 1.5m height.	
Impact 16: Loss of station	Maximum operational life of 35 years. **Operation of:** ▪ 39 floating semi-submersible WTGs with sea surface dimensions of 102m×96.7m; and ▪ Six mooring lines per floating WTG.	Largest possible extent of floating infrastructure and greatest duration resulting in the maximum spatial and temporal effect on loss of station.
Impact 17: Reduction of SAR capabilities	Refer to Impact 9.	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.
Decommissioning		
Impact 18: Vessel displacement	The worst-case scenario will be equal to (or less than) that of the construction phase. Refer to Impact 1.	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 during adverse weather. Decommissioning

Potential Impact	Assessment Parameter	Explanation
		impact is assumed to be no more than construction.
Impact 19: Increased third party vessel to vessel collision risk	The worst-case scenario will be equal to (or less than) that of the construction phase. Refer to Impact 2.	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. Decommissioning impact is assumed to be no more than construction.
Impact 20: Increased third party vessel to project vessel collision risk	The worst-case scenario will be equal to (or less than) that of the construction phase. Refer to Impact 3.	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. Decommissioning impact is assumed to be no more than construction.
Impact 21: Vessel to structure allision risk	The worst-case scenario will be equal to (or less than) that of the construction phase. Refer to Impact 4.	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. Decommissioning impact is assumed to be no more than construction.

Potential Impact	Assessment Parameter	Explanation
Impact 22: Reduced access to local ports	The worst-case scenario will be equal to (or less than) that of the construction phase. Refer to Impact 5.	Greatest number of vessels on-site simultaneously, greatest extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on reduced access to local ports. Decommissioning impact is assumed to be no more than construction.
Impact 23: Loss of station	The worst-case scenario will be equal to (or less than) that of the construction phase. Refer to Impact 7.	Largest possible extent of floating infrastructure and greatest duration resulting in the maximum spatial and temporal effect on loss of station. Decommissioning impact is assumed to be no more than construction.
Impact 24: Reduction of SAR capabilities	The worst-case scenario will be equal to (or less than) that of the construction phase. Refer to Impact 8.	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. Decommissioning impact is assumed to be no more than construction.

9.7 Potential Effects

9.7.1 Construction

Impact 1: Vessel Displacement

9.7.1.1 Construction activities associated with the Proposed Development (Offshore) may displace existing vessel routes or activity, which may be more prevalent during periods of adverse weather.

9.7.1.2 These two related elements are each considered in the subsequent assessment in terms of frequency of occurrence and severity of consequence.

Vessel Displacement

Qualification of Risk

9.7.1.3 Vessel traffic data collected during the winter and summer 2023 surveys have been used to establish the vessel traffic baseline, alongside 12 months of AIS collected via coastal receivers between November 2022 and October 2023. These vessel traffic datasets have been validated by Anatec's ShipRoutes database, and analysed to identify the volume of traffic passing within or in proximity to the Caledonia OWF. Additionally, main routes were recognised from these datasets using the principles set out in MGN 654 (MCA, 2021[7]) (see Section 9.4.3.31).

9.7.1.4 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 within the buoyed construction area, therefore some main route deviations will be required. It is noted that Tidal Transit, who provide offshore transport services, responded to the regular operators outreach (see Section 9.3) stating they may choose to transit internally within the Caledonia OWF if it is allowable to save fuel or energy. On this basis, smaller commercial vessel operators may choose to transit through (noting Tidal Transit vessels are small wind farm crew transfer vessels (below 28m in length), and were recorded working between Wick and Beatrice OWF), however it is likely that the majority of commercial vessels will deviate in line with other developments.

9.7.1.6 The full methodology for classifying main route deviations is provided in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment), noting it is in line with MGN 654 (MCA, 2021[7]). A deviation will be required for three of the 10 main routes identified within the Shipping and Navigation study area, with details as follows:

- Route 5 (Pentland Firth to East England) – eight vessels per week, deviation of 0.6nm (1%). Vessels on this route will likely pass further east to increase passing distance from the Caledonia OWF leading to a minor deviation;
- Route 6 (Pentland Firth to East Scotland) – six vessels per week, deviation of 0.7nm (1%). Vessels on this route will also likely pass further east to increase passing distance from the Caledonia OWF leading to a minor deviation; and
- Route 7 (Fraserburgh – Moray East OWF) – six vessels per week, deviation of 0.1nm (<0.3%). Vessels on this route will likely pass further south to increase passing distance from the Caledonia OWF leading to a minor deviation.

9.7.1.7 These all represent relatively low magnitude of deviations, which aligns with feedback received during consultation including at the Hazard Workshop (see Section 9.3).

9.7.1.8 Regular routeing involving RoRo vessels was identified within the vessel traffic datasets and was attributed to Smyril Line and Serco NorthLink Ferries, both of which were observed to transit within the Shipping and Navigation study area every one to two days. Smyril Line vessels were noted to intersect the Proposed Development (Offshore); however, during consultation, Smyril Line stated that there would not be any issues or concern with deviating to the east of the Proposed Development (Offshore).

9.7.1.9 Regular routeing of Roll-on/Roll-off passenger (RoPax) vessels operated by Serco NorthLink Ferries was also noted within the vessel traffic data. Route deviation was also deemed unnecessary for these regular journeys due to the distance from the Caledonia OWF. Serco NorthLink confirmed during consultation that they had no concerns with impacts on their regular routeing.

9.7.1.10 It is noted that certain transits from NorthLink Ferries were observed to intersect the Caledonia OWF. Consultation with NorthLink confirmed these transits were during adverse weather. Vessel displacement during adverse weather is considered in the relevant impact below.

9.7.1.11 Based on experience at previously under construction OWFs, it is anticipated that fishing vessels and recreational vessels may also 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. However, they may be more likely to do so than commercial vessels, in particular in any areas of the Caledonia OWF where active construction is not ongoing, or structures are not yet present. Input received during the Hazard Workshop

from commercial fishing representatives was that (as for commercial vessels) only a minor deviation would be required for fishing vessels in transit and as such it is likely that such vessels will choose to deviate. Input from the RYA Scotland indicated that this would likely apply to recreational vessels as well, noting that it is of the skippers preference as to whether or not a transit is made through a wind farm.

9.7.1.12 For any smaller vessels that do choose to deviate, there is considered to be sufficient sea room outside of the Caledonia OWF for transits from such vessels to be accommodated, noting this aligns with general consensus from the Hazard Workshop. It is noted that displacement of active commercial fishing is assessed separately in Volume 2, Chapter 8: Commercial Fisheries.

9.7.1.13 Given the east and west routeing of commercial vessels across the Caledonia OECC, installation activities associated with the offshore export cables will likely lead to vessel displacement. However, any associated displacement will be temporary in nature and spatially limited to the area immediately around the installation vessel position. Considering embedded mitigation measures such as promulgation of information, any displacement as a result of cable installation will be minor and manageable with appropriate passage planning.

9.7.1.14 The main consequences of vessel displacement will be increased journey times and distances for affected third party vessels, under the assumption that the buoyed construction area will be deployed around the maximum extent of the Caledonia OWF. Any notable safety impacts are considered unlikely given the available sea room, noting this aligns with outputs of the Hazard Workshop. Vessels are expected to comply with international and flag state regulations (including COLREGs (IMO, 1972/77[1]) and SOLAS (IMO, 1974[2]) and will be able to passage plan in advance given the promulgation of information relating to the Proposed Development (Offshore) and relevant nautical charts.

9.7.1.15 Relevant embedded mitigation measures include DSLP approval (M-2), adherence to an LMP (M-14), adherence to an NSP (M-19), marking on nautical charts (M-28), and promulgation of information (M-21).

Frequency of Occurrence

9.7.1.16 The frequency of occurrence in relation to displacement of vessel traffic during the construction phase is considered **Frequent**.

Severity of Consequence

9.7.1.17 The severity of consequence in relation to displacement of vessel traffic during the construction phase is considered **Negligible**.

Significance of Effect

9.7.1.18 Taking the frequency of occurrence as frequent and the severity of consequence as negligible, the overall effect of vessel displacement during construction of the Proposed Development (Offshore) is considered to be tolerable.

9.7.1.19 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms**.

Vessel Displacement During Adverse Weather

Qualification of Risk

9.7.1.20 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.

9.7.1.21 Based on review of the input received, it is unlikely that commercial vessels would choose to make transit through the buoyed construction area during adverse weather conditions. Larger deviations may be required than during more favourable conditions (e.g., vessels may choose to increase passing distance from the buoyed construction area or transit inshore of the Moray Firth OWFs), however there is considered to be sufficient sea room to safely accommodate these chosen transits.

9.7.1.22 The long term vessel traffic data studied for the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment) showed the presence of transits within the Caledonia OWF undertaken by Serco NorthLink Ferries, further inshore of their typical routeing. Consultation with Serco NorthLink Ferries confirmed these transits were utilised during adverse weather conditions. The presence of the buoyed construction area may therefore impact Serco NorthLink adverse weather transits, with the potential for delays in sailings, a large deviation inshore of the Moray Firth OWFs, or sailing cancellation. However, as each historical transit is based upon individual Master decisions based upon the conditions and factors on the day, Serco NorthLink have confirmed that the impact cannot be quantified (i.e., it cannot be confirmed whether any given historical transit would have been delayed, deviated or cancelled).

9.7.1.23 The Applicant engaged with Serco NorthLink ferries throughout the NRA process, and this engagement culminated in the Applicant proposing a Structure Exclusion Zone (SEZ) on the eastern boundary of the Caledonia OWF within which no surface piercing infrastructure will be placed for the purposes of increasing searoom and optionality for Serco NorthLink ferries in adverse weather conditions. The SEZ was proposed to Serco NorthLink via a meeting on 12 August 2024. Feedback received was that the SEZ and

associated increase in searoom would be a significant positive for NorthLink adverse weather routeing, and also shipping and navigation in general.

9.7.1.24 There may still be works undertaken within the SEZ (e.g., cable installation), however any such impact would be temporary in nature and spatially limited to the area around the operation. The placement of the buoyed construction area will be agreed with NLB as part of the LMP process (M-14) to ensure any impacts to shipping and navigation are managed.

9.7.1.25 From a navigational safety perspective, worst case consequences are an increase in delays, deviations or cancellation, however based upon Serco NorthLink feedback it is considered that the implementation of the SEZ reduces the risk to ALARP parameters noting frequency of the impact is reduced. Socioeconomic impacts are assessed in Volume 6, Chapter 2: Socioeconomics, Tourism and Recreation.

9.7.1.26 Full details of the assessment and consultation undertaken in relation to Serco NorthLink are provided in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment). The SEZ is illustrated in Figure 17.1 of the NRA, with coordinates of the SEZ provided in Table 9–14.

Table 9–14: Structure Exclusion Zone coordinates.

Point	Co-ordinates					
	Easting	Northing	DD Latitude	DD Longitude	DDM Latitude	DDM Longitude
1	534142.0769	6457516.0421	58.2574	-2.4182	58°15.444'N	2°25.092'W
2	539478.2685	6443317.1324	58.1294	-2.3297	58°7.766'N	2°19.781'W
3	541003.8019	6449861.5115	58.1881	-2.3026	58°11.285'N	2°18.158'W

Frequency of Occurrence

9.7.1.27 The frequency of occurrence relating to vessel displacement during periods of adverse weather during construction is considered to be **Remote**.

Severity of Consequence

9.7.1.28 The severity of consequence relating to vessel displacement during periods of adverse weather during construction is considered to be **Serious**.

Significance of Effect

9.7.1.29 Taking the frequency of occurrence as remote and the severity of consequence as serious, the overall effect of adverse weather during construction of the Proposed Development (Offshore) is considered to be tolerable.

9.7.1.30 Assuming the implementation of the SEZ, the impact is considered ALARP. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 2: Increased Third Party Vessel to Vessel Collision Risk

Qualification of Risk

9.7.1.31 As noted in relation to the impact of vessel displacement, three of 10 main routes will deviate as a result of the construction of the Proposed Development (Offshore). This will likely cause an increase in vessel density in proximity to the Proposed Development (Offshore), leading to a higher chance of vessel to vessel encounters and therefore a greater collision risk.

9.7.1.32 Based on pre OWF modelling, the baseline collision risk levels within the Shipping and Navigation study area are low, with an estimated vessel to vessel collision frequency of one every 520 years. This level of collision risk is due to the volume of traffic in the area relative to the available sea space, noting the presence of Moray East and Beatrice OWFs, as well as the under-construction Moray West OWF. Additionally, it is noted that no collisions occurring within the Shipping and Navigation study area were recorded within the MAIB over the most recent 20 years of data, nor were any responded to by the RNLI between 2010 and 2022.

