Environmental Impact Assessment Report
Volume 3, Appendix 15.1: Navigational Risk

MarramWind Offshore Wind Farm

December 2025

MarramWind

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MarramWind Offshore Wind Farm Navigational Risk Assessment

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	Aberdeen Office	Cambridge Office
Address	10 Exchange Street, Aberdeen, AB11 6PH, UK	Braemoor, No. 4 The Warren, Witchford Ely, Cambs, CB6 2HN, UK
Tel	01224 253700	01353 661200
Email	aberdeen@anatec.com	cambs@anatec.com

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01	5 September 2025	Updated after review
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Glossary of Terms and Abbreviations

Abbreviation	Definition
Allision	The act of striking or collision of a moving vessel against a stationary object.
Automatic Identification System	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status. Most commercial vessels and European Union fishing vessels over 15 metre (m) in length are required to carry AIS.
Baseline	Existing conditions as represented by the latest available data, whether from literature or survey and used as a benchmark for making comparisons to assess the impact of a development or project.
Collision	The act or process of colliding (crashing) between two moving objects.
Cumulative Effects	Additional changes caused by the Project in conjunction with other similar developments or as a combined effect of a set of developments, taken together.
Cumulative Effects Assessment	Assessment of effects as a result of the incremental changes caused by other past, present and reasonably foreseeable human activities and natural processes together with the Project.
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Environmental Impact Assessment Regulations	Collectively the term used to refer to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, The Marine Works (Environmental Impact Assessment) Regulations 2007, and The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
Electromagnetic field	An electric and magnetic force field that surrounds a moving electrical charge.
Embedded Mitigation Measure	Equate to 'primary environmental measures' as defined by Institute of Environmental Management and Assessment (2016). They are measures to avoid or reduce environmental effects that are directly incorporated into the preferred masterplan for the Project.
Environmental Impact Assessment	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').

Abbreviation	Definition
Environmental Impact Assessment Report	The outcome of the EIA process is reported within a document called an EIA Report.
Export Cable	The cable(s) that transmit electricity produced by the WTGs to landfall.
Formal Safety Assessment	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity as defined by the International Maritime Organisation (IMO).
Future Case	The assessment of risk based on the predicted growth in future shipping densities and traffic types as well as foreseeable changes in the marine environment.
Landfall	The generic term applied to the entire coastal area between the limit of Mean Low Water Springs (MLWS) and the position of the Transition Joint Bay (TJB) located above the limit of Mean High Water Springs (MHWS), inclusive of all construction works, including the offshore and onshore export cable corridor, intertidal working area and landfall compound.
Main Commercial Route	Defined transit route (mean position) of commercial vessels identified within each study area.
Marine Guidance Note	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
MarramWind Limited	A 50/50 Joint Venture company between ScottishPower Renewables (SPR) UK Limited and Shell New Energies Holding Limited (Shell). The Joint Venture is formalised by way of a Shareholder Agreement and has been created for the delivery of the MarramWind Offshore Wind Farm.
Navigational Risk Assessment	A document which assesses the hazards to Shipping and Navigation of a proposed Offshore Renewable Energy Installation (OREI) based upon Formal Safety Assessment (FSA).
Offshore Export Cable Corridor	The area within which the offshore export cable(s) will be installed.
Offshore Export Cable Corridor Study Area	A buffer of two nautical miles (nm) applied around the offshore export cable corridor.
Offshore Renewable Energy Installation	As defined by MGN 654 (Merchant and Fishing) Safety of Navigation: OREIs – Guidance on United Kingdom (UK) Navigational Practice,

Abbreviation	Definition
	Safety and Emergency Response (MCA, 2021). For the purposes of this report and in keeping with the consistency of the EIA, OREI can mean offshore wind turbines and the associated electrical infrastructure such as offshore substations.
Offshore Wind Farm	An offshore wind farm is a group of wind turbine generators in the same location (offshore) in the sea, which are used to produce electricity.
Option Area Agreement	Term for the wind farm site upon the seabed at a location specified in the Option Agreement between the Crown Estate Scotland and a developer. It is the agreement that allows the developer the rights to undertake such tests, survey and site investigations that do not entail the temporary or permanent installation of any works or structures on the seabed.
Project	MarramWind Offshore Wind Farm – comprises the wind farm and all associated offshore and onshore components.
Radio Detection and Ranging	An object-detection system which uses radio waves to determine the range, altitude, direction or speed of objects.
Reactive Compensation Platform	For HVAC transmission, there is an upper limit of offshore export cable route length, beyond which the electrical losses incurred during transmission become prohibitive. This limit can be increased using reactive power compensation equipment connected through a separate substation(s) along the export cable route, typically close to the mid-point between the offshore substation and onshore substation.
RCP search area	A five kilometre (km) buffer of the export cable corridor area covering 40–60% distance along the offshore export cable corridor in which the RCP(s) will be located.
RCP Search Are Study Area	A buffer of 10nm around the RCP search area.
Regular Operator	Commercial operator whose vessel(s) are observed to transit through a particular region on a regular basis.
Safety Zone	A statutory marine zone demarcated for the purposes of safety around a possibly hazardous installation or works/construction area.
Scoping Opinion	A Scoping Opinion is adopted by the Planning Authority and Scottish Ministers for a proposed project.
Scoping Report	A report that presents the findings of an initial stage in the Environmental Impact Assessment process.

Abbreviation	Definition
Section 36 Consent	Consent to construct and operate an offshore generating station, under Section 36 (S.36) of the Electricity Act 1989. This includes deemed planning permission for onshore works.
Study Area	A buffer of 10nm applied around the OAA.
Unique Vessel	An individual vessel identified on any particular calendar day, irrespective of how many tracks were recorded for that vessel on that day. This prevents vessels being over counted. Individual vessels are identified using their Maritime Mobile Service Identity (MMSI).
Vessel Monitoring System	A system used in commercial fishing to allow environmental and fisheries regulatory organisations to monitor, minimally, the position, time at a position, and course and speed of fishing vessels.

Abbreviations Table

Abbreviation	Definition
µT	Microtesla
AC	Alternating Current
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ALB	All-Weather Lifeboats
ARPA	Automatic Radar Plotting Aid
ATBA	Area to be Avoided
AtoN	Aid to Navigation
BBC	British Broadcasting Corporation
BWEA	British Wind Energy Association
CA	Cruising Association
CaP	Cable Plan
CBA	Cost Benefit Analysis
CBRA	Cable Burial Risk Assessment
CBRA	Cable Burial Risk Assessment
CCTV	Closed Circuit Television
CD	Chart Datum

Abbreviation	Definition
CEA	Cumulative Effects Assessment
CfD	Contract for Difference
CFSR	Climate Forecast System Reanalysis
CHIRP	Confidential Human Factors Incident Reporting Programme
CMS	Construction Method Statement
COLREGs	Convention on International Regulations for Preventing Collisions at Sea
CTV	Crew Transfer Vessel
DC	Direct Current
DECC	Department of Energy & Climate Change
DF	Direction Finding
DfT	Department for Transport
DSC	Digital Selective Calling
DSLP	Development Specification and Layout Plan
DWT	Deadweight Tonnage
EGL2	Eastern Green Link 2
EGL3	Eastern Green Link 3
EIA	Environmental Impact Assessment
EMF	Electromagnetic field
EMP	Environmental Management Plan
ERCoP	Emergency Response Cooperation Plan
ESRI	Environmental Systems Research Institute
ETRS89	European Terrestrial Reference System 1989
EU	European Union
FLiDAR	Floating Light Detection and Ranging
FMMMS	Fisheries Monitoring, Management and Mitigation Strategy
FPSO	Floating Production, Storage and Offloading
FSA	Formal Safety Assessment
GIS	Geographical Information System
GLA	General Lighthouse Authority

Abbreviation	Definition
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
GRP	Glass Reinforced Plastic
GT	Gross Tonnage
HAT	Highest Astronomical Tide
HF	High Frequency
HM	His Majesty
HRA	Helicopter Refuge Area
HSE	Health and Safety Executive
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ID	Identification
IHO	International Hydrographic Organisation
ILB	Inshore Lifeboats
IMCA	International Marine Contractors Association
IMO	International Maritime Organisation
IOWAGA	Integrated Ocean Waves for Geophysical and other Applications
IPS	Intermediate Peripheral Structures
JV	Joint Venture
kHz	Kilohertz
km	Kilometre
kt	Knot
LMP	Lighting and Marking Plan
LOA	Length Overall
LPG	Liquid Petroleum Gas
m	Metre
m^2	Square Metres
MAIB	Marine Accident Investigation Branch

Abbreviation	Definition
MCA	Maritime and Coastguard Agency
MD-LOT	The Marine Directorate - Licensing Operations Team
MEHRA	Marine Environmental High Risk Areas
MEPC	Marine Environment Protection Committee
MetOcean	Meteorological and Oceanographic
MF	Medium Frequency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MMSI	Maritime Mobile Service Identity
MOD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
MPS	Marine Policy Statement
MSC	Maritime Safety Committee
MSI	Maritime Safety Information
MSL	Mean Sea Level
MW	Megawatt
N	North
NAVTEX	Navigational Telex
NLB	Northern Lighthouse Board
nm	Nautical Mile
nm^2	Square Nautical Miles
NRA	Navigational Risk Assessment
O&M	Operation and Maintenance
OAA	Option Area Agreement
OOMP	Offshore O&M Plan
OREI	Offshore Renewable Energy Installation
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic

Abbreviation	Definition
PDER	Project Design Envelope Register
PEMP	Project Environmental Monitoring Programme
PEXA	Practice and Exercise Area
PLA	Port of London Authority
PLL	Potential Loss of Life
PNT	Positioning, Navigation and Timing
POB	Person on Board
QHSE	Quality, Health, Safety and Environment
Racon	Radar Beacon
Radar	Radio Detection and Ranging
RAM	Restricted her Ability to Manoeuvre
RCP	Reactive Compensation Platform
REZ	Renewable Energy Zones
RIB	Rigid Inflatable Boat
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
SCADA	Supervisory Control and Data Acquisition
SCF	Specialised Committee on Fisheries
SDC	Subsea Distribution Centre
SFF	Scottish Fishermen's Federation
SLoO	Single Line of Orientation
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
SONAR	Sound Navigation Ranging
SOV	Service Operation Vessel
SPR	ScottishPower Renewables
SPS	Significant Peripheral Structure

Abbreviation	Definition
TJB	Transition Joint Bay
TPV	Third-Party Verification
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
VHF	Very High Frequency
VMNSP	Vessel Management and Navigational Safety Plan
VMS	Vessel Monitoring System
VTS	Vessel Traffic Service
W	West
WETREP	Western European Tanker Reporting System
WTG	Wind Turbine Generator

1 Introduction

1.1 Background

1. Anatec was commissioned by ScottishPower Renewables (UK) Limited and Shell New Energies Holding Limited, a Joint Venture (JV) on behalf of MarramWind (hereafter, referred to as 'the Applicant') to undertake a Navigational Risk Assessment (NRA) for the MarramWind Offshore Wind Farm (hereafter, referred to as 'the Project'). The NRA has been undertaken with respect to the offshore components of the Project comprising the Offshore Agreement Area (OAA), the offshore export cable corridor, and the reactive compensation platform(s) (RCP).

2. This NRA presents information on the Project relative to the existing and estimated future navigational activity and forms a technical appendix to the Environmental Impact Assessment Report (EIA Report), **Volume 1, Chapter 15: Shipping and Navigation**.

1.2 Navigational Risk Assessment

3. An Environmental Impact Assessment (EIA) is a process which identifies the likely significant environmental effects of a project, both adverse and beneficial. An important requirement of the EIA for offshore projects is the NRA. Following the Maritime and Coastguard Agency's (MCA) Marine Guidance Note (MGN) 654 (MCA, 2021), this NRA includes:

   - Outline of methodology applied in the NRA including relevant guidance;
   - Summary of consultation undertaken with shipping and navigation stakeholders;
   - Lessons learnt from previous offshore wind farm developments;
   - Summary of Project Design Envelope Register (PDER) relevant to shipping and navigation;
   - Overview of existing environmental including:
     - Navigational features;
     - Meteorological and oceanographic conditions;
     - Emergency response resources and historical maritime incidents; and
     - Vessel traffic movements.
   - Implications for marine navigation and communication equipment;
   - Cumulative and transboundary overview;
   - Overview of anticipated future case vessel traffic;
   - Assessment of navigation risk pre and post construction of the Project including collision and allision risk modelling;
   - Hazard identification for further assessment;
   - Identification of embedded mitigation measures; and
   - Completion of the MGN 654 Checklist (See **Appendix A**).

4. Potential hazards have been considered for each stage of the Project as follows:

   - Construction (including pre-construction);

- Operation and maintenance (O&M); and
- Decommissioning.

5. The shipping and navigation baseline and risk assessment has been undertaken based upon the information available and responses received at the time of preparation, including the including the maximum design scenario which has been defined for the NRA based on the information detailed in **Volume 1, Chapter 4: Project Description**.

2 Guidance and Legislation

2.1 Legislation

6. As part of the EIA Directive (2011/92/European Union (EU), as amended by Directive 2014/52/EU) (which remains applicable following EU Exit), an EIA Report is required to support the consenting applications for the Project. The MCA require that, as part of the EIA Report, an NRA is undertaken to "*inform the shipping and navigation chapter of the EIA Report*" (MCA, 2021).

2.2 Primary Guidance

7. The primary guidance documents used during the assessment are the following:

- MGN 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response and its annexes (MCA, 2021); and
- Revised Guidelines for Formal Safety Assessment (FSA) for Use in the Rule-Making Process (International Maritime Organization (IMO), 2018).

8. MGN 654 highlights issues that shall be considered when assessing the potential effect on navigational safety from offshore renewable energy developments proposed in United Kingdom (UK) internal waters, territorial sea or Renewable Energy Zones (REZ).

9. MGN 654 includes several annexes including the *Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of OREI* which the MCA require to be used as a template for preparing NRAs. The methodology is centred on risk management and requires a submission that shows that sufficient controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with mitigation (see **Section 3**). In both **Volume 1, Chapter 15: Shipping and Navigation** of the EIA Report and the NRA, the base and future case levels of risk have been identified as well as the mitigation measures required to ensure the future case remains broadly acceptable, or tolerable with mitigation.

2.3 Other Guidance

10. Other guidance documents used during the assessment include:

- MGN 372 Amendment 1 (Merchant and Fishing) OREI: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2022);
- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation O-139 on The Marking of Man-Made Offshore Structures (IALA, 2021a);
- IALA Guidance G1162 The Marking of Offshore Man-Made Structures (IALA, 2021b);
- IALA Guidance G1185 Enhancing the Safety and Efficiency of Navigation Around OREIs (IALA, 2024)

- The Royal Yachting Association's (RYA) Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019);
- Standard Marking Schedule for Offshore Installations (Department of Energy & Climate Change (DECC)), 2011); and
- Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and Health and Safety Executive (HSE), 2017).

2.4 Lessons Learnt

11. There is considerable benefit for the Project in the sharing of lessons learnt within the offshore industry. The NRA, and in particular the risk assessment undertaken from **Sections 18** and **Volume 1, Chapter 15: Shipping and Navigation** of the EIA Report, includes general consideration for lessons learnt and expert opinion from previous offshore wind farm developments and other sea users, capitalising upon the UK's position as a leading generator of offshore wind power.

12. Data sources for lessons learnt include the following:

- Sharing the Wind – Recreational Boating in the Offshore Wind Strategic Areas (RYA and Cruising Association (CA), 2004);
- Results of the Electromagnetic Investigations (MCA and QinetiQ, 2004);
- Offshore Wind Farm Helicopter Search and Rescue Trials Undertaken at the North Hoyle Wind Farm (MCA, 2005);
- Interference to Radio Detection and Ranging (Radar) Imagery from Offshore Wind Farm (Port of London Authority (PLA) ,2005);
- Strategic Assessment of Impacts on Navigation of Shipping and Related Effects on Other Marine Activities Arising from the Development of Offshore Wind Farms in the UK Renewable Energy Zone (Anatec and the Crown Estate, 2012);
- Offshore Wind and Marine Energy Health and Safety Guidelines (RenewableUK, 2014);
- Influence of UK Offshore Wind Farm Installation on Commercial Vessel Navigation: A Review of Evidence (Anatec, 2016); and
- G+ Global Offshore Wind Health & Safety Organisation 2020 Incident Data Report (G+, 2021).

3 Navigational Risk Assessment Methodology

3.1 Formal Safety Assessment Methodology

13. A shipping and navigation user can only be affected by a hazard if there is a pathway through which a hazard can be transmitted between the source activity (cause) and the user. In cases where a user is exposed to a hazard, the overall severity of consequence to the user is determined. This process incorporates a degree of subjectivity. The assessments presented herein for shipping and navigation users have considered the following criteria:

- Baseline data and assessment;
- Expert opinion;
- Outputs of the Hazard Workshop;
- Level of stakeholder concern;
- Time and / or distance of any deviation;
- Number of transits of specific vessel and / or vessel type; and
- Lessons learnt from existing offshore developments.

14. With regards to commercial fishing vessels, the methodology and assessment considers hazards to commercial fishing vessels in transit. A separate methodology and assessment have been applied in **Volume 1, Chapter 14: Commercial Fisheries** of the EIA Report to consider hazards to commercial fishing vessels related to commercial fishing activity (rather than commercial fishing vessels in transit).

3.2 Formal Safety Assessment Process

15. The IMO FSA process (IMO, 2018) (the FSA process) as approved by the IMO in 2018 under Maritime Safety Committee (MSC) – Marine Environment Protection Committee (MEPC).2 / circ. 12 / Rev.2 has been applied to the risk assessment in **Volume 1, Chapter 15: Shipping and Navigation** of the EIA Report and from **Sections 18**.

16. The FSA process is a structured and systematic methodology based upon risk analysis and Cost Benefit Analysis (CBA) (if applicable) to reduce risks to As Low as Reasonably Practicable (ALARP). There are five basic steps within this process as illustrated in **Figure 3-1** and summarised in the following list:

- **Step 1** – identification of hazards (a list is produced of hazards prioritised by risk level specific to the problem under review);
- **Step 2** – risk analysis (investigation of the causes and initiating events and consequences of the more important hazards identified in Step 1);
- **Step 3** – risk control options (identification of measures to control and reduce the identified hazards);
- **Step 4** – CBA (identification and comparison of the benefits and costs associated with the risk control options identified in Step 3); and

- **Step 5** – recommendations for decision-making (defining of recommendations based upon the outputs of Steps 1–4).

Figure 3-1 Flow Chart of the FSA Methodology (IMO, 2018)

3.2.1 Hazard Workshop Methodology

17. A key tool used when undertaking an NRA is the Hazard Workshop which ensures that all risks are identified and qualified in agreement with relevant consultees prior to assessment within the EIA Report. Risks (and the determined qualification) are recorded via the hazard log which is presented in full in **Appendix B**.

18. **Table 3.1** and **Table 3.2** identify how the severity of consequence and the frequency of occurrence has been defined within the hazard log, respectively, completed based on the outputs of the Hazard Workshop. Further information on the Hazard Workshop is included in **Section 4.2**.

Table 3.1 Severity of consequence ranking definitions

Rank	Description	Definition			
		People	Property	Environment	Business
1	Negligible	No perceptible risk	No perceptible risk	No perceptible risk	No perceptible risk
2	Minor	Slight injury(ies)	Minor damage to property, i.e. superficial damage	Tier 1 local assistance required	Minor reputational risks – limited to users

Rank	Description	Definition			
		People	Property	Environment	Business
3	Moderate	Multiple minor or single serious injury	Damage not critical to operations	Tier 2 limited external assistance required	Local reputational risks
4	Serious	Multiple serious injuries or single fatality	Damage resulting in critical risk to operations	Tier 2 regional assistance required	National reputational risks
5	Major	More than one fatality	Total loss of property	Tier 3 national assistance required	International reputational risks

Table 3.2 Frequency of occurrence ranking definitions

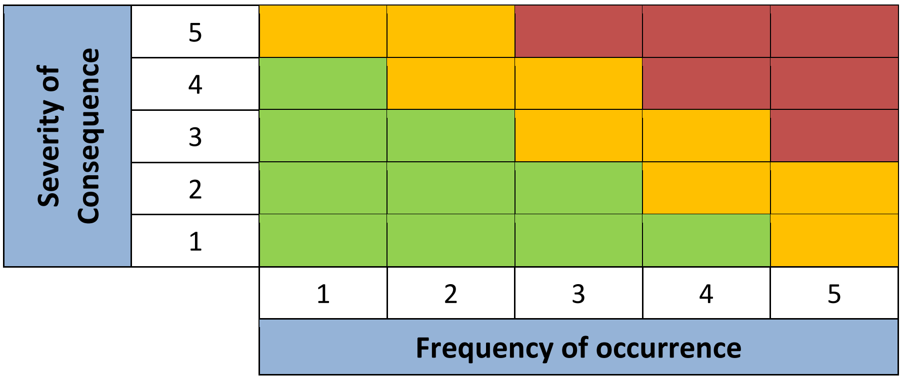
Rank	Description	Definition
1	Negligible	Less than 1 occurrence per 10,000 years
2	Extremely unlikely	1 per 100–10,000 years
3	Remote	1 per 10–100 years
4	Reasonably probable	1 per 1–10 years
5	Frequent	Yearly

19. An aggregate of the severity of consequence (**Table 3.1**) and frequency of occurrence (**Table 3.2**) provide the level of risk for each hazard; the method for undertaking this aggregation is through use of a tolerability matrix, as presented in **Table 3.3**. The risk of a hazard is defined as **Broadly Acceptable** (low risk), **Tolerable with Mitigation** (intermediate risk), or **Unacceptable** (high risk).

20. Once identified, the risk of a hazard is assessed to ensure it is ALARP. Further risk control measures may be required to further mitigate a hazard in accordance with the ALARP principle. Unacceptable risks are not considered to be ALARP.

21. Outputs of the hazard log have been used as evidence to support and refine the assessment undertaken in **Volume 1, Chapter 15: Shipping and Navigation** of the EIA Report and from **Sections 18**.

Table 3.3 Tolerability matrix and risk rankings



	Unacceptable (high risk)
	Tolerable (intermediate risk)
	Broadly Acceptable (low risk)

3.3 Methodology for Cumulative Risk Assessment

22. The hazards identified in the FSA are also assessed for cumulative risks with the inclusion of other projects and the Project within the cumulative risk assessment. Given the varying type, status and location of developments, different scenarios have been considered in the cumulative risk assessment, which allocates developments into the scenarios depending upon the following criterion:

- Development status;
- Distance from the Project;
- Level of interaction with baseline traffic relevant to the Project;
- Level of concern raised during consultation; and
- Data confidence.

23. It is noted that given the unique nature of shipping and navigation, the tiering system applied in the NRA differs from that assumed in the overarching EIA Report (see **Volume 1, Chapter 5: Approach to the EIA** of the EIA Report).

24. The scenarios and associated level of assessment undertaken for each, are summarised in **Table 3.4**. Given the level of interest during consultation in the cumulative scenario, a detailed qualitative and quantitative (where applicable) approach to the cumulative risk assessment has been applied for each scenario.

25. The maximum distance within which developments are considered for the cumulative risk assessment is 50 nautical miles (nm) from the OAA, 10nm from the RCP search area, and 2nm from the offshore export cable corridor on the basis that there is not considered to be a direct pathway between the Project and any development beyond these distances.

This distance is standard within NRAs and provides a good overview of cumulative traffic patterns.

26. An aggregate of the criterion can determine the relevant scenario(s) for each development. For example, if a development is located within 50nm of the OAA but does not impact a main commercial route passing within 1nm of the OAA and has low data confidence it may still be screened out of the cumulative risk assessment.

27. For the purpose of the cumulative assessment, the development status in the context of shipping and navigation has been defined as the following:

- 'Consented' indicates that a development has been consented but does not have a Contract for Difference (CfD) secured.
- 'Pre-construction' indicates that a development has been consented and has a CfD secured.
- 'Under determination' refers to a project submitted but not yet consented.
- 'Under construction' indicates that offshore construction was ongoing at the time of the baseline being established and a buoyed construction area is present.

28. Projects meeting the assessment criteria are detailed in **Section 13**.

Table 3.4 Cumulative development screening summary

Tier	Minimum Development Status	Criterion	Data Confidence Level	Level of Cumulative Risk Assessment
1	Under construction, ongoing decommissioning, consented or under determination	▪ May impact a main commercial route passing within 1nm of the OAA or RCP and / or interacts with traffic which may be directly displaced by the OAA or RCP. ▪ Raised as having possible cumulative effect during consultation. ▪ Offshore wind farms up to 25nm from the OAA; 5nm from the RCP search area; and 2nm from the offshore export cable corridor. ▪ Subsea cables up to 2nm from all offshore Project components. ▪ Oil and gas infrastructure up to 5nm from the OAA and RCP; and 2nm from the offshore export cable corridor.	High or medium	Quantitative cumulative re-routeing of main commercial routes

Tier	Minimum Development Status	Criterion	Data Confidence Level	Level of Cumulative Risk Assessment
2	Under construction, scheduled decommissioning, consented or under determination	▪ May impact a main commercial route passing within 1nm of the OAA or RCP and / or interacts with traffic which may be directly displaced by the OAA or RCP. ▪ Offshore wind farms up to 50nm from the OAA; 10nm from the RCP search area; and 5nm from the offshore export cable corridor. ▪ Subsea cables up to 2nm from all offshore Project components. ▪ Oil and gas infrastructure up to 5nm from the OAA and RCP; and 2nm from the offshore export cable corridor.	High or medium	Quantitative cumulative re-routeing of main commercial routes
3	Scoped, under determination, or decommissioning	▪ Does not impact a main commercial route passing within 1nm of the OAA or RCP and does not interact with traffic which may be directly displaced by the OAA or RCP. ▪ Offshore wind farms up to 50nm from the OAA; 10nm from the RCP search area; and 5nm from the offshore export cable corridor. ▪ Subsea cables up to 2nm from all offshore Project components. ▪ Oil and gas infrastructure up to 5nm from the OAA and RCP; and 2nm from the offshore export cable corridor.	Low	Qualitative assumptions of routeing only

3.4 Shipping and Navigation Study Area

29. A 10nm buffer has been applied around the OAA (hereafter the 'study area') as shown in **Figure 3-2**. This study area has been defined to provide local context to the analysis of risks by obtaining vessel traffic movements within, and in proximity to, the Project. A 10nm study area has been used within the majority of United Kingdom (UK) offshore wind farm NRAs and is suitable for collection of Radio Detection and Ranging (Radar) data and ensures that relevant routeing which may be affected is captured while still remaining specific to the area being studied.

30. A 10nm buffer has also been applied around the RCP search area (hereafter the 'RCP search area study area'), as shown in **Figure 3-2**. Again, as surface structures may be present, a 10nm buffer is industry standard and again ensures that relevant routeing which may be affected is captured while still remaining specific to the area being studied.

31. A 2nm buffer has been applied around the offshore export cable corridor (hereafter the 'offshore export cable corridor study area') as shown in **Figure 3-2**. As above, this offshore export cable corridor study area has also been defined to capture relevant users and their movements within and near the offshore export cable corridor.

32. These study areas have been presented to and agreed with by stakeholders including in the Scoping Report and at the Hazard Workshop.

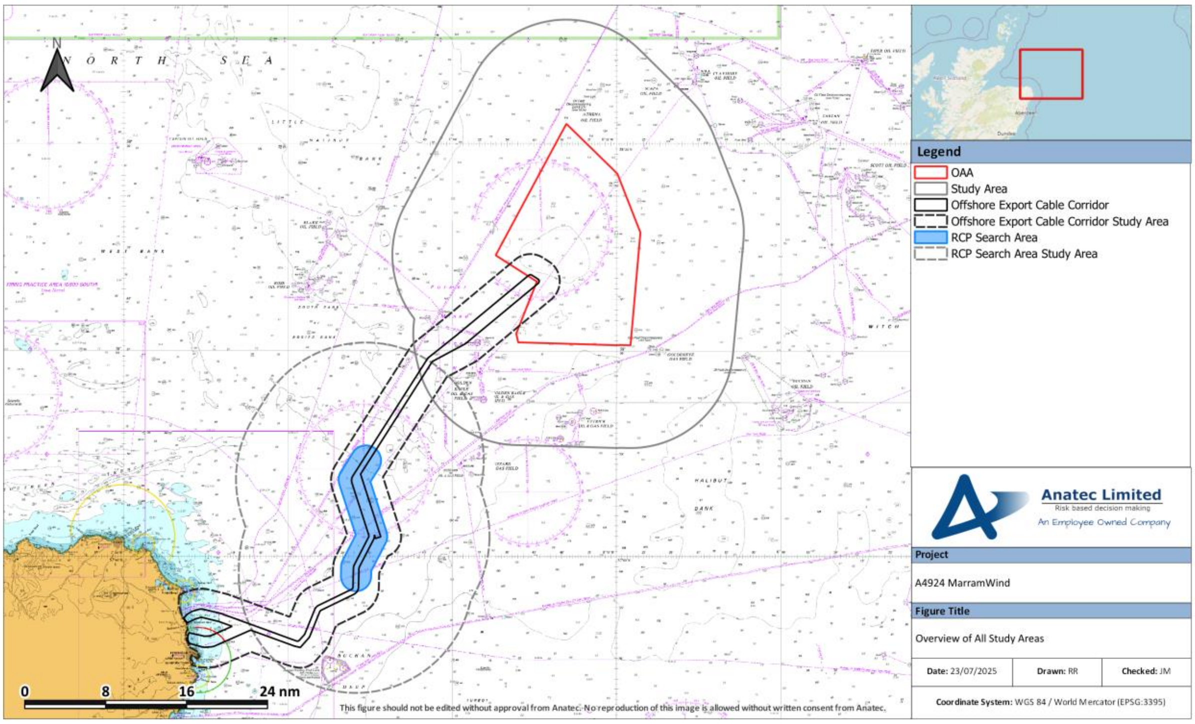


Figure 3-2 Overview of All Study Areas

4 Consultation

4.1 Stakeholders Consulted in the Navigational Risk Assessment Process

33. Key shipping and navigation stakeholders have been consulted in the NRA process. The following stakeholders have been consulted with via dedicated meetings, including the Hazard Workshop (see **Section 4.2**):

- MCA;
- Northern Lighthouse Board (NLB);
- UK Chamber of Shipping;
- Peterhead Port Authority;
- Fraserburgh Harbour Commissioners;
- Scottish Fishermen's Federation (SFF); and
- Serco NorthLink Ferries.

34. As well as consulting with the organisations outlined above, 34 Regular Operators identified routeing in proximity to the OAA and RCP from the multiple vessel traffic datasets were provided with an overview of the Project with subsequent opportunity to provide feedback. Specific questions were included to aid Regular Operators wishing to make a response, including in relation to changes in routeing or adverse weather routeing. The Regular Operator letter is presented in full in **Appendix D**.

35. The Regular Operators identified and subsequently contacted is provided below:

- Altera Shuttle Tankers (*Maran Shuttle Tankers under Angelicoussis Group*);
- Amasus;
- Atlantica Shipping;
- Aurora Offshore;
- Boskalis (*Gardline Limited*);
- BP Offshore;
- Britoil Offshore Service;
- Maritime Craft Services;
- North Star Shipping;
- Serco NorthLink Ferries;
- REM Offshore AS;
- Remøy Shipping;
- Samskip;
- Scotline;
- Sentinel Marine;
- Silver Sea;
- Eimskip;
- ESVAGT;
- Fletcher Supply;
- Golden Energy;
- Intermara Marine;
- Island Offshore;
- James Fisher and Sons;
- Longship;
- Maersk;
- Simon Mokster;
- SMT Shipping;
- Smyril Line;
- Tidewater;
- TorCargo;
- Viking Cruises;
- Vroon Offshore;
- Wagenborg Shipping; and
- Wilson ASA.

36. Of these operators, only five operators responded. These responses are outlined in **Table 4.1**.

4.2 Hazard Workshop

37. A key element of the consultation undertaken was the Hazard Workshop, a meeting of local and national marine stakeholders to identify and discuss potential shipping and navigation hazards.

38. The Hazard Workshop was held in-person in Edinburgh on Thursday 3 July 2025 and was attended, either in-person or virtually via Microsoft Teams, by Project representatives, Anatec Ltd and stakeholders including: MCA, NLB, UK Chamber of Shipping, Peterhead Port Authority, Fraserburgh Harbour Commissioners, and SFF.

39. It is noted the Serco NorthLink Ferries could not attend the Hazard Workshop and so a follow up meeting occurred via Microsoft Teams with Serco NorthLink representatives, including vessel masters, on Monday 21 July 2025. Both the Royal National Lifeboat Institution (RNLI) and RYA were unable to attend the Hazard Workshop, but the output materials were also circulated to these organisations.

40. During the Hazard Workshop, key maritime hazards associated with the construction, O&M, and decommissioning of the Project were identified and discussed. Where appropriate, hazards were considered by vessel type to ensure risk control options could be identified on a type-specific basis.

41. Following the Hazard Workshop, the risks associated with the identified hazards were ranked in the hazard log based upon the discussions held during the workshop. Where appropriate, mitigation measures were identified, including any additional measures required to reduce the risks to ALARP. The hazard log was then provided to the Hazard Workshop attendees for comment. The final Hazard Log produced in agreement with stakeholders was used as input into the risk assessment undertaken from **Sections 18** and in **Volume 1, Chapter 15: Shipping and Navigation** of the EIA Report. This ensured that expert opinion and local knowledge was incorporated into the hazard identification process and that the hazard log was site-specific. The Hazard Log is provided in full in **Appendix B**.

4.3 Consultation Response

42. Various responses have been received from stakeholders during consultation undertaken in the NRA process including during the Hazard Workshop, Regular Operator outreach, dedicated consultation meetings, via email correspondence, and through the Scoping Opinion. These include from The Marine Directorate - Licensing Operations Team (MD-LOT), MCA, NLB, RYA, and the UK Chamber of Shipping. The key points and where they have been addressed in the NRA or **Volume 1, Chapter 15: Shipping and Navigation** of the EIA Report are summarised in **Table 4.1** as well as in **Table 15.1** of **Volume 1, Chapter 15: Shipping and Navigation**.

Table 4.1 Summary of key points raised during consultation

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Pre Scoping and Scoping Opinion			
NatureScot	29 September 2023 Meeting, Scoping Workshop.	*"Any data currently available to reduce cumulative impact of multiple boats in and out of Peterhead*?"	Port access in included in the risk assessment for Shipping and Navigation, inclusive of Peterhead Port, in **Sections 18** to **20**.
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"With regards to baseline data listed in Table 5.10.5 of the Scoping Report, the Scottish Ministers direct the Developer to the representation from the UK Chamber of Shipping. The Scottish Ministers advise that Marine Accident Investigation Branch (MAIB) data included in the EIA Report should be increased from 10 years to 20 years. should be extended to cover a 20-year period to fully assess trends and historic incidents. Additionally, The Scottish Ministers recommend, in line with UK Chamber of Shipping representation, that a range of scenarios should be modelled, noting the large increase in renewable activity planned for the area with resulting project and third-party project traffic."*	20-years of MAIB incident data is included in the assessment of historical maritime incidents detailed in **Table 5.1** and in **Section 9.4**. A 10% and 20% increase has also been applied to all vessel types in the future case vessel traffic assessment which was agreed with Stakeholders at the Hazard Workshop outlined in **Section 14**.
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"In line with the MCA representation, The Scottish Ministers are content that two separate 14-day periods of Automatic Identification System ("AIS") data set out in the Scoping Report meets the standard MGN 654. The Scottish Ministers highlight the advice from the UK Chamber of Shipping 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 UK Chamber of Shipping to reach a suitable agreement on the provision of AIS data and document the rationale for the final approach within the EIA Report. However, in line with UK Chamber of Shipping representation, the Scottish Ministers strongly advise that this is extended to show 12 months of continuous AIS*	An additional 12-month AIS only data set was used as validation to the vessel traffic survey data, in agreement with MCA, as detailed in **Table 5.1** and presented in **Appendix E**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		data to allow for seasonal variation and smoothing given the scale of development."	
UK Chamber of Shipping	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"The development presently appears to only be proposing 28 days of shipping activity to be studied as part of the NRA. Whilst perhaps in accordance with MGN 654 as a minimum, given the scale of the development the Chamber strongly advises and recommends that a full 12 month AIS data is obtained for seasonal variation and smoothing. The data is widely available, needn't be backed up with Radar and Visual Data and is now a commonplace inclusion in NRAs for other proposed developments."*	
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"Table 5.10.7 of the Scoping Report summarises the potential impacts to shipping and navigation for each phase of the Proposed Development which the Developer proposed to scope into and out of the EIA Report. The Scottish Ministers broadly agree with the impacts scoped in and out however, advise that interference with navigation, communications, and position fixing equipment (including potential effects of electromagnetic interference) and reduction of Search and Rescue ("SAR") capability due to surface infrastructure should be scoped in for all phases. This is in line with the UK Chamber of Shipping representation."*	Interference with navigation, communications, and position fixing equipment (including potential effects of electromagnetic interference) is assessed in **Section 15** in terms of frequency of occurrence and severity of consequence and significance of risk was determined to be Broady Acceptable. Consideration have been given to construction and decommissioning for emergency response and SAR access **in Section 19.8**.
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"With regards to cabling routes and cable burial, the Scottish Ministers confirm that a Burial Protection Index should be completed, and, subject to traffic volumes, an anchor penetration study may also 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*	This is already covered by MGN 654 compliance (M-045) in **Table 17.1** in **Section 17**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		measures are required and where depths are decreasing towards the shore."	
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"The Scottish Ministers also highlight the MCA representation regarding SAR, Emergency Response Co-operation Plans, levels of radar surveillance, AIS, and shore-based Very High frequency (VHF) radio coverage. The Scottish Minsters advise that the MCA representation must be fully addressed in the EIA Report and that a SAR checklist must be completed by the Developers in consultation with the MCA."*	
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"The Developer should note that compliance with regulatory expectations on moorings for floating wind and marine devices (HSE and MCA, 2017), as identified in Table 5.10.6 of the Scoping Report, is required and Third-Party Verification of mooring arrangements will also be required. This is in line with MCA representation."*	
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"In Table 5.10.6, M-044, compliance with regulatory expectations on moorings for floating wind and marine devices (HSE and MCA, 2017) is identified as a potential mitigation for floating infrastructure. This guidance should be followed, and a Third-Party Verification of mooring arrangements will be required."*	
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"MGN 654 Annex 4 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager. Failure to report the survey or conduct it to Order 1a might invalidate the Navigational Risk Assessment if it was deemed not fit for purpose."*	

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"The Scottish Ministers advise that the Developer must give consideration within the EIA Report for the potential effect of electromagnetic deviation on ships' compasses should High-Voltage Direct Current transmission infrastructure be installed. The Scottish Ministers highlight the advice from the MCA a three-degree deviation for 95% of the cable route would be acceptable, and that for the remaining 5% of the cable route, no more than five degrees will be attained."*	A desk-based study is included in **Section 15** under the assessment of Navigation, Communication, and Position Fixing Equipment.
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"The Scottish Ministers highlight, in line with MCA representation, that the development area carries a moderate amount of traffic and several important commercial shipping routes to/from UK ports and the North Sea. This requires that careful attention is paid to routing, particularly in heavy weather, so that vessels can continue to make safe passage without large-scale deviations."*	Adverse weather and vessel deviations are considered in **Section 14** with careful consideration to adverse weather routes if present.
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	*"Regarding mitigation, The Scottish Ministers confirm that, in line with MCA representation, the Developer will be required to submit a navigational risk assessment in accordance with MGN 654, accompanied by a detailed MGN 654 checklist. The MCA, NLB and RYA representations regarding the Navigational Risk Assessment, Design Specification and Layout Plan, Lighting and marking Plan and Navigational Safety Plan should be addressed by the Developer in the EIA Report."*	This **NRA** is submitted in line with MGN 654 requirements, inclusive of a MGN 654 Checklist (**Appendix A)**.
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	"The MCA has reviewed the scoping report provided by the Project Offshore Wind Farm Limited as detailed in your correspondence of 15th February 2023 and would comment as follows: The Environmental Impact Report should supply detail on the possible impact on navigational issues for both commercial and recreational craft, specifically: ▪ Collision Risk.	