9.7.1.33 Based on post OWF modelling, the collision frequency was estimated at one every 292 years, with the change primarily associated with vessels displaced east of the Caledonia OWF. This represents an increase of 78% on the pre OWF scenario. Although there is an increase in risk, it should be considered that a conservative approach has been undertaken within the modelling process in the NRA, with an assumption made that vessel routeing will remain in proximity to the north eastern boundary of the Caledonia OWF. In reality it is likely that vessels will deviate to use more of the available sea space offshore of the Caledonia OWF. This aligns with general stakeholder consensus of the Hazard Workshop which indicated that there is sufficient post wind farm sea room available to safely accommodate the likely number of users.

9.7.1.34 For the Caledonia OECC, any displacement of commercial vessels due to installation activities is not anticipated to affect available sea room to such an extent that the risk of a collision between third party vessels is materially increased. This is due to the temporary nature of the installation process, and spatially limited extent of the operation at any given time.

9.7.1.35 An additional factor is the potential for installed or partially installed WTGs to obscure vessels from one another, thus hindering ability to comply with COLREGs (IMO, 1972/77[1]). Minimum spacing of 944m between WTGs will likely provide sufficient sea room for visual observations, with full obstruction likely only to occur when vessels are at opposite ends of a WTG row. Collision risk is likely to be low in such cases due to the distance between vessels and the avoidance of the buoyed construction area.

9.7.1.36 In the event of an encounter between third party vessels, it is likely to be localised and short in duration, with collision avoidance action implemented by the vessels involved, as per compliance with COLREGs (IMO, 1972/77[1]), to

ensure that a collision incident does not develop. This is supported by experience at previous under construction OWFs, where no collision incidents involving two third party vessels have been reported as a result of an OWF (as detailed in the NRA).

9.7.1.37 Historical collision incident data studied within the NRA also indicates that the most likely consequences will be low should a collision occur, with contact between the vessels resulting in minor damage and no injuries to persons, with the vessels involved able to resume their respective passages and undertake a full inspection at the next port.

9.7.1.38 As an unlikely worst-case scenario, a high impact collision event could occur. This may result in vessel foundering and subsequent Potential Loss of Life (PLL), as well as pollution. In such a circumstance, vessels associated with the Proposed Development (Offshore) may attend the incident under SOLAS obligations and in liaison with the MCA, and the procedures within the ERCoP and MPCP would be implemented.

9.7.1.39 Relevant embedded mitigation measures includes marking on nautical charts (M-28), clear buoyage to mark the construction area (M-29), promulgation of information (M-21), DSLP approval (M-2), adherence to an LMP (M-14), adherence to an MPCP (M-9), and adherence to an ERCoP (M-25).

Frequency of Occurrence

9.7.1.40 The frequency of occurrence in relation to encounters and collision risk between third party vessels during the construction phase is **Extremely Unlikely**.

Severity of Consequence

9.7.1.41 The severity of consequence in relation to encounters and collision risk between third party vessels during the construction phase is considered **Serious**.

Significance of Effect

9.7.1.42 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of third party vessel to vessel collision risk during construction of the Proposed Development (Offshore) is considered to be tolerable.

9.7.1.43 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 3: Increased Third Party Vessel to Project Vessel Collision Risk

9.7.1.44 The presence of vessels associated with construction activities of the Proposed Development (Offshore) may increase encounters and thus collision risk for vessels already operating in the area.

Qualification of Risk

9.7.1.45 During the construction phase of the Proposed Development (Offshore) there may be up to 3,992 vessel movements made by up to 25 project vessels on-site simultaneously. This will include vessels which are Restricted in Ability to Manoeuvre (RAM). It is assumed that construction vessels will be on-site throughout the entire duration of the construction phase.

9.7.1.46 Encounter and collision risk involving project vessels will be managed through the implementation of marine coordination with full details of this to be provided in the VMP and NSP. Project vessels will also be expected to carry AIS and comply with flag state regulations including the COLREGs (IMO, 1972/77[1]) and SOLAS (IMO, 1974[2]). COLREGs will remain the navigational priority for project vessels at all times.

9.7.1.47 Applications for safety zones of 500m around on-going construction activities will be sought during the construction phase and will protect deployed project vessels, especially if they are RAM. Minimum advisory passing distances and guard vessels, as defined by risk assessment, may also be implemented where safety zones do not apply, for example around cable installation vessels. Details of safety zones, minimum safe passing distances, and guard vessels will be promulgated including via Notifications to Mariners and Kingfisher Bulletins.

9.7.1.48 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 Caledonia OWF.

9.7.1.49 Third-party vessels may experience decreased capability to visually identify project vessels entering and exiting the Caledonia OWF during reduced visibility; however, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and the mandatory carriage of AIS by project vessels 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 Caledonia OWF may be impeded.

9.7.1.50 Based on historical incident data, there has been one instance of a third-party vessel colliding with a project vessel in the UK (see NRA in Volume 7B, Appendix 9-1: Navigational Risk Assessment for further details). In this case, moderate vessel damage was reported with no harm to persons. It is noted that the incident occurred in 2011, 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.

9.7.1.51 If an encounter between a project vessel and third party vessel occurs, it is likely to be localised and short in duration. Assuming the implementation of collision avoidance action as required by the COLREGs, the most likely

outcome will be any vessels involved being able to resume their respective passages or activities with no long-term consequences.

9.7.1.52 In the event of a collision, the likely consequences will be minor contact between the vessels resulting in minor damage and no injuries to persons. As an unlikely worst-case scenario, foundering could occur resulting in PLL and pollution. Other project vessels may be able to assist in the event of a collision under SOLAS obligation and the adherence to the ERCoP, noting this would be done in liaison with the MCA. If pollution were to occur in proximity to the Proposed Development (Offshore) or involving a project vessel, the MPCP will be implemented to minimise the risks.

9.7.1.53 Relevant embedded mitigation measures include application for safety zones (M-23), a buoyed construction area (M-29), guard vessels as required by risk assessment (M-23), DSLP approval (M-2), adherence to an LMP (M-14), VMP (M-13), and NSP (M-19), MPCP (M-9), ERCoP (M-25), promulgation of information (M-21), marine coordination (M-26), and marking on nautical charts (M-28).

Frequency of Occurrence

9.7.1.54 The frequency of occurrence in relation to encounters and collision risk between project vessels and third party vessels during the construction phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.1.55 The severity of consequence in relation to encounters and collision risk between project vessels and third party vessels during the construction phase is considered to be **Serious**.

Significance of Effect

9.7.1.56 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of encounters and collision risk between project vessels and third party vessels during construction of the Proposed Development (Offshore) is considered to be tolerable.

9.7.1.57 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 4: Vessel to Structure Allision Risk

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

9.7.1.59 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.

Powered Allision Risk

Qualification and Quantification of Risk

9.7.1.60 Based on quantitative assessment undertaken in the NRA (see Volume 7B, Appendix 9-1: Navigational Risk Assessment), the base case annual powered vessel to structure allision frequency was estimated to be $2.9x10^{-3}$, corresponding to a return period of one every 341 years. This is reflective of the volume of traffic within the available sea room, noting that the NRA has conservatively assumed that vessels will not use the full available sea room offshore of the Caledonia OWF. In reality, it is likely that vessels will increase passing distance from the Caledonia OWF, noting this aligns with feedback received at the Hazard Workshop, where general consensus was that there was sufficient sea room to accommodate likely users.

9.7.1.61 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. These allisions resulted in minor to moderate damage to the vessels with minor injury to crew members.

9.7.1.62 Temporary marine lighting and marking will be implemented including the buoyed construction area in agreement with the NLB. Promulgation of information and marking on charts will ensure vessels can passage plan in advance to minimise risk. Safety zones of 50m in radius around structures will also be applied for during the construction phase up until the point of commissioning of the Proposed Development (Offshore) (rising to 500m where active construction is ongoing).

9.7.1.63 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 Caledonia OWF. 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 founder resulting in PLL and pollution. Project vessels may assist in the event of an allision under SOLAS obligation and the adherence to the ERCoP, in line with the MCA. If pollution were to occur, then the MPCP will be implemented to minimise the environmental risk.

9.7.1.64 Relevant embedded mitigation measures include DSLP approval (M-2), adherence to a MPCP (M-9), adherence to an LMP (M-14), adherence to an NSP (M-19), promulgation of information (M-21), application for safety zones (M-23), adherence to an ERCoP (M-25), guard vessels where required by risk assessment (M-23), and appropriate marking via construction buoyage (M-29) as well as on nautical charts (M-28).

Frequency of Occurrence

9.7.1.65 The frequency of occurrence in relation to powered vessel to structure allision risk during the construction phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.1.66 The severity of consequence in relation to powered vessel to structure allision risk during the construction phase is considered to be **Moderate**.

Significance of Effect

9.7.1.67 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of powered vessel to structure allision risk during construction of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.1.68 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Drifting Allision Risk

Qualification and Quantification of Risk

9.7.1.69 Based on quantitative assessment undertaken in Volume 7B, Appendix 9-1: Navigational Risk Assessment, the base case annual drifting vessel to structure allision frequency was estimated to be $2.5x10^{-4}$, corresponding to a return period of one every 4,045 years.

9.7.1.70 Based on historical incident data, there have been no instances of a third-party vessel alliding with an under-construction 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 Proposed Development (Offshore) which indicates that machinery failure is the most common incident type (approximately 50%) in the 2012-2021 dataset, noting that only two were recorded. 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 or in close proximity to the Caledonia OWF and the direction of the wind and/or tide directs the vessel towards a structure. Promulgation of information and marking on charts will help mitigate the risks of a drifting allision.

9.7.1.71 In circumstances where a vessel drifts towards a structure in the Caledonia OWF, 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 Caledonia OWF (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).

9.7.1.72 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[2]). 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.

9.7.1.73 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, PLL, 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. Project vessels may assist in the event of an allision under SOLAS obligation and the adherence to the ERCoP, in line with the MCA. 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.

9.7.1.74 Relevant embedded mitigation measures include adherence to an ERCoP (M-25), adherence to an MPCP (M-9), marking on nautical charts (M-28), and project vessel compliance with SOLAS (IMO, 1974) (M-27).

Frequency of Occurrence

9.7.1.75 The frequency of occurrence in relation to drifting vessel to structure allision risk during the construction phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.1.76 The severity of consequence in relation to drifting vessel to structure allision risk during the construction phase is considered to be **Moderate**.

Significance of Effect

9.7.1.77 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of drifting vessel to structure allision risk during construction of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.1.78 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Internal Allision Risk

Qualification and Quantification of Risk

9.7.1.79 As noted previously, based on experience at previously under-construction OWFs, it is anticipated that commercial vessels will be unlikely to navigate internally within the Caledonia OWF. Fishing and recreational vessels may be more likely to transit through noting they may choose not to depending on various conditions. They may be less likely to navigate within a site which hosts floating wind farm structures due to the presence of mooring lines and dynamic cables.

9.7.1.80 The base case fishing vessel to structure allision frequency is estimated to be $2.9x10^{-1}$, corresponding to a return period of approximately one in 3.5 years. This return period is reflective of the volume of fishing vessel traffic in the Shipping and Navigation study area, both in transit and engaged in active fishing. Conservative modelling has been undertaken with the assumption that fishing levels in proximity to the WTGs will not change. In reality fishing vessels will account for the presence of the WTGs, and may choose to transit or fish elsewhere, noting this aligns with feedback received during the Hazard Workshop.

9.7.1.81 The worst-case consequences reported for vessels involved in an allision incident involving a UK OWF has been flooding, with no life-threatening injuries to persons reported (the model is calibrated against known reported incidents). If an allision incident were to occur, project vessels may assist under obligation of SOLAS (IMO, 1974[2]) and adherence to the ERCoP. Additionally, if pollution occurs as a result of an allision incident, the MPCP would be implemented where appropriate.

9.7.1.82 If a vessel chooses to transit within the Caledonia OWF, the minimum spacing of 944m between wind farm structures is considered sufficient for safe internal navigation. Furthermore, application for safety zones around construction activities, as well as the buoyed construction area and temporary lighting and marking provides mitigation against internal allision risk. Any vessel planning to transit through the Caledonia OWF is expected to passage plan in advance in accordance with SOLAS Chapter V (IMO, 1974[2]) and promulgation of information including through ongoing liaison with fishing fleets via an appointed Fisheries Liaison Officer (FLO) to ensure that such vessels have good awareness of the Proposed Development (Offshore).

9.7.1.83 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, 2022[9]) 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.

9.7.1.84 Relevant embedded mitigation measures include application for safety zones (M-23), buoyed construction area (M-29), DSLP approval (M-2), adherence to an LMP (M-14), marking on nautical charts (M-28), promulgation of information (M-21), adherence to an ERCoP (M-25), adherence to an MPCP (M-9), appointment of a FLO and adherence to an FMMS (M-17).

Frequency of Occurrence

9.7.1.85 The frequency of occurrence of internal vessel to structure allision risk during the construction phase is considered to be **Remote**.