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		▪ 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.”	
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*“A Navigational Risk Assessment will need to be submitted in accordance with MGN 654. This NRA should be accompanied by a detailed MGN 654 Checklist which can be found at https://www.gov.uk/guidance/offshore-renewable-energy-installations-impact-on-shipping”*	
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*“Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Co-operation Plans (ERCoP). The report must recognise 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 (DSC)). A SAR checklist will also need to be completed in consultation with MCA, as per MGN 654 Annex 5 SAR requirements.”*	
MD-LOT	12 May 2025	*“The Scottish Ministers confirm that cumulative and in combination effects on shipping routes must be considered. This should consider the proximity to other offshore renewable development, other infrastructure,*	This is covered by the standard NRA process with cumulative effects considered in the cumulative risk assessment. See **Section 21**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
	MD-LOT Scoping Opinion (MD-LOT, 2023).	*and the impact on navigable sea room. This is in line with MCA and UK Chamber of Shipping representation. Coordination with other projects may be necessary to avoid vessel deviation far as possible. The Scottish Ministers advise in line with the UK Chamber of Shipping representation that the potential cumulative impacts identified in section 7.4.25 of the Scoping Report should also include a reduction in SAR capability and cumulative displacement of vessels."*	
MD-LOT	12 May 2025 MD-LOT Scoping Opinion (MD-LOT, 2023).	"Marine traffic is considered in section 5.11 Shipping and Navigation and section 5.14 Infrastructure and Other Marine Users."	N/A (no response required).
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"A vessel traffic survey will be undertaken to the standard of MGN 654 – at least 28 days which is to include seasonal data (two x 14-day surveys) collected from a vessel-based survey using AIS, radar and visual observations to capture all vessels navigating in the Study Area. We understand from the information presented in table 5.10.5 that the summer vessel survey carried out from 29th July- 14th Aug 2022 was to the MGN 654 standard. It is also noted that the data presented in figure 5.10.2 in Appendix 1a will be updated further once the project-specific winter vessel traffic survey has been completed in 2023."*	As a standard requirement of the NRA process, seasonal vessel traffic survey data has been included in agreement with the MCA and outlined in **Section 5.2**.
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"The development area carries a moderate amount of traffic with several important commercial shipping routes to/from UK ports and the North Sea. Attention needs to be paid to routing, particularly in heavy weather so that vessels can continue to make safe passage without large-scale deviations. The likely cumulative and in combination effects on shipping routes should be considered for this project. It should consider the*	Adverse weather and vessel deviations are considered in **Section 14** with careful consideration to adverse weather routes if present.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		proximity to other windfarm developments, other infrastructure, and the impact on safe navigable sea room."	
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"The Development Specification and Layout Plan (DSLP) referred to in Table 5.10.6, M-043, will require MCA approval prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue aircraft operating within the site. Any additional navigation safety and / or Search and Rescue requirements, as per MGN 654 Annex 5, will be agreed at the approval stage."*	The DSLP (M-043) is included in the table of embedded environmental measures (**Table 17.1** in **Section 17**) and approval will be obtained by the MCA post consent prior to construction.
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"It is noted that High Voltage Alternating Current (HVAC) and High Voltage Direct Current (HVDC) transmission infrastructure maybe installed. In the case of HVDC installation, consideration must be given to electromagnetic deviation on ships' compasses. The MCA would be willing to accept a three-degree deviation for 95% of the cable route. For the remaining 5% of the cable route no more than five degrees will be attained. The MCA would however expect a deviation survey post the cable being laid; this will confirm conformity with the consent condition. The developer should then provide this data to UKHO via a hydrographic note (H102), as they may want a precautionary notation on the appropriate Admiralty Charts."*	A desk-based study is included in **Section 15** under the assessment of Navigation, Communication, and Position Fixing Equipment.
MCA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"On the understanding that the Shipping and Navigation aspects are undertaken in accordance with MGN 654 and its annexes, along with a completed MGN checklist, MCA is likely to be content with the approach."*	N/A (no response required).
NLB	12 May 2023 MD-LOT Scoping Opinion Appendix 1:	*"NLB note the inclusion of Section 5.10 – Shipping and Navigation within the report, with particular reference to Table 5.10.6, detailing the Environmental Measures Proposed to ensure safety of navigation*	N/A (no response required).

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
	Consultation Responses & Advice.	*throughout the lifetime of the project. This includes the development of a Lighting and Marking Plan (LMP) and Navigational Safety Plan (NSP).”*	
RYA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*“I agree that navigation should be scoped in and that recreational boating should be included. RYA Scotland will be happy to take part in the Navigational Risk Assessment. Rather few recreational craft pass through the lease area and these will be on passage between Scotland and Scandinavia and vice versa. I estimate that about a quarter of them will transmit an AIS signal and that rather more will be able to receive one. In the open sea, as here, the tracks of AIS transmitting craft are expected to be typical of the tracks of all recreational craft. The routes taken will depend inter alia on the wind direction and so may vary from year to year. Recreational craft can be difficult to spot using radar, particularly in rough seas. It is unclear to me that much will be gained by trying to gain an accurate assessment of the number of recreational craft passing through the lease area. It can be safely assumed that a small number will do so each year. However, skippers of recreational craft in these waters will be used to navigating in proximity to oil and gas installations.”*	Baseline recreational vessel traffic in proximity to the Project has been assessed in **Section 10**.
RYA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*“Over the past few years there has been a surprisingly large number of cases where lights or signals from wind farm installations have failed and it has often taken several weeks for a repair to be made due to adverse weather. Thus following NLB prescriptions for marking and lighting is necessary but not sufficient mitigation. It is important that there is a mechanism to ensure that failures are remedied quickly, perhaps by installing duplicate systems. It is often assumed in risk assessments that factors are independent. However, the same storm that damages the lights will also make repairing them quickly difficult and may also have washed away the navigational aerials on a yacht.”*	The Aids to Navigation Management Plan which will be completed post consent will consider protocol in the event of aid to navigation failure in consultation with NLB.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
RYA	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"I do not expect there to be any issues related to the landfall in the neighbourhood of Peterhead provided that normal best practice is followed. However, RYA Scotland will be happy to confirm whether that is the case with the developer once the location has been decided."*	The refined offshore export cable corridor has been assessed in **Section 10.3** and no comments have been raised by RYA Scotland.
UK Chamber of Shipping	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"The Chamber would strongly agree with the MCA's raining that the Project (once operational) could have cumulative vessel route impacts in the north to south direction and also out of the Moray Firth and their recommendation that coordination with other projects to avoid vessel deviation as much as possible would be essential."*	Cumulative re-routeing of main commercial routes is assessed in **Section 14.6** and detailed where necessary in the cumulative risk assessment in **Section 21**.
UK Chamber of Shipping	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"The Chamber strongly advocates for examination of a longer period of MAIB than a single 10-year period. The Chamber, having consulted with the MAIB and been informed that digital spatial data exists and is accessible for developers dating back to 1992. The Chamber considers that a single 10-year period to be an unnecessarily short period for accident data to be used and that it may not accurately reflect historic accidents and safety to navigation, in particular given the scoping report states that the full lease agreement runs until 2080. It is now customary for developers to examine a 20-year period of which the Chamber would be more satisfied."*	20-years of MAIB incident data in included in the assessment of historical maritime incidents detailed in **Table 5.1** and shown in **Section 9.4**.
UK Chamber of Shipping	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"Future baseline as discussed within 7.4.13 refers to conservative increase following discussion with stakeholders. The Chamber would strongly advocate for a range of scenarios to be modelled in particular noting the large increase in renewable activity planned for the area with resulting project and third party project traffic."*	A 10% and 20% increase has also been applied to all vessel types in the future case vessel traffic assessment which was agreed with Stakeholders at the Hazard Workshop outlined in **Section 14**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
UK Chamber of Shipping	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"The Chamber would assert that the below two activities should not only be scoped in during operation and maintenance phase but across all phases as there is potential to be significant impact to navigation.* *1. Interference with navigation, communications and position fixing equipment during the operation / maintenance phases (includes potential effects of electromagnetic interference)* *2. Reduction of Search and Rescue capability during operation / maintenance due to surface infrastructure."*	Interference with navigation, communications, and position fixing equipment (including potential effects of electromagnetic interference) is assessed in **Section 15** in terms of frequency of occurrence and severity of consequence and significance of risk was determined to be Broady Acceptable. Consideration have been given to construction and decommissioning for emergency response and SAR access **in Section 19.8**
UK Chamber of Shipping	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"Paragraph 7.4.25 fails to include reduction in SAR capability as an impact from the Project that has the potential to act cumulatively with impacts from other developments to contribute to cumulative effects and should be included. Furthermore under 7.4.25, whilst it is also correct that there is increased vessel to vessel collision risk resulting from cumulative displacement, it is also true that cumulative displacement from multiple developments result in potentially significant impacts to vessel's deviation, and accordingly scheduling, environmental impact and economic/business cost basis and should be fully considered. This is especially true given the proximity of oil and gas fields adjacent to the proposed developments and their respective decommissioning schedules if relevant."*	Acknowledged in the cumulative risk assessment in **Section 21**.
UK Chamber of Shipping	12 May 2023 MD-LOT Scoping Opinion Appendix 1: Consultation Responses & Advice.	*"The Chamber trusts these comments will be factored in and offers its ongoing assistance to MS and the developers to ensure minimum impact upon navigational safety for commercial shipping."*	N/A (no response required).

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Ministry of Defence	12 September 2023 MD-LOT Scoping Opinion Addendum.	*"The Ministry of Defence (MOD) has highly surveyed routes within the locality of the development area which maybe relevant to the installation of wind turbines, export cables & associated infrastructure. These routes are retained by the MOD to support national defence requirements and are not defined in the public domain. Highly surveyed routes must not be obstructed or impeded by offshore developments such as wind turbines. At this time, we are unable to advise if the development will impede any highly surveyed routes in the area. An assessment to determine any impact has been requested and we will share the results with you as soon as we are able to."*	It was confirmed via email on 12 November 2024 that the MOD has no concerns regarding highly surveyed routes for the Project.
MCA	12 September 2023 MD-LOT Scoping Opinion Addendum.	*"The MOD has highly surveyed routes within the locality of the development area which maybe relevant to the installation of wind turbines, export cables & associated infrastructure. These routes are retained by the MOD to support national defence requirements and are not defined in the public domain. Highly surveyed routes must not be obstructed or impeded by offshore developments such as wind turbines. At this time, we are unable to advise if the development will impede any highly surveyed routes in the area. An assessment to determine any impact has been requested and we will share the results with you as soon as we are able to."*	It was confirmed via email on 12 November 2024 that the MOD has no concerns regarding highly surveyed routes for the Project.
Dedicated Meetings and Email Consultation			
MCA	20 September 2023 Meeting.	The MCA has expressed that if the submission date of the EIA goes beyond 4-6 weeks past the 2 year vessel traffic validity, then the MCA would expect another summer vessel traffic survey.	Two additional seasonal vessel traffic surveys have been undertaken for the Project to comply with the requirements of MGN 654, see **Table 5.1** and **Section 5.2**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
MD-LOT	19 September 2023 Meeting.	The Project outlined that they have been advised by their shipping and navigation subcontractor to include both the Vessel Management and Navigation Safety plans in one overall plan. MD-LOT confirmed it is acceptable to include both plans in one document, if the overall plan meets the regulatory requirements of each individual plan.	**Volume 4: Outline Vessel Management and Navigational Safety Plan** has been submitted as part of the application.
MCA	18 March 2025 Email.	The Project emailed the MCA regarding the consideration of the implementation of a RCP into the design envelope, which will be located approximately halfway along the offshore export cable corridor. The Project reached out to query if an offshore dedicated vessel traffic survey would be required for the RCP NRA, or whether AIS only assessment would be sufficient The MCA responded: "*Thank you for your query regarding the potential addition of a RCP into the design envelope for the Project. MCA can confirm that we would be content with an AIS only assessment on this occasion. This AIS data should consist of at least 28 days which is to include seasonal data (2 x 14-day surveys) representing winter and summer periods*." The AIS data should be as up to date as possible. Consideration should be given to a full 12-month AIS data set for the fullest picture of traffic movements in the area."	12-months AIS only data covering the RCP Search Area Study Area for the entirety of 2024 has been used for the analysis of the RCP Search Area for Shipping in Navigation in **Section 10.2** (see **Table 5.1**).
MCA	20 May 2025 Meeting.	*"Discussions will need to be had with NLB regarding lighting and marking requirements, in particular with the phased build out approach".*	During the construction and decommissioning stages, buoyed construction and decommissioning areas will be established and marked, where required, in accordance with NLB requirements based on the IALA Maritime Buoyage System (M-118). In addition, where advised by NLB, additional

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
			marking on structures may also be applied. Marking during the O&M stage will be agreed in consultation with NLB once the final array layout has been selected post consent (M-038). See **Section 17**.
		The MCA have no concern over the proximity of the Green Volt Offshore Wind Farm to the Project.	Acknowledged in the cumulative risk assessment in **Section 21**.
		The MCA noted that third-party towing of WTGs may need to be accounted for.	Third-party towage operations are highlighted in the cumulative risk assessment in **Section 21**.
		The MCA raised recent UK-EU fishing agreement and could be worth discussing any relevant effects with a fisheries liaison officer and commercial fisheries specialists.	Acknowledged in the increases in commercial fishing activity in the future case vessel traffic **Section 14.**
		The MCA noted recent instances of non-events being assessed in hazard logs and preference to assess low impacts events and would like to see the inclusion of loss of buoyage assessed.	Further discussions were had at the Hazard Workshop and is reflected in the Hazard Log included in **Appendix B**.
Hazard Workshop			
UK Chamber of Shipping	3 July 2025 Hazard Workshop.	The UK Chamber of Shipping was in agreement with the placements of the Offshore substations and the RCP as a worst-case for the Shipping and Navigation assessments.	The indicative locations of the offshore substations and the RCP are illustrated in the **Section 6.1**. These have been selected as the worst-case locations for the Shipping and Navigation assessment to maximise passing vessel allision risk while still being realistic. The Maximum design scenario is included in **Table 6.4**
		The UK Chamber of Shipping queried the consideration of a single line of orientation (SLoO) and appreciates the grid layout.	The layout is currently indicative and the Project is looking to develop a grid layout. If a SLoO is being

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
			considered, a safety justification would be carried out in line with MGN 654 requirements as noted in **Section 6.2**.
		The UK Chamber of Shipping was in agreement that shared anchors should be assumed for the loss of station hazard.	Shared anchors have been assumed for the loss of station hazard in the risk assessment for Shipping and Navigation in **Sections 18** to **20**.
		The UK Chamber of Shipping highlighted the loss of sea space and how towing objects will further increase risk.	Towage operations are highlighted in the risk assessment for Shipping and Navigation both for the Project in isolation and cumulative, along with loss of sea room in **Sections 18** to **21**.
		The UK Chamber of Shipping suggested that the 1nm mean passing distance be revisited for floating projects due to presence of mooring lines.	Consideration has been included in the methodology for future case vessel traffic (**Section 14**). There is no precedent for typical passing distances for large scale floating developments and therefore there is limited evidence to refine the existing methodology used. It is confirmed that all mooring lines are within the Red Line Boundary which will be charted and it is anticipated that mariners will base their deviations on the charted boundary. The deviated main commercial routes are assessed in the future case vessel traffic in **Section 14.5.2**.
		The UK Chamber of Shipping raised concern of deviating other commercial vessels closer to oil and gas infrastructure.	Deviated main commercial routes maintain at least 1nm from any existing oil and gas infrastructure. Throughout the risk assessment (**Sections 18** to **20**) displacement will be the focus as well as allision risk and a 50nm buffer will be

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
			utilised for the cumulative assessment (see **Section 21**).
NLB	3 July 2025 Hazard Workshop.	Concerns were raised by NLB regarding lighting and marking of each phase of the layout during construction.	Lighting and marking in agreement with NLB is considered under **Volume 3, Appendix 5.2: Commitments Register** for shipping and navigation. During the construction and decommissioning stages, buoyed construction and decommissioning areas will be established and marked, where required, in accordance with NLB requirements based on the IALA Maritime Buoyage System (M-118). In addition, where advised by NLB, additional marking on structures may also be applied. Marking during the O&M stage will be agreed in consultation with NLB once the final array layout has been selected post consent (M-038).
		NLB queried the maintenance strategy and whether O&M movements are considered in the future case scenarios given there will be an increase in project vessels in the area.	The presence of project vessels is assessed in the risk assessment for Shipping and Navigation both for the Project in isolation and cumulatively in **Sections 18** to **21**. Post-consent plans will also contain more detail on the O&M strategy. An Offshore O&M Plan is also included in the relevant commitments registered for Shipping and Navigation (M-122). Outline plans will be submitted at EIA.
		NLB highlighted the future interlink cables that are planned to make landfall in a similar location to the offshore export cable corridor which	Cumulative developments including relevant subsea cables are screened in where relevant

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		will increase complexity including relevant Eastern Green Link interconnectors.	based on the cumulative screening criteria for Shipping and Navigation. Those screened in are included in the cumulative risk assessment. See **Section 21**.
		NLB highlighted that they have responsibility for wreck response and the project will need to consider how this will be managed. Failure modes for the WTGs will also need consideration, particularly regarding lit peripheral structures.	The ERCoP (**Volume 3, Appendix 5.2**) will address wreck response and the Aids to Navigation Management Plan will consider protocol in the event of aid to navigation failure in consultation with NLB.
		NLB clarified the RCP would be lit and marked as a single structure and be based on existing bridge-linked structures as mariners already familiar with them from oil and gas industry. GB highlighted the importance of resilience and back-up systems when planning and offered that NLB can aid in resilience plans.	The Aids to Navigation Management Plan will capture requirement and will be undertaken post consent in further consultation with NLB.
SFF	3 July 2025 Hazard Workshop.	Concerns were raised by the SFF regarding the phased build out of the layout and requests it is done in such a way to reduce impacts on fishing activity.	It is not feasible to confirm the manner of the phased build out at this stage but it is intended they will be continuous in nature and follow a systematic approach over the course of the construction stage such that fishing activity could continue in areas not currently under construction.
		SFF noted that fishing vessels would be unlikely to utilise the 1.6km gap within the layout for navigation but would be master preference.	Acknowledged in discussion of internal transits of small craft in the vessel displacement impact in **Sections 18** to **20**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		SFF noted allision incidents occur more often than what is being reported and would expect to see the frequency reflected as such for fishing vessels. Additionally, the chances of multiple fatalities should be considered higher.	Consideration has been taken when ranking impacts for fishing vessels and is reflected in the Hazard Log included in **Appendix B**.
		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels and noted the potential of non-compliance so not to rely on AIS. Additional data sources may be required to validate fishing activity for the OAA and offshore export cable corridor. No additional data is required for the RCP search area.	In addition to the AIS, Radar, and visual observation data used to analyse vessel traffic in proximity to the OAA, a plot of VMS data covering the entirety of 2024 has been included to highlight any fishing vessel activity not covered by the vessel traffic surveys. Data sources are outlined in **Table 5.1** VMS data is also included covering the offshore export cable corridor Study Area also.
		SFF noted fishing vessels in proximity to the RCP search area will likely be in transit and that vessels may transit close to the RCP as there is no legal obligation to avoid.	Acknowledged in the assessment of allision risk for the RCP in **Sections 18** to **20**.
MCA	3 July 2025 Hazard Workshop.	The MCA confirmed there is no need to include a navigational corridor safety case on this basis and the volume of traffic but advises the MCA Shipping Route Template is considered.	The Shipping Route Template has been included as consideration in the cumulative risk assessment in **Section 21**.
		The MCA and NLB both confirmed it was useful to see how vessel traffic routeing around the currently operational floating Hywind Offshore Wind Farm and this is beneficial to understand future case vessel patterns.	Wind farm vessel traffic around Hywind Scotland Pilot Park is illustrated and assessed in the baseline vessel traffic movement within the RCP search area Study Area in **Section 10**.
		The MCA noted that the shallowest draught (12m) for project infrastructure occurs next to the foundation so it will unlikely pose a risk to under keel clearance and most vessels will likely avoid array transits.	Acknowledged in the assessment of under keel clearance risk for Shipping and Navigation in **Section 19**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The MCA noted traffic monitoring may be required as a mitigation but would be on a case-by-case basis after discussions with MD-LOT; therefore not necessary to incorporate as an embedded mitigation measure.	MCAs feedback has been acknowledged throughout the NRA.
		The MCA noted that engagement with Serco NorthLink Ferries would be needed to understand how they may be affected, though unlikely to be an issue cumulatively as there is plenty of sea room.	A follow-up meeting to the Hazard Workshop was undertaken with Serco NorthLink Ferries to discuss the impact of the Project on their vessels specifically.
		The MCA raised concern that Salamander may produce similar deviations and should be included high on the cumulative tier list. However, for the scale of the RCP, including in the presence of Salamander, there is ample sea room.	Methodology for cumulative tiering of other offshore wind farm developments has been included in **Section 3.3** with concerns being taken into consideration. Salamander has been screened in for the quantitative re-routing as a Tier 1 development outlined in **Section 13**.
		The MCA noted standard MGN 654 requirements for reduction in navigate water depth and highlighted that charting magnetic anomalies may be needed should compass deviations exceed MCA tolerances. A desk-based study would be suitable for assessing this.	A desk-based study is included in **Section 15** under the assessment of Navigation, Communication, and Position Fixing Equipment.
Brown & May	3 July 2025 Hazard Workshop.	Brown & May noted that 6 knot (kt) cut-off used for fishing vessel figures is not the most accurate and would be better to breakdown individual track points rather than taking the average and that fishing vessels have higher level of relevance to the array than commercial vessels, as these vessels will likely be exposed to the hazard for longer.	Concerns were acknowledged in the assessment of baseline fishing vessel activity in **Section 10**. In regard to fishing vessels relevance to the OAA, this has been considered in the Hazard Log in **Appendix B** as well as highlighted in the risk assessment.
Peterhead Port	3 July 2025 Hazard Workshop.	Peterhead Port stated port access issues will be on a case-by-case basis but acknowledged that there is good existing working relationship with	Acknowledged in the assessment of risk for port access in **Sections 18** to **20**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		the Project from previous survey work and Peterhead Port will coordinate with the Project as appropriate.	
		Peterhead Port stated that vessel traffic would increase with the developments at Peterhead Port, as there are plans to extend the quays and agreed that a 20% increase of vessel traffic is realistic if planned developments went ahead.	Increase in commercial vessel activity, including at future port developments in acknowledged under the future vessel traffic assessment in **Section 14**.
Fraserburgh Harbour	3 July 2025 Hazard Workshop.	It was confirmed that although Fraserburgh Harbour had submitted the Scoping for the harbour development, they are still awaiting funding and so there is no further update or progress on the expansion.	Increase in commercial vessel activity, including future port developments is acknowledged under the future vessel traffic assessment in **Section 14**.
Serco NorthLink Ferries	21 July 2025 Meeting. Hazard Workshop Follow Up.	Serco NorthLink Ferries confirmed that vessel transits to the west of the of the Project were instances of adverse weather – near Rattray Head can be particularly rough and so passing further offshore is more comfortable and ensures a good angle for waves and wind. Transits in proximity to RCP search area are similar adverse weather routeing to avoid proximity to Rattray Head, particularly in southeasterly weather which may cause rolling.	Adverse weather vessel traffic movements is detailed in **Section 12** and included in the risk assessment where relevant in **Sections 18** to **20**.
		Serco NorthLink Ferries confirmed at the point of RCP installation, new stabilised freight ferries will be in use (by 2029) which should reduce the frequency of such offshore routeing, passenger ferries already have such stabilisers.	Adverse weather vessel traffic movements is detailed in in **Section 12** and included in the risk assessment where relevant in **Sections 18** to **20**.
		Serco NorthLink Ferries had a general agreement that the array posed no material concern and RCP is of no material concern with appropriate lighting.	Acknowledged in the risk assessment where relevant in **Sections 18** to **20**. Appropriate lighting of the RCP will be agreed with NLB post consent.
		Serco NorthLink Ferries notes in the cumulative scenario, there is potential for displacement of traffic towards remaining open sea areas.	Acknowledged in the cumulative risk assessment where relevant in **Section 21.**

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Serco NorthLink Ferries noted export cables may lead to some disruption but good communications as to when and where lay activity is planned should mitigate any issues.	Advance notice of project activities and promulgation of information (M-030) is included in the commitments registered for Shipping and Navigation in **Section 17**.
Regular Operator Outreach			
Tidewater Marine	17 June 2025 Regular Operator Outreach Email Response.	A response from a vessel master operated by Tidewater Marine noted that their specific oil and gas route may use adverse weather routes, but this mostly applies to the winter season.	Adverse weather vessel traffic movements is detailed in in **Section 12** and included in the risk assessment where relevant in **Sections 18** to **20**.
Fletcher Group	17 June 2025 Regular Operator Outreach Email Response.	Fletcher Group noted their vessels change charter and routes change regularly but any vessels routeing from Aberdeen or Peterhead may have to change routes when development begins but vessels and crews are used to navigating through and around the various oil and gas assets already in the North Sea although planned windfarm developments are likely to be much larger areas so may necessitate larger deviations from the shortest route, leading to increased fuel burn. This would be exacerbated during bad weather when vessels may adjust their course / speed to reduce the effects of the weather. No internal transits of the OAA would be considered.	Acknowledged in the assessment of vessel deviations in the risk assessment in **Sections 18** to **20**.
Sentinel Marine	17 June 2025 Regular Operator Outreach Email Response.	Two response from vessel masters operated by Sentinel Marine noted that on one occasion, no impact is considered for their vessel and the other noted that their vessel only encroaches on the area and wont take much of an alteration/change of passage plan to avoid.	Vessel deviations and internal transiting is considered in the risk assessment in **Sections 18** to **20**.

Stakeholder	Date and form of correspondence	Point raised	Response and where addressed in the NRA
TorCargo	18 June 2025 Regular Operator Outreach Email Response.	TorCargo noted that with the presence of the Project, their routes may be extended by 5-10nm. Internal transits within the OAA are not considered and floating offshore wind farms are considered the same as fixed in regard to vessel safety and navigation.	Acknowledged in the assessment of vessel deviations in the risk assessment in **Sections 18** to **20**.
Gardline (Boskalis)	19 June 2025 Regular Operator Outreach Email Response.	Gardline responded on behalf of Boskalis noting that due to the nature of the services Gardline undertakes vessels do not rely on specific routes and therefore the project is unlikely to impact future routeing of any specific vessels. No internal transits would be proposed and there is no overall safety concerns with regard to the Project.	Acknowledged in the assessment of vessel deviations in the risk assessment in **Sections 18** to **20**.

5 Data Sources

43. This section summarises the main data sources used to characterise the shipping and navigation baseline relative to the Project.

5.1 Summary of Data Sources

44. The main data sources used in assessing the shipping and navigation baseline relative to the Project are outlined in **Table 5.1**.

Table 5.1 Data sources used to inform shipping and navigation baseline

Data	Sources(s)	Purpose
Vessel traffic	AIS, Radar, and visual observation Summer survey data for the study area (14 days, August 2022). This data was superseded by a further dedicated Summer vessel traffic survey undertaken also collecting AIS, Radar, and visual observation data from the 19 July–2 August 2024.	Characterising vessel traffic movements within and in proximity to the OAA.
	AIS, Radar, and visual observation Summer survey data for the study area (14 days, January 2023). This data was superseded by a further dedicated Winter vessel traffic survey undertaken also collecting AIS, Radar, and visual observation data from the 6–19 November 2024.	
	12-months AIS only data covering the study area (2024).	
	14-days Summer AIS only vessel traffic data for the offshore export cable corridor study area covering 19 July–1 August 2024.	Characterising vessel traffic movements within and in proximity to the offshore export cable corridor.
	14-days Winter AIS only vessel traffic data for the offshore export cable corridor study area covering 6–19 November 2024.	
	12-months AIS only data covering the RCP search area study area (2024).	Characterising vessel traffic movements within and in proximity to the RCP search area.
	Anatec's ShipRoutes database (2025).	Secondary source for characterising vessel traffic movements including cumulatively within and in proximity to the Project.
	12-months Vessel Monitoring System (VMS) Data covering the study area and offshore export cable corridor study area (2024)	Secondary source for characterising fishing vessel activity in proximity to the Project.
Maritime incidents	20-year coverage of MAIB marine accidents data (2004–2023).	Review of maritime incidents within and in proximity to the Project.
	10-year coverage of RNLI incident data (2014–2023).	

Data	Sources(s)	Purpose
	Department for Transport (DfT) UK civilian Search and Rescue (SAR) helicopter taskings (April 2015–March 2024).	
Recreational traffic density and features	*East Coast of Scotland Sailing Directions* (Andy Carnduff and Forth Yacht Clubs Association, 2023).	Characterising recreational activity within and in proximity to the Project.
Other navigational features	Admiralty Charts 115, 213, 291, 278, 1409, 1438, and 2182B (United Kingdom Hydrographic Office (UKHO), 2025).	Characterising other navigational features in proximity to the Project.
	Admiralty Sailing Directions North Coast of Scotland Pilot, NP52 (UKHO, 2022).	
Weather	Wind direction and significant wave height data provided by the Applicant from the Climate Forecast System Reanalysis (CFSR) data extracted from Integrated Ocean Waves for Geophysical and other Applications (IOWAGA) wind forcing model from the period of 1990-2016.	Characterising weather conditions in proximity to Project.
	Tidal data provided by Admiralty Charts 115. 278 and 1409 (UKHO, 2025).	
	Visibility data provided in *Admiralty Sailing Directions North Coast of Scotland Pilot, NP52* (UKHO, 2022).	
	Case Studies of Past Weather Events (Met Office, 2025).	Identifying periods of adverse weather in proximity to the Project.

5.2 Vessel Traffic Surveys

45. The vessel traffic surveys were undertaken by the survey vessel *Artemis* (IMO number 8644802) and were undertaken using a methodology agreed with the MCA. Two seasonal 14-day AIS, Radar, and visual observation surveys were undertaken in August 2022 and January 2023, with the Summer survey being presented in the Scoping Report (SCOP-0020) (MD-LOT, 2023). These surveys were superseded by more recent seasonal vessel traffic surveys undertaken in Summer 2024 (19 July–2 August 2024) and Winter 2024 (6–20 November 2024) outlined in **Table 5.1**. The most recent surveys have been considered within the baseline for a total of 28 full days, with a long-term dataset covering 12-month, the entirety of 2024, used as validation (see **Section 5.3** and **Appendix E**).

46. 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-routine survey and operations vessels as well as temporary and stationary semi-submersible drilling rigs which broadcast on AIS, along with the relevant vessel traffic attending them and vessels involved in activities at nearby under construction offshore wind farms. These vessel tracks have therefore been excluded from the analysis.

47. During the analysis of the vessel traffic survey data, for any instances where Radar was prioritised over AIS, the information shared via AIS has been applied to the corresponding Radar track and vice-versa. Non-AIS and AIS data were combined to create a single dataset of all vessels. Overall, the majority of traffic was recorded via AIS; approximately 96% during the Summer survey and 98% during the Winter survey.

48. The dataset is assessed in full in **Section 178**.

5.3 Long-Term Vessel Traffic Data

5.3.1 Option Agreement Area

49. Although seasonally varied, 28 days of vessel traffic survey data in isolation may not fully capture all maritime activities or periods of relevance to shipping and navigation. Therefore, in line with good practice assessment procedures as well as requests within the Scoping Opinion (SCOP-0020) (MD-LOT, 2023) by The Scottish Ministers and the UK Chamber of Shipping, a long-term AIS dataset covering 12 months across the entirety of 2024 has been analysed to ensure a comprehensive characterisation of vessel traffic movements can be established, including any seasonal variation in vessel routeing or activity.

50. AIS only data was collected from terrestrial, offshore, and satellite receivers between 1 January and 31 December 2024. Accounting for the distance offshore of the OAA, the long-term vessel traffic data is considered to be comprehensive for the study area. The assessment of this dataset allowed seasonal variations to be captured.

51. The same review of temporary traffic undertaken for the vessel traffic surveys was also carried out for the long-term dataset (Appendix E). Vessels deemed non-routine and temporary, and so removed from the analysis, included temporary jack-up vessels supporting oil and gas platforms or engaged in decommissioning work; noted at the Ettrick and Golden Eagle fields to the south of the OAA. Vessels also engaged in survey or research activities were removed, inclusive of the dedicated survey vessel which undertook the two seasonal vessel traffic surveys for the Project in 2024 as well as other vessels undertaking geophysical and geotechnical survey work for the consented Green Volt Offshore Wind Farm to the south of the Project. Several guard vessels were also removed which were undertaking guard duties at the Golden Eagle field as well as for the Shetland HVDC Link which was under construction at the time of data collection.

52. The dataset is assessed in full in Appendix E.

5.3.2 Reactive Compensation Platform

53. During consultation with the MCA, it was agreed that dedicated vessel traffic surveys were not required for the RCP search area and a long-term AIS only dataset was sufficient.

54. Like the OAA, a long-term AIS dataset covering 12 months across the entirety of 2024 has been analysed to ensure a comprehensive characterisation of vessel traffic movements

can be established, including any seasonal variation in vessel routeing or activity in proximity to the RCP search area.

55. AIS only data was collected from terrestrial, offshore, and satellite receivers between 1 January and 31 December 2024.

56. Again, the same review of temporary traffic undertaken for the vessel traffic surveys was also carried out and vessels deemed non-routine and temporary, and so removed from the analysis, included survey work or guard duties, vessels transiting to temporary drilling operations, as well as vessels transiting to a survey or work site outside of the study area where there was a clear indication they were doing so.

5.4 Data Limitations

5.4.1 Automatic Identification System Data

57. The carriage of AIS is required on board all vessels of greater than 300 Gross Tonnage (GT) engaged on international voyages, cargo vessels of more than 500GT not engaged on international voyages, passenger vessels irrespective of size built on or after 1 July 2002, and fishing vessels over 15 metre (m) Gross Tonnage (LOA).

58. Therefore, for the vessel traffic surveys larger vessels were recorded on AIS, while smaller vessels without AIS installed (including fishing vessels under 15m LOA and recreational craft) were recorded, where possible, on the Automatic Radar Plotting Aid (ARPA) Radar on board the *Artemis*. A proportion of smaller vessels also carry AIS voluntarily, typically utilising a Class B AIS device.

59. In their Scoping Response, RYA Scotland indicated that current assumptions are approximately 25% of recreational vessels broadcast on AIS and that rather more will be able to receive one. However, tracks of AIS transmitting craft are expected to be typical of the tracks of all recreational craft.

60. The long-term vessel traffic data – an AIS only dataset – assumes that vessels under a legal obligation to broadcast via AIS would do so. Both the long-term vessel traffic data and the AIS component of the vessel traffic survey data assume that the details broadcast via AIS is accurate (such as vessel type and dimensions) unless there is clear evidence to the contrary.

5.4.2 Historical Incident Data

61. 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 a non-commercial recreational craft to report accidents to the MAIB.

62. 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 a RNLI resources were not mobilised has not been accounted for in this dataset.

5.4.3 United Kingdom Hydrographic Office Charts

63. 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 (AtoN), only those charted and considered key to establishing the shipping and navigation baseline are shown.

64. 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.

6 Project Design Envelope Relevant to Shipping and Navigation

65. The NRA reflects the PDER, which is outlined in full in **Volume 1, Chapter 4: Project Description** of the EIA Report. The following subsections outline the maximum extent of the Project for which any shipping and navigation hazards are assessed.

6.1 Project Boundaries

6.1.1 Option Agreement Area

66. The OAA is located within the Central North Sea, approximately 41nm from the Aberdeenshire coast of the UK, with the closest point being Rattray Head. The total area covered by the OAA is approximately 198 square nautical miles (nm^2), with water depths ranging between 87.8 and 133.7m.

67. The Wind Turbine Generators (WTG), offshore substations, and associated floaters, foundations, subsea cables mooring lines, and anchors will all be located within the OAA, inclusive of blade overfly. The coordinates defining the boundary of the OAA are illustrated in **Figure 6-1**, and described in **Table 6.1**. It is not intended that the OAA be designated as an Area to be Avoided (ATBA), with navigation only restricted where Safety Zones are active (see **Section 17**).