Severity of Consequence

9.7.1.86 The severity of consequence of internal vessel to structure allision risk during the construction phase is considered to be **Moderate**.

Significance of Effect

9.7.1.87 Taking the frequency of occurrence as remote and the severity of consequence as moderate, the overall effect of internal vessel to structure allision risk during construction of the Proposed Development (Offshore) is considered to be tolerable.

9.7.1.88 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and ALARP and Not Significant in EIA terms.**

Impact 5: Reduced Access to Local Ports

Qualification of Risk

9.7.1.89 Up to 3,992 vessel movements made by construction vessels (excluding site preparation activities) may be made throughout the construction phase 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 (IMO 1972/77[1]).

9.7.1.90 The closest port or harbour to the Caledonia OWF is Wick Harbour, located approximately 13.2nm to the northwest. Banff Harbour is located approximately 20nm to the south. 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.

9.7.1.91 For offshore cable installation activity, there is a greater likelihood of impact on port access given the proximity to Whitehills Harbour and Marina which is located in proximity to the Landfall Site. Additionally, the Landfall Site lies in

proximity to approaches to Banff and Macduff harbours, which are located at their closest approximately 2.3nm southeast of the Caledonia OECC.

9.7.1.92 Where cable installation is ongoing, vessel displacement is possible. Recreational vessels may be particularly sensitive given that the RYA Scotland has indicated that Whitehills Marina is a key stopping point for vessels travelling north as well as along the northeast coast. No concerns were raised during consultation over access to ports during the construction phase in relation to the Caledonia OWF nor the offshore export cables. Additionally, offshore export cable installation activities will likely be short-term in duration and localised at any given time, thus any reduced access will likely be minor and temporary. Regardless, liaison in advance of and during installation is considered necessary with the Whitehills, Banff, and Macduff harbour authorities based on proximity to the Caledonia OECC. It is noted that no known issues have been raised regarding the installation or operation of Moray East OWF offshore export cables, the landfall of which is situated approximately 1nm east of the Caledonia OECC.

9.7.1.93 The most likely consequences are increased journey times and distances, as per the vessel displacement impact. There is only one pilot boarding station nearby, at Macduff and outside of the Caledonia OECC, where the service is not compulsory. However, the charted anchorage is adjacent to the Caledonia OECC, and therefore liaison may be needed with local harbour authorities depending on the final cable routeing.

9.7.1.94 Relevant embedded mitigation measures includes clear buoyage of the construction area (M-29), adherence to an LMP (M-14), adherence to a VMP (M-13), marine coordination of project vessels (M-26), marking on nautical charts (M-28), and promulgation of information (M-21).

Frequency of Occurrence

9.7.1.95 The frequency of the risk of reduced access to local ports during the construction phase is considered to be **Reasonably Probable**.

Severity of Consequence

9.7.1.96 The severity of consequence of the risk of reduced access to local ports during the construction phase is considered to be **Minor**.

Significance of Effect

9.7.1.97 Taking the frequency of occurrence as reasonably probable and the severity of consequence as minor, the overall effect of reduced port access during construction of the Proposed Development (Offshore) is considered to be tolerable.

9.7.1.98 Assuming liaison with the Whitehills, Banff, and Macduff harbour authorities in advance of and during installation, the impact is considered ALARP. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 6: Reduction of Under Keel Clearance

9.7.1.99 The presence of subsea cables and mooring lines may reduce under keel clearance during the construction phase of the Proposed Development (Offshore).

Qualification of Risk

9.7.1.100 There may be up to six mooring lines per floating WTG used to secure the substructures to the seabed, and use of subsea cabling. During the construction phase, such components may be wet stored within the Caledonia OWF or Caledonia OECC prior to attachment to the substructures noting at this stage it is likely that only the offshore export cables may be wet stored.

9.7.1.101 Taking into consideration the baseline and anticipated post wind farm vessel routeing, it is considered highly unlikely that a commercial vessel would pass within the buoyed construction area. Though fishing and recreational vessels are more likely to transit in proximity to the buoyed construction area compared to commercial vessels, these vessels are smaller and tend to have lower draughts.

9.7.1.102 The buoyed construction area will be appropriately marked on nautical charts and other electronic charts as appropriate to increase awareness. It was raised at the Hazard Workshop that making the locations of mooring lines and dynamic cables available to fishing vessels was a key mitigation. Locations of relevant infrastructure will be provided in the weekly notices distributed during the construction phase as per the FMMS (M-17).

9.7.1.103 There is limited experience of deployment of floating offshore wind projects in UK waters; however, to date there have been no reported under keel interactions between passing vessels and the components associated with such projects.

9.7.1.104 In line with MGN 654 (MCA, 2021[7]), water depths will not be reduced by more than 5% without prior agreement with the MCA. Further, wet storage plans will be included in the Construction Method Statement which will be required to be approved by MD-LOT in consultation with the MCA.

9.7.1.105 The most likely consequences of reduced under keel clearance is that a vessel transits over an area of reduced clearance but does not make contact.

9.7.1.106 Should an underwater allision occur, minor damage incurred is the most likely consequence, with foundering or grounding of the vessel resulting in PLL and pollution as an unlikely worst-case. Should pollution occur, the MPCP (M-9) will be implemented, with adherence to the ERCoP (M-25) in the case of risk of PLL, as well as under SOLAS (IMO, 1974) obligations (M-27).

9.7.1.107 Other relevant embedded mitigation measures include promulgation of information and any potential under keel interaction risk (M-21), including via the FLO (M-17). The location of the buoyed construction area (M-29) will be clearly shown on appropriate nautical charts (M-28).

Frequency of Occurrence

9.7.1.108 The frequency of occurrence in relation to reduction of under keel clearance during the construction phase is considered **Extremely Unlikely**.

Severity of Consequence

9.7.1.109 The severity of consequence in relation to reduction of under keel clearance during the construction phase is considered **Serious**.

Significance of Effect

9.7.1.110 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of reduced under keel clearance during the construction phase of the Proposed Development (Offshore) is considered to be tolerable. Assuming the implementation of ensuring locations of subsea infrastructure are made available to fishing vessels including via FLO liaison the hazard is considered **Tolerable with mitigation and ALARP and therefore Not Significant in EIA terms**

Impact 7: Loss of Station

9.7.1.111 The floating substructures may suffer loss of station in the event that the mooring system fails, or there is damage to tow during WTG towage for installation. This may become a floating hazard to passing vessels. This impact is only relevant to the floating WTGs within the Caledonia OWF, and thus there will be no risk of this impact from the Caledonia OECC.

Qualification of Risk

9.7.1.112 The MCA require under their Regulatory Expectations on Moorings for Floating Wind and Marine Devices (HSE and MCA, 2017[13]) that developers arrange TPV of the mooring systems by an independent and competent person/body. The Regulatory Expectations state that TPV is a "continuous activity" and that should there be any modifications to a system or if new information becomes available with regard to its reliability, additional TPV would be required.

9.7.1.113 The Regulatory Expectations also require the provision of continuous monitoring either by Global Positioning System (GPS) or other suitable means. Each WTG should also have an alarm system in place, whereby an alert will be provided to the Marine Coordination Centre in the event that any floating substructure leaves a pre-defined ringfenced alarm zone. This means in the unlikely event that a floating substructure suffers total loss of station and drifts outside of its alarm zone, the Applicant would be made aware, and would be able to track its position and make the necessary emergency arrangements, which will depend upon the design of the substructure and any predefined emergency response protocols.

9.7.1.114 On the basis of compliance with the Regulatory Expectations, a loss of station is considered likely to represent a low frequency event. Noting that for a total loss of station, all moorings would be required to fail (each WTG will have a minimum of six), which is more likely to occur in extreme storm conditions,

during which it is unlikely vessels will be navigating within proximity to the WTGs.

9.7.1.115 Towing operations will be covered in the VMP (M-104). Any WTG towing operations will be subject to a dedicated internal risk assessment process undertaken prior to the tows occurring, once the full specifications of the operation is known. This risk assessment will cover all phases of the operations, including within port approach areas. During the tow, all vessels involved will be lit and marked as required under COLREGs (IMO, 1972/1977[1]).

9.7.1.116 Relevant embedded mitigation measures include compliance with regulatory expectations on moorings for floating wind and marine devices (HSE and MCA, 2017[13]) (M-31) and MGN 654 (M-27), adherence to a DSLP (M-2), promulgation of information (M-21), adherence to an ERCoP (M-25), compliance with international regulations (SOLAS; IMO, 1974[2]) (M-27), appropriate marking of the structures and adherence to an LMP (M-14).

Frequency of Occurrence

9.7.1.117 The frequency of occurrence relating to loss of station during the construction phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.1.118 The severity of consequence relating to loss of station during the construction phase is considered to be **Moderate**.

Significance of Effect

9.7.1.119 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of loss of station during the construction phase of the Proposed Development (Offshore) is considered to be **Broadly Acceptable and ALARP, and therefore Not Significant in EIA terms**.

Impact 8: Reduction of SAR Capabilities

9.7.1.120 The installation of structures as well as increased vessel activity and personnel numbers may reduce emergency response capabilities during the construction phase of the Proposed Development (Offshore) by increasing the number of incidents, increasing consequences or reducing access for the responders.

Qualification of Risk

9.7.1.121 The spatial extent of this impact is large given the area covered by the Caledonia OWF (123nm^2), as well as the distance covered by air-based SAR support (the SAR helicopter base is located at Inverness, 66nm southwest of the Caledonia OWF). It is unlikely that a SAR operation will require the entire Caledonia OWF to be searched, and it is probable that a search will be restricted to a smaller area in which a casualty is known to be located (accounting for assumptions on any potential drift of the casualty).

9.7.1.122 Up to 3,992 vessel movements may be made by construction vessels during the construction phase of the Proposed Development (Offshore). It is assumed that construction vessels will be on-site throughout the majority of the construction phase, although severe weather may lead to vessels being withdrawn. The presence of these vessels increase the likelihood of an incident and subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability. However, they may also be able to provide additional response resource in the event of an incident in liaison with the MCA.

9.7.1.123 The most likely consequence to occur would be a delay to any emergency response request. As an unlikely worst-case, this could result in a failure of emergency response to an incident resulting in PLL and pollution. However, project vessels will be managed via marine coordination and comply with flag state regulations which will minimise this risk. Additionally, the presence of project vessels themselves may mitigate this risk as they may self-help at incidents involving other project vessels under the obligation of SOLAS (IMO, 1974[2]) and adherence to an ERCoP, noting this would be undertaken with liaison with the MCA. The MPCP will also be implemented should pollution occur.

9.7.1.124 From recent SAR data, the frequency of helicopter SAR operations in proximity to the Proposed Development (Offshore) is one per year on average, with no SAR helicopter incidents occurring within the Caledonia OWF. The frequency of incidents in proximity to the Caledonia OWF is not anticipated to increase significantly 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 Caledonia OWF are facilitated. A SAR checklist will also be completed and agreed with the MCA.

9.7.1.125 Relevant embedded mitigation measures include DSLP approval (M-2), promulgation of information (M-21), adherence to an LMP (M-14), marking on appropriate charts (M-28), marine coordination of project vessels (M-26), adherence to an ERCoP (M-25), adherence to an MPCP (M-9), adherence to a VMP (M-13) and NSP (M-19), and compliance with MGN 654 and international marine regulations (M-27).

Frequency of Occurrence

9.7.1.126 The frequency of occurrence relating to the risk of reduced emergency response capabilities during the construction phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.1.127 The severity of consequence relating to the risk of reduced emergency response capabilities during the construction phase is considered to be **Serious**.

Significance of Effect

9.7.1.128 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of reduced emergency response capability during construction of the Proposed Development (Offshore) is considered to be tolerable.

9.7.1.129 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

9.7.2 Operation

Impact 9: Vessel Displacement

9.7.2.1 Operational activities associated with the Proposed Development (Offshore) as well as presence of structures throughout the lifetime of the Proposed Development (Offshore) may displace existing vessel routes or activity, which may be more prevalent during periods of adverse weather.

9.7.2.2 These two related elements are each considered in the subsequent assessment in terms of frequency of occurrence and severity of consequence.

Vessel Displacement

Qualification of Risk

9.7.2.3 Based on experience at existing operational OWFs and input during consultation, it is anticipated that the majority of commercial vessels will choose not to navigate within the Caledonia OWF, therefore some main route deviations will be required as per the respective construction phase impact. Based on previous consultation, smaller commercial vessel operators may choose to transit through; however, it is likely that the majority of commercial vessels will deviate in line with other operational OWFs.

9.7.2.4 As discussed in relation to the equivalent construction phase impact, a deviation will be required for three of the 10 main routes identified within the Shipping and Navigation study area; however, they all represent relatively low magnitude of deviations, which aligns with feedback received during consultation including at the Hazard Workshop (see Section 9.3). Further, deviations will be well established during the construction phase, with it being likely that commercial vessels will continue these same established deviations into the O&M phase.

9.7.2.5 Minimum spacing of 944m within the Caledonia OWF is considered sufficient to accommodate transits of smaller vessels, noting there will be no restrictions on entry into the Caledonia OWF with the exception of any active 500m major maintenance safety zones.

9.7.2.6 As discussed in relation to the equivalent construction phase impact, regular routeing involving RoRo vessels was identified within the vessel traffic

datasets, however these transits would either not be displaced by the Proposed Development (Offshore) or it has been indicated during consultation that the deviation would be minor and not pose a concern.

9.7.2.7 Based on experience at existing operational OWFs, it is anticipated that fishing vessels and recreational vessels may also choose not to routinely navigate internally within the Caledonia OWF. However, they may be more likely to do so than commercial vessels. As discussed in relation to the equivalent construction phase impact, input received during the Hazard Workshop from commercial fishing representatives was that only a minor deviation would be required for fishing vessels in transit and as such it is likely that such vessels will choose to deviate. The RYA Scotland indicated that this would likely apply to recreational vessels as well, noting that it is of the skippers preference as to whether or not a transit is made through a wind farm.

9.7.2.8 For any smaller vessels that do choose to deviate, there is considered to be sufficient sea room outside of the Caledonia OWF for transits from such vessels to be accommodated, noting this aligns with general consensus from the Hazard Workshop. It is noted that displacement of active commercial fishing is assessed separately in Volume 2, Chapter 8: Commercial Fisheries.

9.7.2.9 Given that any O&M activities associated with the Proposed Development (Offshore) will be infrequent and localised, the likelihood of vessel displacement due to these activities is considered to be very low.

9.7.2.10 The main consequences of vessel displacement will be increased journey times and distances for affected third party vessels, under the assumption that the WTGs will be built to the full extent of the Caledonia OWF. Any notable safety impacts are considered unlikely given the available sea room, noting this aligns with outputs of the Hazard Workshop. Vessels are expected to comply with international and flag state regulations (including COLREGs (IMO, 1972/77[1]) and SOLAS (IMO, 1974[2]) and will be able to passage plan in advance given the promulgation of information relating to the Proposed Development (Offshore) and relevant nautical charts.

9.7.2.11 Relevant embedded mitigation measures include DSLP approval (M-2), adherence to an LMP (M-14), adherence to an NSP (M-19), marking on nautical charts (M-28), and promulgation of information (M-21).

Frequency of Occurrence

9.7.2.12 The frequency of occurrence in relation to displacement of vessel traffic during the O&M phase is considered **Frequent**.

Severity of Consequence

9.7.2.13 The severity of consequence in relation to displacement of vessel traffic during the O&M phase is considered **Negligible**.

Significance of Effect

9.7.2.14 Taking the frequency of occurrence as frequent and the severity of consequence as negligible, the overall effect of vessel displacement during O&M of the Proposed Development (Offshore) is considered to be tolerable.

9.7.2.15 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Vessel Displacement During Adverse Weather

9.7.2.16 As discussed within the equivalent construction phase impact, adverse weather can severely affect a vessels journey, with the impact of this dependent on various factors including specific vessel parameters such as hull geometry or vessel size.

9.7.2.17 Based on review of the input received, it is likely that no commercial vessels would choose to make transit through the Caledonia OWF during adverse weather conditions. Larger deviations may be required than during more favourable conditions (e.g., vessels may choose to increase passing distance from the Caledonia OWF or transit inshore of the Moray Firth OWFs); however, there is considered to be sufficient sea room to safely accommodate the chosen transits.

9.7.2.18 The long term vessel traffic data studied for the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment) showed the presence of transits within the Caledonia OWF undertaken by Serco NorthLink Ferries, further inshore of their typical routeing. Consultation with Serco NorthLink Ferries confirmed these transits were utilised during adverse weather conditions. The presence of structures within the Caledonia OWF may therefore impact Serco NorthLink adverse weather transits, with the potential for delays in sailings, a large deviation inshore of the Moray Firth OWFs, or sailing cancellation. However, as each historical transit is based upon individual Master decisions based upon the conditions and factors on the day, Serco NorthLink have confirmed that the impact cannot be quantified (i.e., it cannot be confirmed whether any given historical transit would have been delayed, deviated or cancelled).

9.7.2.19 The Applicant engaged with Serco NorthLink ferries throughout the NRA process, and this engagement culminated in the Applicant proposing a SEZ on the eastern boundary of the Caledonia OWF within which no surface piercing infrastructure will be placed for the purposes of increasing searoom and optionality for Serco NorthLink ferries in adverse weather conditions. The SEZ was proposed to Serco NorthLink via a meeting on 12th August 2024. Feedback received was that the SEZ and associated increase in searoom would be a significant positive for NorthLink adverse weather routeing, and also shipping and navigation in general.

9.7.2.20 From a navigational safety perspective, worst case consequences are an increase in delays, deviations or cancellation, however based upon Serco NorthLink feedback it is considered that the implementation of the SEZ

reduces the risk to ALARP parameters noting frequency of the impact is reduced. Socioeconomic impacts are assessed in Volume 6, Chapter 2: Socioeconomics, Tourism and Recreation.

9.7.2.21 Full details of the assessment and consultation undertaken in relation to Serco NorthLink are provided in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment). The SEZ is illustrated in Figure 17.1 of the NRA.

Frequency of Occurrence

9.7.2.22 The frequency of occurrence relating to vessel displacement during periods of adverse weather during O&M is considered to be **Remote**.

Severity of Consequence

9.7.2.23 The severity of consequence relating to vessel displacement during periods of adverse weather during O&M is considered to be **Serious**.

Significance of Effect

9.7.2.24 Taking the frequency of occurrence as remote and the severity of consequence as serious, the overall effect of adverse weather during O&M is considered to be tolerable.

9.7.2.25 Assuming the implementation of the SEZ, the impact is considered ALARP. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 10: Increased Third Party Vessel to Vessel Collision Risk

Qualification of Risk

9.7.2.26 As noted in relation to the construction phase, three of the 10 main routes will likely deviate as a result of the presence of the Proposed Development (Offshore). Post wind farm collision frequency was estimated at one every 292 years, based on conservative post OWF modelling, which assumed that vessels would not use the full available sea room offshore of the Caledonia OWF. In reality, as per the construction phase impact, it is likely that vessels will deviate to use the available sea space. This aligns with general stakeholder consensus of the Hazard Workshop which indicated that there is sufficient post wind farm sea room available to safely accommodate the likely number of users.

9.7.2.27 For the Caledonia OECC, any displacement of commercial vessels due to O&M activities is not anticipated to affect available sea room to such an extent that the risk of a collision between third party vessels is materially increased. This is due to the infrequency of operational activities, and spatially limited extent of the operation at any given time.

9.7.2.28 An additional factor is the potential for WTGs to obscure vessels from one another, thus hindering ability to comply with COLREGs (IMO, 1972/77[1]). Minimum spacing of 944m between WTGs will likely provide sufficient sea room for visual observations, with full obstruction likely only to occur when vessels are at opposite ends of a WTG row. Collision risk is likely to be low in such cases due to the distance between vessels.

9.7.2.29 In the event of an encounter between third party vessels, it is likely to be localised and short in duration, with collision avoidance action implemented by the vessels involved, as per compliance with COLREGs (IMO, 1972/77[1]), to ensure that a collision incident does not develop.

9.7.2.30 As per the respective construction phase impact, historical collision incident data 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 the vessels involved able to resume their respective passages and undertake a full inspection at the next port.

9.7.2.31 As an unlikely worst-case scenario, a high impact collision event could occur. This may result in vessel foundering and subsequent PLL, as well as pollution. In such a circumstance, vessels associated with the Proposed Development (Offshore) may attend the incident under SOLAS obligations and in liaison with the MCA, and the procedures within the ERCoP and MPCP would be implemented.

9.7.2.32 Relevant embedded mitigation measures includes marking on nautical charts (M-28), promulgation of information (M-21), DSLP approval (M-2), adherence to an LMP (M-14), adherence to an MPCP (M-9), and adherence to an ERCoP (M-25).

Frequency of Occurrence

9.7.2.33 The frequency of occurrence in relation to encounters and collision risk between third party vessels during the O&M phase is considered **Extremely Unlikely**.

Severity of Consequence

9.7.2.34 The severity of consequence in relation to encounters and collision risk between third party vessels during the O&M phase is considered **Serious**.

Significance of Effect

9.7.2.35 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of third party vessel to vessel collision risk during O&M of the Proposed Development (Offshore) is considered to be tolerable.

9.7.2.36 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 11: Increased Third Party Vessel to Project Vessel Collision Risk

9.7.2.37 The presence of vessels associated with O&M activities of the Proposed Development (Offshore) may increase encounters and thus collision risk for vessels already operating in the area.

Qualification of Risk

9.7.2.38 During the O&M phase of the Proposed Development (Offshore) there may be up to 938 vessel movements annually, and up to 25 project vessels on-site simultaneously (during major maintenance; i.e., likely less during normal operations). This will include vessels which are RAM.

9.7.2.39 Encounter and collision risk involving project vessels will be managed through the implementation of marine coordination as will be set out in the VMP and NSP. Project vessels will also be expected to carry AIS and comply with flag state regulations including the COLREGs (IMO, 1972/77[1]) and SOLAS (IMO, 1974[2]). COLREGs will remain the navigational priority for project vessels at all times.

9.7.2.40 Applications for safety zones of 500m around major maintenance activities during O&M will be sought and will protect deployed project vessels, especially if they are RAM. Minimum advisory passing distances and guard vessels, as defined by risk assessment, may also be implemented where safety zones do not apply. Details of safety zones, minimum safe passing distances, and guard vessels will be promulgated including via Notifications to Mariners and Kingfisher Bulletins.

9.7.2.41 Appropriate operational marine lighting and marking will be agreed with the NLB and set out in an LMP. These navigational aids will further maximise mariner awareness when in proximity to the Caledonia OWF.

9.7.2.42 Third-party vessels may experience decreased capability to visually identify project vessels during reduced visibility, especially if visual observations are obscured by WTGs; however, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and the mandatory carriage of AIS by project vessels regardless of size.

9.7.2.43 As discussed in the equivalent construction phase impact, there has been one instance of a third-party vessel colliding with a project vessel in the UK (see NRA in Volume 7B Appendix 9-1: Navigational Risk Assessment for further details). Moderate vessel damage was reported with no harm to persons. It is noted that the incident occurred in 2011, 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.

9.7.2.44 As per the respective construction phase impact, if an encounter between a project vessel and third party vessel occurs, it is likely to be localised and short in duration. Assuming the implementation of collision avoidance action as required by the COLREGs, the most likely outcome will be any vessels involved being able to resume their respective passages or activities with no long-term consequences.

9.7.2.45 In the event of a collision, the likely consequences will be minor contact between the vessels resulting in minor damage and no injuries to persons. As an unlikely worst-case scenario, foundering could occur resulting in PLL and

pollution. Other project vessels may be able to assist in the event of a collision under SOLAS obligation and the adherence to the ERCoP, noting this would be done in liaison with the MCA. If pollution were to occur in proximity to the Proposed Development (Offshore) or involving a project vessel, the MPCP will be implemented to minimise the risks.

9.7.2.46 Relevant embedded mitigation measures include application for safety zones (M-23), guard vessels as required by risk assessment (M-23), DSLP approval (M-2), adherence to an LMP (M-14), VMP (M-13), and NSP (M-19), MPCP (M-9), ERCoP (M-25), promulgation of information (M-21), marine coordination (M-26), and marking on nautical charts (M-28).

Frequency of Occurrence

9.7.2.47 The frequency of occurrence in relation to encounters and collision risk between project vessels and third party vessels during the O&M phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.2.48 The severity of consequence in relation to encounters and collision risk between project vessels and third party vessels during the O&M phase is considered to be **Serious**.

Significance of Effect

9.7.2.49 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of encounters and collision risk between project vessels and third party vessels during O&M of the Proposed Development (Offshore) is considered to be tolerable.

9.7.2.50 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 12: Vessel to Structure Allision Risk

9.7.2.51 Presence of structures within the Caledonia OWF will lead to creation of powered, drifting and internal allision risk for vessels during the O&M phase.

9.7.2.52 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.

Powered Allision Risk

Qualification and Quantification of Risk

9.7.2.53 As discussed in relation to the respective construction phase impact, the base case annual powered vessel to structure allision frequency was estimated to be $2.9x10^{-3}$, corresponding to a return period of one every 341 years. This is reflective of the volume of traffic within the available sea room, noting that the NRA has conservatively assumed that vessels will not use the full available sea room offshore of the Caledonia OWF. In reality, it is likely that vessels will increase passing distance from the Caledonia OWF, which aligns with feedback received at the Hazard Workshop.