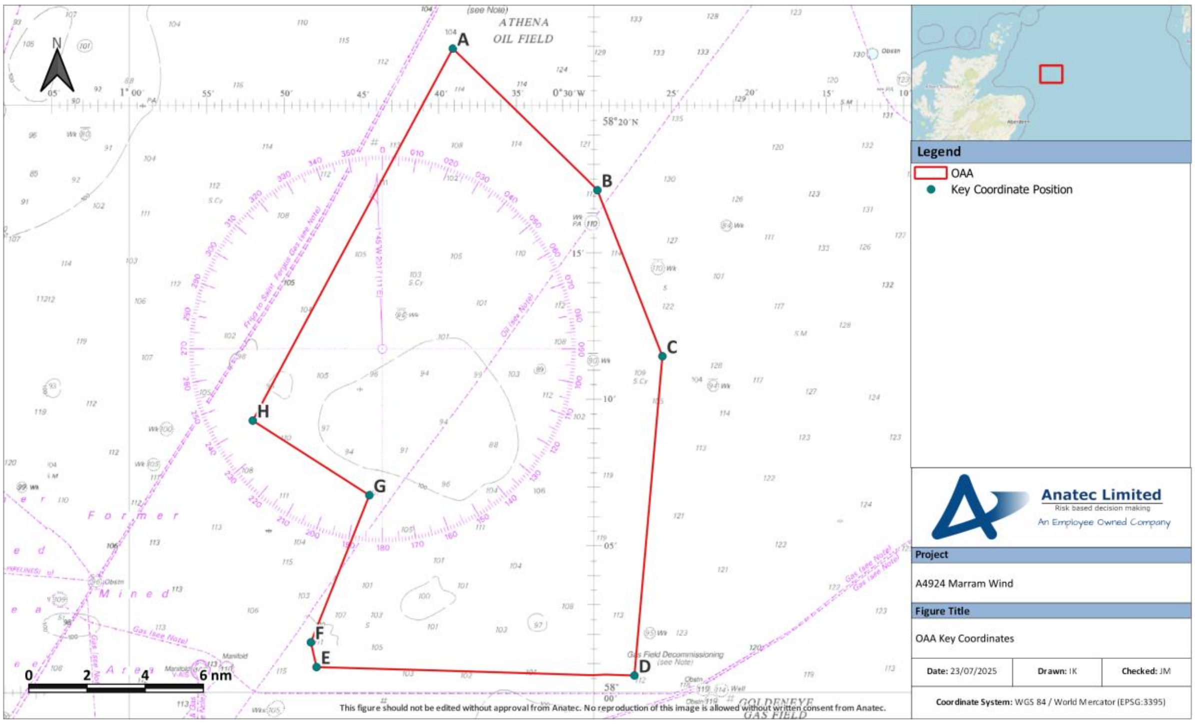


Figure 6-1 OAA Coordinates

Table 6.1 OAA coordinates

Coordinate	Latitude (World Geodetic System 1984 (WGS84))	Longitude (WGS84)
A	58° 21′ 55.40″ North (N)	000° 39′ 06.18″ West (W)
B	58° 17′ 07.00″ N	000° 29′ 46.28″ W
C	58° 11′ 28.04″ N	000° 25′ 34.40″ W
D	58° 00′ 33.73″ N	000° 27′ 22.80″ W
E	58° 00′ 50.97″ N	000° 47′ 54.11″ W
F	58° 01′ 41.84″ N	000° 48′ 16.00″ W
G	58° 06′ 43.55″ N	000° 44′ 29.56″ W
H	58° 09′ 16.35″ N	000° 52′ 01.14″ W

6.1.2 Reactive Compensation Platform Search Area and Offshore Export Cable Corridor

68. The offshore export cable corridor extends from the OAA at approximately 46nm offshore to the Aberdeenshire coast and covers a total area of approximately 49nm^2 with up to two landfall locations north of Peterhead; Lunderton and Scotstown. Charted water depths within the offshore export cable corridor range from zero (nearshore) to 115m below Chart Datum (CD).

69. Along the offshore export cable corridor, up to two RCPs may be required if HVAC is utilised during Phase 2 of construction (see **Section 6.5**). An RCP search area has been defined as a five kilometre (km) buffer of the area covering 40–60% distance along the offshore export cable corridor (16–23nm from the coastline).

70. An overview of the RCP search area and offshore export cable corridor and is illustrated in **Figure 6-2**.

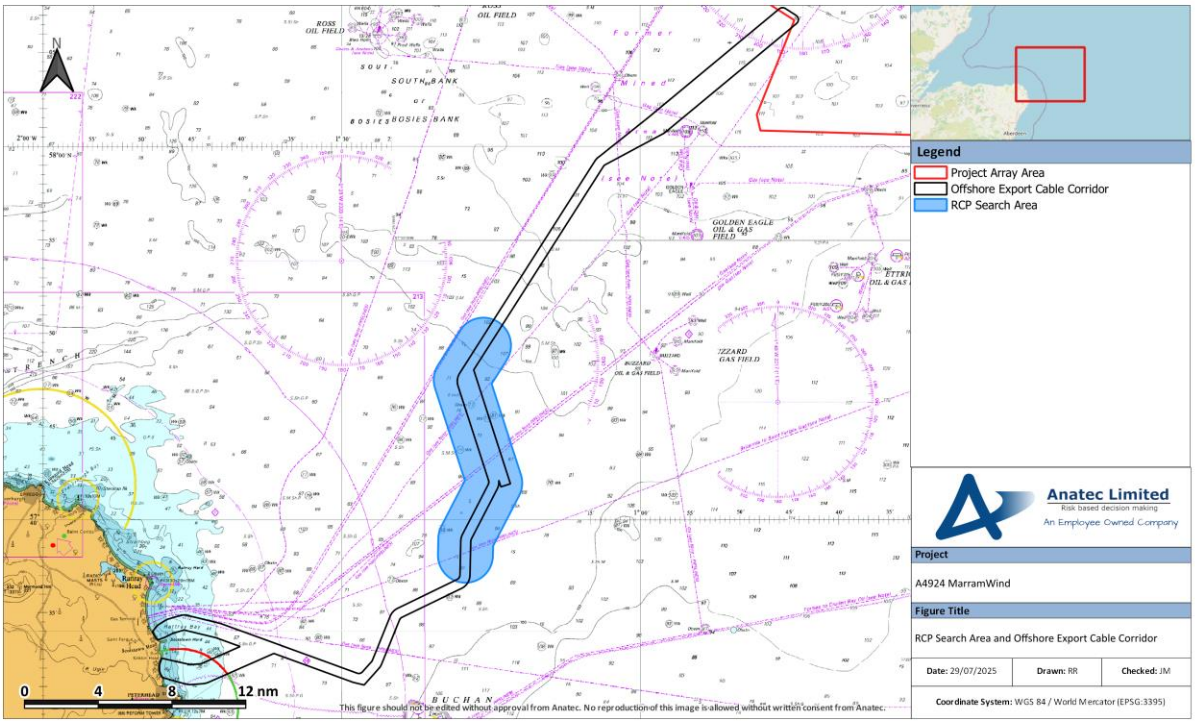


Figure 6-2 Overview of RCP Search Area and Offshore Export Cable Corridor

6.1.3 Post Assessment Offshore Export Cable Corridor Reduction

71. Late in the assessment process, the offshore export cable corridor was refined. This refinement involved a reduction to the offshore export cable corridor area within the RCP search area and also where the offshore export cable corridor reaches the OAA. This refinement does not impact the assessment and the analysis undertaken assesses a wider area and so is deemed worst case.

6.2 Surface Infrastructure

6.2.1 Indicative Maximum Design Scenario Layout

72. Up to 229 surface structures will be installed within the OAA consisting of 225 WTGs and four offshore substations. The offshore substations have been positioned on the north-west boundary of the OAA to maximise passing vessel allision risk during the modelling process in **Section 15**, this was presented to stakeholders at the Hazard Workshop with the UK Chamber of Shipping in favour of the offshore substations locations for the purposes of the NRA. Although final locations of infrastructure have not yet been defined, an indicative maximum design scenario layout has been determined for shipping and navigation[1] and is presented in **Figure 6-3**.

[1] The Applicant is also considering a 126 25 Megawatt (MW) WTG layout option, however, the 226 WTG layout is considered maximum design for Shipping and Navigation given the maximum number for structures.

73. These layout assumptions are for the purposes of modelling / risk assessment only and the final array layout will need to be agreed with the MCA and NLB post consent.

74. The minimum spacing between WTGs (measured centre-to-centre) is 800m and the maximum design scenario layout follows a grid pattern with multiple lines of orientation. Although it is not anticipated, if a SLoO is deemed necessary at the post consent stage then a safety justification would be undertaken in line with MGN 654 requirements. It is also noted that there is a setback of surface infrastructure from the boundary of the OAA to allow for perimeter packing with a margin of space being maintained between the mooring arrangements and the perimeter.

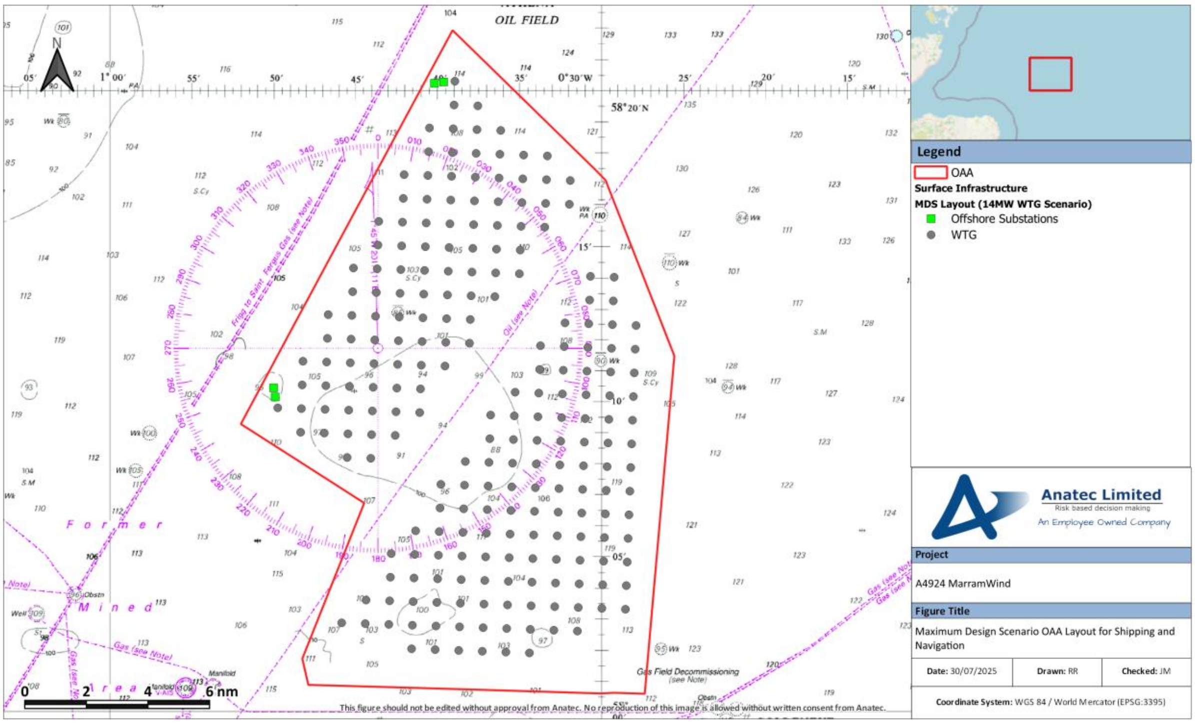


Figure 6-3 Maximum Design Scenario OAA Layout for Shipping and Navigation

75. For the RCP(s), they would be situated within the offshore export cable corridor only if required during the Phase 2 of construction, and only if HVAC is utilised. As a maximum design scenario, up to two RCPs will be considered for shipping and navigation and would be connected via bridge-link. The position of these structures was identified to increase passing vessel allision risk while maintaining the requirements of location between 40 and 60% of the offshore export cable corridor. This was presented to stakeholders at the Hazard Workshop with the UK Chamber of Shipping in favour of the RCP locations for the purposes of the NRA.

76. Although final location and requirement have not yet been defined, an indicative maximum design scenario layout has been determined for the RCPs (central point of two RCPs connected via bridge-link) and is presented in **Figure 6-4**.

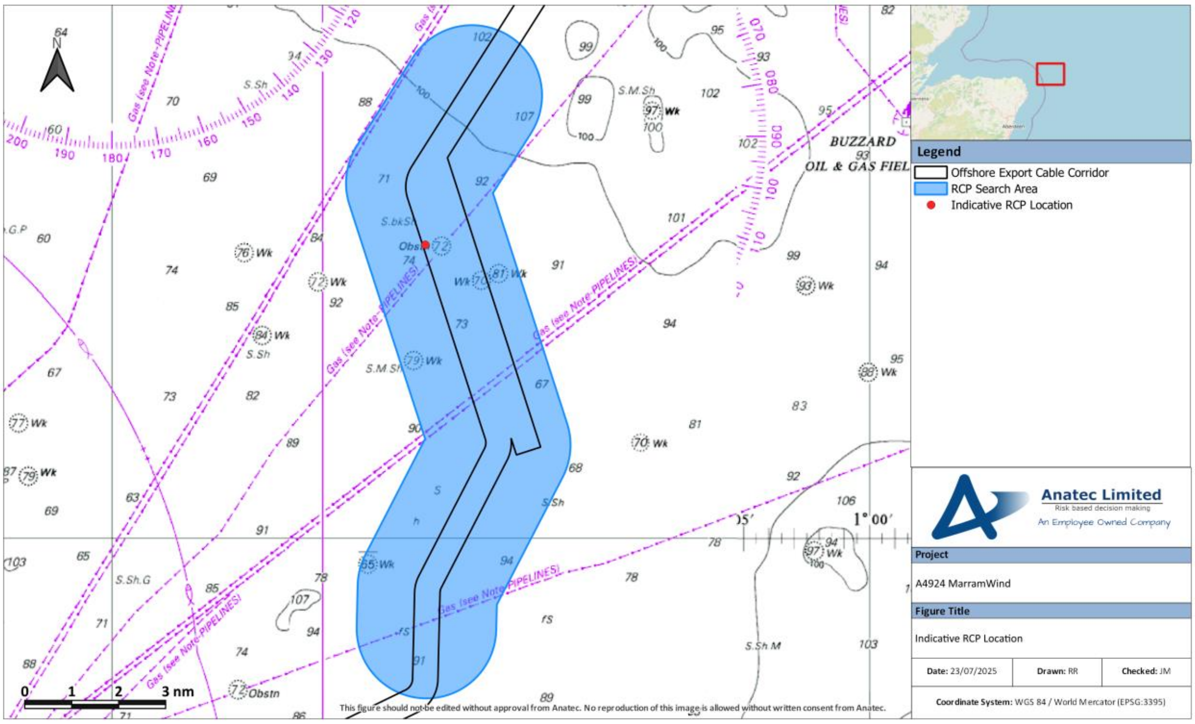


Figure 6-4 Indicative RCP Location

6.2.2 Wind Turbine Generators

77. The WTGs within the indicative layout each have a maximum rotor diameter of 236m and a maximum blade tip height (above Mean Sea Level (MSL) of 274 m, noting that these values represent a maximum design scenario for shipping and navigation rather than the Project as a whole but fall within the scope of the Project design in **Volume 1, Chapter 4: Project Description**.

78. The maximum design scenario WTG measurements are provided in **Table 6.2**, noting that the values provided are specific to the worst-case selected for shipping and navigation and do not necessarily represent the maximum design overall.

Table 6.2 Maximum design scenario for shipping and navigation – WTGs

Parameter	Maximum Design for Shipping and Navigation
Maximum number of WTGs	225
Maximum blade tip height (above MSL)	274m
Minimum blade clearance above Mean High Water Springs (MHWS)	22m
Maximum rotor diameter	236m
Minimum spacing between WTGs (centre-to-centre)	800m

6.2.3 Floating Unit

79. Semi-submersible floating units have been considered as the maximum design scenario for shipping and navigation for both allision risk and underkeel clearance risk hazards.

80. The maximum design scenario floating unit measurements are provided in **Table 6.3**, noting that the values provided are specific to the worst-case selected for shipping and navigation and do not necessarily represent the maximum design overall.

81. As well as multi-tower semi-submersible, the other floating unit types under consideration include standard semi-submersibles, barge, tension-leg platform, and buoys. Descriptions of each floating unit under consideration are provided in **Volume 1, Chapter 4: Project Description**.

Table 6.3 Maximum design scenario for shipping and navigation – floating unit

Parameter	Maximum Design for Shipping and Navigation
Maximum dimensions at sea surface	100 × 120m
Minimum floating unit draught	12m
Minimum spacing between other floating units (centre-to-centre)	800m

6.2.4 Mooring and Anchoring Systems

82. The floating unit will be attached to the seabed via a mooring and anchoring system. Taut line or semi-taut mooring lines are being considered for the maximum design scenario for shipping and navigation with the maximum number of mooring lines proposed (**Volume 1, Chapter 4: Project Description**) being eight. As for loss of station, a minimum of three mooring lines is considered maximum design and has been taken into consideration where relevant. In agreement with the UK Chamber of Shipping, as per discussions at the Hazard Workshop, shared anchors would also be considered maximum design for the loss of station hazard.

83. For the maximum design scenario, the mooring lines will connect to the base of the floater at 12m below the sea surface with a shallowest rate of descent to the seabed demonstrated in **Section 16.2.4**. The overall footprint of the mooring lines will be at a maximum of 800m radius from the floating unit with a maximum length in the water column of 810m. Indicative mooring arrangements are illustrated in **Figure 6-5**, with emphasis this only demonstrates the maximum design parameters.

84. Up to eight anchors will be deployed (corresponding to the maximum number of mooring lines) with drag, embedment, driven piles, and suction anchors under consideration.

85. As aforementioned, all mooring arrangements inclusive of anchors, will be fully within the OAA boundary with a margin of space between arrangements and the perimeter.

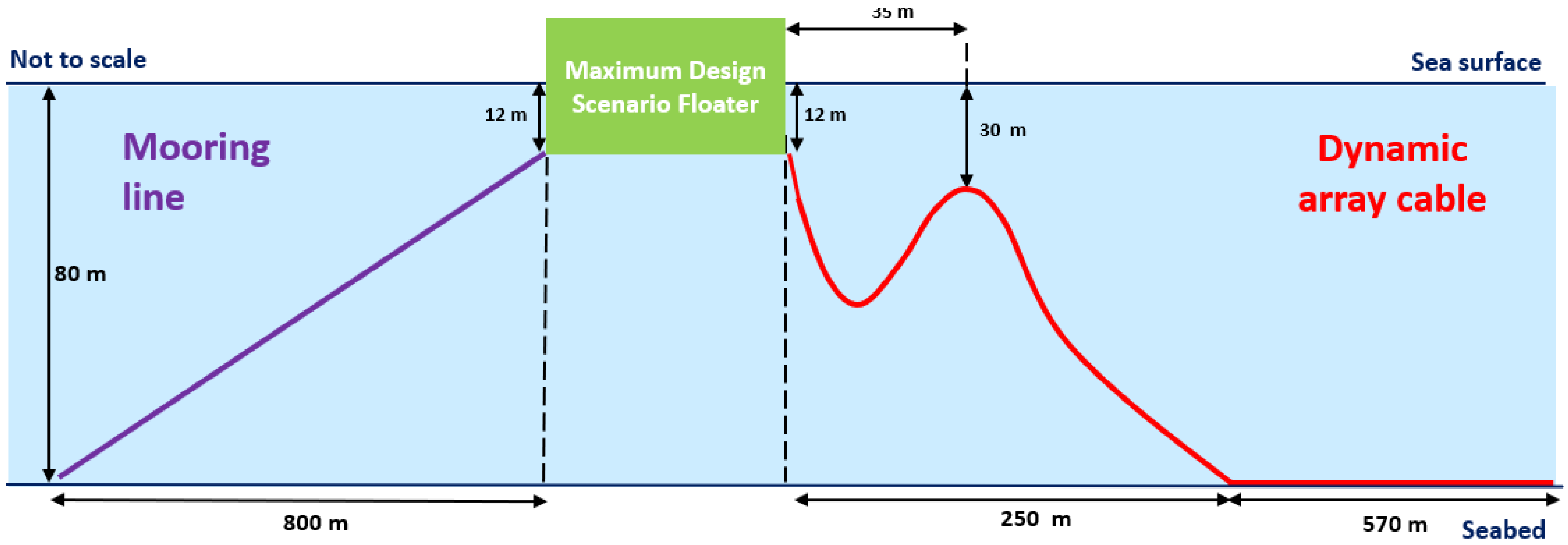


Figure 6-5 Indicative Floating Technology Parameters for Shipping and Navigation

6.2.5 Offshore Substations

86. Up to four offshore substations will be installed on fixed foundations of either jackets with pin piles or suction caissons within the OAA. The maximum topside dimensions for the offshore substations at sea surface will be 106 × 70m. This topside dimension is the larger of two options and is associated with HVDC; the dimensions would be smaller for HVAC.

87. Minimum spacing of 500m would be maintained between offshore substations with 500m also being maintained between any offshore substation topside and WTG blade tip.

6.2.6 Reactive Compensation Platform

88. Up to two RCPs each with topside dimensions of 50 × 50m, connected via a maximum length bridge link of 150m (total maximum dimensions of 250 × 50m) may be installed within the offshore export cable corridor. RCPs will only be installed during Phase 2 of construction, if HVAC is utilised. The RCPs would be on fixed foundations of either jackets with pin piles or suction caissons.

6.3 Subsea Cables

89. Various types of subsea cables will be installed and can be categorised as follows: array cables, interconnector cables, and export cables. Each of these categories is summarised in the following subsections.

6.3.1 Array Cables

90. The array cables will connect individual WTGs to offshore substations, with up to 225 array cables, one per WTG, being required. Up to 367nm of array cables will be installed with the final length dependent on the final agreed array layout. All array cables would be installed within the OAA boundary.

91. Array cables will have a maximum length of 1.6nm in the water column with a maximum of 570m of cable remaining on the seabed. The maximum horizontal touchdown of array cables from the floating unit will be 250m with the minimum connection point 12m below sea surface on the base of the floating unit. Indicative parameters are also outlined in **Figure 6-5**.

92. As part of the maximum design scenario, a lazy wave configuration may be incorporated into the *in situ* array cables. If so the minimum depth of the array cable lazy wave below the sea surface will be 30m located at a maximum distance of 35m from the floating unit, illustrated also in **Figure 6-5**.

93. There is the potential for between five and eight array cables to connect to a subsea distribution centre (SDC) with a maximum of 45 SDCs being installed. Each SDC will be situated on the seabed within the OAA boundary and have a maximum height of 5m into the water column. Maximum dimensions of the SDCs are 18 × 8m.

6.3.2 Export Cables

94. The export cables will carry the energy generated by the WTGs from the OAA to shore, via the RCP(s) if required. Up to five export cable trenches, each potentially containing more than one export cable, will be required each with a route length of 70–76nm which will be installed within the offshore export cable corridor in up to five cable trenches.

95. The export cables will make landfall north of Peterhead at one or two locations; Lunderton and Scotstown (illustrated in **Figure 6-2**). If multiple export cables are installed, the maximum spacing between cables within the offshore export cable corridor will take into account a minimum distance of three times the varying water depth along the route between the export cables.

6.3.3 Cable Burial

96. Where available the primary means of cable protection will be by seabed burial. The extent and method by which the subsea cables will be buried will depend on the results of a detailed seabed survey of the final cable routes and associated Cable Burial Risk Assessment (CBRA).

97. The array cables will have a typical burial depth of 1.0 - 2.0m, and export cables will also have a typical burial depth of 1.0 – 2.0m.

98. Where cable burial is not possible, alternative cable protection methods such as rock placement or mattresses may be deployed which will again be determined within the CBRA. It is anticipated that up to 80% of subsea cables will be buried and the maximum height of any required cable protection will be 2.0m.

99. It is noted that there are up to six assumed cable crossings anticipated for array cables and up to 16 known crossings for the export cables with six additional crossings estimated.

100. Cable burial and protection is captured in the **Volume 4: Outline Cable Plan** (CaP), included in the embedded mitigation measures (**Section 17**).

6.4 Wet Storage

101. It is assumed that wet storage of assembled WTGs would occur within port limits. In such instances it would be the responsibility of the relevant port authority to conduct its own risk assessment regarding wet storage operations and therefore this aspect of the Project is scoped out of the risk assessment.

6.5 Construction Stage

102. The offshore construction will be carried out in three continuous phases which could last for up to 12 years. **Figure 6-6** outlines an indicative construction programme for the Project which indicates the maximum duration of construction for each element.

103. A construction method statement (CMS) is also included as an embedded mitigation measure in **Section 17**.

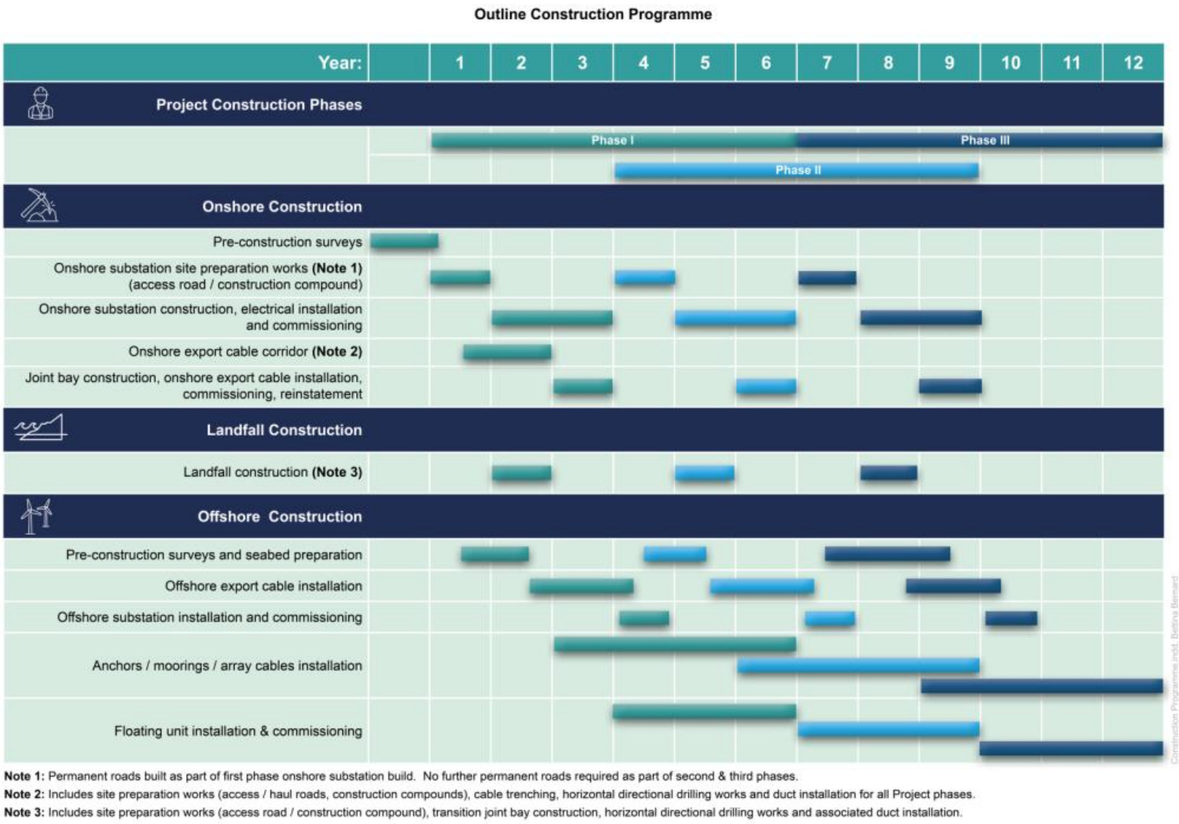


Figure 6-6 Indicative Construction Programme

6.6 Indicative Vessel and Helicopter Numbers

6.6.1 Construction Stage

104. It is estimated that approximately 3,838 individual vessels transits (each representing a one-way journey between port and worksite) would be required during the construction of the Project. It is estimated that the installation of each floating unit will require up to three vessel transits of the installation vessel.

105. It is anticipated that approximately 10 vessels would be on site at any one time during the construction of the Project. The numbers of vessels will be confirmed with further input from construction contractors post-consent.

106. There may also be a requirement for helicopters to travel to and from the OAA to assist with construction activities. Helicopters will largely be used to transfer personnel in between port visits and to any accommodation vessels, but may also be used for construction materials or to support specific construction activities. It is estimated that two helicopter trips per week for duration of the main offshore construction, approximately 1,040 helicopter round trips may be required during the offshore

construction period. The helicopter port or airfield location has not yet been determined but is expected to be Aberdeen bases on facilities at time of writing.

107. A CMS is also included as an embedded mitigation measures in **Section 17**.

6.6.2 Operation and Maintenance Stage

108. Up to 364 round trips per year by up to a peak of 7 O&M vessels at any one time may be made throughout a maximum 35-year operational lifetime O&M stage.

109. During both the construction and O&M stages, logistics will be managed by a marine coordination team with an integrated Quality, Health, Safety and Environment (QHSE) management system in place to ensure control of all vessels and their respective works. The Project will be operational 24/7.

110. Additionally, daily round trips by helicopters, four weeks of the week are assumed.

111. An offshore O&M plan is also included as an embedded mitigation measures in **Section 17**.

6.6.3 Decommissioning Stage

112. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels. The decommissioning duration of the offshore infrastructure is anticipated to take three years. A decommissioning plan is included as an embedded mitigation measures in **Section 17**.

6.7 Maximum Design Scenario

113. The maximum design scenario for each shipping and navigation hazard is provided in **Table 6.4** and is based on the parameters described in the previous subsections.

Table 6.4 Maximum design scenario for shipping and navigation by hazard

Potential Hazard	Stage(s)	Maximum Design Scenario for Shipping and Navigation	Justification
Vessel displacement and increased vessel to vessel collision risk between third-party vessels	Construction	▪ Maximum extent of buoyed construction area; ▪ Use of 500m construction safety zones and 50m pre-commissioning safety zones; ▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables; ▪ Peak of 10 construction vessels offshore; and ▪ Continuous phased offshore construction of approximately 12 years.	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.
	O&M	▪ Full buildout of OAA; ▪ Up to 225 WTGs and floating units; ▪ Floating unit surface dimensions of up to 100 x 120m; ▪ Up to four fixed offshore substations with topside dimensions of up to 106 x 70m; ▪ Up to two RCP connected via bridge link with a maximum dimension of 250 × 50m; ▪ Up to 367nm of array cables including use of dynamic cable sections; ▪ Peak of 7 O&M vessels offshore with up to 364 round trips to port per year; ▪ Use of 500m major maintenance safety zones; and ▪ Operational life of 35 years per phase.	
	Decommissioning	▪ Maximum extent of buoyed decommissioning area; ▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables; ▪ Peak of 42 decommissioning vessels offshore; and ▪ Continuous phased offshore decommissioning of approximately 12 years.	
	Construction	▪ Maximum extent of buoyed construction area;	

Potential Hazard	Stage(s)	Maximum Design Scenario for Shipping and Navigation	Justification
		▪ Use of 500m construction safety zones and 50m pre-commissioning safety zones; ▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables; ▪ Peak of 10 construction vessels on site; and ▪ Continuous phased offshore construction of approximately 12 years.	
Increased vessel to vessel collision risk between a third-party vessel and a project vessel	O&M	▪ Full buildout of OAA; ▪ Up to 225 WTGs and floating units; ▪ Floating unit surface dimensions of up to 100 x 120m; ▪ Up to four fixed offshore substations with topside dimensions of up to 106 x 70m; ▪ Up to two RCP connected via bridge link with a maximum dimension of 250 × 50m; ▪ Up to 367nm of array cables including use of dynamic cable sections; ▪ Peak of 7 O&M vessels offshore with up to 364 round trips to port per year; ▪ Use of 500m major maintenance safety zones; and ▪ Operational life of 35 years per phase.	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	▪ Maximum extent of buoyed decommissioning area; ▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables; ▪ Peak of 42 decommissioning vessels offshore; and ▪ Continuous phased offshore decommissioning of approximately 12 years.	
Reduced access to local ports and harbours	Construction	▪ Maximum extent of buoyed construction area; ▪ Use of 500m construction safety zones and 50m pre-commissioning safety zones;	Largest possible extent, greatest number of vessel activities associated with the Project and greatest duration resulting in

Potential Hazard	Stage(s)	Maximum Design Scenario for Shipping and Navigation	Justification
		▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables; ▪ Peak of 10 construction vessels on site; and ▪ Continuous phased offshore construction of approximately 12 years.	the maximum spatial and temporal effect on access to local ports.
	O&M	▪ Full buildout of the OAA; ▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables; ▪ Up to two RCP connected via bridge link with a maximum dimension of 250 × 50m; ▪ Use of 500m major maintenance safety zones; ▪ Peak of 7 O&M vessels offshore with up to 364 round trips to port per year; and ▪ Operational life of 35 years per phase.	
	Decommissioning	▪ Maximum extent of buoyed decommissioning area; ▪ Use of 500m construction safety zones and 50m pre-commissioning safety zones; ▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables; ▪ Peak of 42 decommissioning vessels offshore; and ▪ Continuous phased offshore decommissioning of approximately 12 years.	
Loss of station	Construction	▪ Maximum extent of buoyed construction area; ▪ Up to 225 WTGs and floating units; ▪ Minimum of three mooring lines per floating unit; ▪ Taut mooring lines; ▪ Floating unit surface dimensions of up to 100 x 120m; and ▪ Continuous phased offshore construction of approximately 12 years.	Maximum number of WTGs with greatest surface dimensions and greatest duration resulting in the maximum spatial and temporal effect on loss of station risk.

Potential Hazard	Stage(s)	Maximum Design Scenario for Shipping and Navigation	Justification
	O&M	▪ Full buildout of OAA; ▪ Up to 225 WTGs and floating units; ▪ Minimum of three mooring lines per substructure; ▪ Taut mooring lines; ▪ Floating unit surface dimensions of up to 100 x 120m; and ▪ Operational life of 35 years per phase.	
	Decommissioning	▪ Maximum extent of buoyed decommissioning area; ▪ Up to 225 WTGs and floating units; ▪ Minimum of three mooring lines per floating unit; ▪ Taut mooring lines; ▪ Floating unit surface dimensions of up to 100 x 120m; and ▪ Continuous phased offshore decommissioning of approximately 12 years.	
Creation of vessel to structure allision risk (including powered, drifting and internal)	O&M	▪ Full buildout of OAA; ▪ Up to 225 WTGs and floating units; ▪ Floating unit surface dimensions of up to 100 x 120m; ▪ Up to four fixed offshore substations with topside dimensions of up to 106 x 70m; ▪ Up to two RCP connected via bridge link with a maximum dimension of 250 × 50m; ▪ Use of 500m major maintenance safety zones; ▪ Minimum spacing of 800m between WTGs and 500m between WTGs and offshore substation topsides; and ▪ Operational life of 35 years per phase.	Largest possible extent of surface infrastructure, greatest number of surface structures and greatest duration resulting in the maximum spatial and temporal effect on vessel to structure allision risk.
Reduction of under keel clearance as a result of cable protection,	O&M	▪ Total failure of mooring / shared anchor system or towage operation leads to drifting of multiple floating structures with risk of collision with vessels.	Largest possible extent of subsea infrastructure and greatest duration

Potential Hazard	Stage(s)	Maximum Design Scenario for Shipping and Navigation	Justification
dynamic cables, and mooring lines			resulting in the maximum spatial and temporal effect on under keel clearance.
Anchor interaction with mooring lines and subsea cables	O&M	▪ Full buildout of OAA; ▪ Up to 225 WTGs and floating units; ▪ Maximum of eight taut mooring lines per floating unit; ▪ Mooring line radius up to 800m; ▪ Maximum of five offshore export cable trenches of 76nm in length, with each trench potentially containing multiple cables, with up to 16 known cable crossings and six additional; ▪ Up to 367nm of array cables including use of dynamic cable sections with up to six assumed cable crossings and a touchdown of 250m; ▪ Array cable lazy wave at depth of 30m at 35m from the floating unit; ▪ Typical burial depth of 1.0 - 2.0m for non-dynamic cable sections; ▪ External protection where needed, with a height of up to 2m; and ▪ Operational life of 35 years per phase.	Largest possible extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on anchor interaction with subsea cables.
Reduction of emergency response capability including SAR access	O&M	▪ Full buildout of OAA; ▪ Up to 225 WTGs and floating units; ▪ Maximum of eight mooring lines per floating unit; ▪ Floater surface dimensions of up to 100 x 120m; ▪ Up to four fixed offshore substations with topside dimensions of up to 106 x 70 m; ▪ Up to two RCP connected via bridge link with a maximum dimension of 250 × 50m; ▪ Peak of 7 maintenance vessels offshore with up to 364 round trips to port per year; and ▪ Operational life of 35 years per phase.	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.

7 Navigational Features

114. The navigational features recorded within and in proximity to the Project have been identified using the relevant UKHO Admiralty Sailing Directions (UKHO, 2022) and the UKHO Admiralty Charts (UKHO, 2025), as presented in **Figure 7-1**. Each relevant feature is discussed in the following subsections.

115. An overview of the relevant navigational features in proximity are presented in **Figure 7-1**. Following this, those navigational features in proximity to the RCP search area and the offshore export cable corridor are presented in **Figure 7-2**, with a detailed view of those features closer to landfall presented in **Figure 7-3**.

116. Stakeholders confirmed during dedicated meetings, and at the Hazard Workshop, that all expected navigational features in proximity to Project were suitably characterised.

117. It is noted that no IMO routeing measures, marine aggregate dredging areas, or anchorage areas were identified in proximity to the Project.