9.7.2.54 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. These allisions resulted in minor to moderate damage to the vessels with minor injury to crew members.

9.7.2.55 Marine lighting and marking will be implemented in agreement with the NLB and defined within the LMP. These discussions will include contingency measures for the event that a WTG with a key navigational light needs to be towed away from site. Promulgation of information and marking on charts will ensure vessels can passage plan in advance to minimise risk.

9.7.2.56 Should an allision occur, the consequences will depend on multiple factors as discussed in relation to the equivalent construction phase impact. Fishing vessels and recreational vessels are considered most vulnerable to the impact and 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 founder resulting in PLL and pollution. Project vessels may assist in the event of an allision under SOLAS obligation and the adherence to the ERCoP, in liaison with the MCA. If pollution were to occur, then the MPCP will be implemented to minimise the environmental risk.

9.7.2.57 Relevant embedded mitigation measures include DSLP approval (M-2), adherence to a MPCP (M-9), adherence to an LMP (M-14), adherence to an NSP (M-19), promulgation of information (M-21), application for safety zones (M-23), adherence to an ERCoP (M-25), and marking on nautical charts (M-28).

Frequency of Occurrence

9.7.2.58 The frequency of occurrence in relation to powered vessel to structure allision risk during the O&M phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.2.59 The severity of consequence in relation to powered vessel to structure allision risk during the O&M phase is considered to be **Moderate**.

Significance of Effect

9.7.2.60 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of powered vessel to structure allision risk during O&M of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.2.61 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Drifting Allision Risk

Qualification and Quantification of Risk

9.7.2.62 Based on quantitative assessment undertaken in the NRA (see Volume 7B, Appendix 9-1: Navigational Risk Assessment), the base case annual drifting vessel to structure allision frequency was estimated to be $2.5x10^{-4}$, corresponding to a return period of one every 4,3054 years. This is reflective of the volume of traffic within the available sea room.

9.7.2.63 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; this is reflected in the MAIB incident data, where two incidents of machinery failure were recorded between 2012 and 2021, as discussed in relation to the equivalent construction phase impact. Promulgation of information, lighting and marking, and marking on charts will help vessels to passage plan and mitigate the risks of a drifting allision.

9.7.2.64 In circumstances where a vessel drifts towards a structure in the Caledonia OWF, powered vessels may be able to regain power prior to reaching the Caledonia OWF (that is, by rectifying any fault). Failing this, the vessel's emergency response procedures would be implemented which may include an emergency anchoring event or the use of thrusters (depending on availability and power supply).

9.7.2.65 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[2]). 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.

9.7.2.66 Should an allision occur, the consequences will be similar to those noted for the respective construction phase impact including the unlikely worst-case of foundering, PLL, 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. Project vessels may assist in the event of an allision under SOLAS (IMO, 1974[2]) obligation and the adherence to the

ERCoP, in line with the MCA. 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.

9.7.2.67 Relevant embedded mitigation measures include adherence to an ERCoP (M-25), adherence to an MPCP (M-9), marking on nautical charts (M-28), adherence to an LMP (M-14), and project vessel compliance with SOLAS (IMO, 1974) (M-27).

Frequency of Occurrence

9.7.2.68 The frequency of occurrence in relation to drifting vessel to structure allision risk during the O&M phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.2.69 The severity of consequence in relation to drifting vessel to structure allision risk during the O&M phase is considered to be **Moderate**.

Significance of Effect

9.7.2.70 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of drifting vessel to structure allision risk during O&M of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.2.71 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Internal Allision Risk

Qualification and Quantification of Risk

9.7.2.72 As noted previously, based on experience at existing operational OWFs, it is anticipated that commercial vessels will be unlikely to navigate internally within the Caledonia OWF. Fishing and recreational vessels may be more likely to transit through noting they may choose not to depending on various conditions (this aligns with consultation input). Vessels may be less likely to navigate within a site which hosts floating wind farm structures due to the presence of mooring lines and dynamic cables.

9.7.2.73 As noted in the respective construction phase impact, the base case fishing vessel to structure allision frequency is estimated to be $2.9x10^{-1}$, corresponding to a return period of approximately one in 3.5 years. This return period is reflective of the volume of fishing vessel traffic in the Shipping and Navigation study area, both in transit and engaged in active fishing. Conservative modelling has been undertaken with the assumption that fishing levels in proximity to the WTGs will not change. In reality, as discussed within the equivalent construction phase impact, fishing vessels will account for the presence of the WTGs, and may choose to transit or fish elsewhere (noting this aligns with consultation input).

9.7.2.74 The worst-case consequences reported for vessels involved in an allision incident involving a UK OWF has been flooding, with no life-threatening

injuries to persons reported. If an allision incident were to occur, project vessels may assist under obligation of SOLAS (IMO, 1974[2]) and adherence to the ERCoP in liaison with the MCA. Additionally, if pollution occurs as a result of an allision incident, the MPCP would be implemented where appropriate.

9.7.2.75 If a vessel chooses to transit within the Caledonia OWF, the minimum spacing of 944m between wind farm structures is considered sufficient for safe internal navigation. Furthermore, operational lighting and marking and marking on nautical charts provide mitigation against internal allision risk. Should a WTG with a key navigational light need towed, sufficient alternative lighting will be agreed with the NLB. Any vessel planning to transit through the Caledonia OWF is expected to passage plan in advance in accordance with SOLAS Chapter V (IMO, 1974[2]) and promulgation of information including through ongoing liaison with fishing fleets via an appointed FLO will seek to ensure that such vessels have good awareness of the Proposed Development (Offshore). Locations of relevant infrastructure will be provided in the weekly notices distributed during the construction phase as per the FMMS (M-17).

9.7.2.76 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. As noted in the equivalent construction phase impact, from previous studies of offshore wind developments, it has been concluded that WTGs do reduce wind velocity downwind of a WTG (MCA, 2022[9]) 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 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.

9.7.2.77 Relevant embedded mitigation measures include application for safety zones (M-23), DSLP approval (M-2), adherence to an LMP (M-14), marking on nautical charts (M-28), promulgation of information (M-21), adherence to an ERCoP (M-25), adherence to an MPCP (M-9), appointment of a FLO and adherence to an FMMS (M-17).

Frequency of Occurrence

9.7.2.78 The frequency of occurrence of internal vessel to structure allision risk during the O&M phase is considered to be **Remote**.

Severity of Consequence

9.7.2.79 The severity of consequence of internal vessel to structure allision risk during the O&M phase is considered to be **Moderate**.

Significance of Effect

9.7.2.80 Taking the frequency of occurrence as remote and the severity of consequence as moderate, the overall effect of internal vessel to structure allision risk during O&M of the Proposed Development (Offshore) is considered to be tolerable.

9.7.2.81 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and ALARP and Not Significant in EIA terms.**

Impact 13: Reduced Access to Local Ports

Qualification of Risk

9.7.2.82 Up to 938 vessel movements annually by O&M vessels may be made throughout the O&M phase, which 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 Caledonia OWF, and designated routes to and from the base port. Project vessels will also carry AIS and be compliant with flag state regulations including the COLREGs (IMO 1972/77[1]).

9.7.2.83 As discussed in the baseline description and equivalent construction phase impact, the closest port or harbour is Wick Harbour, located approximately 13.2nm to the northwest, with Banff Harbour located approximately 20nm to the south. 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.

9.7.2.84 For offshore export cable O&M activity, there is a greater risk given the proximity to Whitehills Harbour and Marina which is located approximately 0.37nm (682m) southeast of the Caledonia OECC. Recreational vessels may be particularly sensitive given that the RYA Scotland has indicated that Whitehills Marina is a key stopping point for vessels travelling north as well as along the northeast coast. No concerns were raised over access to ports during the O&M phase in relation to the Caledonia OWF nor the offshore export cables. Additionally, offshore export cable maintenance activities will likely be very infrequent, short-term in duration and localised at any given time, thus any reduced access will likely be minor and temporary (and less than during construction).

9.7.2.85 The most likely consequences are increased journey times and distances, as per the vessel displacement impact. There is only one pilot boarding station nearby, at Macduff, where the service is not compulsory. Thus, no effect is anticipated on port related services such as pilotage.

9.7.2.86 Relevant embedded mitigation measures includes adherence to an LMP (M-14), adherence to a VMP (M-13), marine coordination of project vessels (M-26), marking on nautical charts (M-28), and promulgation of information (M-21).

Frequency of Occurrence

9.7.2.87 The frequency of the risk of reduced access to local ports during the O&M phase is considered to be **Remote**.

Severity of Consequence

9.7.2.88 The severity of consequence of the risk of reduced access to local ports during the O&M phase is considered to be **Minor**.

Significance of Effect

9.7.2.89 Taking the frequency of occurrence as remote and the severity of consequence as minor, the overall effect of reduced port access during O&M of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.2.90 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Impact 14: Reduction of Under Keel Clearance

9.7.2.91 The presence of subsea cable protection, dynamic inter-array cables and mooring lines may reduce under keel clearance during the O&M phase of the Proposed Development (Offshore).

Subsea Cable Protection

Qualification of Risk

9.7.2.92 Reduced water depth due to the presence of subsea infrastructure will lead to a reduction in under keel clearance. The target burial depth for all subsea cables is 1m, noting actual burial depth will be determined via the CBRA process which will be undertaken post consent.

9.7.2.93 Where burial is not feasible, cable protection may be used instead, which again will be determined by the CBRA. In line with MGN 654, any reduction in water depth which exceeds 5% will be discussed with the MCA to determine if additional mitigation is necessary. 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, 2019[12]).

9.7.2.94 Given that depths within the Caledonia OWF range between 39m to 82m, it is not anticipated that subsea cable protection will reduce water depths over the 5% threshold. In terms of the offshore export cables, a water depth reduction of over 5% is possible in nearshore areas if cable protection is required. The vessel traffic data shows the majority of vessels operating near the Landfall Site tend to be recreational and fishing vessels which are generally smaller in size and have reduced draughts compared to larger commercial vessels. As discussed in the equivalent construction phase impact, no specific concerns from stakeholders were raised during consultation including the Hazard Workshop, with MGN 654 compliance considered suitable to manage the impact.

9.7.2.95 In the event of an underwater allision, the most likely consequence is minor damage. The unlikely worst-case consequence may be vessel foundering resulting in PLL and pollution. Implementation of the MPCP (M-9) will mitigate against pollution, whilst adherence to an ERCoP (M-25) as well as operating under the obligations of SOLAS (IMO, 1974[2]) (M-27) will mitigate against the risk of PLL.

Frequency of Occurrence

9.7.2.96 The frequency of occurrence of the risk of reduced under keel clearance due to the presence of subsea cables during O&M is considered **Extremely Unlikely**.

Severity of Consequence

9.7.2.97 The severity of consequence of the risk of reduced under keel clearance due to the presence of subsea cables during O&M is considered to be **Moderate**.

Significance of Effect

9.7.2.98 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of reduced under keel clearance due to subsea cables during O&M of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.2.99 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Dynamic Inter-array Cables and Mooring Lines

Qualification of Risk

9.7.2.100 The presence of inter-array cables and mooring lines associated with floating substructures of the Proposed Development (Offshore) may reduce under keel clearance during the O&M phase of the Proposed Development (Offshore).

9.7.2.101 There may be up to six mooring lines per floating WTG used to secure the substructures to the seabed. The highest risk areas will be the immediate vicinity of the floating substructures where mooring lines and inter-array cables will be closest to the surface.

9.7.2.102 As previously noted, it is likely that commercial vessels will not enter the Caledonia OWF. Moreover, experience indicates that commercial vessels frequently pass 1nm or more away from established developments. On this basis, taking into consideration the baseline and anticipated post wind farm vessel routeing, it is considered highly unlikely that a commercial vessel would pass within the Caledonia OWF, in particular in sufficiently close proximity to the floating substructures for an under keel interaction to arise.

9.7.2.103 As discussed in relation to the equivalent construction phase impact, fishing and recreational vessels are more likely to transit in proximity to the Caledonia OWF compared to commercial vessels. However these vessels are smaller and tend to have lower draughts. Consultation input, including at the

Hazard Workshop, was that fishing and recreational vessels would likely avoid any floating WTGs.

9.7.2.104 The mooring lines and inter-array cables will be appropriately marked on nautical charts and other electronic charts as appropriate to increase awareness. It was raised at the Hazard Workshop that making the locations of mooring lines and dynamic cables available to fishing vessels was a key mitigation. Locations of relevant infrastructure will be provided in the weekly notices distributed during the construction phase as per the FMMS (M-17).

9.7.2.105 As discussed in the equivalent construction phase impact, it will be necessary to confirm available under keel clearance from the mooring lines post installation, in particular if taut mooring lines are used. The confirmed available clearance should be discussed with the MCA and NLB post installation to determine if any additional mitigation is required (M-105).