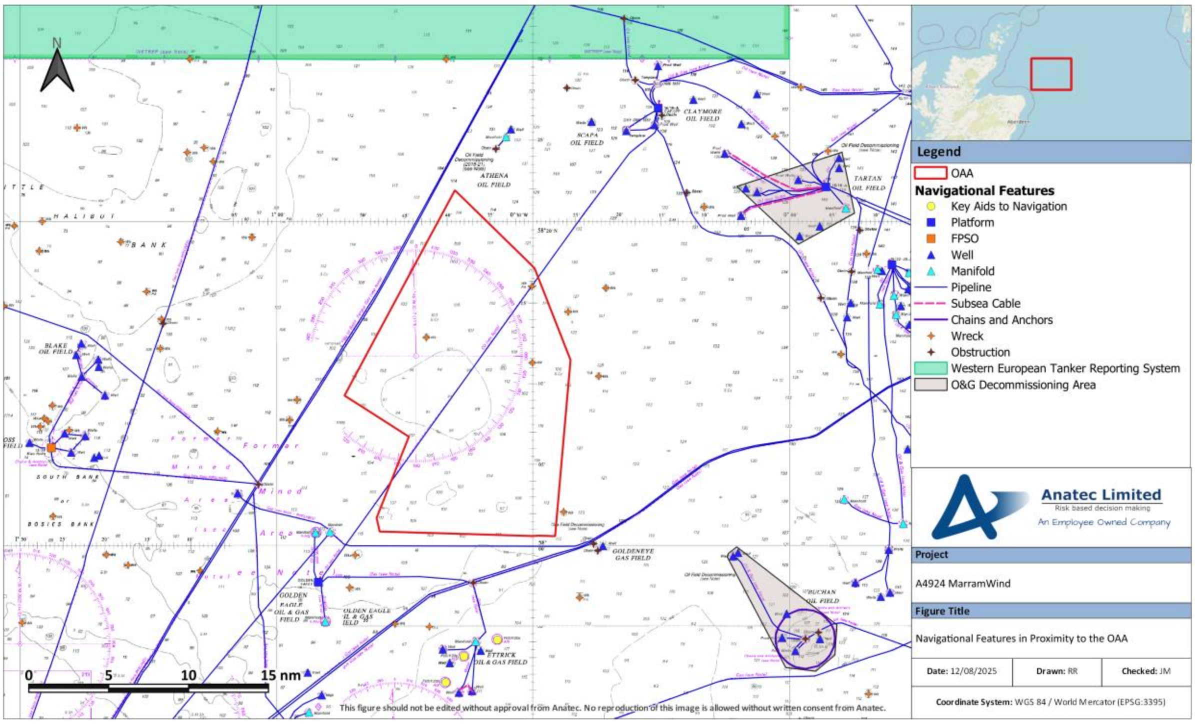


Figure 7-1 Navigational Features in Proximity to the OAA

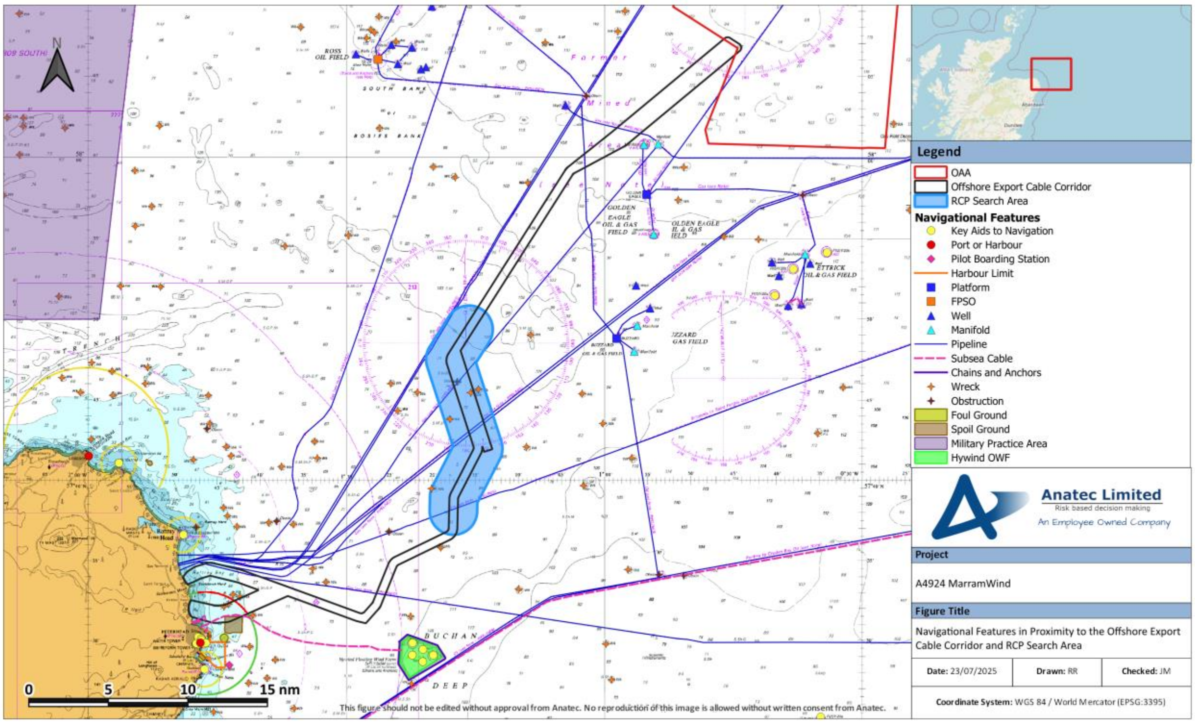


Figure 7-2 Navigational Features in Proximity to the Offshore Export Cable Corridor and RCP Search Area

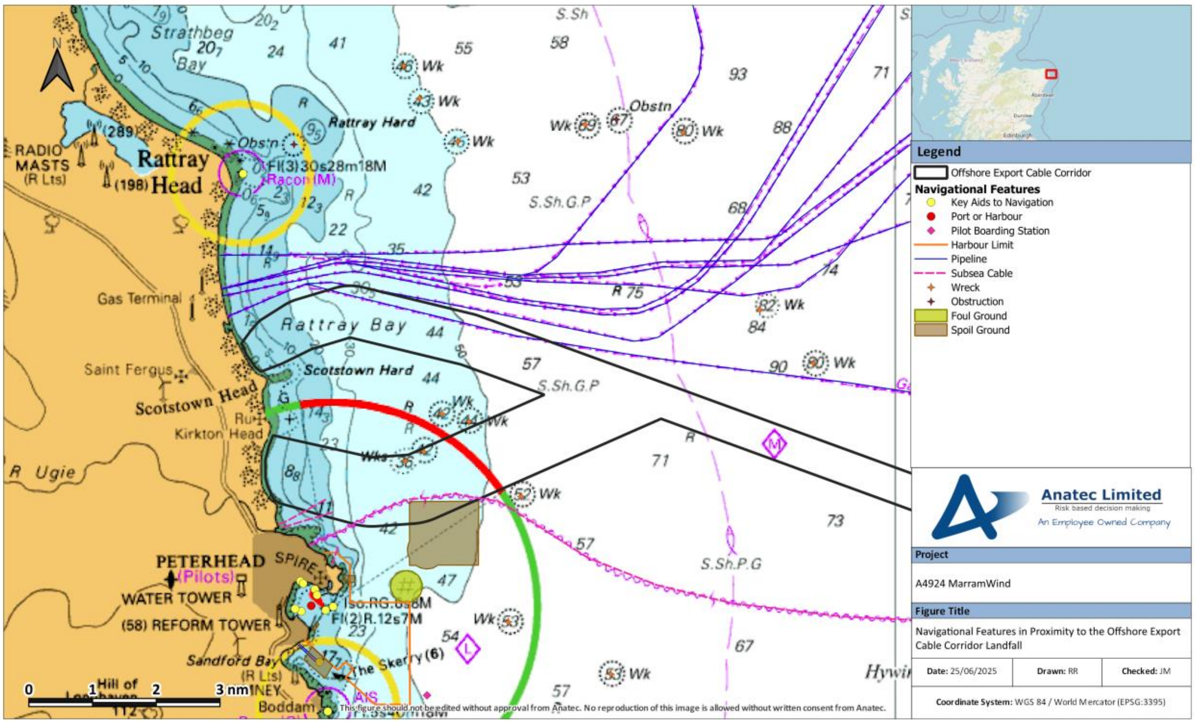


Figure 7-3 Navigational Features in Proximity to the Offshore Export Cable Corridor Landfall

7.1 Other Offshore Wind Farm Developments

118. Only those offshore wind farm developments which are operational or under construction are considered part of the baseline assessment with those proposed or in planning considered in the cumulative assessment in **Section 13**.

119. The closest operational offshore wind farm to the Project is the Hywind Scotland Pilot Park located approximately 2.5nm south of the offshore export cable corridor, 7nm south of the RCP search area, and 35nm south-west from the OAA. Hywind Scotland Pilot Park has been operational since 2017.

7.2 Oil and Gas Infrastructure

120. Various oil and gas infrastructure is present in proximity to the Project. The closest surface platform to the OAA is the Golden Eagle platform, approximately 5nm to the south-west. The Claymore surface platform the second closest to the OAA at 12.5nm to the north-east and a subsea pipeline between Golden Eagle and Claymore is the only subsea pipeline to intersect the OAA, and is reasoning for the gap in the indicative layout presented in **Section 6.2.1**.

121. Several other subsea pipelines run parallel to the boundary of the OAA with several wells and manifolds associated with nearby fields: none intersecting the OAA.

122. To the east of the OAA, there are also two oil and gas decommissioning areas; one at the Tartan Oil Field and the other the Buchan Oil Field. At the time of writing these fields were undergoing decommissioning and as noted on the relevant UKHO chart "*during the works, aids to navigation may be unreliable and certain features may not be as shown. Consult local notices to mariners issued by oil/gas field operators for details of decommissioning process*." (UKHO, 2025).

123. The closest surface platform to the RCP search area is the Buzzard platform approximately 7.7nm to the east. Six subsea pipelines intersect the RCP search area, all of which make landfall at the Saint Fergus Gas Terminal north of Peterhead.

124. A total of nine subsea pipelines intersect the offshore export cable corridor with two pipelines crossing at two separate locations.

125. The *Bleo Holm* Floating Production, Storage and Offloading (FPSO) stationary vessel is situated 16nm north of the RCP search area and 18nm west of the OAA. There are many other oil and gas fields beyond those outlined above in which oil and gas vessels are recorded routeing to / from as outlined in **Section 10.1.2.1**.

7.3 Key Ports and Harbours and Related Facilities

7.3.1 Fraserburgh Harbour

126. Fraserburgh Harbour is the closest to the Project at approximately 42nm south-west from the OAA, 20nm west of the RCP search area, and approximately 9nm north-west of

the offshore export cable corridor. Fraserburgh Harbour is primarily a fishing port with two large fish markets on site. The harbour is home to a large local fishing fleet also.

127. Fraserburgh Harbour offers extensive shore-based facilities including fresh water supply and shore power as well as waste and waste oil disposal (Fraserburgh Harbour Commissioners, 2025a).

7.3.2 Peterhead Port

128. Peterhead Port is located approximately 44nm to the south-west of the OAA, 16nm south-west of the RCP search area, and 1nm south of the offshore export cable corridor. Peterhead Port is the largest fishing port in Europe as well as being an important base for serving a range of commercial vessels (Peterhead Port Authority, 2025). A pilot boarding station is located approximately 2nm offshore from the port and pilotage is compulsory for:

- All vessels exceeding 3,500GT;
- All tankers carrying oil in bulk as cargo;
- Vessels carrying hazardous cargoes or dangerous good in bulk in quantities of 100 tonnes or more;
- Vessels carrying more than one tonne of IMO Class 1 explosives;
- All vessels which, in the opinion of the Harbour Master or his appointed deputies, are defective, damaged or handicapped to such an extent that pilotage is required;
- When a pilot is required due to an obstruction in Peterhead Bay Harbour; and
- Vessels carrying more than 12 passengers.

129. Peterhead Port Authority operates a vessel traffic service (VTS) with Radar surveillance.

130. Anchoring within Peterhead Bay and the Peterhead VTS area is prohibited unless in an emergency or authorised by the Harbour Master or his deputies.

131. Within Peterhead Port is Peterhead Bay Marina which is a common stopping point for transiting recreational vessels.

7.3.3 Port of Aberdeen

132. The Port of Aberdeen is located approximately 66nm to the south-west of the OAA, 37nm south-west of the RCP search area, and 25nm south of the offshore export cable corridor. The Port of Aberdeen is Scotland’s largest berthage port which is classed as “an international hub for energy, trade, and tourism” (Port of Aberdeen, 2025a). The Port of Aberdeen facilitates oil and gas, renewables, decommissioning, cargo, cruise liners, and commercial ferry services. Aberdeen South Harbour was commissioned in August 2023 as an expansion of the Port offering “1,500m of deep-water berths to a maximum depth of -15m, extensive heavy-lift capabilities, 125,000 square metres (m^2) of flexible laydown

space, and ample project areas for vessels up to 300m in length" (Port of Aberdeen, 2025b).

133. The Port of Aberdeen operates a VTS and when vessels are 3nm from the Fairway Light Buoy, they must request permission to enter the VTS area.

7.4 Key Aids to Navigation

134. The closest AtoN to the OAA at the time of writing is the AIS transmitting Floating Light Detection and Ranging (FLiDAR) buoys approximately 6.5nm south. These buoys are associated with the Green Volt Offshore Wind Farm and consist of two FLiDARs and an associated wave buoy. These buoys are temporary and were deployed in May 2024 with optionality for extension of deployment until June 2026.

135. There are various AtoNs located to the south of the southern landfall option of the offshore export cable corridor including the significant all round light on the north breakwater on approach to Peterhead Port and the Peterhead Lighthouse on the south breakwater. An all-round light Radar beacon (Racon) is also present at Rattray Head, approximately 3nm north of the northern landfall option of the offshore export cable corridor. There is also a red light buoy south of Cruden Bay, highlighting the shallow, rocky reef of The Skares which is just north of the Buchan Ness Lighthouse further to the south.

136. There are no AtoNs in close proximity to the RCP search area.

7.5 Charted Wrecks and Obstructions

137. There are three charted wrecks located within the OAA, the shallowest at 90m below CD.

138. There are four wrecks and one obstruction within the RCP search area with the shallowest at 70m below CD.

139. There are four wrecks and one obstruction within the offshore export cable corridor with the shallowest at 39m below CD.

7.6 Western European Tanker Reporting System

140. The Western European Tanker Reporting System (WETREP) is located approximately 8nm north of the OAA and as noted on the relevant UKHO chart "*Tankers of more than 600 dwt [deadweight tonnage] carrying heavy crude oil, heavy fuel oil or bitumen and tar and their emulsions are required to participate in the Western European Tanker Reporting System (WETREP).*" Commercial vessel routeing in the area is detailed in **Section 11**.

7.7 Other Navigational Features

141. The only active subsea cable to intersect the Project is the Hywind Scotland Pilot Park offshore export cable which crosses the southern landfall option of the offshore export cable corridor.

142. A spoil ground also intersects the southern landfall option of the offshore export cable corridor, with a foul ground also located approximately 0.7nm south of the same area.

143. A Military Practice and Exercise Area (PEXA) is located approximately 20nm west of the RCP search area and 33nm west of the OAA. As noted on the relevant UKHO chart "*No restrictions are placed on the right to transit the firing practice areas at any time. The firing practice areas are operated using a clear range procedure; exercises and firing only take place when the areas are considered to be clear of all shipping*".

8 Meteorological Ocean Data

144. This section presents meteorological and oceanographic (MetOcean) statistics local to the Project. The data presented in this section has been used as input to the collision and allision risk modelling (**Section 16**).

8.1 Wind

145. Based on wind direction data provided by the Applicant (see **Table 5.1**); the distribution of wind direction data within each 30-degree interval is presented in **Figure 8-1**, in the form of a wind rose.

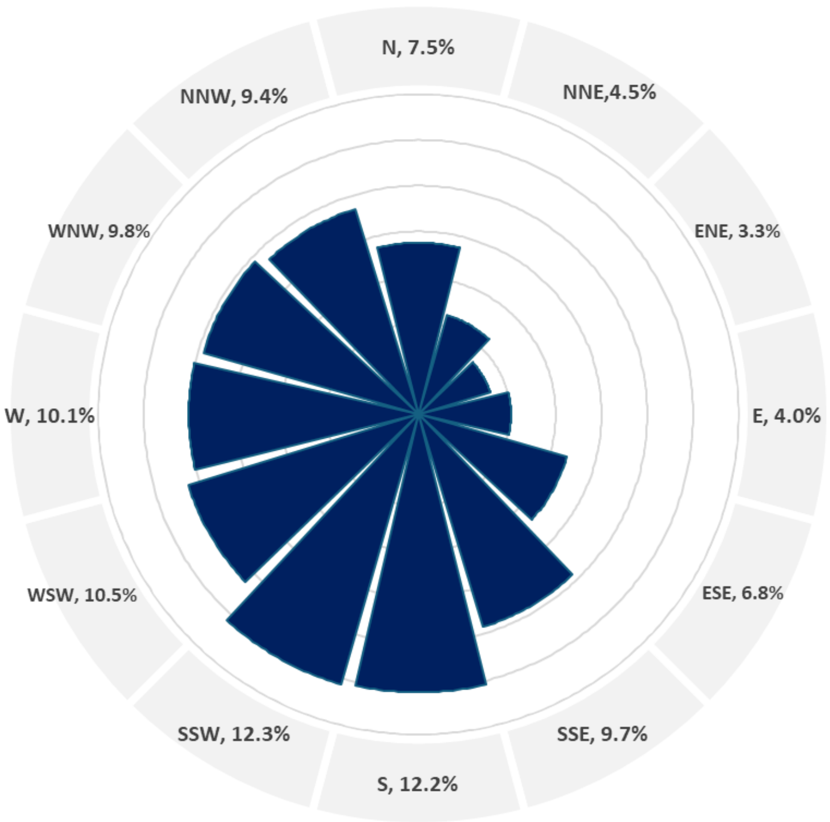


Figure 8-1 Wind Direction Distribution in Proximity to the OAA

146. Winds are most frequent from the south-south-west (12.3%) and south (12.2%).

8.2 Significant Wave Height

147. Significant wave height data was provided by the Applicant (see **Table 5.1**); **Table 8.1** presents the proportion of the significant wave height within each of three defined ranges which are categorised as calm, moderate and severe sea states.

Table 8.1 Sea State Distribution in Proximity to OAA

Significant Wave Height (m)	Sea State	Proportion (%)
Less than 1	Calm	19.2
1–5	Moderate	78.6
More than or equal to 5	Severe	2.2

8.3 Visibility

148. The annual average incidence of poor visibility (defined as the proportion of a year where the visibility can be expected to be less than 1km) is 2%. This is based upon information available within *Admiralty Sailing Directions North Coast of Scotland Pilot, NP52* (UKHO, 2022).

8.4 Tide

149. Tidal data to be used as input to the collision and allision modelling is based upon the information available from UK Admiralty charts 115, 278, and 291. The greatest flood peak tidal rate is 0.9kt, and the greatest peak ebb tidal rate is 0.8kt. **Table 8.2** presents the peak flood and ebb direction and speed values for each of the charted tidal diamonds in proximity to the Project.

Table 8.2 Tidal data

UKHO Admiralty Chart	Tidal Diamond	Flood		Ebb	
		Direction (°)	Speed (kt)	Direction (°)	Speed (kt)
115	T	149	0.8	318	0.7
	U	180	0.7	352	0.8
278	B	006	0.9	189	0.8
	D	009	0.6	187	0.7
291	B	007	0.6	183	0.6

9 Emergency Response and Incident Overview

9.1 Search and Rescue Helicopters

150. In July 2022, the Bristow Group were awarded a new 10-year contract by the MCA (as an executive agency of the DfT) beginning in September 2024 to provide helicopter SAR operations in the UK. Bristow have been operating this service since April 2015.

151. The SAR helicopter service is currently operated out of ten base locations around the UK, with the closest to the Project located at Sumburgh, approximately 94nm to the north of the OAA area. The Sumburgh base operates two Sikorsky S92 helicopters. The Inverness base is located approximately 108nm to the west of the OAA and operates two Leonardo Agusta Westland 189 helicopters.

152. The location of the SAR helicopter bases in proximity to the Project are presented in **Figure 9-1**.

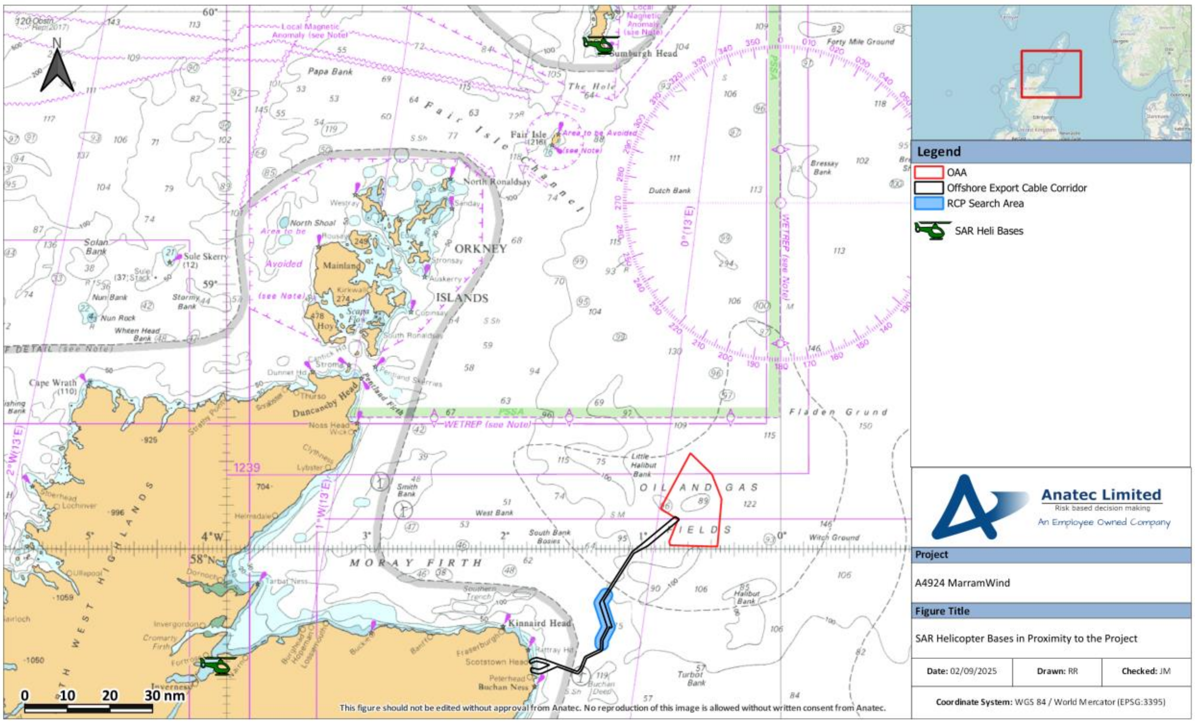


Figure 9-1 SAR Helicopter Bases in Proximity to the Project

153. The DfT has produced data on civilian SAR helicopter activity in the UK by the Bristow Group on behalf of the MCA between April 2015 and March 2024.

154. The location of SAR helicopter taskings within the combined study areas are colour-coded by tasking type and presented in **Figure 9-2**.

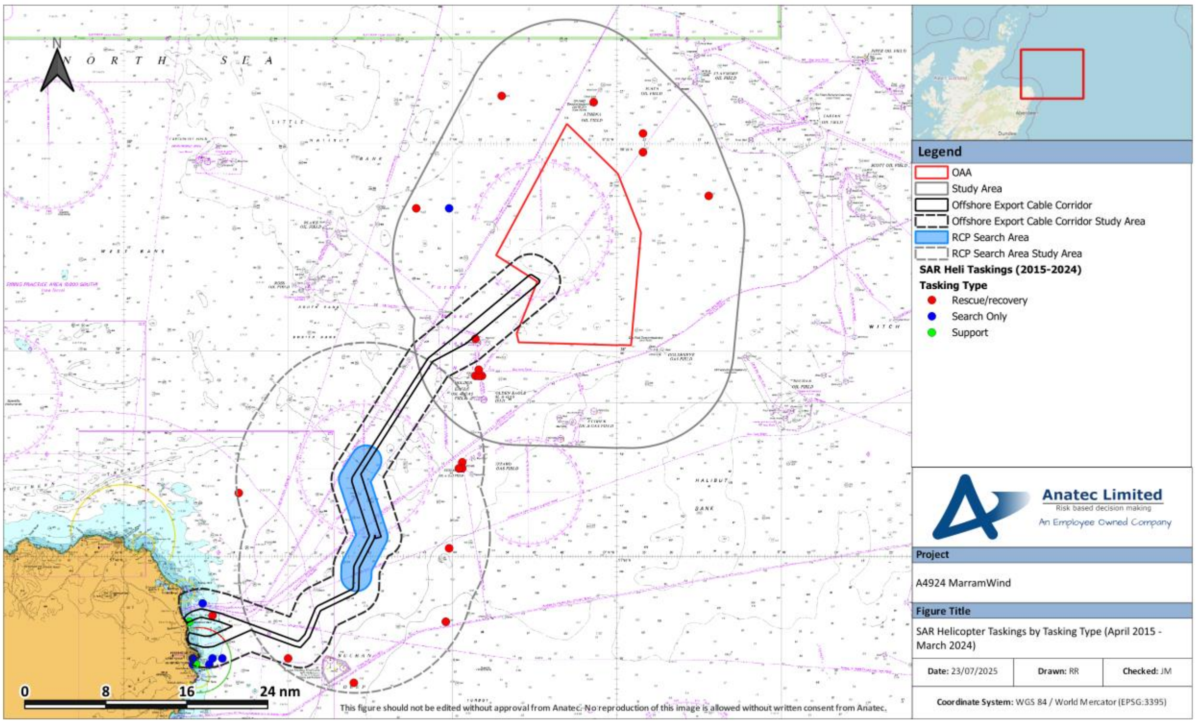


Figure 9-2 SAR Helicopter Taskings by Tasking Type (April 2015 - March 2024)

155. There were 35 SAR taskings within the combined study areas between April 2015 and March 2024, corresponding to an average of three–four SAR taskings per year. Of these, '*Rescue / recovery*' accounted for 74% of all taskings, with '*Search*' accounting for 20%, and the other 6% being '*Support'* taskings.

156. No taskings occurred within the OAA or RCP search area and two occurred within the offshore export cable corridor. These two taskings were a '*Rescue / recovery*' and a '*Support'*, both in proximity to the coastline.

157. In total, 31% of taskings occurred within 3nm of the coastline and out of all taskings, the Inverness base responded to 80%. Sumburgh (11%) and Stornoway (9%) responded to the remainder.

158. It is noted that several '*Rescue / recovery*' taskings occurred at neighbouring oil and gas platforms to the OAA.

9.2 Royal National Lifeboat Institution

159. The RNLI is organised into six divisions, with the relevant region for the Project being the 'Scotland' division. Based out of more than 230 stations, there are over 400 active lifeboats across the RNLI fleet, including both All-Weather Lifeboats (ALB) and Inshore Lifeboats (ILB). There are a number of RNLI stations in proximity to the Project, as illustrated in **Figure 9-3**.

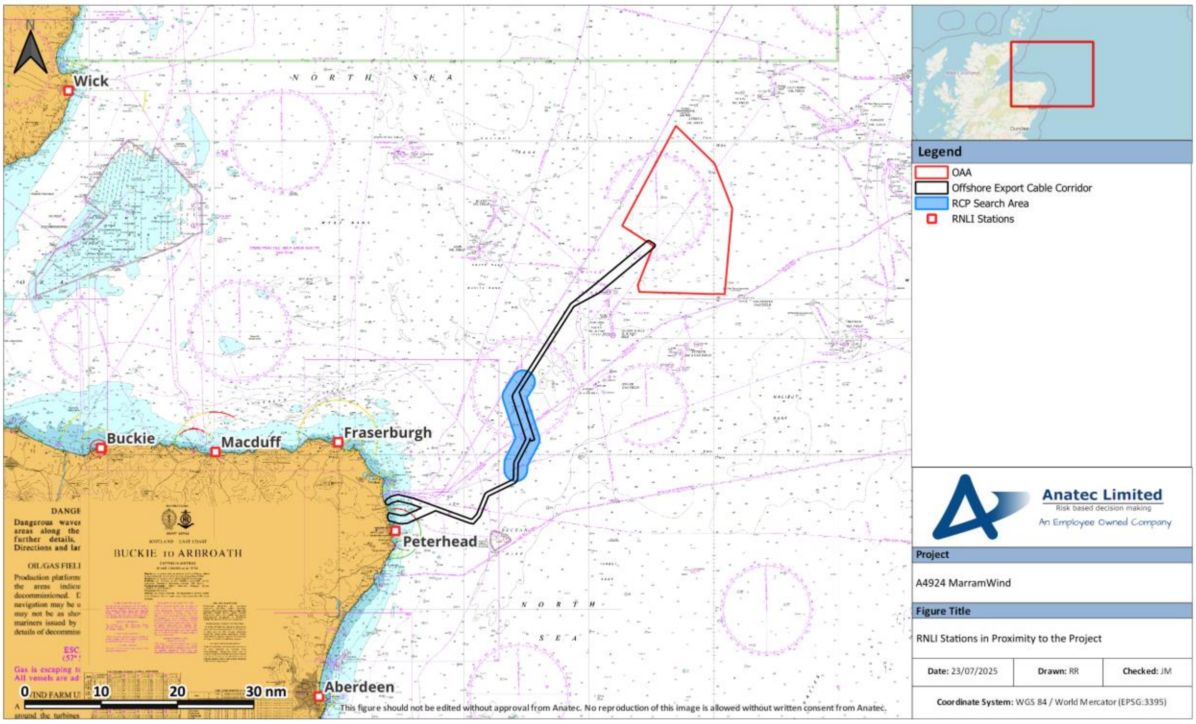


Figure 9-3 RNLI Stations in Proximity to the Project

160. The closest RNLI stations to the OAA are Fraserburgh and Peterhead, located 43nm and 44nm south-west, respectively. Both stations operate an ALB. The Aberdeen and Macduff RNLI stations are also within 50nm of the RCP search area, where ILB are operated at both stations and an ALB also operated at Aberdeen.

161. Given that the RNLI have an operational limit of 100nm, it is anticipated that an incident occurring in proximity to the Project may result in a response from a RNLI asset.

162. The incidents recorded within the RNLI dataset between 2014 and 2023 occurring within the combined study areas are presented in **Figure 9-4**, colour-coded by incident type. Following this, **Figure 9-5** shows the same data colour-coded by casualty type. It is noted that incidents which were deemed hoaxes or false alarms have been excluded from the analysis.

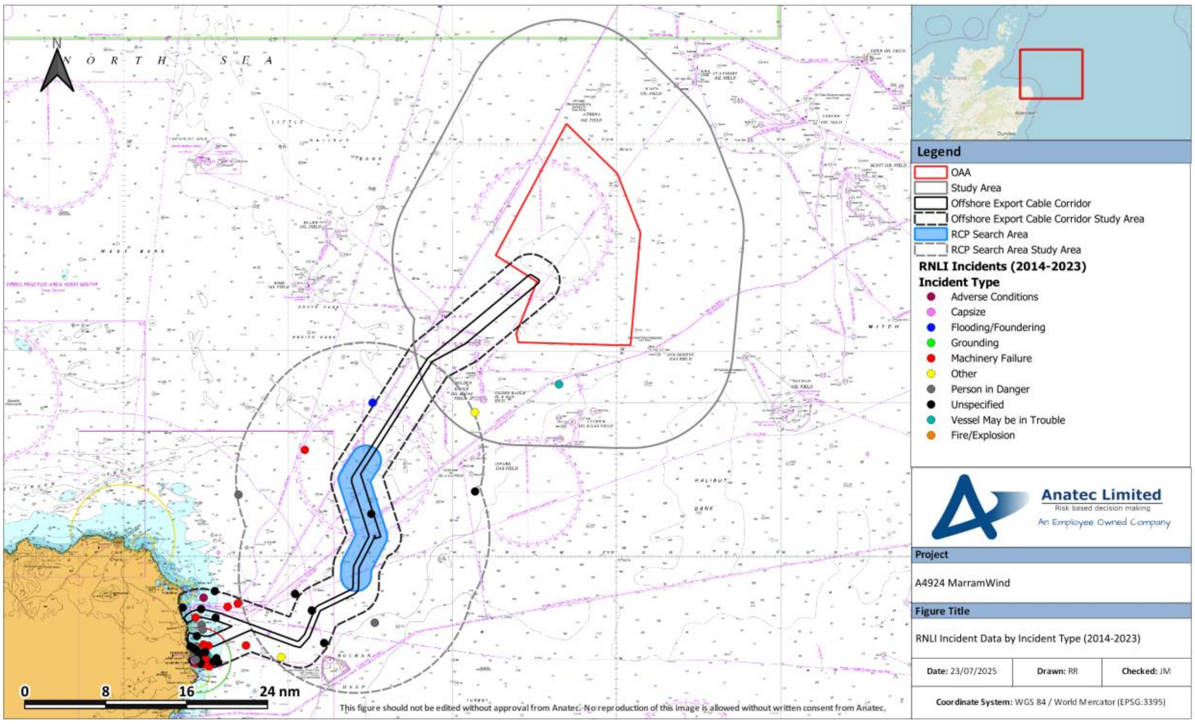


Figure 9-4 RNLI Stations and Incidents by Incident Type (2014-2023)

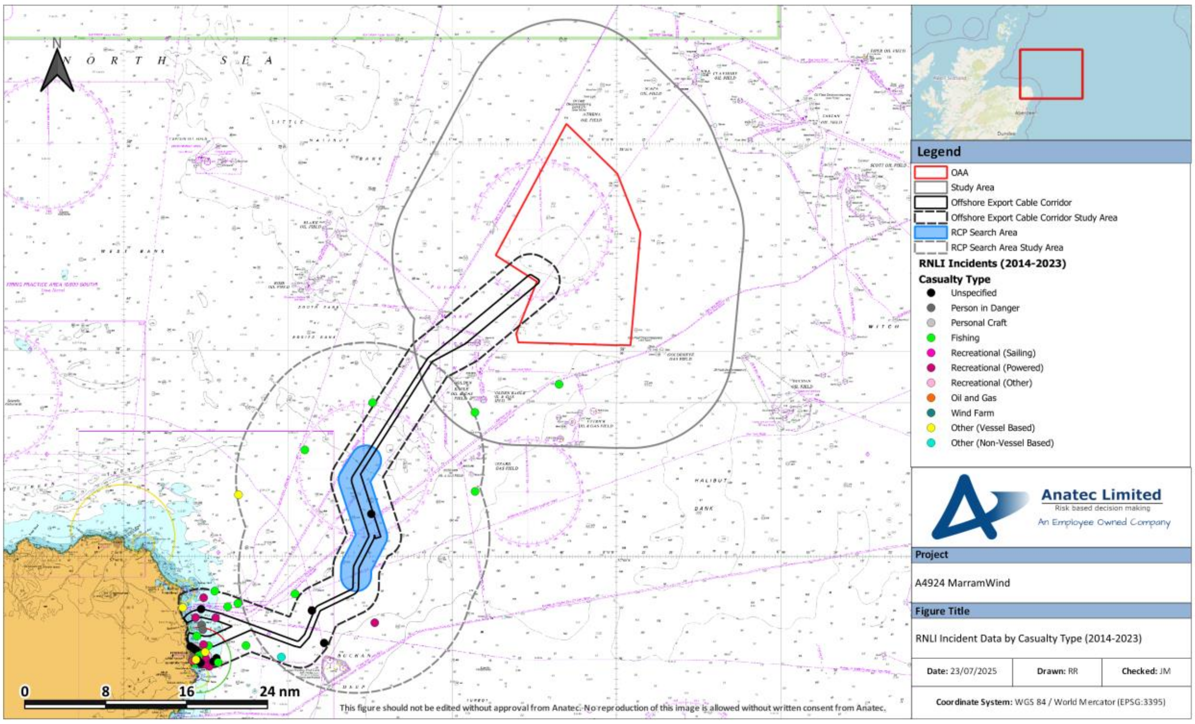


Figure 9-5 RNLI Stations and Incidents by Casualty Type (2014-2023)

163. There were 13 hoaxes or false alarms recorded within the combined study area during the 10-year period. Excluding these cases, a total of 78 incidents were responded to by the RNLI within the combined study areas between 2014 and 2023. This corresponds

to an average of eight incidents per year; however, it is noted that the majority of incidents (approximately 78%) were recorded within 3nm of the coastline, with only two being recorded further offshore in the study area. However, no incidents were recorded within the OAA.

164. Of the incidents recorded, 49% had unspecified incident types. Machinery failure accounted for 21% of incidents and person in danger for 19% of incidents. As for casualty types, unspecified casualties accounted for 29%. Fishing vessels accounted for 24% and powered recreational vessels for 19% of casualties.

165. One of these incidents, of unspecified type, occurred within the RCP search area.

166. Seven incidents occurred within the offshore export cable corridor and consisted of four unspecified incidents and three instances of machinery failure. As for casualties, three powered recreational vessels, two fishing vessels, and two unspecified were recorded.

167. Peterhead RNLI station responded to 76% of all incidents with Fraserburgh RNLI station responding to 23%. Aberdeen RNLI station responded to 1%.

9.3 Global Maritime Distress and Safety System

168. The Global Maritime Distress and Safety System (GMDSS) is a maritime communications system used for emergency and distress messages, vessel to vessel routeing communications and vessel to shore routine communications. It is implemented globally, and vessels engaged in international voyages are obliged to carry GMDSS certified communication equipment.

169. There are four GMDSS sea areas, and in the UK, it is the responsibility of the MCA to ensure VHF coverage from coastal stations within sea area A1. The Project is located approximately 41nm offshore and is likely within an A1 sea area, as shown in **Figure 9-6**. Therefore, in the event of an emergency involving a vessel located further offshore within sea area A1 or A2, vessels are able to contact coastal stations using High Frequency (HF) or Medium Frequency (MF) radio or otherwise contact other offshore resources.

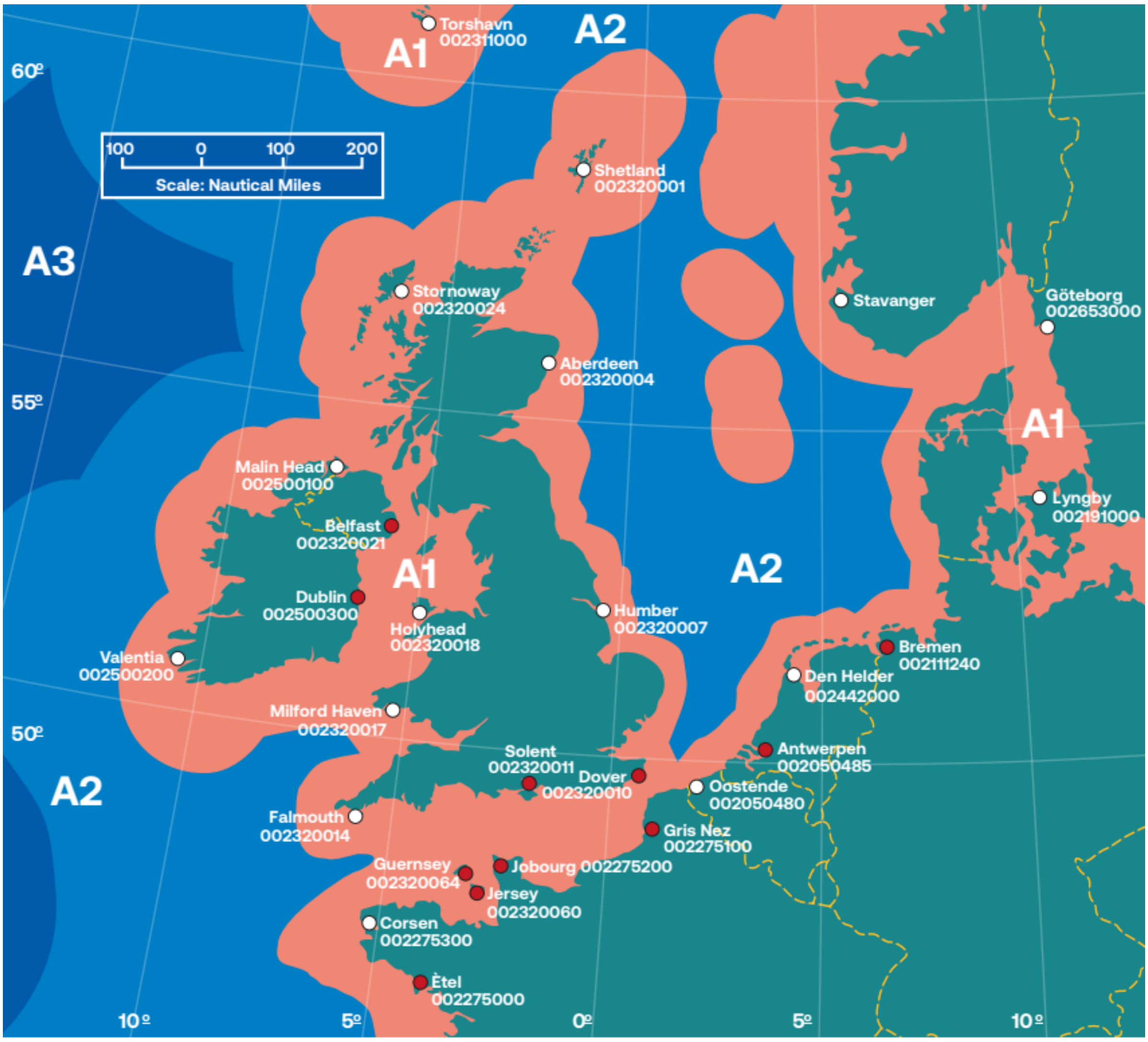


Figure 9-6 GMDSS Sea Areas (MCA, 2021).

9.4 Marine Accident Investigation Branch

170. All UK flagged vessels and non-UK flagged vessels in UK territorial waters (12nm) a UK port or carrying passengers to a UK port are required to report incidents to the MAIB. Data arising from these reports are assessed within this section, primarily covering the ten-year period between 2014 and 2023.

171. The incidents recorded within the MAIB dataset between 2014 and 2023 occurring within the combined study areas are presented in **Figure 9-7**, colour-coded by incident type. Following this, **Figure 9-8** shows the same data colour-coded by the type of vessel(s) involved in each incident.

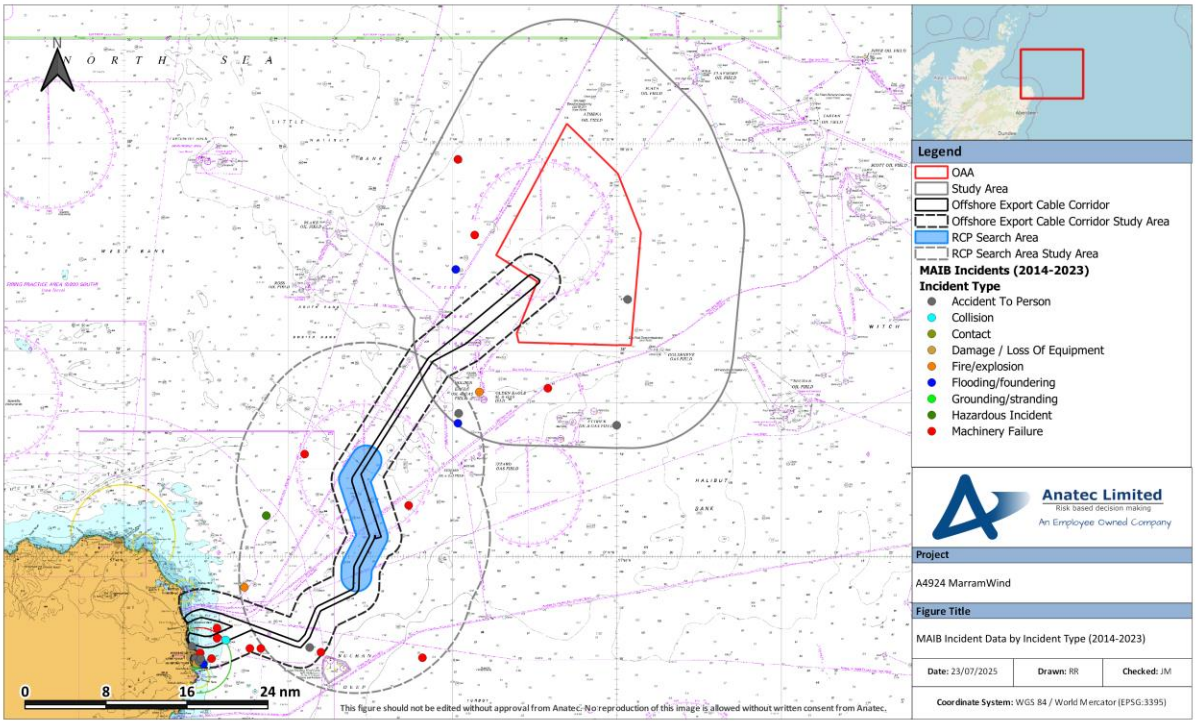


Figure 9-7 MAIB Incident Data by Incident Type (2014-2023)

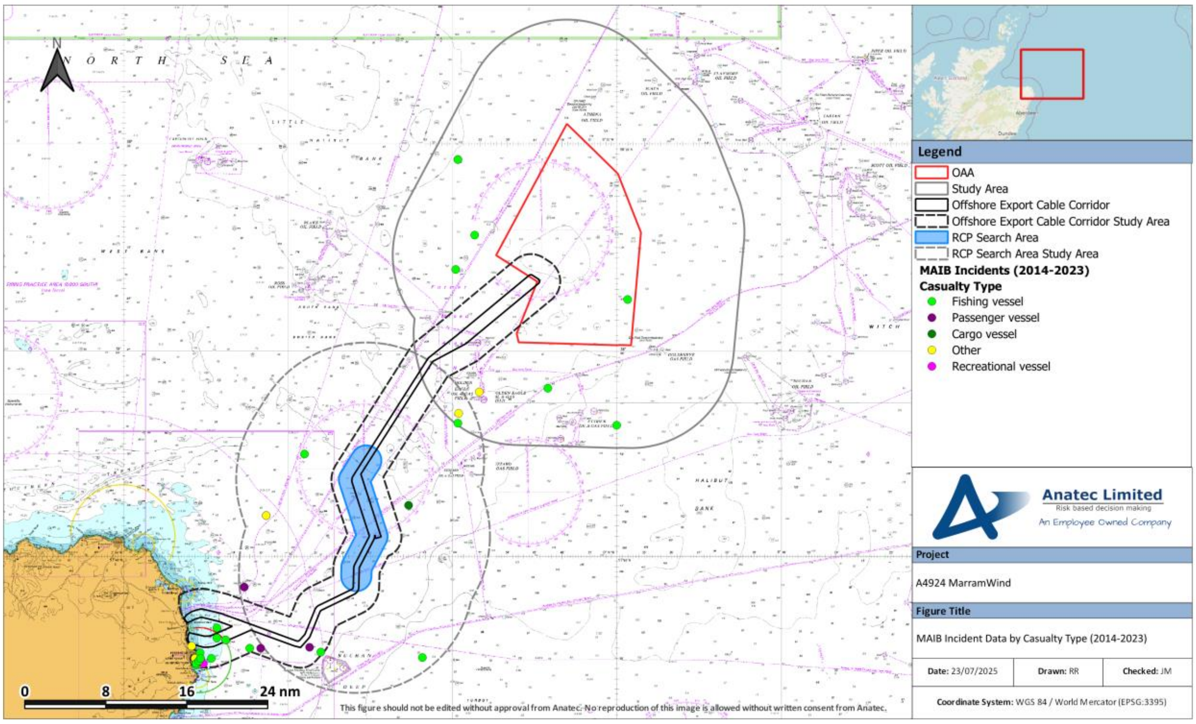


Figure 9-8 MAIB Incident Data by Casualty Type (2014-2023)

172. A total of 41 unique incidents were reported to the MAIB within the combined study areas between 2014 and 2023. This corresponds to an average of four incidents per year. Of these incidents, 54% were recorded within 3nm of the coastline.

173. The most common incident types recorded were "*machinery failure*" (31%), "*accident to person*" (29%), and "*fire / explosion*" (15%). The most common casualty type recorded was fishing vessels (59%) and 'other' vessels (24%).

174. One incident was recorded within the OAA. This incident occurred in 2022 and consisted of an accident to person onboard a fishing trawler. The incident itself was not investigated by the MAIB as was deemed a minor injury. No fatalities or damage to the vessel occurred.

175. A review of older MAIB incident data within the combined study areas between 2004 and 2013 indicates that the number of incidents has decreased over time by nearly half, with 76 unique incidents recorded in the previous 10-year period, corresponding to an average of seven–eight incidents per year. Of those incidents recorded, the main incident types were "*machinery failure*" (40%) and "*accident to person*" (25%). The main casualty type recorded was fishing vessels (69%).

9.5 Historical Offshore Wind Farm Incidents

9.5.1 Incidents Involving United Kingdom Offshore Wind Farm Developments

176. As of September 2025, there are 43 operational offshore wind farms in the UK, ranging from the North Hoyle Offshore Wind Farm (fully commissioned in 2003) to the Seagreen Offshore Wind Farm (fully commissioned in 2025). Between them these developments encompass approximately 26,572 fully operational WTG years. Based on the number of collision and allision incidents associated with UK offshore wind farms reported to date, there is an average of one incident per 1,265 operational WTG years.

177. MAIB incident data has been used to collate a list of reported historical collision and allision incidents involving UK offshore wind farm developments[2], which is summarised in **Table 9.1**. Other sources have also been used to produce this list including the UK Confidential Human Factors Incident Reporting Programme (CHIRP) for Aviation and Maritime, International Marine Contractors Association (IMCA) and basic web searches.

[2] Includes only incidents reported to an accident investigation branch or an anonymous reporting service.

Table 9.1 Summary of historical collision and allision incidents involving uk offshore wind farm developments

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
Project	Allision	7 August 2005	WTG installation vessel allision with WTG base whilst manoeuvring alongside it. Minor damage sustained to a gangway on the vessel, the WTG tower and a WTG blade.	Minor damage to gangway on the vessel	None	MAIB
Project	Allision	29 September 2006	Offshore services vessel allision with rotating WTG blade.	None	None	MAIB
Project	Allision	8 February 2010	Work boat allision with disused pile following human error with throttle controls whilst in proximity. Passenger later diagnosed with injuries and no serious damage sustained by vessel.	Minor	Injury	MAIB
Project / third-party	Collision	23 April 2011	Third-party catamaran collision with project guard vessel within harbour.	Moderate	None	MAIB
Project	Allision	18 November 2011	Cable-laying vessel allision with WTG foundation following watchkeeping failure. Two hull breaches to vessel.	Major	None	MAIB
Project / project	Collision	2 June 2012	Crew Transfer Vessel (CTV) allision with flotel. Nine persons safely evacuated and transferred to nearby vessel before being brought back into port.	Moderate	None	UK CHIRP
Project	Allision	20 October 2012	Project vessel allision with WTG monopile following human error (misjudgement of distance). Minor damage sustained by vessel.	Minor	None	MAIB
Project	Allision	21 November 2012	Passenger transfer catamaran allision with buoy following navigational error. Vessel abandoned by crew of 12 having been holed, causing extensive flooding but no injuries sustained.	Major	None	MAIB

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
Project	Allision	21 November 2012	Work boat allision with unlit WTG transition piece at moderate speed following navigational error. Vessel able to proceed to port unassisted with no water ingress but some structural damage sustained.	Moderate	None	MAIB
Project	Allision	1 July 2013	Service vessel allision with WTG foundation following machinery failure. Minor damage sustained by vessel.	Minor	None	IMCA Safety Flash
Project	Allision	14 August 2014	Standby safety vessel allision with WTG pile. Oil leaked by vessel which moved away from environmentally sensitive areas until leak was stopped.	Minor with pollution	None	UK CHIRP
Third-party	Allision	26 May 2016	Third-party fishing vessel allision with WTG following human error (autopilot). Lifeboat attended the incident.	Moderate	Injury	Web search (RNLI, 2016)
Project	Allision	14 February 2019	Survey vessels rubbing stake made contact with a WTG jacket while autopilot was engaged.	Minor	None	MAIB
Project	Allision	17 January 2020	Project vessel allision with WTG. Injury sustained by crew member but vessel able to proceed to port unassisted.	None	Injury	Web search (Vessel Tracker, 2020)
Project	Allision	27 January 2020	Project vessel allision with WTG. Minor damage to vessel and WTG sustained, with no personal injuries.	Minor	None	Marine Safety Forum
Project	Allision	February 2021	The deckhand engineer fell asleep whilst supposed to be on watch, resulting in a CTV making contact with a WTG at low speed.	None	None	MAIB
Project	Allision	12 April 2021	An allision occurred with a WTG resulting in a passenger suffering a chest injury and was attended to by paramedics upon the vessel's return to port.	None	Injury	MAIB
Project	Allision	May 2021	A CTV was drifting towards the WTG it was tied off to. The Master started the engines but was with insufficient time to avoid contact. Upon returning to port the vessel began listing due to substantial water ingress.	Moderate	None	MAIB

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
Third-party	Allision	9 June 2022	Fishing vessel allision with WTG resulting in damage to vessel and two minor injuries for crew members. RNLI lifeboat escorted vessel under its own power to port.	Minor	Injury	MAIB
Project	Allision	October 2022	A project vessel allided with the boat landing for a WTG causing a deformation to the port side midship area.	Minor	None	MAIB
Project	Allision	November 2022	A high speed craft allided with a WTG whilst the vessel propulsion was in neutral resulting in damage to the starboard jet platform and bucket.	Minor	None	MAIB
Project	Allision	April 2023	A supply vessel was drifting after deploying personnel to WTGs. The Master was reportedly distracted and an allision occurred at 5kt resulting in one crew member falling and suffering a rib fracture.	None	Injury	MAIB
Project	Allision	November 2023	A trainee on a CTV misjudged the wind and current causing the vessel to drift sideways and make contact with a WTG resulting in a broken window but no reported injuries.	Minor	None	MAIB
Project	Allision	19 September 2024	Service Operation Vessel (SOV) allided with a WTG in daylight conditions. The contact caused damage to vessel above the waterline and the helideck. There was also some damage to the base of the turbine.	Minor	None	Web search (Maritime Executive, 2024)

(*) As per incident reports.

178. As of September 2025, there have been no third-party collisions directly as a result of the presence of an offshore wind farm in the UK. The only reported collision incident in relation to a UK offshore wind farm involved a project vessel hitting a third-party vessel whilst in harbour.

179. As of September 2025, there have been 21 reported cases of an allision between a vessel and a wind turbine (under construction, operational or disused) in the UK, with all but two involving a support vessel for the development and the errant vessel in each case under power rather than drifting. Therefore, there has been an average of 1,265 wind turbine years per allision incident in the UK, noting that this is a conservative calculation given that only operational wind turbine hours have been included (whereas allision incidents counted include non-operational wind turbines).

180. On an individual project basis, there has been an average of 0.022 allision incidents per operational offshore wind farm year, noting this is an average across the 22-year period since the first UK offshore wind farm became operational.

181. The presence of offshore wind farms and associated activities does increase the likelihood of an incident occurring based on consideration of existing datasets (see Section 9.7.1). This includes the Project given that it will represent new offshore infrastructure and activities. The analysis above incorporates only collision and allision incidents since these are more likely to result in notable consequences and thus are more comprehensively reported, and are also of primary interest to the NRA. The worst consequences reported for vessels involved in a collision or allision incident involving a UK offshore wind farm development has been flooding, with no life-threatening injuries to persons reported.

182. Other types of incidents (such as medical incidents) may also require emergency response and therefore the rates reported above should not be considered comprehensive for all emergency response incidents. An accident to person requiring medical attention (which may include emergency response) is considered the most likely type of incident that may occur at an offshore wind farm.

9.5.2 Incidents Involving Non-United Kingdom Offshore Wind Farms

183. There have also been collision and allision incidents involving non-UK offshore wind farm developments. However, it is not possible to maintain a comprehensive list of such incidents and the associated operational hours.

184. One high profile non-UK incident of relevance involved a bulk carrier in January 2022 which broke its anchor chain during a storm in Dutch waters and collided with a nearby anchored vessel. The vessel began to take on water, leading to all crew members being evacuated by helicopter. The vessel then continued to drift towards shore including through an under construction offshore wind farm where it allided with a WTG foundation and a platform foundation before being taken under tow (Marine Safety Navigation Unit, 2024).

9.5.3 Incidents Responded to by Vessels Associated with United Kingdom Offshore Wind Farms

185. Although the presence of offshore wind farms and associated activities does increase the likelihood of an incident requiring emergency response it is also acknowledged that the presence of project vessels can aid with emergency response efforts, particularly for offshore wind farms located further offshore (such as the Project) where a project vessel is more likely to be able to serve as the first responder to an incident.

186. From news reports, web searches and experience working with existing offshore wind farm developments, a list has been collated of historical incidents responded to by vessels associated with UK offshore wind farm developments, which is summarised in **Table 9.2**. The initial cause of these incidents is not related to the offshore wind farm in question.

187. It is clear that the presence of offshore wind farms create new emergency response resources which can be mobilized to attend a third-party incident in liaison with HM Coastguard. This includes the Project, with project vessel compliance with international marine regulations including International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974) and pollution planning included as embedded mitigation measures (see **Section 17**). Additionally, an ERCoP will be completed post consent in consultation with the MCA.

Table 9.2 Historical incidents responded to by vessels associated with uk offshore wind farm developments

Incident Type	Date	Related Development	Description of Incident	Source
Capsize	21 June 2018	Walney	HM Coastguard issued mayday relay broadcast following trimaran capsize. Support vessel for Walney arrived and recovered two persons from the water who were then winched onboard a Coastguard helicopter.	Web search (4C Offshore, 2018)
Capsize	5 November 2018	Race Bank	Fishing vessel capsized resulting in two persons in the water. Vessel operating at the nearby Race Bank reported to have assisted with the rescue which also involved a Belgian military helicopter and the RNLI.	Web search (British Broadcasting Corporation (BBC), 2018)
Vessel in distress	15 May 2019	London Array	Yacht in difficult sought shelter by tying up to a WTG but suffered damage and a person in the water. Support vessel for London Array identified and secured the casualty vessel and recovered the person in the water. The support vessel raised the alarm to the Coastguard. The Coastguard later instructed the support vessel to return to port and seek medical assistance for the casualty vessel's occupant.	Web search (The Isle of Thanet News, 2019)
Drifting	7 July 2019	Gwynt y Môr	Speedboat suffered mechanical failure stranding four persons. Support vessel for Gwynt y Môr responded to an 'all-ships' broadcast from the Coastguard and prevented the casualty vessel drifting into the Gwynt y Môr array. The support vessel later towed the casualty vessel back towards port.	Web search (Renews, 2019)
Machinery failure	28 September 2019	Race Bank	Fishing vessel suffered mechanical failure and launched flares. Guard vessel and SOV for Race Bank both immediately offered assistance until the MCA's arrival on-scene.	Internal daily progress report received by Anatec
Vessel in distress	13 December 2019	Race Bank	Passing vessel got into difficulty and guard vessel for Race Bank was requested to assist. The Coastguard later requested that the guard vessel tow the casualty vessel into port.	Internal daily progress report received by Anatec

Incident Type	Date	Related Development	Description of Incident	Source
Search	21 May 2020	Walney	Coastguard contacted guard vessel for Walney reporting red flare sighting at the wind farm. Guard vessel proceeded to undertake search but did not find anything to report.	Internal daily progress report received by Anatec
Aircraft crash	15 June 2020	Hornsea Project One	United States jet crashed into sea during routine flight. CTVs and SOVs for Hornsea Project One joined the search for the missing pilot.	Web search (4C Offshore, 2020)
Fire / explosion	15 December 2020	Dudgeon	Fishing vessel experienced explosions on board with crew injured. SOV for Dudgeon deployed its Fast Rescue Boat and evacuated the casualty vessel.	Web search (Offshore WIND, 2020)
Drifting	17 July 2021	Neart na Gaoithe	Small dinghy with two children aboard drifted offshore due to strong winds. A guard vessel associated with Neart na Gaoithe was able to retrieve the children.	Web search (Edinburgh Evening News, 2021)
Vessel in distress	1 September 2022	Rampion	A recreational motorboat experienced power failure and anchored near Rampion. The anchor could then not be recovered, and Coastguard assistance was requested. A CTV for Rampion responded and towed the vessel back to port.	MAIB
Allision	9 June 2022	Westermost Rough	Fishing vessel allided with a WTG at Westermost Rough. A supply vessel was among the responders as a RNLI lifeboat escorted the vessel under its own power to port.	MAIB
Machinery Failure	1 December 2022	Unknown	A survey vessel suffered an engine failure and was towed back to port by a wind farm Rigid Inflatable Boat (RIB).	MAIB
Accident to Person	12 July 2024	Stromar	A deckhand on a fishing vessel became entangled in a creel rope and was pulled overboard. The vessel's crew alerted HM Coastguard and manoeuvred to attempt a rescue. The deckhand was recovered on board and attempts to revive were supported by a paramedic from a HM Coastguard helicopter, a RNLI lifeboat and crew from a nearby survey vessel for the Stromar Offshore Wind Farm. The deckhand could not be revived and was declared deceased.	BBC (2024)

10 Vessel Traffic Movements

188. This section presents an analysis of vessel traffic movements in relation to the OAA, RCP search area and the offshore export cable corridor. The methodology for vessel traffic data collection including details of the on-site vessel traffic surveys and long-term datasets is provided is **Section 5.2**.

10.1 Option Agreement Area

189. This section presents an overview of vessel traffic movements within the study area, primarily based upon the findings of the Summer and Winter vessel traffic surveys undertaken in July / August and November 2024. A number of vessel tracks recorded during the survey periods were classified as temporary (non-routine), such as tracks of the survey vessel. These vessels have therefore been excluded from the analysis as detailed in **Section 5.2**.

190. A plot of the vessel tracks recorded during the 14-day Summer survey period, colour-coded by vessel type and excluding any temporary traffic, is presented in **Figure 10-1**. Following this, a plot of the vessel tracks recorded during the further 14-day Winter survey period, colour-coded by vessel type and excluding any temporary traffic, is presented in **Figure 10.2**.

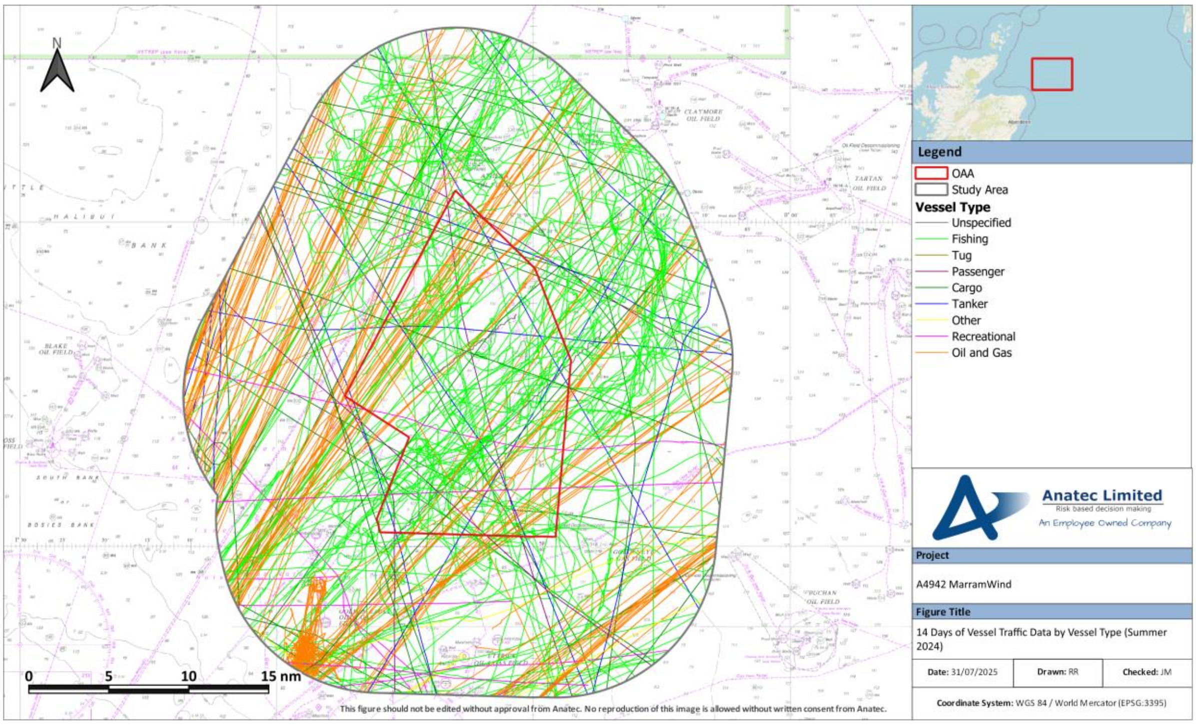


Figure 10-1 14 Days of Vessel Traffic Data by Vessel Type (Summer 2024)

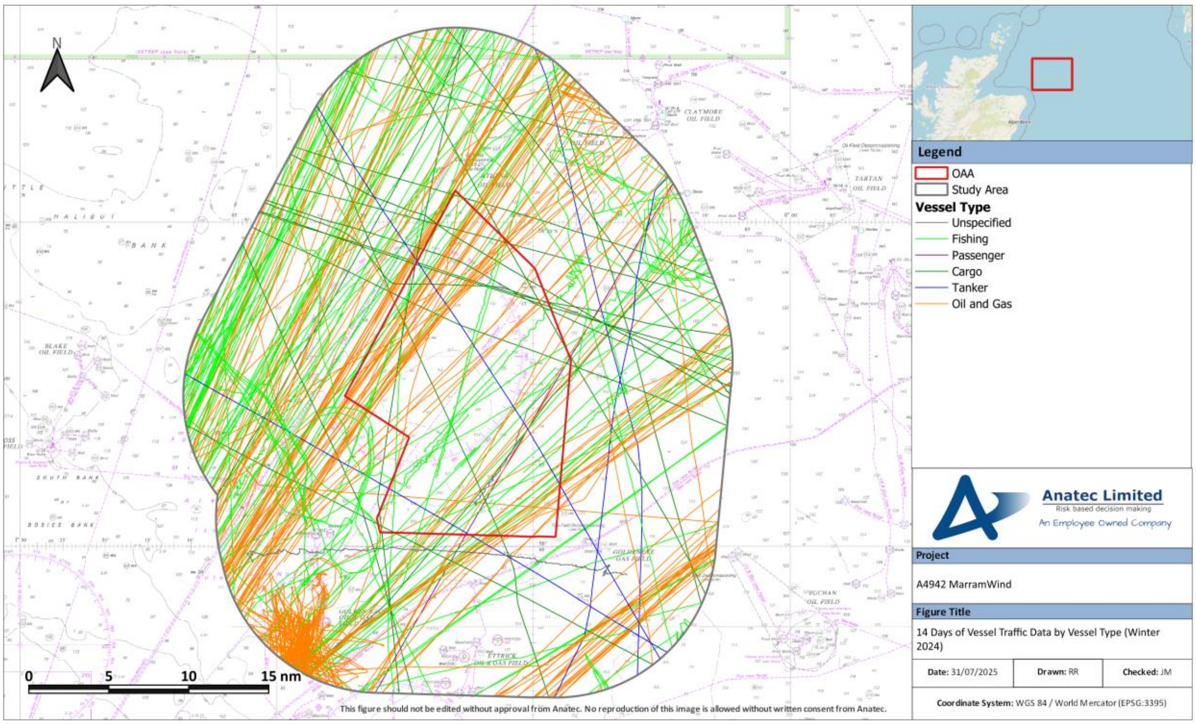


Figure 10-2 14 Days of Vessel Traffic Data by Vessel Type (Winter 2024)

191. Plots of the vessel tracks for the Summer and Winter survey periods converted to a density heat map are presented in **Figure 10-3** and **Figure 10-4**, respectively. It is noted that the same density brackets were used for both survey periods to allow for direct comparison in vessel density.

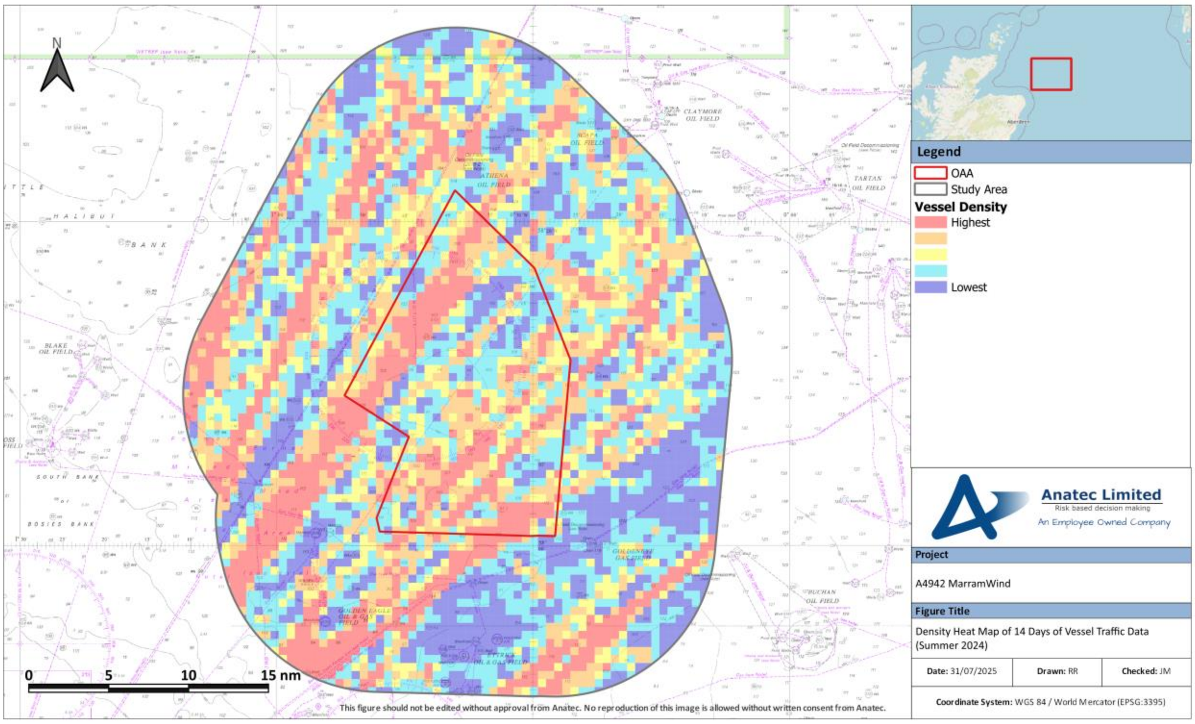


Figure 10-3 Density Heat Map of 14 Days of Vessel Traffic Data (Summer 2024)

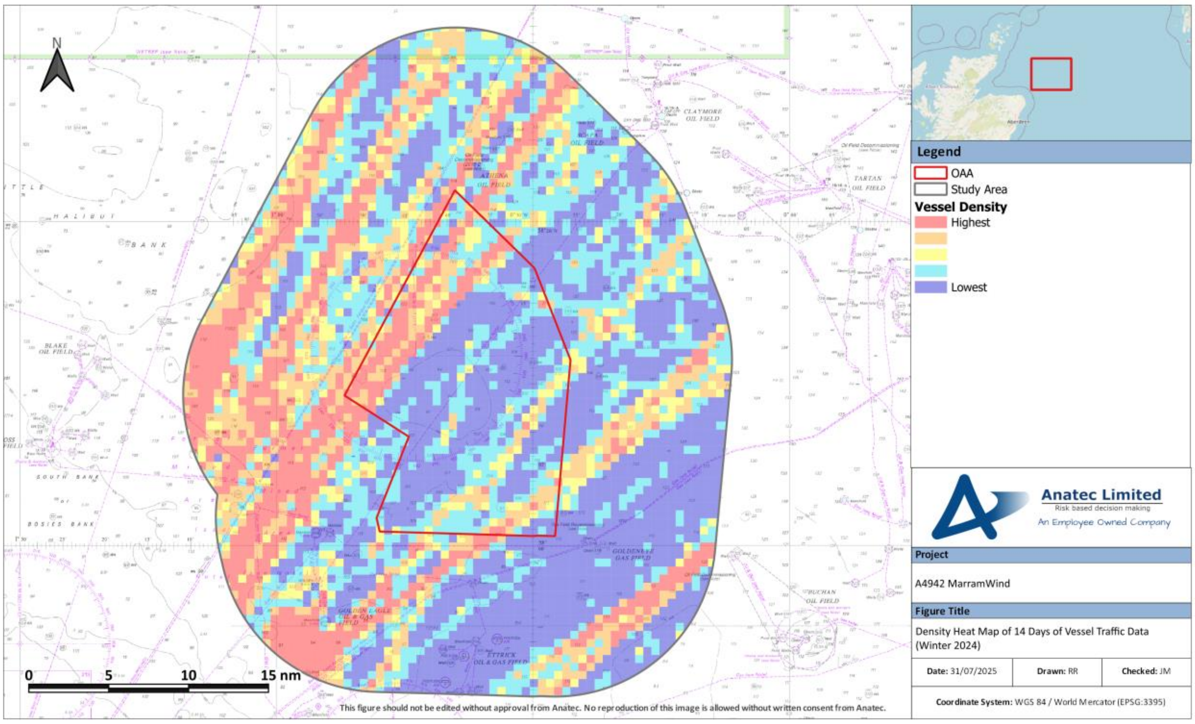


Figure 10-4 Density Heat Map of 14 Days of Vessel Traffic Data (Winter 2024)

10.1.1 Vessel Counts

192. The daily number of unique vessels recorded within the study area and OAA area during the Summer survey period are presented in **Figure 10-5**. It is noted that the first and last days of the Summer survey were partial survey days (as described in Section 5.2) and are depicted by a hatched pattern.

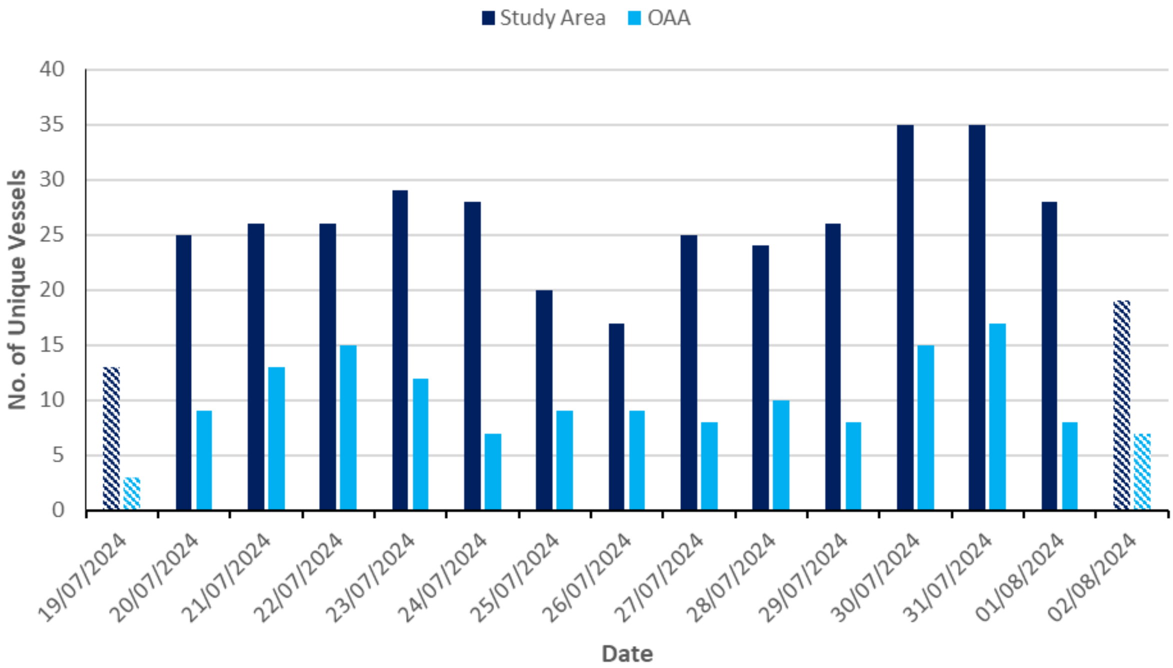


Figure 10-5 Unique Vessels per Day (14 Days, Summer 2024)

193. For the 14 days analysed during the Summer survey period, there was an average of 27 unique vessels recorded per day within the study area. In terms of vessels intersecting the OAA area itself, there was an average of 11 unique vessels per day recorded during the survey period, or approximately 40% of unique vessel tracks recorded within the study area intersected the OAA.

194. The busiest full days recorded within the study area during the Summer survey period were 30 and 31 July 2024, during which 35 unique vessels were recorded each. The busiest full day recorded within the OAA area during the Summer survey period was 31 July 2024, on which 17 unique vessels were recorded.

195. The quietest full day recorded within the study area during the Summer survey period was 26 July 2024, on which 17 unique vessels were recorded. The quietest full day recorded within the OAA area during the Summer survey period was 24 July 2024, on which seven unique vessels were recorded.

196. The daily number of unique vessels recorded within the study area and OAA area during the Winter survey period are presented in **Figure 10-6**. It is noted that the first and last days of the Winter survey were partial survey days (as described in **Section 5.2**) and are depicted by a hatched pattern.

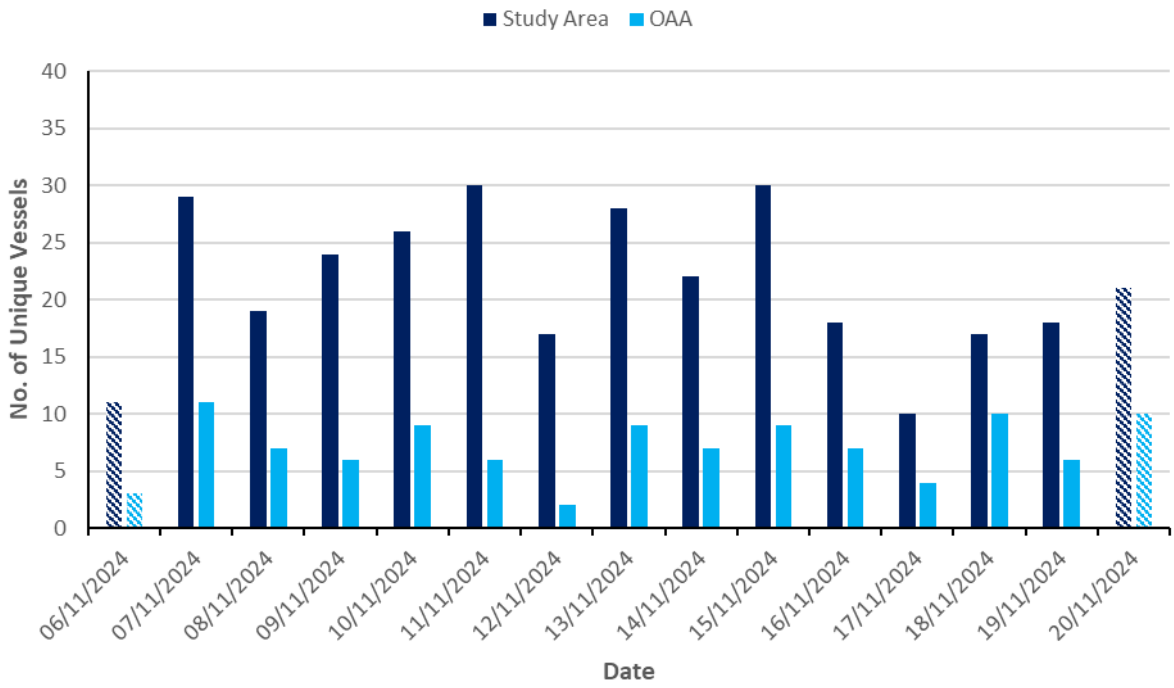


Figure 10-6 Unique Vessels per Day (14 Days, Winter 2024)

197. For the 14 days analysed during the Winter survey period, there was an average of 24 unique vessels recorded per day within the study area. In terms of vessels intersecting the OAA area itself, there was an average of seven–eight unique vessels per day recorded during the survey period, or approximately 32% of unique vessel tracks recorded within the study area intersected the OAA area.

198. The busiest full days recorded within the study area during the Winter survey period were the 11 and 15 November 2024, on which 30 unique vessels were recorded per day. The busiest full day recorded within the OAA area during the Winter survey period was 7 November 2024, on which 11 unique vessels were recorded.