9.7.2.106 There is limited experience of deployment of floating offshore wind projects in UK waters; however, to date there have been no reported under keel interactions between passing vessels and the components associated with such projects.

9.7.2.107 The most likely consequences of reduced under keel clearance due to inter-array cables and mooring lines is that a vessel transits over an area of reduced clearance but does not make contact.

9.7.2.108 Should an underwater allision occur, minor damage incurred is the most likely consequence, with foundering or grounding of the vessel resulting in PLL and pollution as an unlikely worst-case. Should pollution occur, the MPCP (M-9) will be implemented, with adherence to the ERCoP (M-25) in the case of risk of PLL, as well as under SOLAS (IMO, 1974[2]) obligations (M-27).

9.7.2.109 Other relevant embedded mitigation measures include promulgation of information and any potential under keel interaction risk (M-21), including via the FLO (M-17). The locations of the floating substructures will be clearly shown on appropriate nautical charts (M-28), and the Applicant will also provide the locations of the anchors and mooring lines to the UKHO for charting purposes.

Frequency of Occurrence

9.7.2.110 The frequency of occurrence in relation to reduction of under keel clearance as a result of inter-array cables and mooring lines during the O&M phase is considered **Extremely Unlikely**.

Severity of Consequence

9.7.2.111 The severity of consequence in relation to reduction of under keel clearance as a result of inter-array cables and mooring lines during the O&M phase is considered **Serious**.

Significance of Effect

9.7.2.112 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of reduced under keel clearance

due to inter-array cables and mooring lines during O&M of the Proposed Development (Offshore) is considered to be tolerable.

9.7.2.113 Assuming the confirmation of available under keel clearance in agreement with MCA and NLB post installation, and the implementation of ensuring locations of subsea infrastructure are made available to fishing vessels including via FLO liaison as secured by the Outline FMMSs (Volume 7, Appendix 17 and Volume 7, Appendix 18) the hazard is considered **Tolerable with mitigation and ALARP and therefore Not Significant in EIA terms**.

Impact 15: Anchor Interaction with Subsea Cables and Mooring Lines

9.7.2.114 The presence of subsea cables and mooring lines within the Caledonia OWF and Caledonia OECC may increase the risk of anchor interaction.

Qualification of Risk

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

9.7.2.116 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 subsea operations;
- Unplanned anchoring – generally resulting from an emergency situation where the vessel has experienced steering failure; and
- Anchor dragging – caused by anchor failure.

9.7.2.117 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 subsea cables and mooring lines will inform the decision to anchor, as per Regulation 34 of SOLAS (IMO, 1974[2]).

9.7.2.118 No anchored vessels were observed within the Shipping and Navigation study area for the during the survey periods or long-term vessel traffic data. Risk of interaction with an inter-array cable, interconnector cable, or mooring line on a planned anchoring or dragged anchoring basis is therefore anticipated to be extremely 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 (for example, structures, rocks, shallows). However; given the open sea room in proximity to the Caledonia OWF and water depths the likelihood of this scenario arising is very low. The majority of traffic is also anticipated to pass offshore of the Caledonia OWF, away from where the inter-array cables, interconnector cables and mooring lines associated with the Proposed Development (Offshore) are located.

9.7.2.119 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, noting this will account for traffic volumes and sizes. General consensus of the Hazard Workshop was that floating subsea infrastructure including mooring lines and dynamic cables would be avoided by vessels in transit, and therefore frequency of any anchoring in proximity is also likely to be low.

9.7.2.120 In terms of the offshore export cables, Macduff anchorage sits within the OECC study area adjacent to the Caledonia OECC. The volumes and sizes of vessels using this anchorage will be considered within the CBRA process, to ensure the cables are suitably buried and/or protected, noting promulgation of information and marking on nautical charts will further mitigate the risk. Additionally, it is likely that anchoring undertaken in Macduff anchorage will be planned, thus it is anticipated that mariners will take into account the presence of the offshore export cables via nautical charts before dropping anchor. With good practice, it is considered unlikely that an anchor interaction would occur. Final cable routeing within the Caledonia OECC will be defined within the CaP which will be approved by MD-LOT in consultation with the MCA.

9.7.2.121 Should an anchor interaction occur, the most likely consequence is no damage to the cable or anchor, based on previous anchor interaction incidents. As an unlikely worst-case consequence, a snagging incident could occur and the vessel's anchor as well as the cable could be damaged, resulting in a loss of stability noting this would only occur for a smaller vessel which would be less likely to penetrate deeper into the seabed than a larger vessel.

9.7.2.122 Relevant embedded mitigation measures include promulgation of information (M-21), marking on nautical charts (M-28), adherence to a CBRA (M-5), development of and adherence to a CaP (M-1) and vessel compliance with MGN 654 (MCA, 2021[7]) (M-27).

Frequency of Occurrence

9.7.2.123 The frequency of occurrence relating to the risk of anchor interaction with subsea cables and mooring lines during O&M is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.2.124 The severity of consequence relating to the risk of anchor interaction with subsea cables and mooring lines during O&M is considered to be **Moderate**.

Significance of Effect

9.7.2.125 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of anchor interaction with subsea cables and mooring lines during O&M of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.2.126 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Impact 16: Loss of Station

9.7.2.127 The floating substructures may suffer loss of station in the event that the mooring system fails, or there is damage to tow during WTG towage for maintenance. This may become a floating hazard to passing vessels. This impact is only relevant to the floating WTGs within the Caledonia OWF, and thus there will be no risk of this impact from the Caledonia OECC.

Qualification of Risk

9.7.2.128 During the O&M phase, towage of WTGs to and from site for maintenance will be subject to a dedicated risk assessment at the time of the towage operation when full specifications relating to the operations is available. This will be outlined in the VMP (M-104). This dedicated risk assessment should cover all elements of the towage operation including in port approaches and internally within the Caledonia OWF. Where possible, towage of WTGs will be avoided, with infield maintenance being the preferred method. During the tow, all vessels involved will be lit and marked as required under COLREGs (IMO, 1972/1977[1]).

9.7.2.129 The MCA require under their Regulatory Expectations on Moorings for Floating Wind and Marine Devices (HSE and MCA, 2017[13]) that developers arrange TPV of the mooring systems by an independent and competent person/body. The Regulatory Expectations state that TPV is a "continuous activity" and that should there be any modifications to a system or if new information becomes available with regard to its reliability, additional TPV would be required.

9.7.2.130 The Regulatory Expectations also require the provision of continuous monitoring either by GPS or other suitable means. Each WTG should also have an alarm system in place, whereby an alert will be provided to the Marine Coordination Centre in the event that any floating substructure leaves a pre-defined ringfenced alarm zone. This means in the unlikely event that a floating substructure suffers total loss of station and drifts outside of its alarm zone, the Applicant would be made aware, and would be able to track its position and make the necessary emergency arrangements, which will depend upon the design of the substructure and any predefined emergency response protocols.

9.7.2.131 On the basis of compliance with the Regulatory Expectations, a loss of station is considered likely to represent a low frequency event. Noting that for a total loss of station, all moorings would be required to fail (each WTG will have a minimum of six), which is more likely to occur in extreme storm conditions, during which it is unlikely vessels will be navigating within proximity to the WTGs.

9.7.2.132 Relevant embedded mitigation measures include compliance with regulatory expectations on moorings for floating wind and marine devices (HSE and MCA, 2017[13]) (M-31) and MGN 654 (M-27), adherence to a DSLP (M-2), promulgation of information (M-21), adherence to an ERCoP (M-25),

compliance with international regulations (SOLAS; IMO, 1974[2]) (M-27), appropriate marking of the structures and adherence to an LMP (M-14).

Frequency of Occurrence

9.7.2.133 The frequency of occurrence relating to loss of station during the O&M phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.2.134 The severity of consequence relating to loss of station during the O&M phase is considered to be **Moderate**.

Significance of Effect

9.7.2.135 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of loss of station during the O&M of the Proposed Development (Offshore) is considered to be **Broadly Acceptable and ALARP, and therefore Not Significant in EIA terms**.

Impact 17: Reduction of SAR Capabilities

9.7.2.136 The presence of structures as well as increased vessel activity and personnel numbers may reduce emergency response capabilities during the O&M phase of the Proposed Development (Offshore) by increasing the number of incidents, increasing consequences or reducing access for the responders.

Qualification of Risk

9.7.2.137 The spatial extent of this impact is large given the area covered by the Caledonia OWF (123nm^2), as well as the distance covered by air-based SAR support (the SAR helicopter base is located at Inverness, 66nm southwest of the Caledonia OWF). It is unlikely that a SAR operation will require the entire Caledonia OWF to be searched, and it is probable that a search will be restricted to a smaller area in which a casualty is known to be located (accounting for assumptions on any potential drift of the casualty).

9.7.2.138 Up to 938 vessel movements annually may be made by O&M vessels during the lifetime of the Proposed Development (Offshore). It is assumed that O&M vessels will be on-site throughout the majority of the O&M phase, although severe weather may lead to vessels being withdrawn. The presence of these vessels increase the likelihood of an incident and subsequently increases the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability. However, they may also be able to provide additional response resource in the event of an incident in liaison with the MCA.

9.7.2.139 The most likely consequence to occur would be a delay to any emergency response request. As an unlikely worst-case, this could result in a failure of emergency response to an incident resulting in PLL and pollution. However, project vessels will be managed via marine coordination and comply with flag state regulations which will minimise this risk. Additionally, the presence of project vessels themselves may mitigate this risk as they may self-help at

incidents involving other project vessels under the obligation of SOLAS (IMO, 1974[2]) and adherence to an ERCoP, noting this would be undertaken with liaison with the MCA. The MPCP will also be implemented should pollution occur.

9.7.2.140 As discussed in the equivalent construction phase impact, the frequency of SAR helicopter operations in proximity to the Proposed Development (Offshore) is one per year, with no SAR helicopter incidents occurring within the Caledonia OWF. The frequency of incidents in proximity to the Caledonia OWF is not anticipated to increase significantly 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 Caledonia OWF are facilitated. A SAR checklist will also be completed and agreed with the MCA.

9.7.2.141 Relevant embedded mitigation measures include DSLP approval (M-2), promulgation of information (M-21), adherence to an LMP (M-14), marking on appropriate charts (M-28), marine coordination of project vessels (M-26), adherence to an ERCoP (M-25), adherence to an MPCP (M-9), adherence to a VMP (M-13) and NSP (M-19), and compliance with MGN 654 and international marine regulations (M-27).

Frequency of Occurrence

9.7.2.142 The frequency of occurrence relating to the risk of reduced emergency response capabilities during the O&M phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.2.143 The severity of consequence relating to the risk of reduced emergency response capabilities during the O&M phase is considered to be **Serious**.

Significance of Effect

9.7.2.144 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of reduced emergency response capability during O&M of the Proposed Development (Offshore) is considered to be tolerable.

9.7.2.145 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

9.7.3 Decommissioning

Impact 18: Vessel Displacement

9.7.3.1 Decommissioning activities associated with the Proposed Development (Offshore) may displace existing vessel routes or activity, which may be more prevalent during periods of adverse weather.

9.7.3.2 These two related elements are each considered in the subsequent assessment in terms of frequency of occurrence and severity of consequence.

Vessel Displacement

Qualification of Risk

9.7.3.3 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. 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*.

9.7.3.4 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. By the time of decommissioning, deviations will be well established, with vessels likely to continue on their typical routeing around the buoyed decommissioning area.

9.7.3.5 Relevant embedded mitigation measures would be as per the respective construction phase.

Frequency of Occurrence

9.7.3.6 The frequency of occurrence in relation to displacement of vessel traffic during the decommissioning phase is considered **Frequent**.

Severity of Consequence

9.7.3.7 The severity of consequence in relation to displacement of vessel traffic during the decommissioning phase is considered **Negligible**.

Significance of Effect

9.7.3.8 Taking the frequency of occurrence as frequent and the severity of consequence as negligible, the overall effect of vessel displacement during decommissioning of the Proposed Development (Offshore) is considered to be tolerable.

9.7.3.9 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Vessel Displacement During Adverse Weather

Qualification of Risk

9.7.3.10 As discussed within the equivalent construction phase impact, adverse weather can severely affect a vessels journey, with the impact of this dependent on various factors including specific vessel parameters such as hull geometry or vessel size.

9.7.3.11 As discussed in relation to the equivalent construction phase impact, it is likely that no commercial vessels would choose to make transit through the buoyed decommissioning area during adverse weather conditions. Larger deviations may be required than during more favourable conditions, however there is considered to be sufficient sea room to safely accommodate the chosen transits.