199. The quietest full day recorded within the study area during the Winter survey period was 17 November 2024, on which ten unique vessels were recorded. The quietest full day recorded within the OAA area during the Winter survey period was 12 November 2024, on which two unique vessels were recorded.

10.1.2 Vessel Type

200. The percentage distribution of the main vessel types recorded passing within the study area as well as intersecting the OAA during the Summer survey period is presented in **Figure 10-7**. The same distribution for the Winter survey data is presented in **Figure 10-8**.

201. Any vessel which was unable to be assigned a vessel type has been removed from the analysis. Only two vessels per survey period were deemed unspecified (less than 1%).

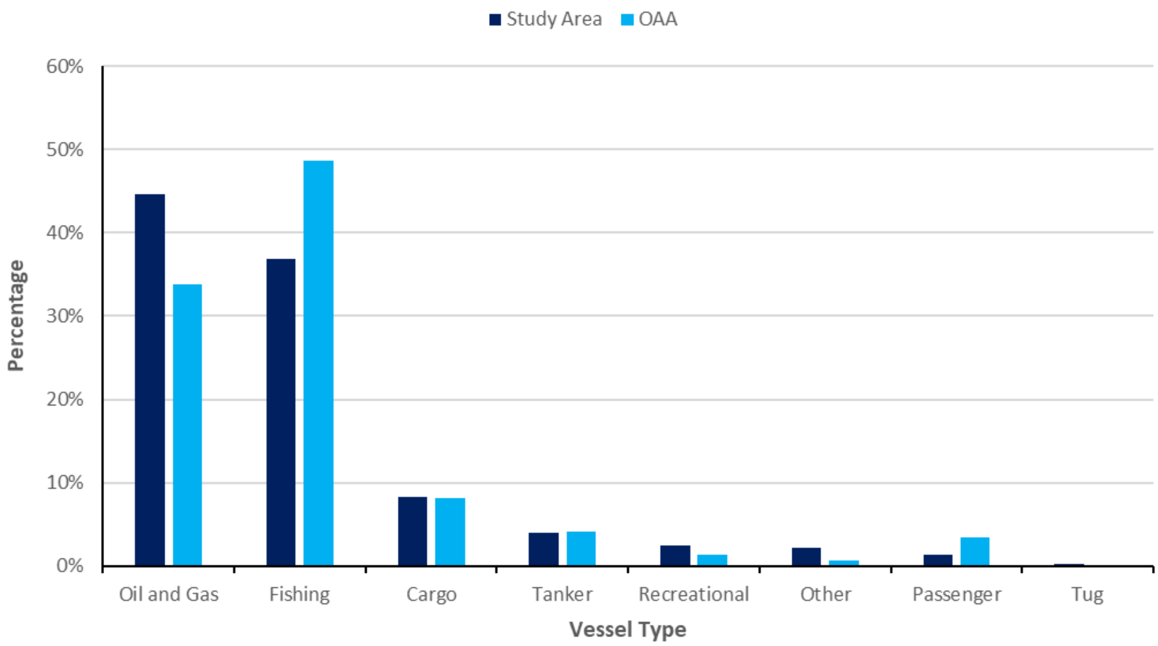


Figure 10-7 Vessel Type Distribution within Study Area and OAA (Summer 2024)

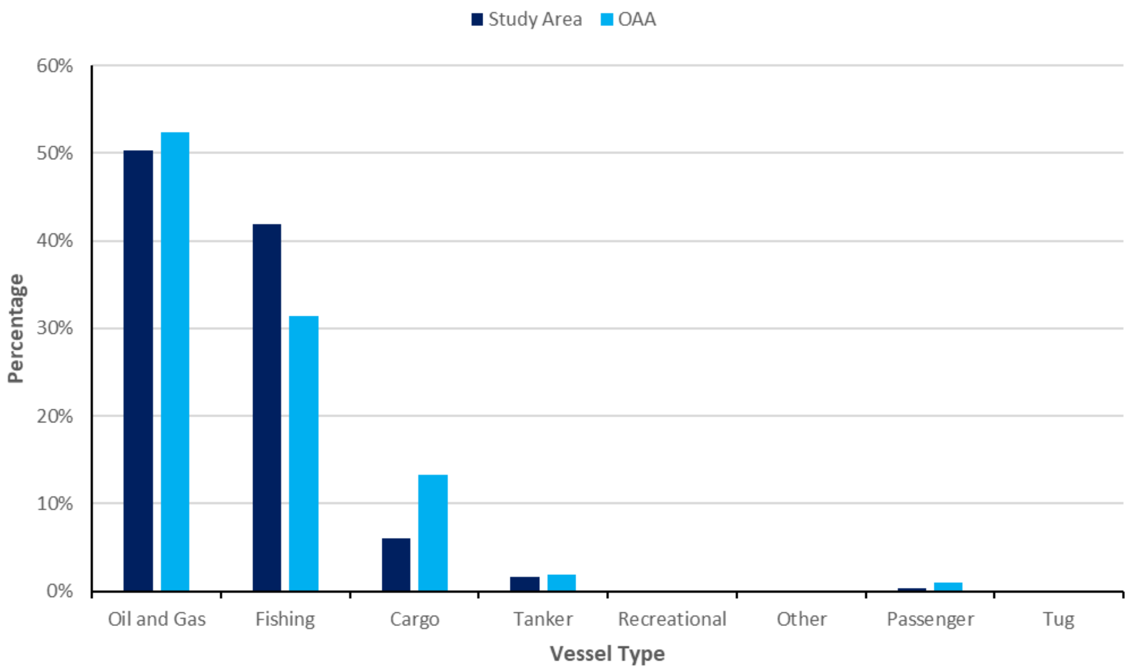


Figure 10-8 Vessel Type Distribution within Study Area and OAA (Winter 2024)

202. Throughout the Summer survey period, the main vessel types within the study area were oil and gas vessels which accounted for 45% of all vessels recorded and fishing vessels which accounted for 37%. Cargo vessels (8%) were the only other type to account for more than 5% of all vessels recorded. There was a similar trend in vessel types

intersecting the OAA with fishing vessels (49%), oil and gas vessels (34%), and cargo vessels (8%) being the most commonly recorded.

203. Throughout the Winter survey period, the main vessel types within the study area were again oil and gas vessels which accounted for 50% of all vessels recorded and fishing vessels which accounted for 42%. Cargo vessels (6%) were the only other type to account for more than 5% of all vessels recorded. There was a similar trend in vessel types intersecting the OAA with oil and gas vessels (52%), fishing vessels (31%), and cargo vessels (13%) being the most commonly recorded. It is noted that no recreational vessels were recorded during the Winter survey period. This is expected given the distance offshore and unfavourable weather conditions.

204. The following subsections consider each of the main vessel types individually.

10.1.2.1 Oil and Gas Vessels

205. The tracks of oil and gas vessels within the study area throughout the combined survey periods are presented alongside nearby oil and gas surface structures in **Figure 10-9**.

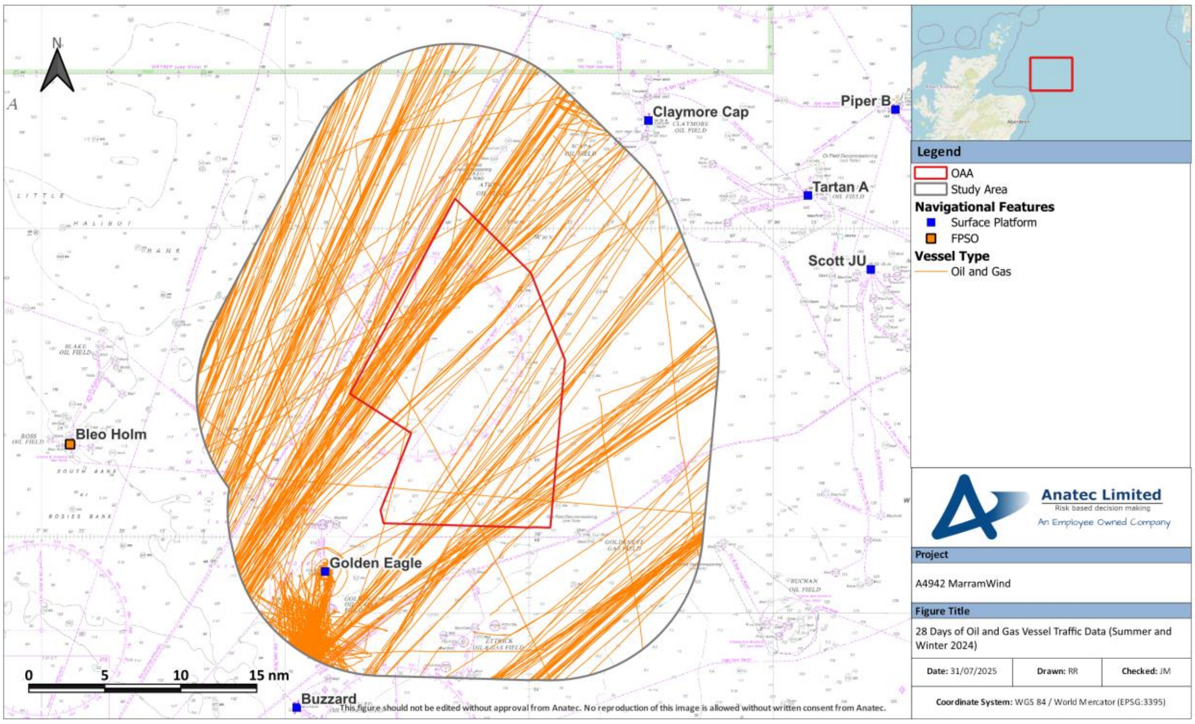


Figure 10-9 28 Days of Oil and Gas Vessel Traffic Data (Summer and Winter 2024)

206. An average of 11–12 oil and gas vessels were recorded per day during the 28-day survey period. An average of four unique oil and gas vessels intersected the OAA per day during 28-day survey period. There was no seasonality in oil and gas vessels, and equal counts were recorded across each survey period.

207. The majority of oil and gas vessels were on well-defined routes north-east south-west to / from ports on the east Scottish coast; primarily Aberdeen (UK) and Peterhead (UK), with Montrose (UK) also recorded to oil and gas fields in the North Sea. Several routes intersect the OAA and routeing of oil and gas vessels are detailed further in **Section 11.2**.

208. Oil and gas vessels carrying out O&M activities at the Golden Eagle and Buzzard fields were noted to the south-west of the study area. Several vessels were also noted to the north-east at the Claymore Oil Field.

10.1.2.2 Fishing Vessels

209. It is noted that approximately 94% of all fishing vessels recorded were via AIS and the other 6% via Radar. The majority of Radar fishing vessels (70%) were recorded in the Summer survey period.

210. The tracks of fishing vessels within the study area throughout the Summer and Winter survey periods combined are presented in **Figure 10-10**. Generally, fishing vessels operating at below 6kt have the potential to be actively fishing. To highlight potential fishing vessel behaviour, **Figure 10-10** presents the fishing vessel traffic recorded within the study area colour-coded by average speed. It is noted that speed alone cannot be definitive for identifying active fishing activity and is looked at along with vessel track behaviour as well as information broadcast via AIS.

211. It was noted during consultation at the Hazard Workshop by SFF that the survey data was representative of transiting fishing vessels this far offshore, but levels of active fishing vessels are underrepresented. To support this, fishing vessels across a 12-month period are assessed within the long-term data in **Appendix E**. The 12-months of data covers all seasonal periods and so any seasonality in fishing activity would be observed. The only additional fishing activity, not already highlighted by the vessel traffic survey data, was noted to the south-west of the study area and is not in proximity to the OAA. In addition to this, a plot of VMS data spanning the entirety of 2024, covering the study area, has also been shown as a density heat map in **Figure 10-11**, as requested at the Hazard Workshop.

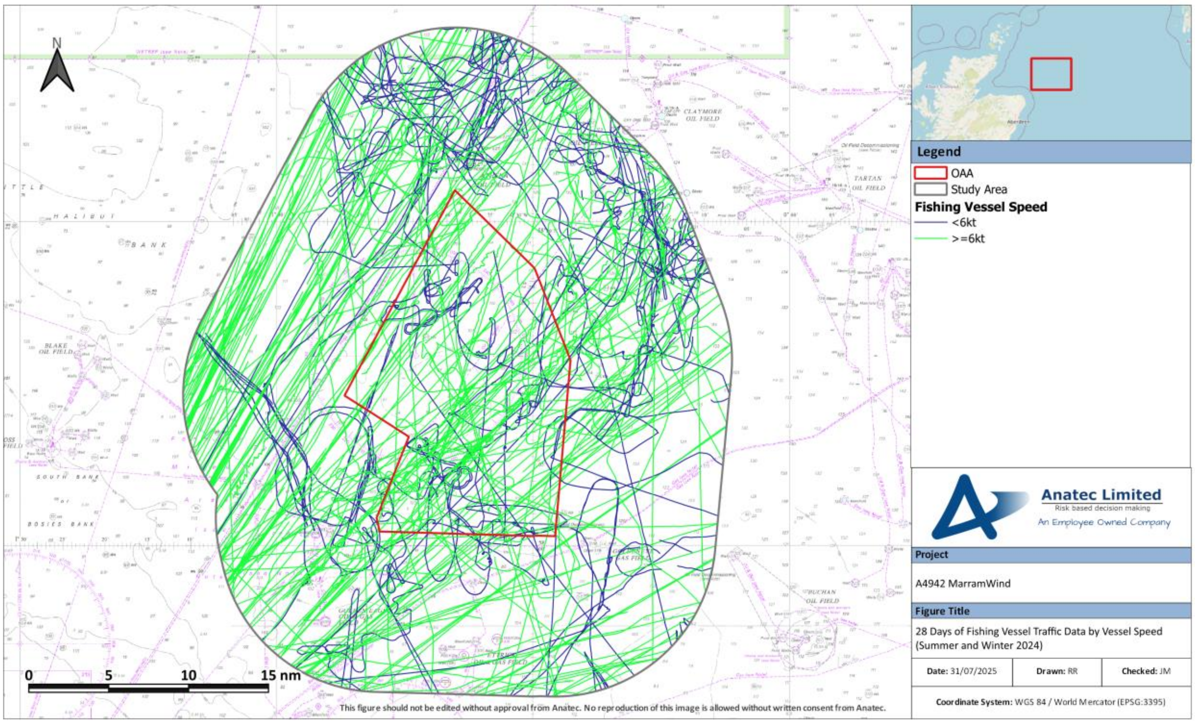


Figure 10-10 28 Days of Fishing Vessel Traffic Data by Vessel Speed (Summer and Winter 2024)

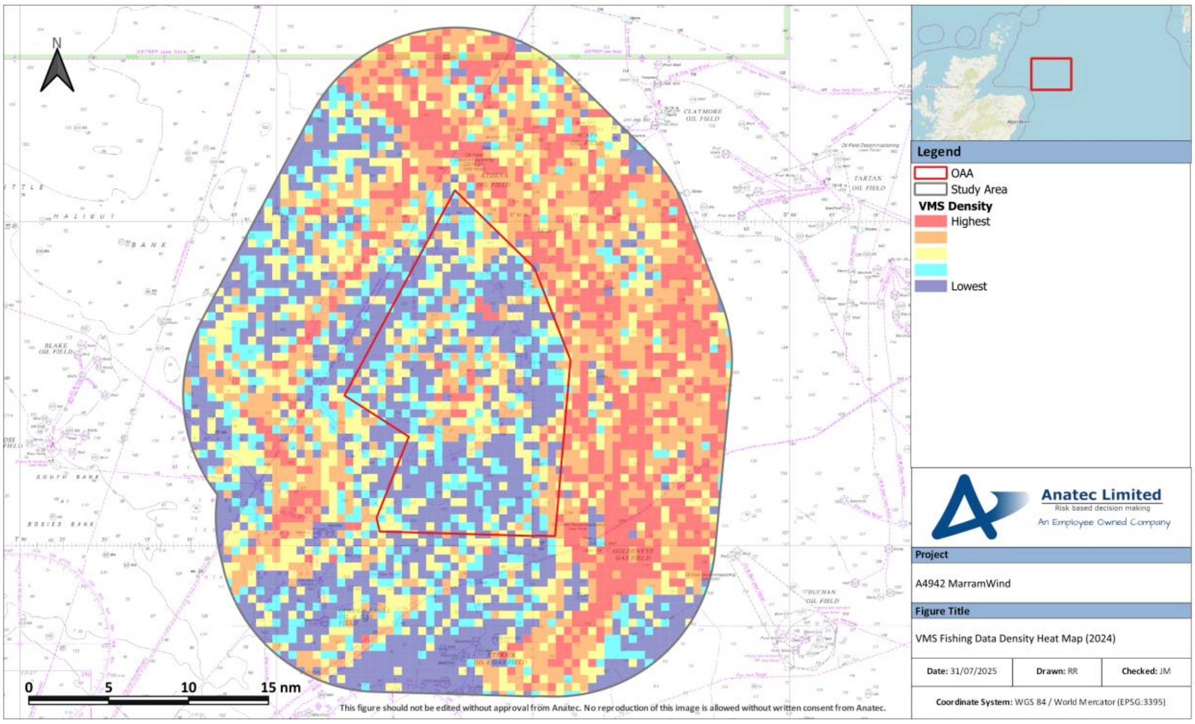


Figure 10-11 VMS Fishing Data Density Heat Map - OAA (2024)

212. An average of ten unique fishing vessels per day were recorded within the study area during the 28-day survey period, with an average of four fishing vessel intersections per

day recorded through the OAA. There was no seasonality in fishing vessels and equal counts were recorded across each survey period.

213. Fishing vessels were transiting mainly north-east south-west to from fishing grounds and ports / harbours; primarily Peterhead and Fraserburgh. Those vessels which could potentially be actively fishing were recorded mainly to the north-east of the study area which aligns with the VMS density in the region. Likely activity was also recorded within the OAA and to the west, again aligning with the VMS density. These vessels were primarily larger trawlers with varying gear types.

214. Gear type was able to be identified for approximately 92% of fishing vessels. Of these vessels, the main gear types identified were bottom otter trawls (36%), midwater otter trawls (17%), bottom pair trawls (14%), and unspecified midwater trawls (11%). It is noted that seiners (4%) and pots and traps (3%) were also recorded among other trawls in low numbers. There was little seasonality in overall gear type, with only midwater otter trawls displaying levels of seasonality as were only recorded in the Winter survey period.

215. Nationality was identified for 96% of vessels, with 73% of these fishing vessels being registered in the UK. Vessels from the Netherlands (9%), Germany (7%), Norway (7%), and France (4%) were also recorded.

216. More consideration of baseline fishing activity is detailed in **Volume 2, Chapter 14: Commercial Fisheries**.

10.1.2.3 Other Commercial Vessels

217. The tracks of cargo, tanker, and passenger vessels within the study area throughout the combined survey periods combined are presented in **Figure 10-12**, colour-coded by vessel type.

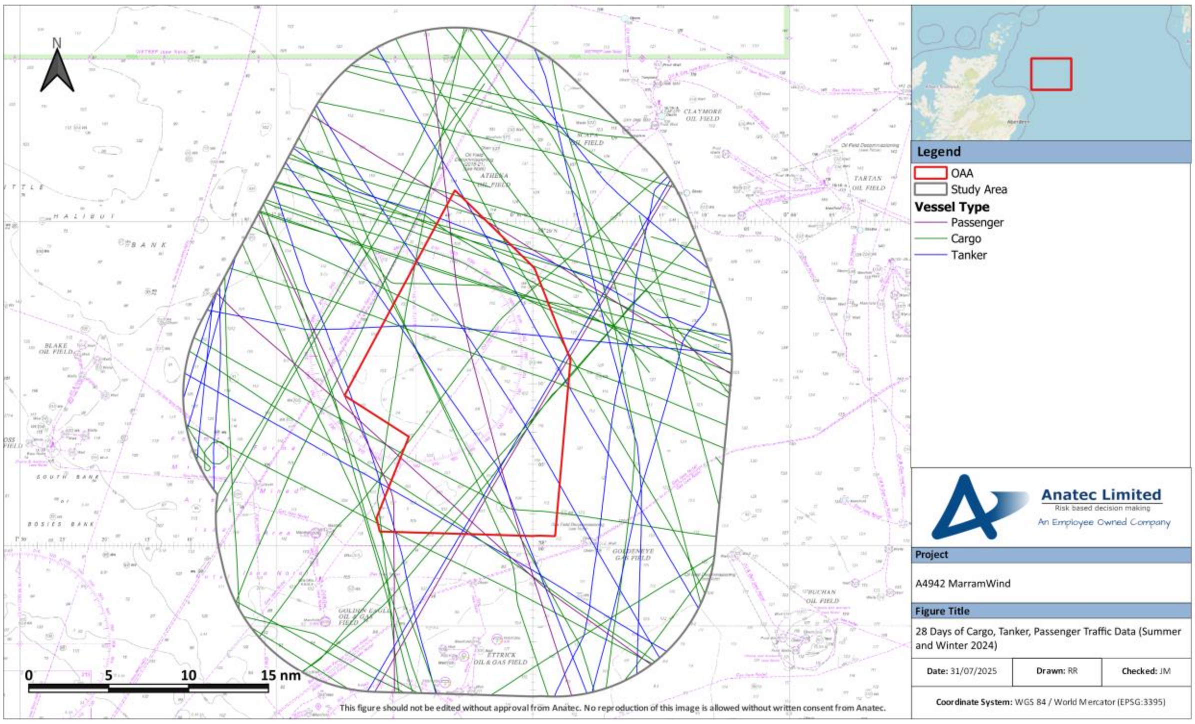


Figure 10-12 28 Days of Cargo, Tanker, and Passenger Vessel Traffic Data (Summer and Winter 2024)

218. An average of two unique cargo vessels per day were recorded within the study area during the 28-day survey period, with an average of one cargo vessel intersection per day recorded through the OAA. Cargo vessels displayed levels of seasonality with higher vessel counts recorded in Summer when compared to Winter.

219. An average of one unique tanker every two days was recorded within the study area during the 28-day survey period, with an average of one tanker intersection every three–four days recorded through the OAA. Tankers also displayed levels of seasonality with the majority (75%) of tankers being recorded in the Summer survey period.

220. An average of one unique passenger vessel every five days was recorded within the study area during the 28-day survey period, with all vessels through the study area intersecting with the OAA, again one unique passenger vessel every five days. Passenger vessels displayed high levels of seasonality with 83% of vessels recorded in the Summer period with only one single passenger vessel transit recorded within the Winter survey period. All passenger vessels recorded were cruise liners which tend to be more common in Summer months due to more favourable weather conditions.

221. Defined routeing of these commercial vessels was identified north-west south-east at the north of the OAA, with vessels also routing more north south across the width of the study area. Commercial vessel routeing is defined in **Section 11.2**.

222. It is noted that no commercial ferries, Roll-On / Roll-Off Cargo (RoRo) or Roll-On / Roll-Off Passenger (RoPax) vessels, were recorded during the survey periods within the study area.

10.1.2.4 Recreational Vessels

223. The tracks of recreational vessels within the study area throughout the combined survey periods combined are presented in **Figure 10-13**.

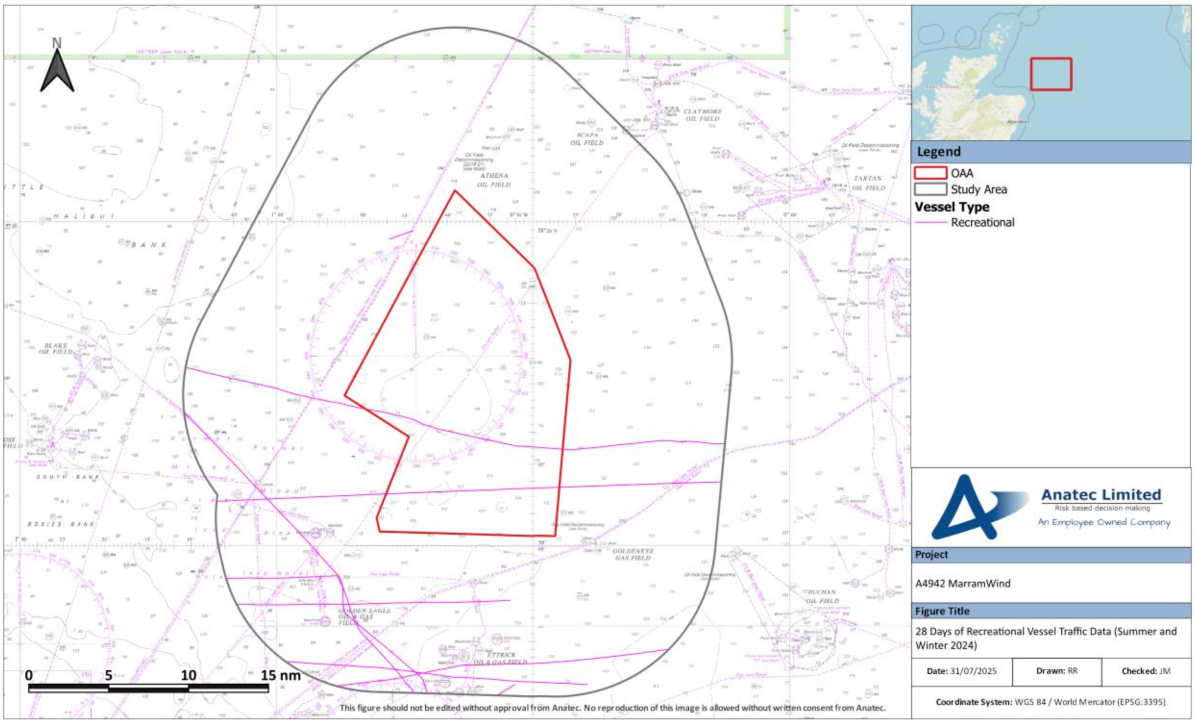


Figure 10-13 28 Days of Recreational Vessel Traffic Data (Summer and Winter 2024)

224. An average of one unique recreational vessel every three days was recorded within the study area during the 28-day survey period, with an average of one vessel intersection every two weeks recorded through the OAA. Recreational vessels were highly seasonal with no recreational vessel transits recorded during the Winter survey period, all only in the Summer survey period as expected given the more favourable weather and sailing conditions.

225. The RYA Scotland have noted in consultation that the OAA is not on a major cruising route and that vessels in proximity to the OAA would be on passage between Scotland and Scandinavia with routes taken dependant on the wind direction and so may vary from year to year. RYA Scotland also noted that recreational craft in these waters would be used to navigating in proximity to oil and gas installations.

10.1.3 Vessel Size

10.1.3.1 Vessel Length

226. Vessel LOA was available for approximately 97% of vessels recorded throughout the combined survey periods. Those vessels with unspecified vessel LOA were all recorded via Radar and LOA was not able to be obtained by crew onboard the survey vessel but would likely be in the lowest vessel LOA category based on the requirements of AIS carriage. These vessels with unspecified LOA have been removed from the analysis where relevant.

227. The combined 28-days survey data is presented in **Figure 10-14**, colour-coded by LOA. Following this, a distribution of these vessel LOA is presented in **Figure 10-15**.

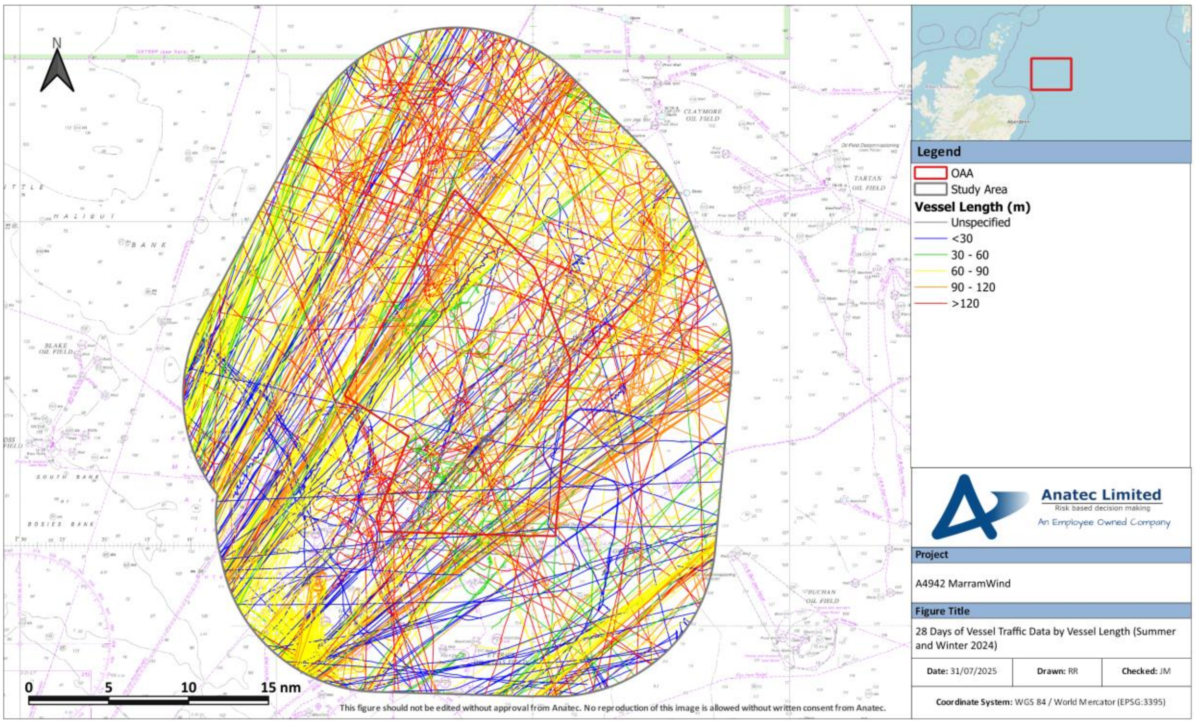


Figure 10-14 28-Day Vessel Traffic Survey Data by Vessel Length (Summer and Winter, 2024)

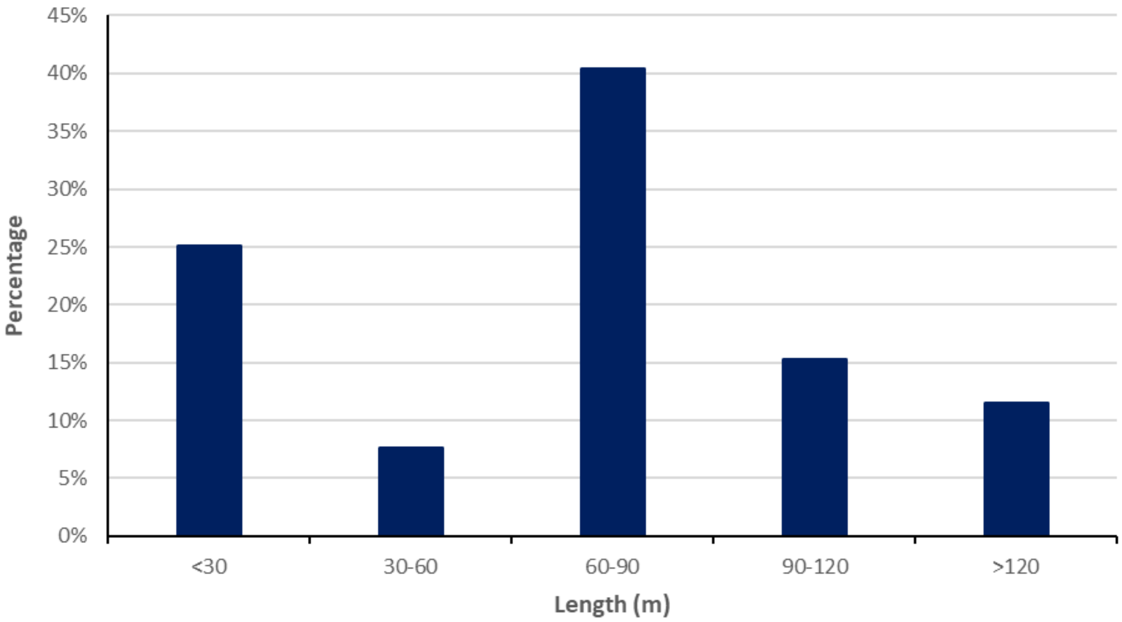


Figure 10-15 Vessel Length Distribution (Summer and Winter, 2024)

228. Of vessels with a valid LOA, the average recorded was 77m. Vessel LOA ranged from 10m for a recreational vessel to 300m for a container vessel routeing at the south-west of the study area. The majority of vessels had a LOA which ranged between 60 and 90m and mainly comprised of oil and gas vessels and fishing vessels. Vessels with greater LOA were primarily cruise liners, cargo vessels, and tankers with those of smaller LOA recreational and fishing vessels.

10.1.3.2 Vessel Draught

229. Vessel draught was available for approximately 85% of all vessels recorded throughout the combined survey periods. Vessels with unspecified vessel draughts were recorded via Radar (22%) or AIS (78%) and were primarily fishing vessels, including those carrying AIS Class B which does not include the broadcast of draughts. Vessels with unspecified draughts have been removed from the analysis where relevant.

230. The combined 28-days vessel traffic survey data is presented in **Figure 10-16**, colour-coded by vessel draught. Following this, a distribution of these vessel draughts is presented in **Figure 10-17**.

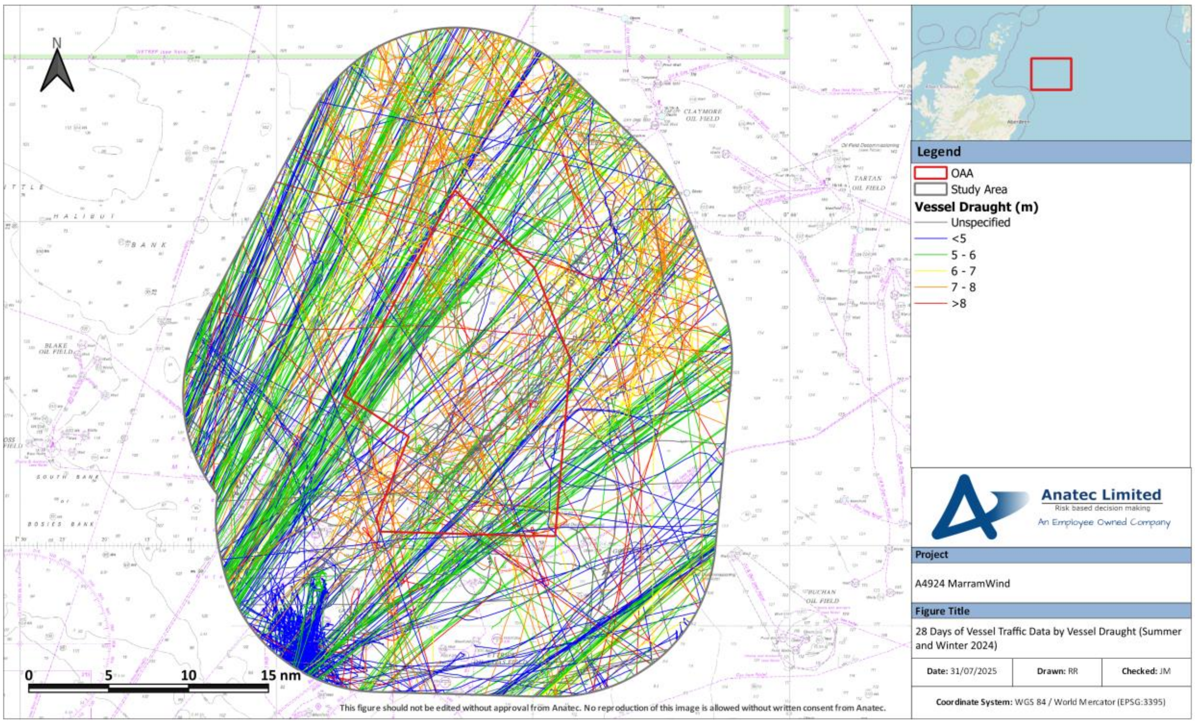


Figure 10-16 28-Day Vessel Traffic Survey Data by Vessel Draught (Summer and Winter, 2024)

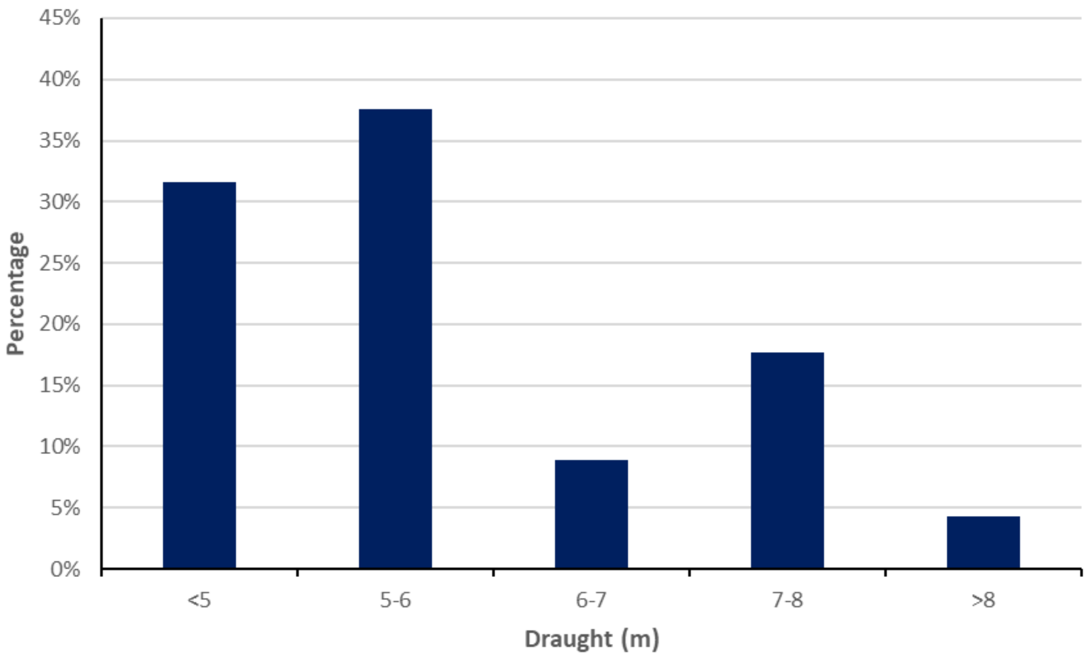


Figure 10-17 Vessel Draught Distribution (Summer and Winter, 2024)

231. Of vessels which broadcast a valid vessel draught, the average draught recorded was 5.7m. Vessel draught ranged from 0.2m for a fishing vessel to 13.9m for a crude oil tanker routeing to the north-east of the study area. The deepest draught to intersect the OAA

was 13.5m and was a container vessel. The majority of vessels had a draught below 6m and mainly comprised of oil and gas vessels and fishing vessels. Vessels with a draught 8m and above accounted for 4% and were larger cargo vessels and tankers. Only 1% of vessels had a draught of 10m or greater.

10.1.4 Anchoring Activity

232. Anchored vessels can be identified based upon the AIS navigational status which is programmed on the AIS transmitter on board a vessel. However, information is manually entered into the AIS, and therefore it is common for vessels not to update their navigational status if only at anchor for a short period of time.