9.7.3.12 The long term vessel traffic data studied for the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment) showed the presence of transits within the Caledonia OWF undertaken by Serco NorthLink Ferries, further inshore of their typical routeing. Consultation with Serco NorthLink Ferries confirmed these transits were utilised during adverse weather conditions. The presence of the buoyed decommissioning area may therefore impact Serco NorthLink adverse weather transits, with the potential for delays in sailings, a large deviation inshore of the Moray Firth OWFs, or sailing cancellation. However, as each historical transit is based upon individual Master decisions based upon the conditions and factors on the day, Serco NorthLink have confirmed that the impact cannot be quantified (i.e., it cannot be confirmed whether any given historical transit would have been delayed, deviated or cancelled).

9.7.3.13 The Applicant engaged with Serco NorthLink ferries throughout the NRA process, and this engagement culminated in the Applicant proposing a SEZ on the eastern boundary of the Caledonia OWF within which no surface piercing infrastructure will be placed for the purposes of increasing searoom and optionality for Serco NorthLink ferries in adverse weather conditions. The SEZ was proposed to Serco NorthLink via a meeting on 12th August 2024. Feedback received was that the SEZ and associated increase in searoom would be a significant positive for NorthLink adverse weather routeing, and also shipping and navigation in general.

9.7.3.14 There may still be works undertaken within the SEZ (e.g., associated with cables), however any such impact would be temporary in nature and spatially limited to the area around the operation. The placement of the buoyed decommissioning area will be agreed with NLB to ensure any impacts to shipping and navigation are managed.

9.7.3.15 From a navigational safety perspective, worst case consequences are an increase in delays, deviations or cancellation; however, based upon Serco NorthLink feedback, it is considered that the implementation of the SEZ reduces the risk to ALARP parameters noting frequency of the impact is reduced. Socioeconomic impacts are assessed in Volume 6, Chapter 2: Socioeconomics, Tourism and Recreation.

9.7.3.16 Full details of the assessment and consultation undertaken in relation to Serco NorthLink are provided in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment). The SEZ is illustrated in Figure 17.1 of the NRA.

Frequency of Occurrence

9.7.3.17 The frequency of occurrence relating to vessel displacement during periods of adverse weather during decommissioning is considered to be **Remote**.

Severity of Consequence

9.7.3.18 The severity of consequence relating to vessel displacement during periods of adverse weather during decommissioning is considered to be **Serious**.

Significance of Effect

9.7.3.19 Taking the frequency of occurrence as remote and the severity of consequence as serious, the overall effect of adverse weather during decommissioning of the Proposed Development (Offshore) is considered to be tolerable.

9.7.3.20 Assuming the implementation of the SEZ, the impact is considered ALARP. The impact is therefore **Tolerable and Not Significant in EIA terms**.

Impact 19: Increased Third Party Vessel to Vessel Collision Risk

Qualification of Risk

9.7.3.21 This hazard is expected to be similar in nature to the equivalent construction phase hazard. As above, 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 it has been assumed that all subsea cables will be removed during decommissioning with only cable protection left *in situ*.

9.7.3.22 The use of a buoyed decommissioning area analogous to the buoyed construction area is assumed and will result in a similar collision risk to that established for the equivalent construction phase hazard. The same assumptions in terms of frequency and consequence apply.

9.7.3.23 Relevant embedded mitigation measures would be as per the respective construction phase.

Frequency of Occurrence

9.7.3.24 The frequency of occurrence in relation to encounters and collision risk between third party vessels during the decommissioning phase is **Extremely Unlikely**.

Severity of Consequence

9.7.3.25 The severity of consequence in relation to encounters and collision risk between third party vessels during the decommissioning phase is considered **Serious**.

Significance of Effect

9.7.3.26 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of third party vessel to vessel

collision risk during decommissioning of the Proposed Development (Offshore) is considered to be tolerable.

9.7.3.27 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 20: Increased Third Party Vessel to Project Vessel Collision Risk

9.7.3.28 The presence of vessels associated with decommissioning activities of the Proposed Development (Offshore) may increase encounters and thus collision risk for vessels already operating in the area.

Qualification of Risk

9.7.3.29 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 phase, including the number of vessel movements by decommissioning vessels. It is noted that in the case of subsea 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*.

9.7.3.30 On this basis the same assumptions made for the equivalent construction phase hazard in terms of frequency and consequence apply.

Frequency of Occurrence

9.7.3.31 The frequency of occurrence in relation to encounters and collision risk between project vessels and third party vessels during the decommissioning phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.3.32 The severity of consequence in relation to encounters and collision risk between project vessels and third party vessels during the decommissioning phase is considered to be **Serious**.

Significance of Effect

9.7.3.33 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of encounters and collision risk between project vessels and third party vessels during decommissioning of the Proposed Development (Offshore) is considered to be tolerable.

9.7.3.34 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 21: Vessel to Structure Allision Risk

9.7.3.35 Presence of structures (including partially removed) during decommissioning will lead to creation of powered, drifting and internal allision risk for vessels.

Powered Allision Risk

Qualification and Quantification of Risk

9.7.3.36 It is likely that powered allision risk during decommissioning will be similar to that observed for the construction phase, noting similar scenarios on-site, including partially removed structures within a buoyed decommissioning area. On this basis the same assumptions made for the equivalent construction phase hazard in terms of frequency and consequence apply.

Frequency of Occurrence

9.7.3.37 The frequency of occurrence in relation to powered vessel to structure allision risk during the decommissioning phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.3.38 The severity of consequence in relation to powered vessel to structure allision risk during the decommissioning phase is considered to be **Moderate**.

Significance of Effect

9.7.3.39 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of powered vessel to structure allision risk during decommissioning of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.3.40 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Drifting Allision Risk

Qualification and Quantification of Risk

9.7.3.41 It is likely that drifting allision risk during decommissioning will be similar to that observed for the construction phase, noting similar scenarios on-site, including partially removed structures within a buoyed decommissioning area. On this basis the same assumptions made for the equivalent construction phase hazard in terms of frequency and consequence apply.

Frequency of Occurrence

9.7.3.42 The frequency of occurrence in relation to drifting vessel to structure allision risk during the decommissioning phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.3.43 The severity of consequence in relation to drifting vessel to structure allision risk during the decommissioning phase is considered to be **Moderate**.

Significance of Effect

9.7.3.44 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of drifting vessel to structure allision risk during decommissioning of the Proposed Development (Offshore) is considered to be broadly acceptable.

9.7.3.45 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Broadly Acceptable and Not Significant in EIA terms.**

Internal Allision Risk

Qualification and Quantification of Risk

9.7.3.46 It is likely that internal allision risk during decommissioning will be similar to that observed for the construction phase, noting similar scenarios on-site, including partially removed structures within a buoyed decommissioning area. On this basis the same assumptions made for the equivalent construction phase hazard in terms of frequency and consequence apply.

Frequency of Occurrence

9.7.3.47 The frequency of occurrence of internal vessel to structure allision risk during the decommissioning phase is considered to be **Remote**.

Severity of Consequence

9.7.3.48 The severity of consequence of internal vessel to structure allision risk during the decommissioning phase is considered to be **Moderate**.

Significance of Effect

9.7.3.49 Taking the frequency of occurrence as remote and the severity of consequence as moderate, the overall effect of internal vessel to structure allision risk during decommissioning of the Proposed Development (Offshore) is considered to be tolerable.

9.7.3.50 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 22: Reduced Access to Local Ports

Qualification of Risk

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

9.7.3.52 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 phase, including the number of vessel movements by decommissioning vessels. It is noted that in the case of subsea 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 will be left *in situ*.

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

9.7.3.54 On this basis the same assumptions made for the equivalent construction phase hazard in terms of frequency and consequence apply.

Frequency of Occurrence

9.7.3.55 The frequency of the risk of reduced access to local ports during the decommissioning phase is considered to be **Reasonably Probable**.

Severity of Consequence

9.7.3.56 The severity of consequence of the risk of reduced access to local ports during the decommissioning phase is considered to be **Minor**.

Significance of Effect

9.7.3.57 Taking the frequency of occurrence as reasonably probable and the severity of consequence as minor, the overall effect of reduced port access during decommissioning of the Proposed Development (Offshore) is considered to be tolerable.

9.7.3.58 Assuming liaison with the Whitehills, Banff, and Macduff harbour authorities in advance of and during decommissioning, the impact is considered ALARP. The impact is therefore **Tolerable and Not Significant in EIA terms.**

Impact 23: Loss of Station

9.7.3.59 As per the construction phase, the floating substructures may suffer loss of station in the event that the mooring system fails, or there is damage to tow during WTG towage during decommissioning. This may become a floating hazard to passing vessels. This impact is only relevant to the floating WTGs within the Caledonia OWF, and thus there will be no risk of this impact from the Caledonia OECC.

Qualification of Risk

9.7.3.60 Given that the process of removing floating WTGs is likely to be similar to the reverse of WTG installation in terms of vessel numbers, vessel movements, and duration of the decommissioning phase, the risk of loss of station during the decommissioning phase is likely to be as described in the equivalent construction phase impact. On this basis the same assumptions made for the equivalent construction phase hazard in terms of frequency and consequence apply.

Frequency of Occurrence

9.7.3.61 The frequency of occurrence relating to loss of station during the decommissioning phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.3.62 The severity of consequence relating to loss of station during the decommissioning phase is considered to be **Moderate**.

Significance of Effect

9.7.3.63 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as moderate, the overall effect of loss of station during the decommissioning phase of the Proposed Development (Offshore) is considered to be **Broadly Acceptable and ALARP, and therefore Not Significant in EIA terms.**

Impact 24: Reduction of SAR Capabilities

9.7.3.64 The removal of structures as well as increased vessel activity and personnel numbers may reduce emergency response capabilities during the decommissioning phase of the Proposed Development (Offshore) by increasing the number of incidents, increasing consequences or reducing access for the responders.

Qualification of Risk

9.7.3.65 Given that removal of structures is likely to be similar to installation in terms of vessel numbers and duration, the risk is likely to be as described in the equivalent construction phase impact. On this basis the same assumptions made for the equivalent construction phase hazard in terms of frequency and consequence apply.

Frequency of Occurrence

9.7.3.66 The frequency of occurrence relating to the risk of reduced emergency response capabilities during the decommissioning phase is considered to be **Extremely Unlikely**.

Severity of Consequence

9.7.3.67 The severity of consequence relating to the risk of reduced emergency response capabilities during the decommissioning phase is considered to be **Serious**.

Significance of Effect

9.7.3.68 Taking the frequency of occurrence as extremely unlikely and the severity of consequence as serious, the overall effect of reduced emergency response capability during decommissioning of the Proposed Development (Offshore) is considered to be tolerable.

9.7.3.69 The impact is considered ALARP with embedded mitigation in place and therefore no additional mitigation is required. The impact is therefore **Tolerable and Not Significant in EIA terms.**

9.8 Cumulative Effects

9.8.1 Overview

9.8.1.1 Potential impacts from the Proposed Development (Offshore) have the potential to interact with those from other developments, plans and activities, resulting in cumulative impacts on Shipping and Navigation receptors. The general approach to the CIA is described in Section 9.5.5.

9.8.1.2 The list of developments identified for assessing cumulative effects in relation to Shipping and Navigation differs from those presented in Volume 7A, Appendix 7-1: Cumulative Impact Assessment Methodology. The full methodology for identifying cumulative developments relevant to Shipping and Navigation is detailed in the NRA (Volume 7B, Appendix 9-1: Navigational Risk Assessment). In Table 9–15, the potential for cumulative effects with each of these developments is examined, and an assessment of the cumulative effects presented where appropriate.

Table 9–15: Shipping and Navigation Cumulative Effects.

Development	Potential for Significant Cumulative Effects	Comment
Ayre OWF	No	No cumulative interaction with main routes and no concern raised during consultation.
Broadshore OWF	Yes	Potential for limited cumulative interaction with main routes and discussed at the Hazard Workshop.
Buchan OWF	No	No cumulative interaction with main routes and no concern raised during consultation.
Flora OWF	No	No cumulative interaction with main routes and no concern raised during consultation.
Marram OWF	No	No cumulative interaction with main routes and no concern raised during consultation.
Pentland Floating OWF	No	No cumulative interaction with main routes and no concern raised during consultation.
Salamander OWF	Yes	Potential interaction with main routes.
Scaraben OWF	No	No cumulative interaction with main routes and no concern raised during consultation.
Sinclair OWF	No	No cumulative interaction with main routes and no concern raised during consultation.
Stromar OWF	Yes	Potential interaction with main routes.

Development	Potential for Significant Cumulative Effects	Comment
West of Orkney OWF	No	No cumulative interaction with main routes and no concern raised during consultation.

9.8.2 Cumulative Impact Assessment

Vessel Displacement and Increased Third Party Vessel to Vessel Collision Risk

Vessel Displacement

9.8.2.1 Based on the cumulative assessment of vessel routeing undertaken in the NRA, three routes are expected to deviate on a cumulative basis, namely Routes 1, 3 and 10.