233. For this reason, vessels recorded within the study area during the survey periods which travelled at a speed of less than 1kt for more than 30 minutes had their corresponding vessel tracks individually checked for patterns characteristic of anchoring activity. Following this, no vessels were deemed to be at anchor within the study area during the survey periods.

10.2 Reactive Compensation Platform

234. This section presents an overview of vessel traffic movements within the RCP search area study area, based upon the 12-months long-term dataset for the entirety of 2024, in agreement with the MCA. A number of vessel tracks recorded during the data period were classified as temporary (non-routine), such as tracks of the survey vessel. These vessels have therefore been excluded from the analysis as detailed in **Section 5.3.2**.

235. A plot of the vessel tracks recorded during the 12-month data period, colour-coded by vessel type and excluding any temporary traffic, is presented in **Figure 10-18**. Following this, a plot of the vessel tracks converted to a density heat map are presented in **Figure 10-19**.

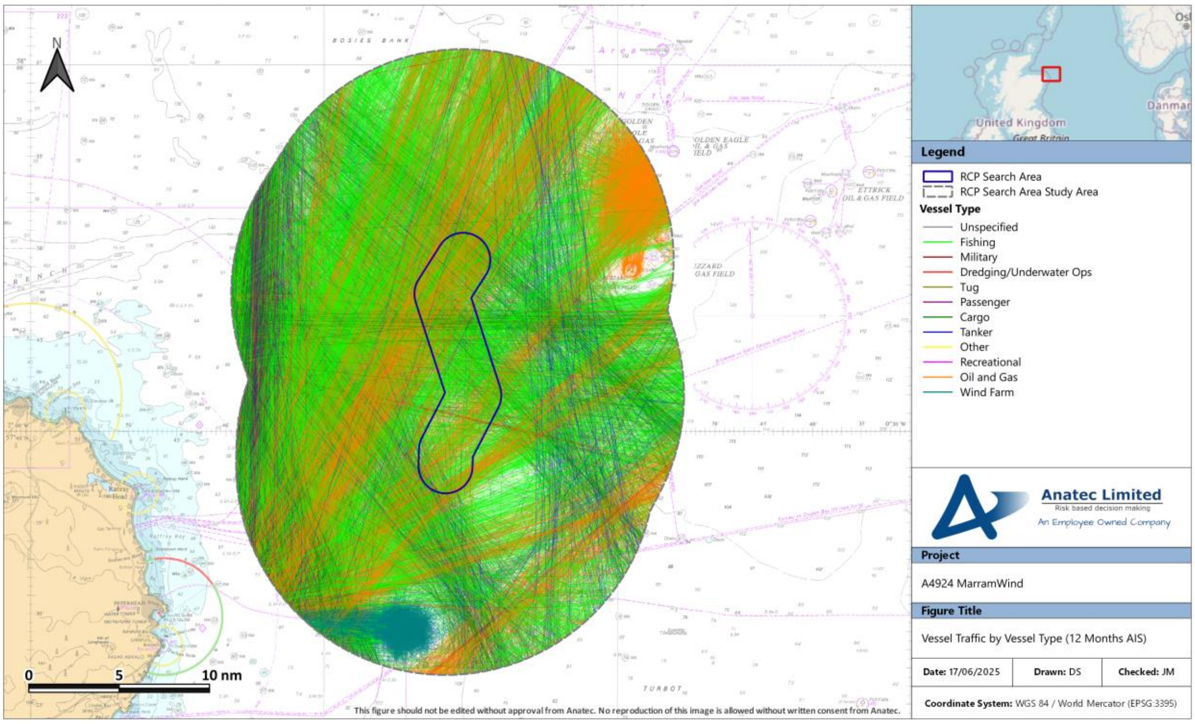


Figure 10-18 Vessel Traffic by Vessel Type (12 Months AIS, 2024)

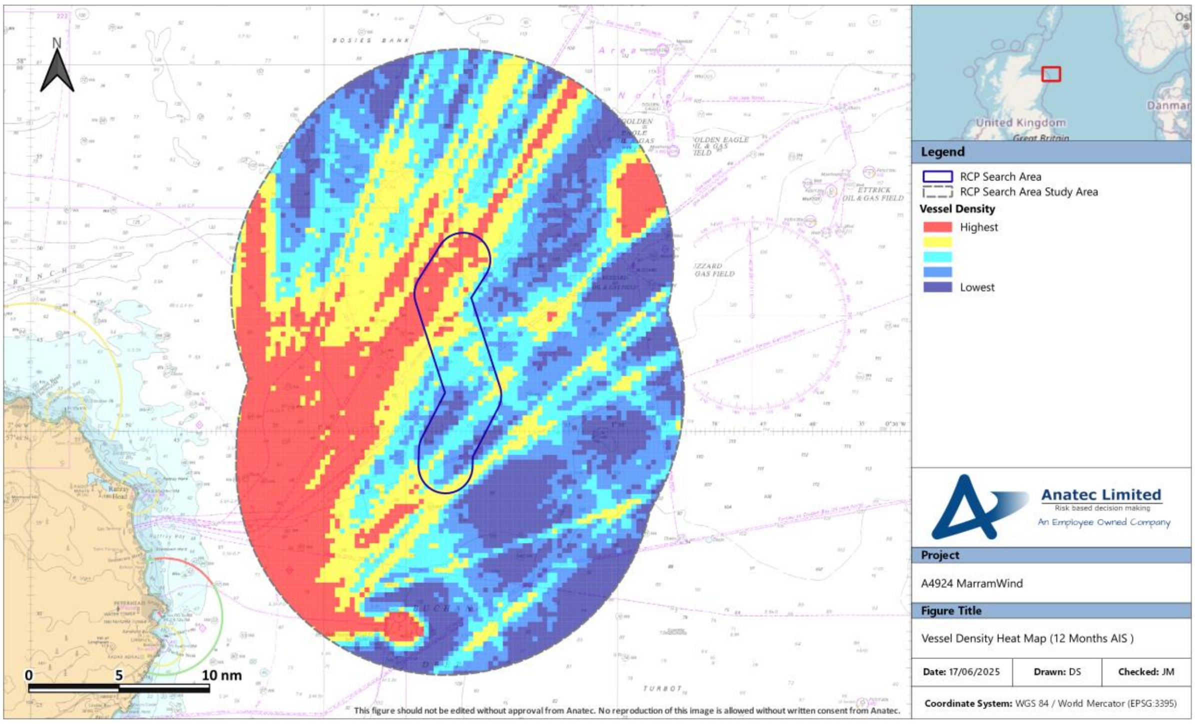


Figure 10-19 Vessel Density Heat Map (12 Months AIS, 2024)

10.2.1 Vessel Counts

236. The average daily number of unique vessels recorded within the RCP search area study area and RCP search area, per month, during the 12-month data period are presented in **Figure 10-20**.

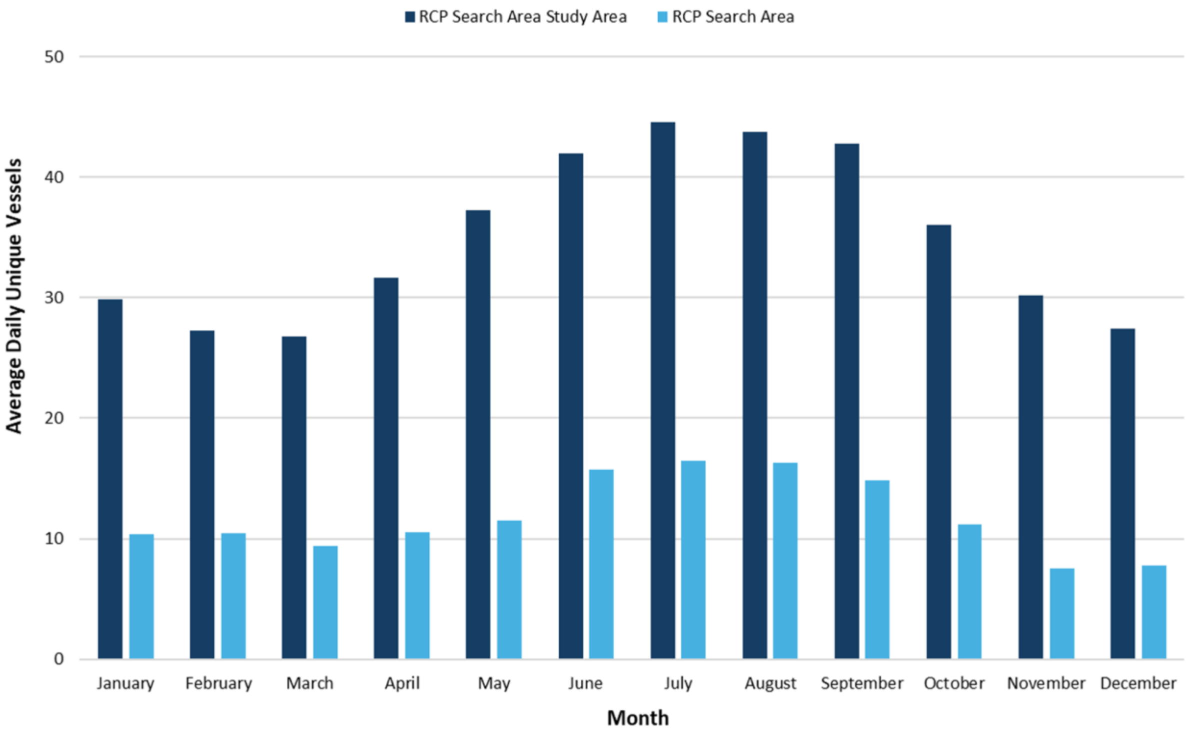


Figure 10-20 Unique Vessels per Day (14 Days, Summer 2024)

237. There was an overall average of 35 unique vessels per day recorded within the RCP search area study area across the data period. The busiest month was July 2024, during which an average of 45 unique vessels per day were recorded within the RCP search area study area. Vessel tracks during the busiest month of July are presented in **Figure 10-21**, colour-coded by vessel type.

238. The busiest day was the 21 October 2024, which recorded 58 unique vessels within the RCP search area study area. The quietest months were February, March and December 2024, which recorded an average of 24 unique vessels per day. The quietest day was the 22 December when five unique vessels were recorded within the RCP search area study area. Vessels displayed general seasonal trends, with higher numbers recorded during Summer and autumn months compared to those of Winter and spring.

239. There was an overall average of 12 unique vessels per day recorded intersecting the RCP search area across the data period. The busiest months were June to August 2024, each recording an average of 16 unique vessels per day within the RCP search area. The busiest day overall was the 11 September 2024 which recorded an average of 29 unique vessels. The quietest months were November and December 2024, when an average of

eight unique vessels were recorded within the RCP search area. The quietest days were shared amongst five separate days, each recording one unique vessel within the RCP search area.

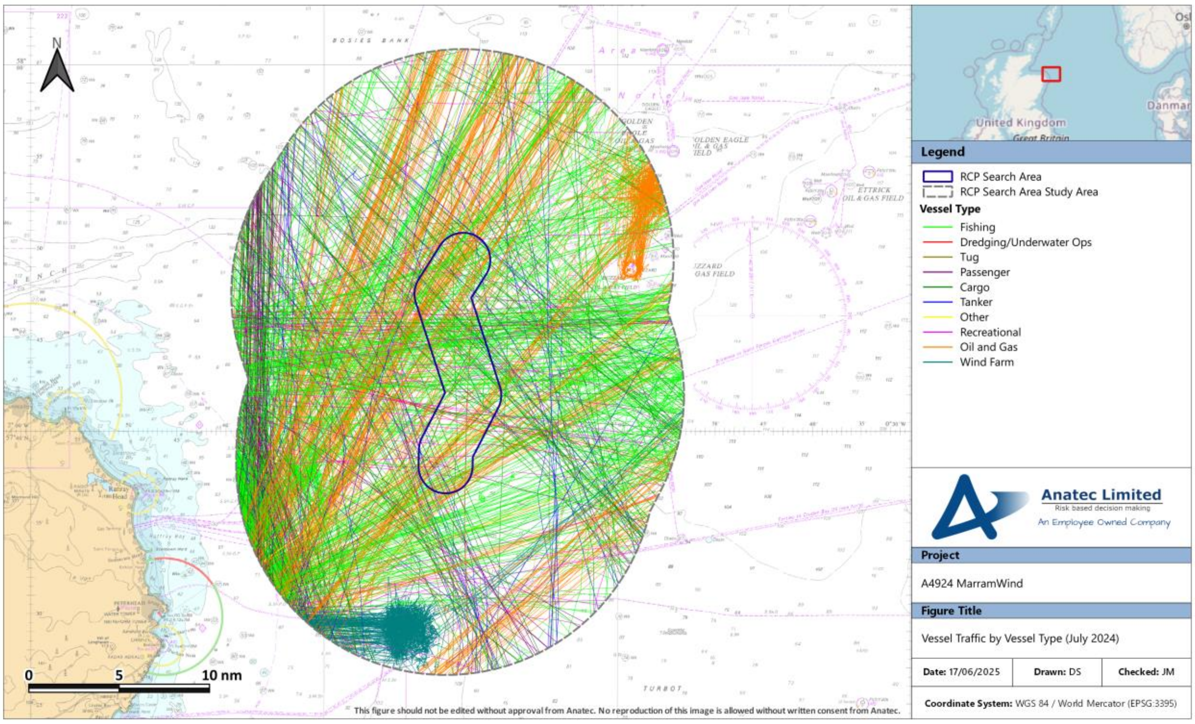


Figure 10-21 Vessel Traffic by Vessel Type (July 2024)

10.2.2 Vessel Type

240. The percentage distribution of the main vessel types recorded within the RCP search area study area as well as intersecting the RCP search area during the data period is presented in **Figure 10-22**.

241. Only one vessel was unable to be assigned a vessel type and so classed as unspecified. This vessel has been removed from the analysis where necessary.

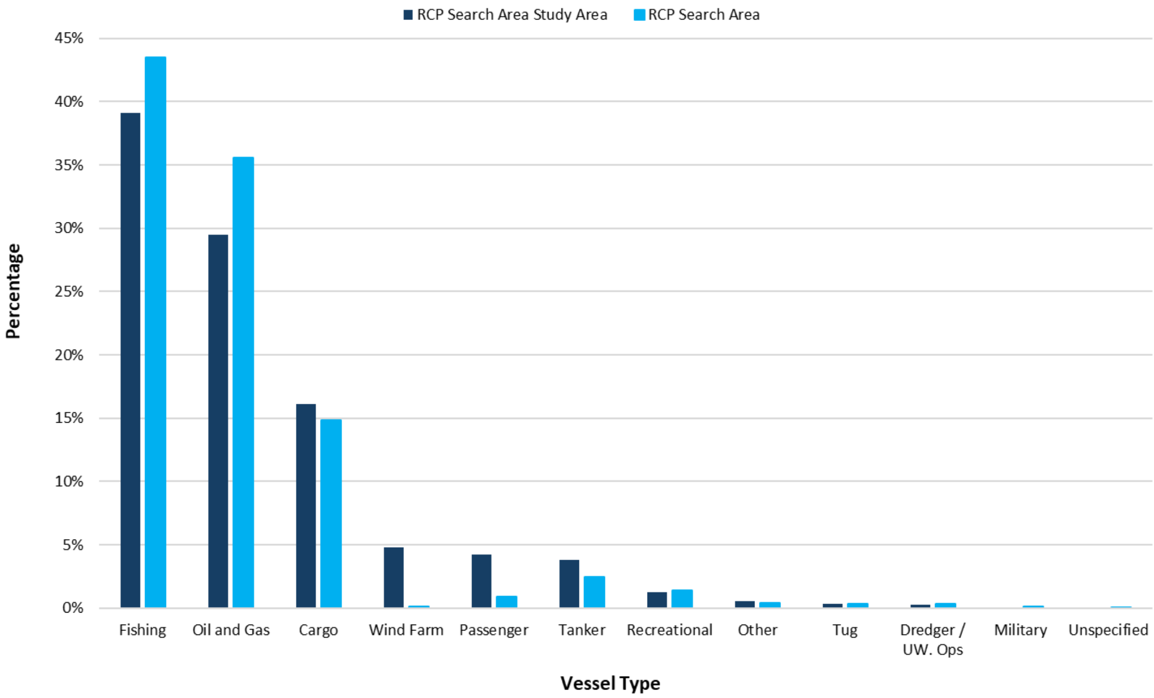


Figure 10-22 Vessel Type Distribution within RCP Search Area Study Area and RCP Search Area (12 Months, 2024)

242. The most common vessel types recorded within the RCP search area study area during the data period were fishing vessels (39%) and oil and gas vessels (29%). Other notable vessel types included cargo vessels (16%) and wind farm vessels (5%). No other vessel type accounted for more than 5% of all vessels recorded.

243. As for vessels intersecting the RCP search area, the most common vessel types recorded were also fishing (43%), oil and gas (36%), and cargo vessels (15%).

244. Vessels in the 'Other' category (which accounted for less than 1% of all vessel traffic) included transiting survey vessels, a buoy-laying vessel, a fishery patrol vessel, an aquaculture supply vessel and RNLI lifeboats.

245. The following subsections consider each of the main vessel types individually.

10.2.2.1 Fishing Vessels

246. The tracks of fishing vessels within the RCP search area study area throughout the 12-month data period are presented in **Figure 10-23**. **Figure 10-23** presents the fishing vessel traffic recorded within the RCP search area study area colour-coded by average speed, for the same justification detailed for the OAA in **Section 10.1.2.2**. Following this, the average number of daily unique fishing vessels recorded within the RCP search area study area per month of the data period is presented in **Figure 10-24**.

247. It was noted during consultation at the Hazard Workshop by SFF and Brown & May Marine that the 12-months of data was representative of transiting fishing vessels in the area.

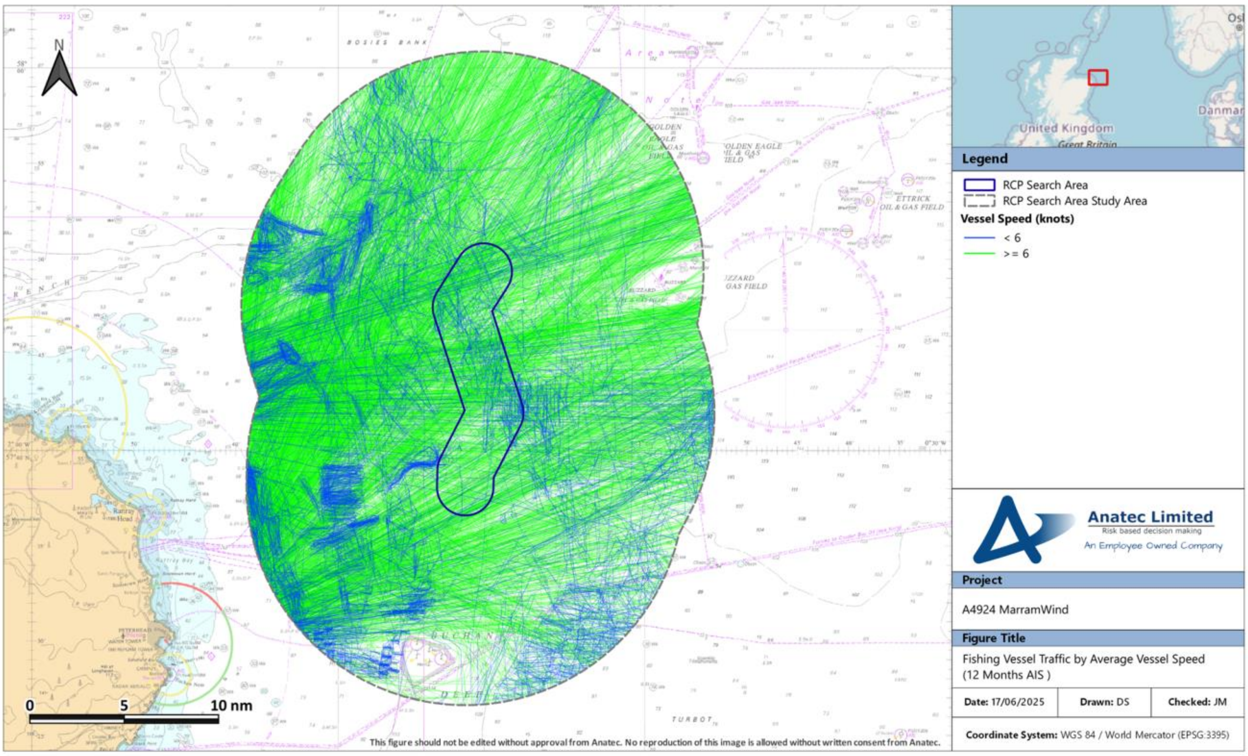


Figure 10-23 Fishing Vessel Traffic by Average Vessel Speed (12-Months AIS, 2024)

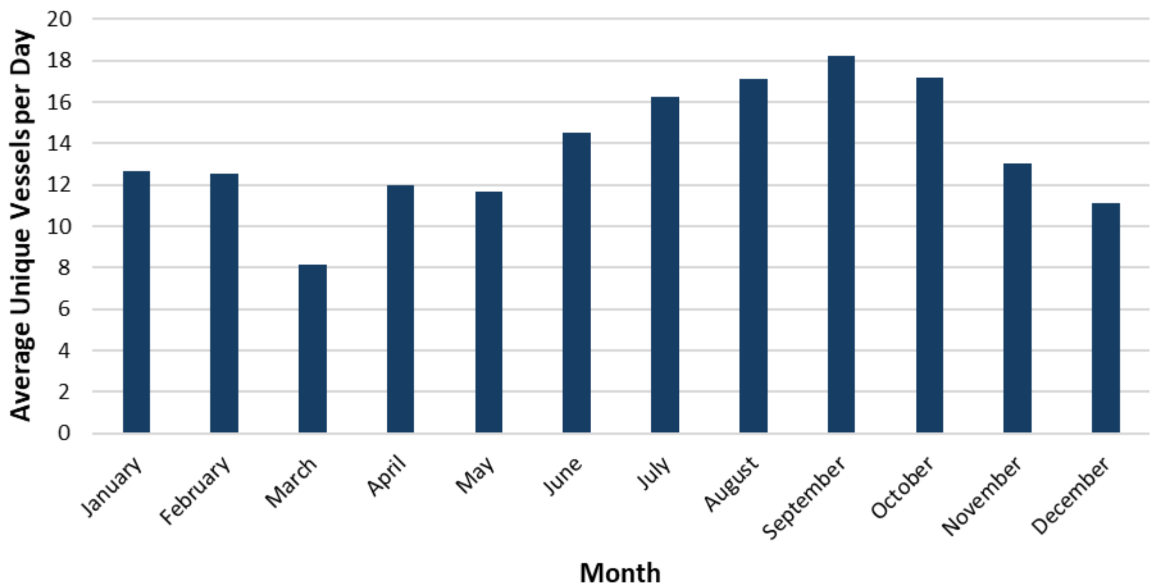


Figure 10-24 Average Daily Fishing Vessel Counts per Month (2024)

248. Overall, there was an average of 14 unique fishing vessels per day recorded within the RCP search area study area across the data period. The busiest month was September 2024, during which an average of 18 unique fishing vessels per day was recorded within the RCP search area study area. The 9 December 2024 was the busiest day, recording 34 unique fishing vessels, largely to the north of the RCP search area. As for fishing vessels intersecting the RCP search area, there was an average of four–five per day across the data period. Fishing vessels displayed seasonality, with higher vessel counts noted between July and October.

249. Fishing vessels engaged in likely active fishing were observed throughout the RCP search area study area, particularly nearer to shore, to the west of the RCP search area study area. These vessels were primarily dredgers and pots and traps. Based on analysis of vessel track speed and behaviour, as well as information broadcast on AIS such as navigation status, it is estimated that fishing vessels engaged in active fishing behaviour commonly operated below 6kt.

250. Gear type was able to be identified for more than 99% of fishing vessels. Of these vessels, the main gear types identified were bottom otter trawls at 61%. Other common gear types included bottom pair trawls (10%) and unspecified midwater trawls (7%) and pots and traps (6%). Nationality was identified for all fishing vessels, with 97% of these fishing vessels being registered in the UK.

251. Further consideration of baseline fishing activity is detailed in **Volume 2, Chapter 14: Commercial Fisheries**.

10.2.2.2 Oil and Gas Vessels

252. The tracks of oil and gas vessels within the RCP search area study area throughout the 12-month data period are presented in **Figure 10-9**, alongside nearby oil and gas surface structures. Vessel tracks have been colour-coded by average vessel speed to aid in distinguishing between vessel on transit and vessels engaged in works at offshore oil and gas fields. Average vessel speed was highlighted to show the likely activity of vessels at oil and gas fields. Following this, the average number of daily unique oil and gas vessels recorded within the RCP search area study area per month of the data period is presented in **Figure 10-26**.

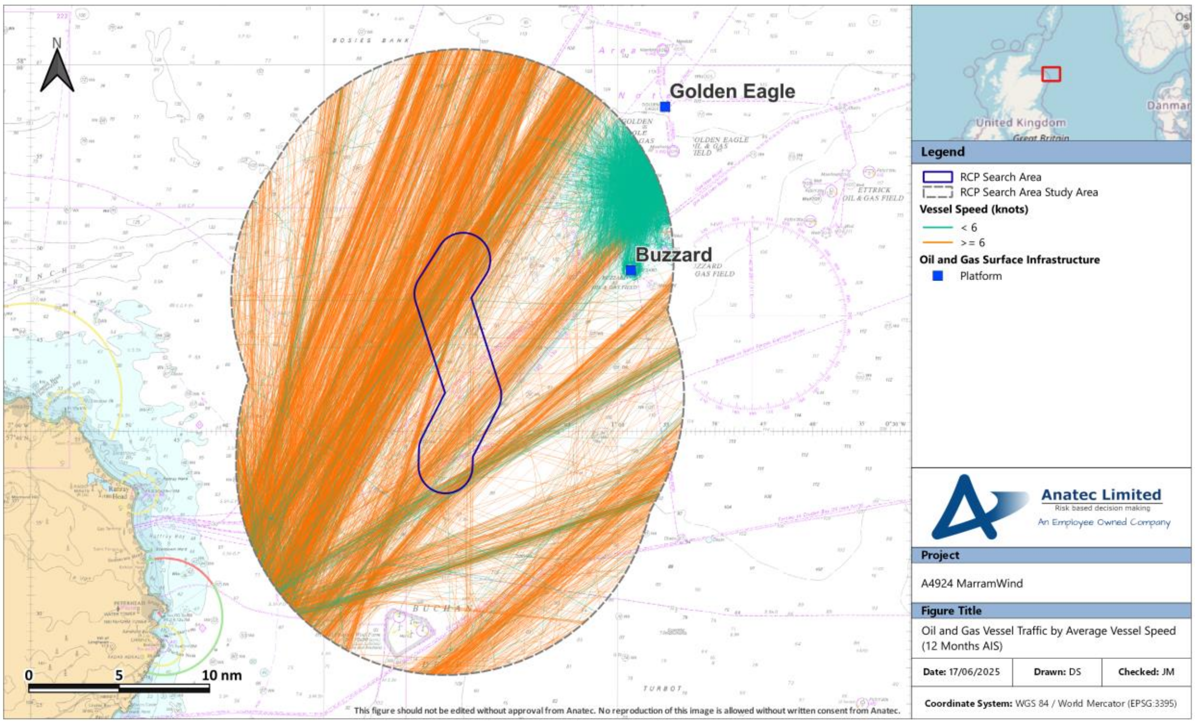


Figure 10-25 Oil and Gas Vessel Traffic Data by Average Vessel Speed (12 Months AIS, 2024)

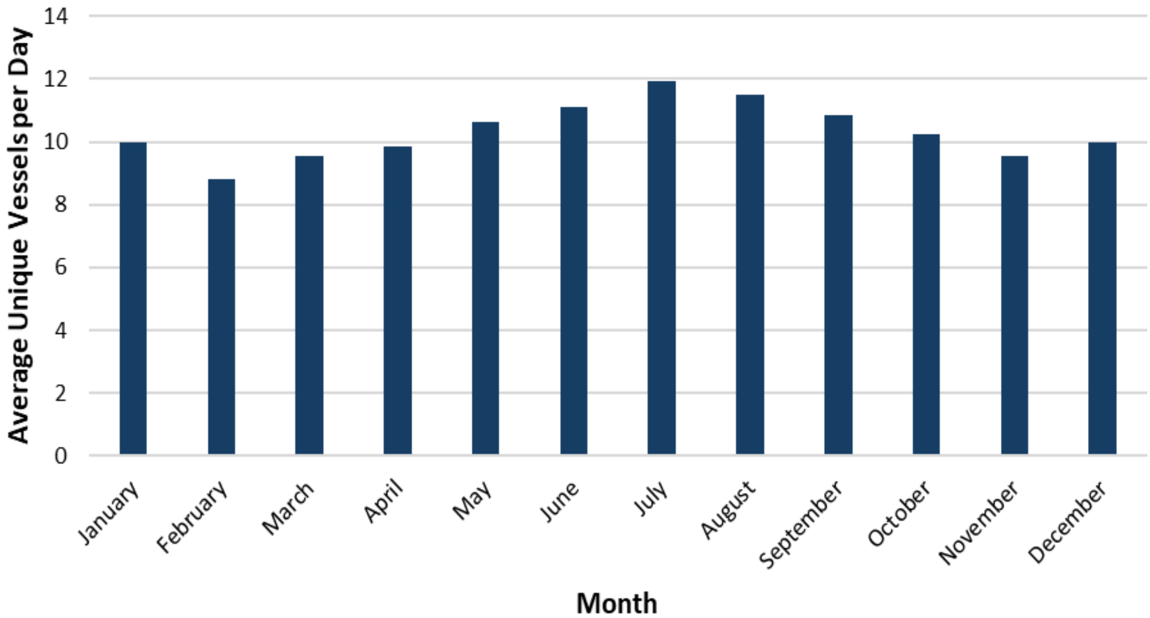


Figure 10-26 Average Daily Oil and Gas Vessel Counts per Month (2024)

253. Overall, there was an average of ten unique oil and gas vessels per day recorded within the RCP search area study area across the data period. The busiest months were July and August 2024, which recorded an average of 12 unique oil and gas vessels per day within the RCP search area study area. The busiest day was associated with the 11 June, 17 July

and 20 November 2024, each recording 18 unique oil and gas vessels. The quietest month was February 2024, which recorded a daily average of nine unique oil and gas vessels.

254. Oil and gas vessels displayed minor seasonality, with an average of between 8 and 12 unique vessels per day recorded monthly throughout the data period but with averages slightly higher in the Summer months.

255. The majority of oil and gas vessels were on well-defined routes north-east south-west to / from ports on the east Scottish coast; primarily Aberdeen (UK) and Peterhead to oil and gas fields in the North Sea. The most popular recorded offshore destination for oil and gas vessels was the Buzzard Oil Field, accounting for 23% of oil and gas vessels heading for a key offshore asset, this was followed by Mariner Oil Field (9%). These are situated approximately 8nm east, and 127nm north-east of the RCP search area, respectively. Several routes intersect the RCP search area and routeing of oil and gas vessels are detailed further in **Section 11.2**.

256. Oil and gas vessels carrying out O&M activities at the Buzzard field were noted to the north-east of the RCP search area study area. This is the same activity overlapping the study area in the analysis of the oil and gas vessels for the OAA in **Section 10.1.2.1**.

10.2.2.3 Cargo Vessels

257. The tracks of cargo vessels within the RCP search area study area throughout the 12-month data period combined are presented in **Figure 10-27**. Following this, the average number of daily unique cargo vessels recorded within the RCP search area study area per month of the data period is presented in **Figure 10-28**.

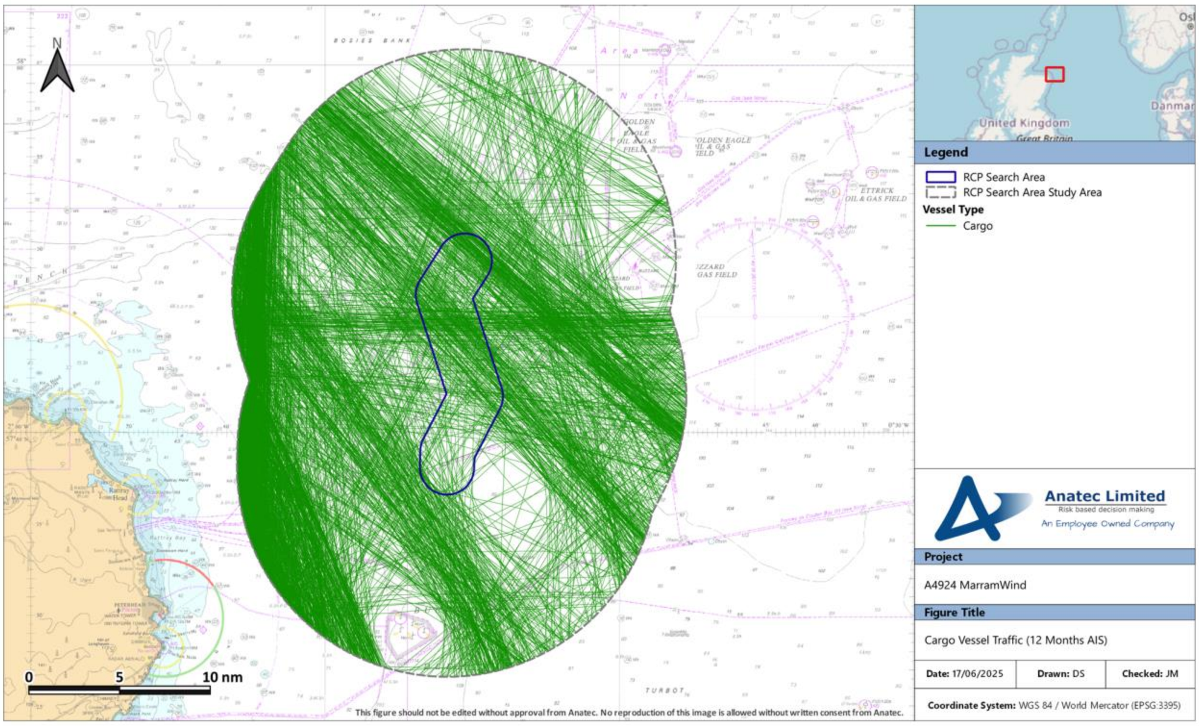


Figure 10-27 Cargo Vessel Traffic (12-Months AIS, 2024)

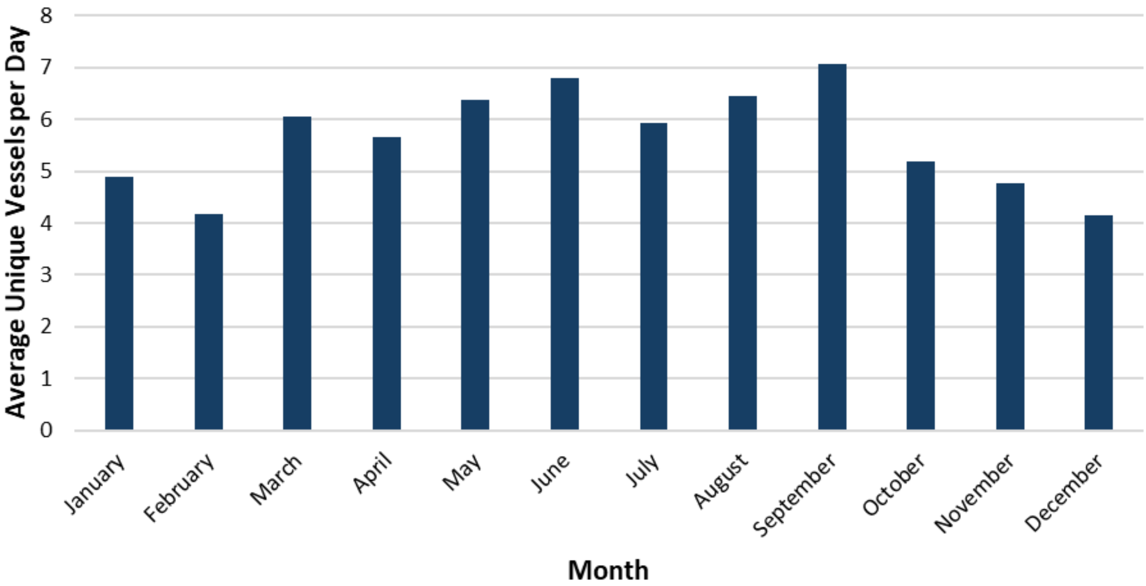


Figure 10-28 Average Daily Passenger Vessel Counts per Month (2024)

258. Overall, there was an average of between five and six unique cargo vessels per day recorded within the RCP search area study area across the data period. The busiest months for cargo vessels were June and September 2024, which recorded an average of seven unique cargo vessels per day within the RCP search area study area. The busiest days were the 1 January, 1 June, 15 June and 6 July 2024, each recording 15 unique cargo vessels. As for cargo vessels intersecting the RCP search area, an average of one–two

vessels per day was recorded across the data period. Cargo vessels displayed minor seasonality with reduced vessel numbers were noted during the Winter months.

259. Cargo vessels were seen throughout the RCP search area study area, primarily to the western extent, and also generally transiting in a north-west south-east direction. Commercial vessel routeing is defined in **Section 11.2**.

260. Cargo vessels sub-types recorded were primarily general cargo (37%), followed by bulk carriers (22%), container vessels (14%) and RoRo vessels (13%). Of the RoRo vessels recorded, 98% were attributable to Serco NorthLink Ferries, routeing between Aberdeen, Kirkwall (UK), and Lerwick (UK). An illustration of the RoRo vessels recorded across the data period, colour-coded by vessel operator is presented in **Figure 10-29**.

261. Serco NorthLink Ferries were consulted with regarding the further offshore transits which deviate from the defined north south routeing to the west of the RCP search area study area. Serco NorthLink confirmed that these transits are in periods of adverse weather. This is discussed further in **Section 12.2.1**.