9.8.2.2 It is anticipated that Routes 1 and 3 will pass further northeast of both Salamander OWF and the Caledonia OWF, leading to a distance increase of approximately 1.6nm. There is considered to be sufficient sea room available to safely accommodate these deviations if necessary, noting that Salamander OWF is located in excess of 43nm southeast of the Caledonia OWF.

9.8.2.3 Route 10 is expected to pass further west of Stromar OWF, closer to the Caledonia OWF, and lead to journey increases of approximately 0.6nm. In this case, there is also sufficient sea room to accommodate for a shift in traffic without the need to deviate around the Caledonia OWF. This aligns with input provided during the Hazard Workshop, which indicated that the sea room between the Caledonia OWF and other developments was considered sufficient, and is not expected to cause concern.

9.8.2.4 Taking the frequency of occurrence as **Frequent** and the severity of consequence as **Negligible**, the cumulative effect of vessel displacement is considered to be **Tolerable and ALARP and Not Significant in EIA terms**.

Increased Third Party Vessel to Vessel Collision Risk

9.8.2.5 In terms of collision risk, given the available sea room to accommodate the deviations and the proximity from the Caledonia OWF, there is not anticipated to be a large change in terms of third party to third party collision. This aligns with input from the Hazard Workshop, where sea room was considered sufficient and no concerns were raised.

9.8.2.6 Taking the frequency of occurrence as **Negligible** and the severity of consequence as **Serious**, the cumulative effect of third party vessel to vessel collision risk is considered to be **Broadly Acceptable and Not Significant in EIA terms**.

Increased Third Party Vessel to Project Vessel Collision Risk

9.8.2.7 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 should be establishing appropriate vessel management systems including through marine coordination, and as such any encounters will be managed, including by COLREGs (IMO, 1972/77[1]) and SOLAS (IMO, 1974[2]).

9.8.2.8 Taking the frequency of occurrence as **Extremely Unlikely** and the severity of consequence as **Serious**, the cumulative effect of third party vessel to project vessel collision risk is considered to be **Tolerable and Not Significant in EIA terms**.

Vessel to Structure Allision Risk

9.8.2.9 The nearest screened in cumulative development is Stromar OWF, located in excess of 11nm northeast of the Caledonia OWF and 21nm northeast of the Caledonia OECC. As discussed in relation to collision risk, input from the Hazard Workshop indicated there was no concern over the sea room available for deviation within a cumulative context. Given this available sea space between the Caledonia OWF and the screened in developments, it is unlikely that vessels will experience increased allision risk beyond the localised risk when passing any given development.

9.8.2.10 All developments will be required to implement marine lighting and marking in agreement with NLB and in compliance with IALA G1162 (IALA, 2022[11]), meaning the localised risk is managed. Further, all layouts will need to be agreed with the MCA and NLB, with these discussions including consideration of allision risk.

9.8.2.11 Taking the frequency of occurrence as **Negligible** and the severity of consequence as **Serious**, the cumulative effect of vessel to structure allision risk is considered to be **Broadly Acceptable and Not Significant in EIA terms**.

Reduced Access to Local Ports

9.8.2.12 As discussed in relation to 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. This increases the number of vessels which may be RAM at any given time as well as generally increasing the number of vessels within an area.

9.8.2.13 Given the relative distance to ports in the area and the anticipated cumulative deviations for the main commercial routes, it is not anticipated that there will

be any substantial effect due to activities associated with cumulative developments beyond the deviations already outlined for impacts relating to vessel displacement. This assumes that the duration and nature of such activities are analogous to that considered for the Proposed Development (Offshore), especially for the areas on approach to the Landfall Site.

9.8.2.14 In the event of temporal overlap in construction of cumulative developments, it is anticipated that the developments would coordinate activities in liaison with local ports so as to ensure that access constraints are minimised. As is the case for the assessment of the Proposed Development (Offshore) in isolation, promulgation of information to allow mariners to passage plan accordingly is key.

9.8.2.15 Taking the frequency of occurrence as **Frequent** and the severity of consequence as **Minor**, the cumulative effect of reduced access to ports is considered to be **Tolerable and Not Significant in EIA terms**.

Reduced SAR Capabilities

9.8.2.16 Given baseline incident rates, and noting the additional resources that would be available for the Proposed Development (Offshore) 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 the NRA).

9.8.2.17 Additionally, other developments will also be expected to comply with MGN 654, and provide measures in liaison with the MCA to mitigate the risk of reduced SAR capabilities. This will include agreement of layouts, production of an ERCoP, and a SAR checklist.

9.8.2.18 Taking the frequency of occurrence as **Extremely Unlikely** and the severity of consequence as **Serious**, the cumulative effect of reduced emergency response capability is considered to be **Tolerable and ALARP and Not Significant in EIA terms**.

9.9 In-combination Effects

9.9.1 Overview

9.9.1.1 In-combination impacts may occur through the inter-relationship with another EIAR topic that may lead to different or greater environmental effects than in isolation. There is also the potential for in-combination impacts resulting from onshore and offshore works. These are identified within Volume 6, Chapter 1: Introduction (Intertidal Interface) and are therefore not repeated here.

9.9.1.2 The potential in-combination effects for Shipping and Navigation receptors resulting from effects between the Proposed Development (Offshore) works are described below.

9.9.2 In-combination Effects Between Proposed Development (Offshore) Stages

9.9.2.1 No in-combination effects (project lifetime effects) are predicted to arise between the construction, operation, and decommissioning stages of the Proposed Development (Offshore) 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.

9.9.3 In-combination Effects ithin Proposed Development (Offshore) Stages

9.9.3.1 For Shipping and Navigation, it is not anticipated that any in-combination 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 with mitigation and ALARP under the FSA (IMO, 2018[8]).

9.10 Transboundary Effects

9.10.1.1 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).

9.10.1.2 Transboundary impacts in terms of vessel routeing (including to international ports are considered to have been assessed in Section 9.7 (for the Proposed Development (Offshore) in isolation) and Section 9.8 (on a cumulative basis). Individual transits may have the potential to be associated with vessels that are internationally owned or located; however, any such transits have been captured within the baseline assessment of vessel traffic as per Section 9.4 noting that AIS carriage requirements are set by the IMO and apply across EEAs.

9.10.1.3 Since international commercial routeing is captured in the existing environment, the environmental assessment for the Proposed Development (Offshore) suitably considers effects in transboundary terms.

9.11 Mitigation Measures and Monitoring

9.11.1 Construction

9.11.1.1 Mitigation measures during the construction phase for the Proposed Development (Offshore), other than those which are embedded, are proposed to reduce the impact of reduced access to local ports to ALARP. This includes liaison with Whitehills, Banff and Macduff harbour authorities.

9.11.1.2 Additional mitigation measures are also proposed to reduce the impact of reduced under keel clearance from wet stored components within the Caledonia OWF during the construction phase of the Proposed Development (Offshore). This includes ensuring the locations of subsea infrastructure are made available to fishing vessels including via FLO liaison.

9.11.1.3 A SEZ with no surface piercing infrastructure will also be implemented to reduce impacts to adverse weather routeing. See Section 9.7.1 for further detail.

9.11.2 Operation

9.11.2.1 Additional mitigation measures are also proposed to reduce the impact of reduced under keel clearance from dynamic inter-array cables and mooring lines during the O&M phase of the Proposed Development (Offshore). This includes consultation with the MCA and NLB to confirm available under keel clearance post installation as well as ensuring the locations of subsea infrastructure are made available to fishing vessels including via FLO liaison.

9.11.2.2 A SEZ with no surface piercing infrastructure will also be implemented to reduce impacts to adverse weather routeing. See Section 9.7.2 for further detail.

9.11.3 Decommissioning

9.11.3.1 Mitigation measures during the decommissioning phase for the Proposed Development (Offshore), other than those which are embedded, are proposed to reduce the impact of reduced access to local ports to ALARP. This includes liaison with Whitehills, Banff and Macduff harbour authorities.

9.11.3.2 A SEZ with no surface piercing infrastructure will also be implemented to reduce impacts to adverse weather routeing. See Section 9.7.3 for further information.

9.12 Summary of Effects

9.12.1.1 Table 9–16 presents a summary of the significant effects assessed within this EIAR, any mitigation required, and the residual effects are provided.

Table 9–16: Summary of Effects for Shipping and Navigation.

Potential Impact	Frequency	Severity of Consequence	Significance of Risk	Additional Mitigation Measure	Residual Effect
Construction					
Impact 1: Vessel displacement	Frequent During adverse weather: Remote	Negligible During adverse weather: Serious	Tolerable During adverse weather: Tolerable	N/A During adverse weather: Implementation of SEZ	Tolerable and ALARP, not significant During adverse weather: Tolerable with mitigation and ALARP, not significant
Impact 2: Increased third party vessel to vessel collision risk	Extremely unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant
Impact 3: Increased third party vessel to project vessel collision risk	Extremely Unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant
Impact 4: Vessel to structure allision risk	Remote	Moderate	Tolerable	Ensure locations of structures are made available to the fishing industry via weekly notice of operations, as secured by the FMMS (M-17)	Tolerable and ALARP, not significant
Impact 5: Reduced access to local ports	Reasonably Probable	Minor	Tolerable	Liaison with Whitehills, Macduff and Banff harbours.	Tolerable with mitigation and ALARP, not significant

Potential Impact	Frequency	Severity of Consequence	Significance of Risk	Additional Mitigation Measure	Residual Effect
Impact 6: Reduction of under keel clearance	Extremely Unlikely	Serious	Tolerable	Ensure locations of structures are made available to the fishing industry via weekly notice of operations, as secured by the FMMS (M-17)	Tolerable with mitigation and ALARP, not significant
Impact 7: Loss of station	Extremely Unlikely	Moderate	Broadly acceptable	N/A	Broadly acceptable, not significant
Impact 8: Reduction of SAR capabilities	Extremely Unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant
Operation and Maintenance					
Impact 9: Vessel displacement	Frequent During adverse weather: Remote	Negligible During adverse weather: Serious	Tolerable During adverse weather: Tolerable	N/A During adverse weather: Implementation of SEZ	Tolerable and ALARP, not significant During adverse weather: Tolerable with mitigation and ALARP, not significant
Impact 10: Increased third party vessel to vessel collision risk	Extremely Unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant
Impact 11: Increased third party vessel to project vessel collision risk	Extremely Unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant

Potential Impact	Frequency	Severity of Consequence	Significance of Risk	Additional Mitigation Measure	Residual Effect
Impact 12: Vessel to structure allision risk	Remote	Moderate	Tolerable	Ensure locations of structures are made available to the fishing industry via weekly notice of operations, as secured by the FMMS (M-17)	Tolerable and ALARP, not significant
Impact 13: Reduced access to local ports	Remote	Minor	Broadly acceptable	N/A	Broadly acceptable, not significant
Impact 14: Reduction of under keel clearance	Extremely Unlikely	Serious	Tolerable	MCA and NLB consultation on under keel clearance. Ensuring locations of subsea infrastructure are made available to fishing vessels including via FLO liaison.	Tolerable with mitigation and ALARP, not significant
Impact 15: Anchor interaction with sub-sea cables and mooring lines	Extremely Unlikely	Moderate	Broadly acceptable	N/A	Broadly acceptable, not significant
Impact 16: Loss of station	Extremely Unlikely	Moderate	Broadly acceptable	N/A	Broadly acceptable, not significant
Impact 17: Reduction of SAR capability	Extremely Unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant

Potential Impact	Frequency	Severity of Consequence	Significance of Risk	Additional Mitigation Measure	Residual Effect
Decommissioning					
Impact 18: Vessel displacement	Frequent During adverse weather: Remote	Negligible During adverse weather: Serious	Tolerable During adverse weather: Tolerable	N/A During adverse weather: Implementation of SEZ	Tolerable and ALARP, not significant During adverse weather: Tolerable with mitigation and ALARP, not significant
Impact 19: Increased third party vessel to vessel collision risk	Extremely unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant
Impact 20: Increased third party vessel to project vessel collision risk	Extremely Unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant
Impact 21: Vessel to structure allision risk	Remote	Moderate	Tolerable	Ensure locations of structures are made available to the fishing industry via weekly notice of operations, as secured by the FMMS (M-17)	Tolerable and ALARP, not significant
Impact 22: Reduced access to local ports	Reasonably Probable	Minor	Tolerable	Liaison with Whitehills, Macduff and Banff harbours.	Tolerable with mitigation and ALARP, not significant

Potential Impact	Frequency	Severity of Consequence	Significance of Risk	Additional Mitigation Measure	Residual Effect
Impact 23: Loss of station	Extremely Unlikely	Moderate	Broadly acceptable	N/A	Broadly acceptable, not significant
Impact 24: Reduction of SAR capabilities	Extremely Unlikely	Serious	Tolerable	N/A	Tolerable and ALARP, not significant

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