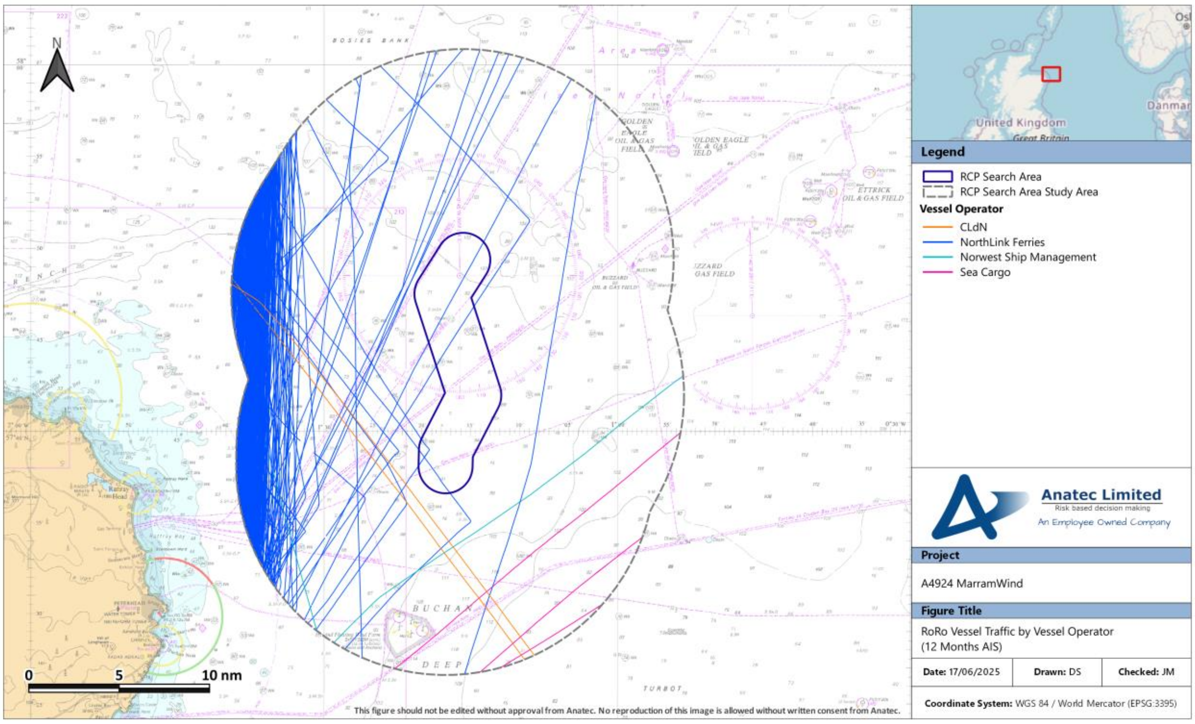


Figure 10-29 RoRo Vessel Traffic by Vessel Operator (12-Months AIS, 2024)

10.2.2.4 Passenger Vessels

262. The tracks of passenger vessels within the RCP search area study area throughout the 12-month data period combined are presented in **Figure 10-30**. Following this, the average number of daily unique passenger vessels recorded within the RCP search area study area per month of the data period is presented in **Figure 10-31**.

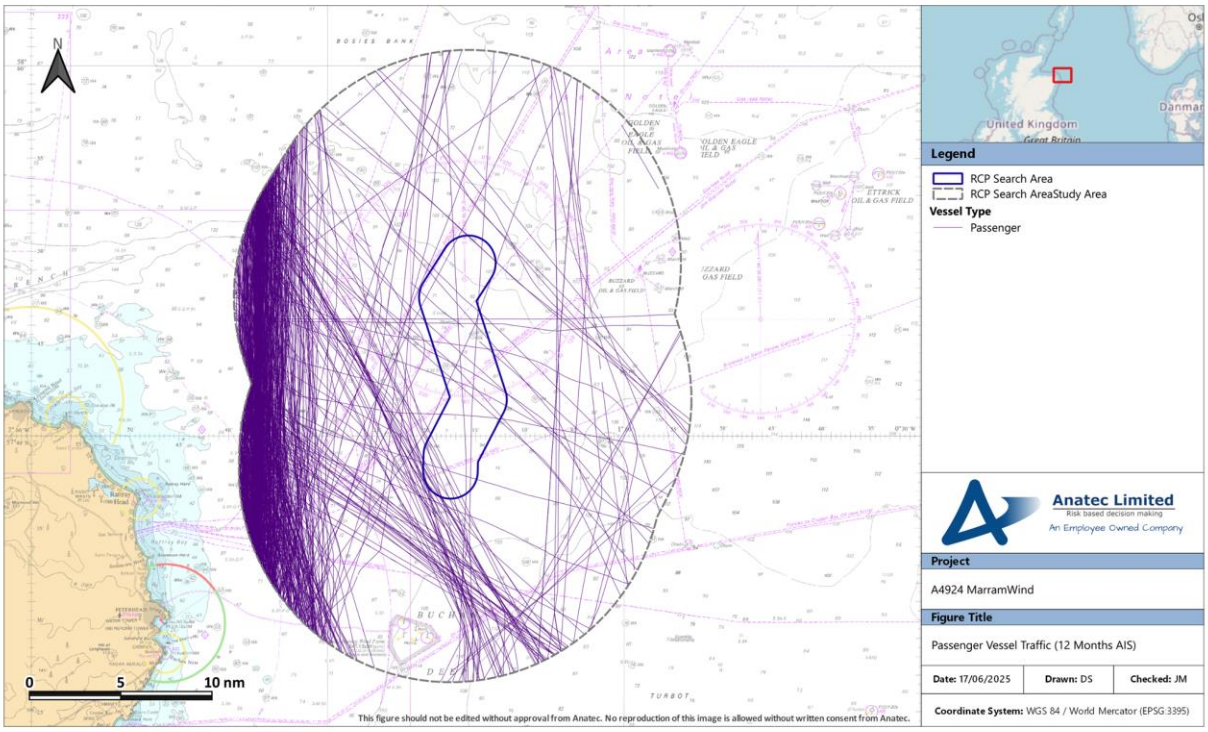


Figure 10-30 Passenger Vessel Traffic (12-Months AIS, 2024)

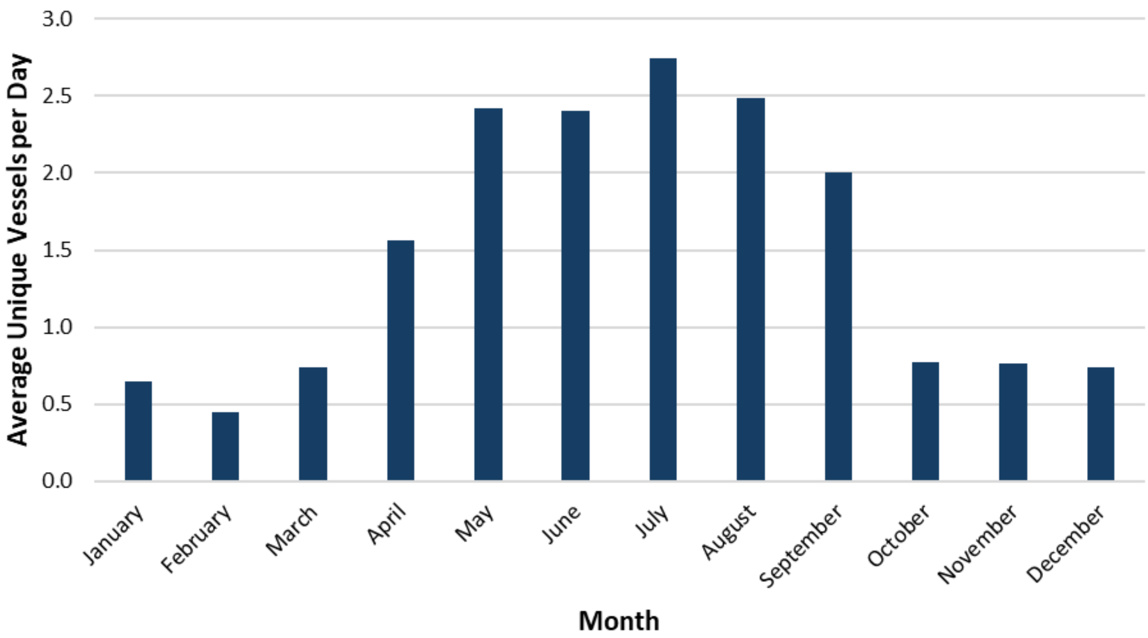


Figure 10-31 Average Daily Passenger Vessel Counts per Month (2024)

263. Overall, there was an average of between one–two unique passenger vessels per day recorded within the RCP search area study area across the data period. The busiest months for passenger vessels was July 2024, which recorded an average of three unique passenger vessels per day within the RCP search area study area. The busiest days were

the 23 August 2024, which recorded six unique passenger vessels. As for passenger vessels intersecting the RCP search area, an average of one every five days was recorded across the data period.

264. Passenger vessels recorded high levels of seasonality with greater numbers recorded during the Summer months when compared to during the Winter months, aligning with cruise liner activity.

265. Cargo vessels sub-types recorded were cruise liners (54%) and RoPax (44%), with the majority of these vessels routeing to the west of the RCP search area study area. Of the RoRo vessels recorded again 98% were attributable to Serco NorthLink Ferries, routeing between Aberdeen, Kirkwall, and Lerwick. An illustration of the RoPax vessels recorded across the data period, colour-coded by vessel operator is presented in **Figure 10-32**.

266. Like the RoRo vessels, Serco NorthLink confirmed offshore transits are in periods of adverse weather. Again, this is discussed further in **Section 12**.

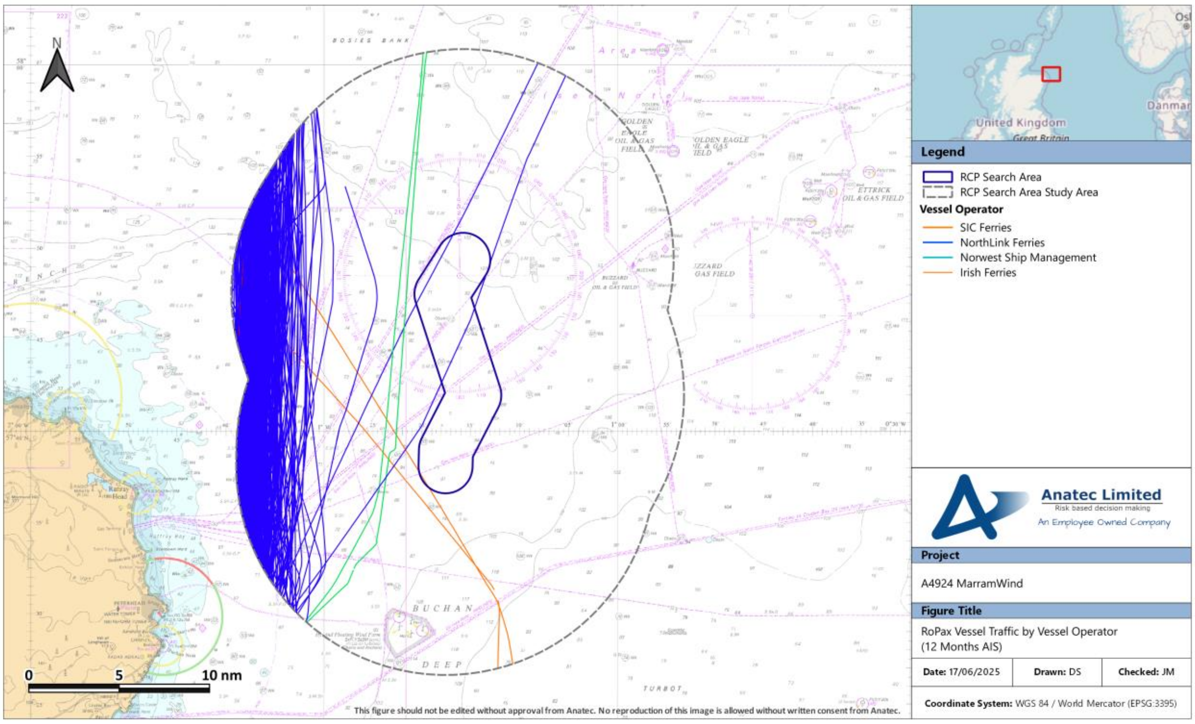


Figure 10-32 RoPax Vessel Traffic by Vessel Operator (12-Months AIS, 2024)

10.2.2.5 Other Commercial Vessels

267. The tracks of tankers and wind farm vessels within the RCP search area study area throughout the 12-month data period are presented in **Figure 10-33**, colour-coded by vessel type. Following this, the average number of daily unique vessels recorded within the RCP search area study area per month, per vessel type, of the data period is presented in **Figure 10-34**.

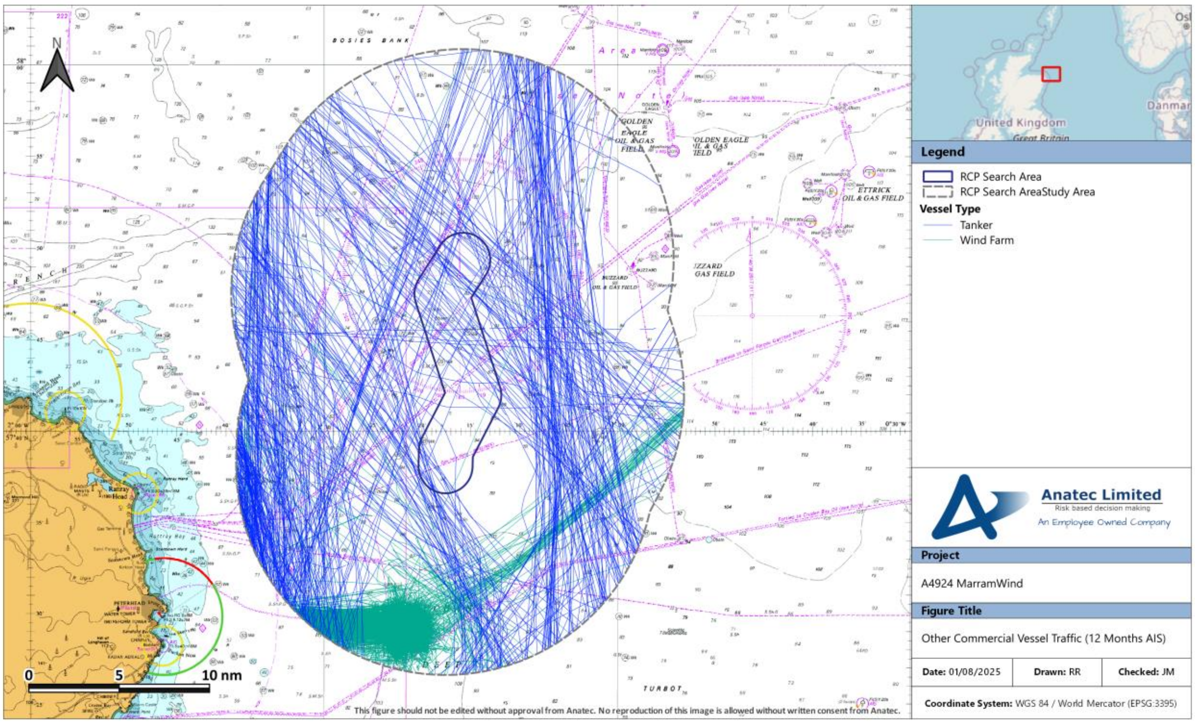


Figure 10-33 Other Commercial Vessel Traffic (12-Months AIS, 2024)

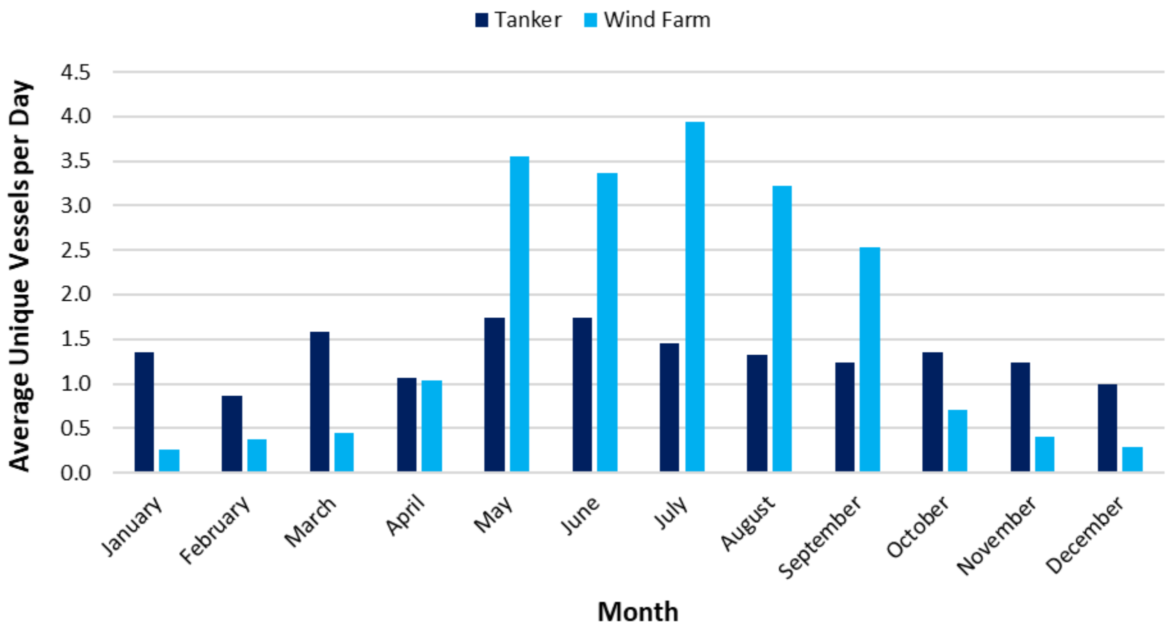


Figure 10-34 Average Daily Commercial Vessel Counts, per Vessel Type, per Month (2024)

268. Overall, for each vessel type, there was an average of between one and two unique vessels per day recorded within the RCP search area study area across the data period. The busiest months for tankers were May and June 2024, of which each recorded an average of two unique tankers per day. July 2024 was the busiest month for wind farm

vessels, recording an average of four vessels per day with wind farm vessels only recorded across April–October.

269. The majority of wind farm vessels were recorded in the south of the RCP Seach Area study area heading between Peterhead and Hywind Scotland Pilot Park (regular maintenance), while a smaller proportion were heading between Slovag (Norway) and Hywind Scotland Pilot Park involved in a heavy maintenance campaign which included the towage of individual WTGs.

270. Tankers were recorded throughout the RCP search area study area, the highest areas of tanker activity were identified to the east and west of the RCP Corridor, in a north / south direction heading to / from Lerwick. Lower levels of tanker activity were noted intersecting the RCP Corridor in a north-west / south-east direction and north-east / south-west direction, respectively.

10.2.2.6 Recreational Vessels

271. The tracks of recreational vessels within the RCP search area study area throughout the combined data period combined are presented in **Figure 10-35**. Following this, the average number of daily unique recreational vessels recorded within the RCP search area study area per month of the data period is presented in **Figure 10-36**.

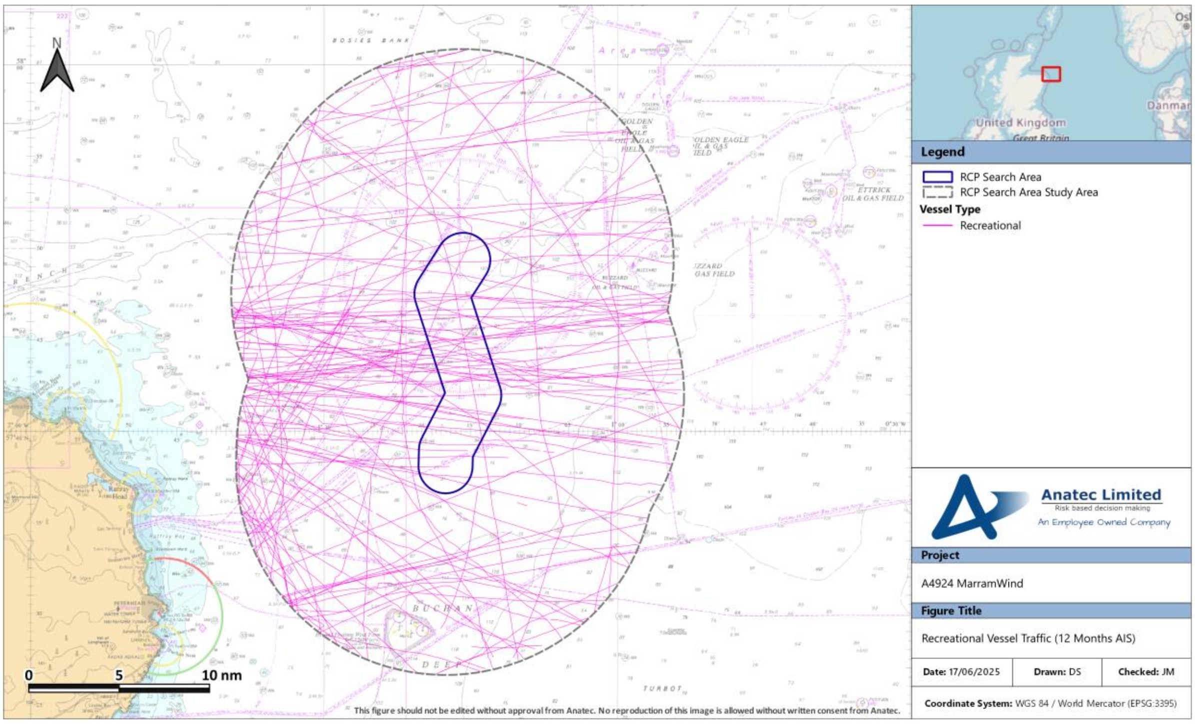


Figure 10-35 28 Days of Recreational Vessel Traffic Data (12-Months AIS, 2024)

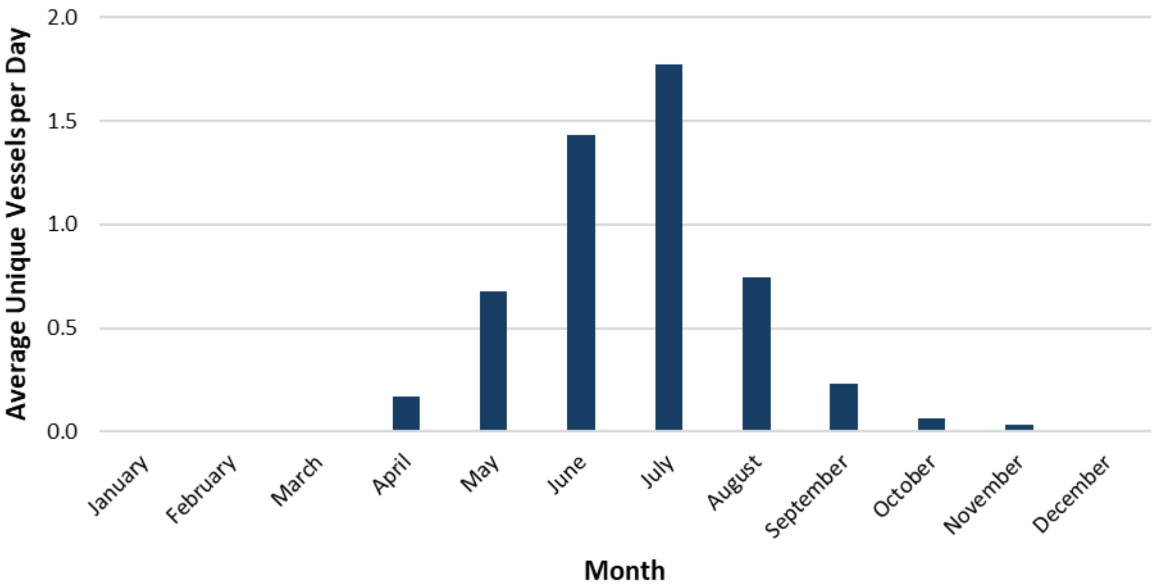


Figure 10-36 Average Daily Recreational Vessel Counts per Month (2024)

272. There was an overall average of one unique recreational vessel recorded every two–three days across the data period within the RCP search area Study Area. When only the Summer season is considered (May–August), this increases to approximately one unique recreational vessel per day. As for recreational vessels intersecting the RCP search area, an average of one per week was recorded across the data period.

273. Recreational vessels are highly seasonal, with Summer months offering more favourable sailing conditions. The busiest month for recreational vessels was July 2024, during which an average of two unique recreational vessels were recorded per day.

274. The majority of recreational vessels were observed on various east west courses; preferred routeing was observed through the centre of the RCP search area.

10.2.3 Vessel Size

10.2.3.1 Vessel Length

275. Vessel LOA was available for more than 99% of vessels recorded throughout the 12-month data period. These vessels with unspecified LOA have been removed from the analysis where relevant.

276. The vessel tracks from the 12-month data are presented in **Figure 10-37**, colour-coded by LOA. Following this, a distribution of these vessel LOA is presented in **Figure 10-38**.

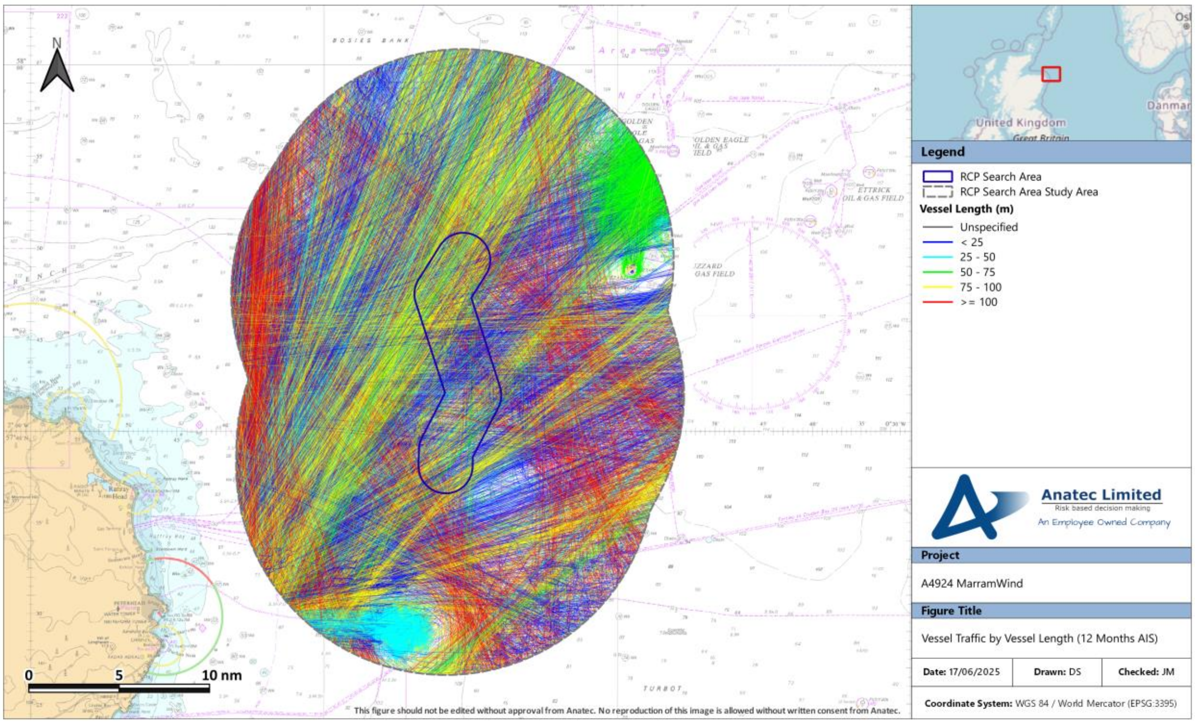


Figure 10-37 Vessel Traffic by Vessel Length (12-Month AIS, 2024)

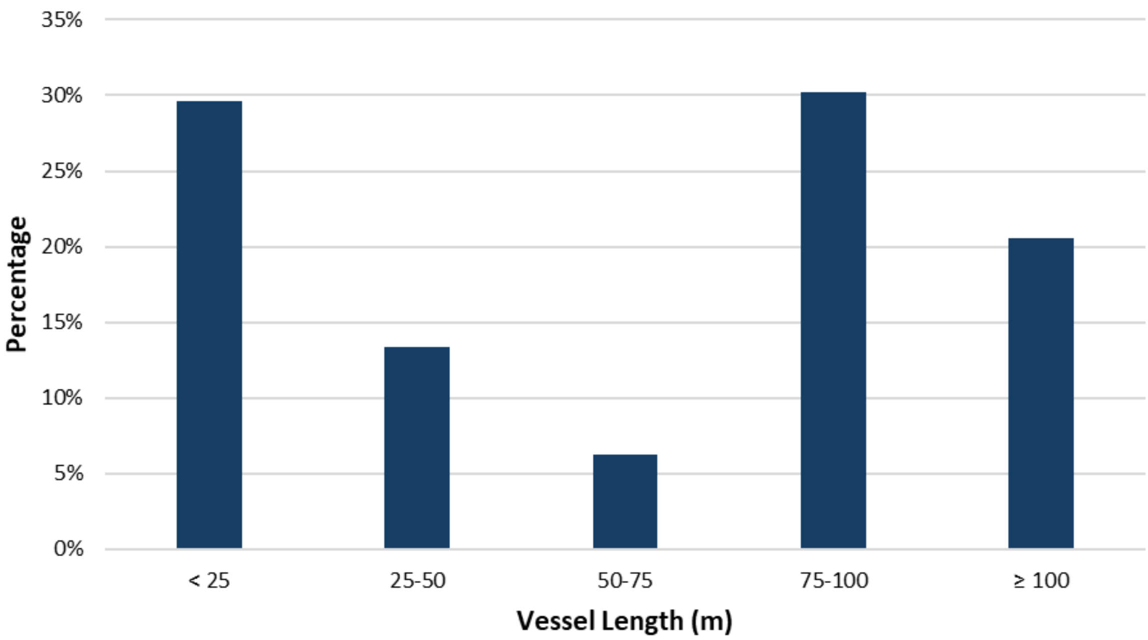


Figure 10-38 Vessel Length Distribution (12-Month AIS, 2024)

277. Of vessels with a valid LOA, the average recorded was 75m. Vessel LOA ranged from 4m for a SAR daughter craft to 345m for a cruise liner; this vessel was routeing at the south-west of the RCP search area study area. Vessels with greater LOA were primarily

cruise liners, cargo vessels, and tankers with those of smaller LOA located inshore including recreational, fishing vessels, and wind farm vessels.

10.2.3.2 Vessel Draught

278. Vessel draught was available for approximately 86% of all vessels recorded throughout the 12-month data period. Vessels with unspecified vessel draughts were primarily fishing vessels and recreational vessels, including those carrying AIS Class B which does not include the broadcast of draughts. Vessels with unspecified draughts have been removed from the analysis where relevant.

279. The combined 28-days vessel traffic survey data is presented in **Figure 10-39**, colour-coded by vessel draught. Following this, a distribution of these vessel draughts is presented in **Figure 10-40**.

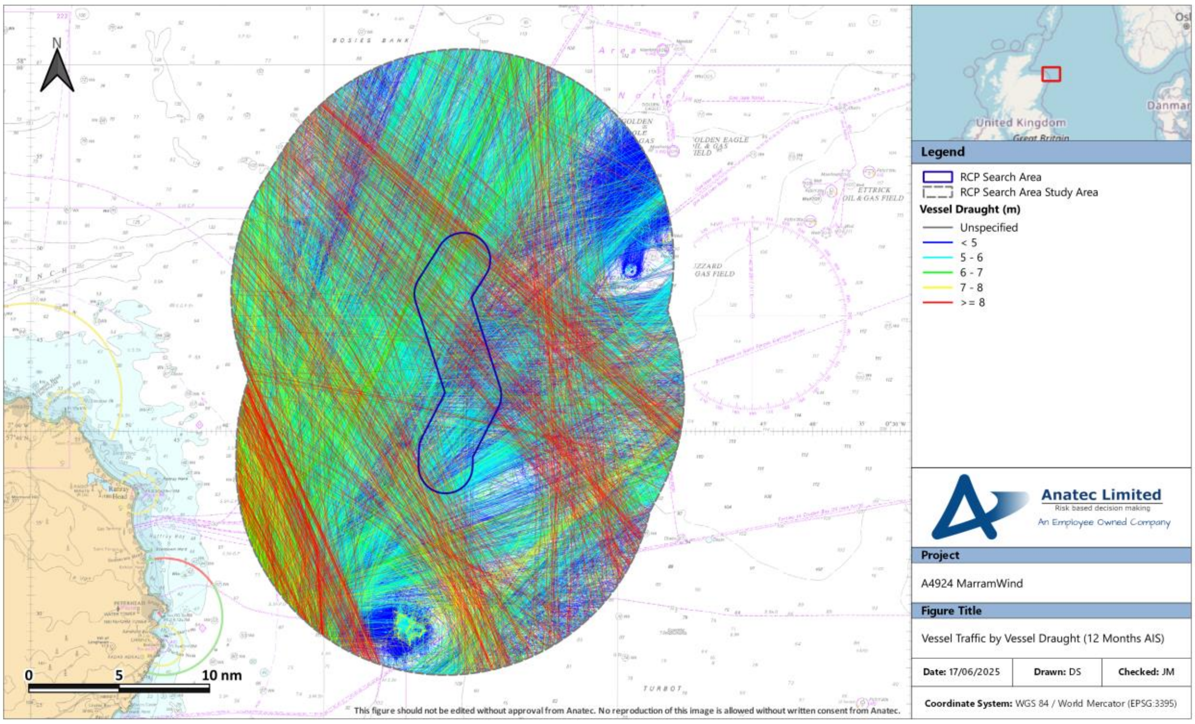


Figure 10-39 Vessel Traffic by Vessel Draught (12-Month AIS, 2024)

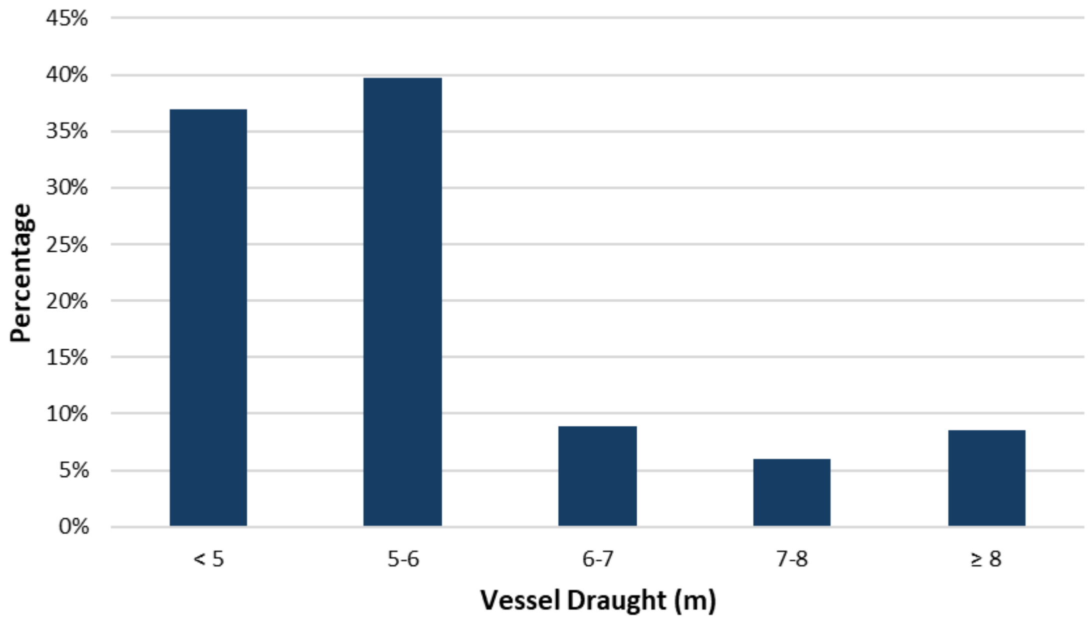


Figure 10-40 Vessel Draught Distribution (12-Month AIS, 2024)

280. Of the vessels which broadcast a valid vessel draught, the average draught recorded was 5.2m. Vessel draught ranged from 0.2m for various fishing vessels to 16.2m for a bulk carrier; this vessel intersected the north of the RCP search area. The majority of vessels had a draught below 6m and mainly comprised of oil and gas vessels and fishing vessels. Vessels with a draught 8m and above accounted for 9% and were larger cargo vessels and tankers. Only 4% of vessels had a draught of 10m or greater.

10.2.4 Anchoring Activity

281. The same approach to identify anchoring activity which was detailed for the OAA in **Section 10.2.4** was applied to the 12-months data for the RCP search area study area. Following this, no vessels were deemed to be at anchor within the study area during the data period.

10.3 Offshore Export Cable Corridor

282. This section presents an overview of vessel traffic movements within the offshore export cable corridor study area, primarily based upon the findings of the 28-day AIS only seasonal vessel traffic data collected across Summer and Winter periods; July / August and November 2024, respectively. A number of vessel tracks recorded during the survey periods were classified as temporary (non-routine), such as tracks of the survey vessel. These vessels have therefore been excluded from the analysis.

283. A plot of the vessel tracks recorded during the 14-day Summer data period, colour-coded by vessel type and excluding any temporary traffic, is presented in **Figure 10-41**. Following this, a plot of the vessel tracks recorded during the further 14-day Winter data

period, colour-coded by vessel type and excluding any temporary traffic, is presented in **Figure 10-42**.

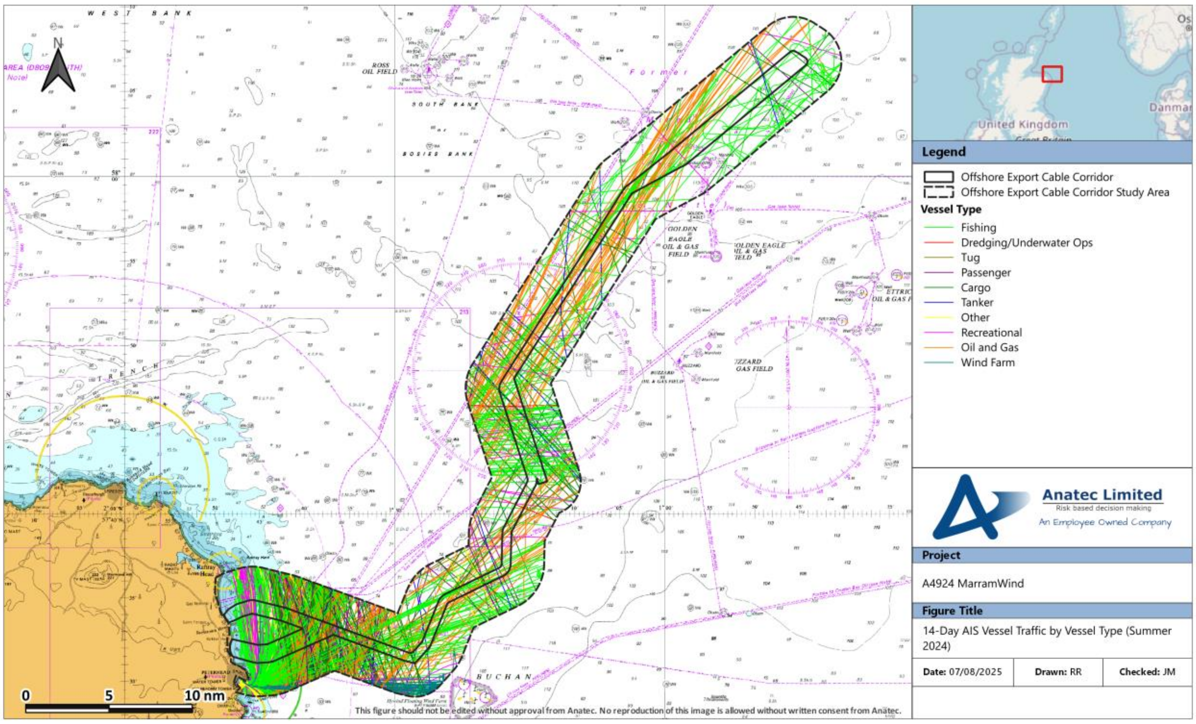


Figure 10-41 14 Days of Vessel Traffic Data by Vessel Type (Summer 2024)

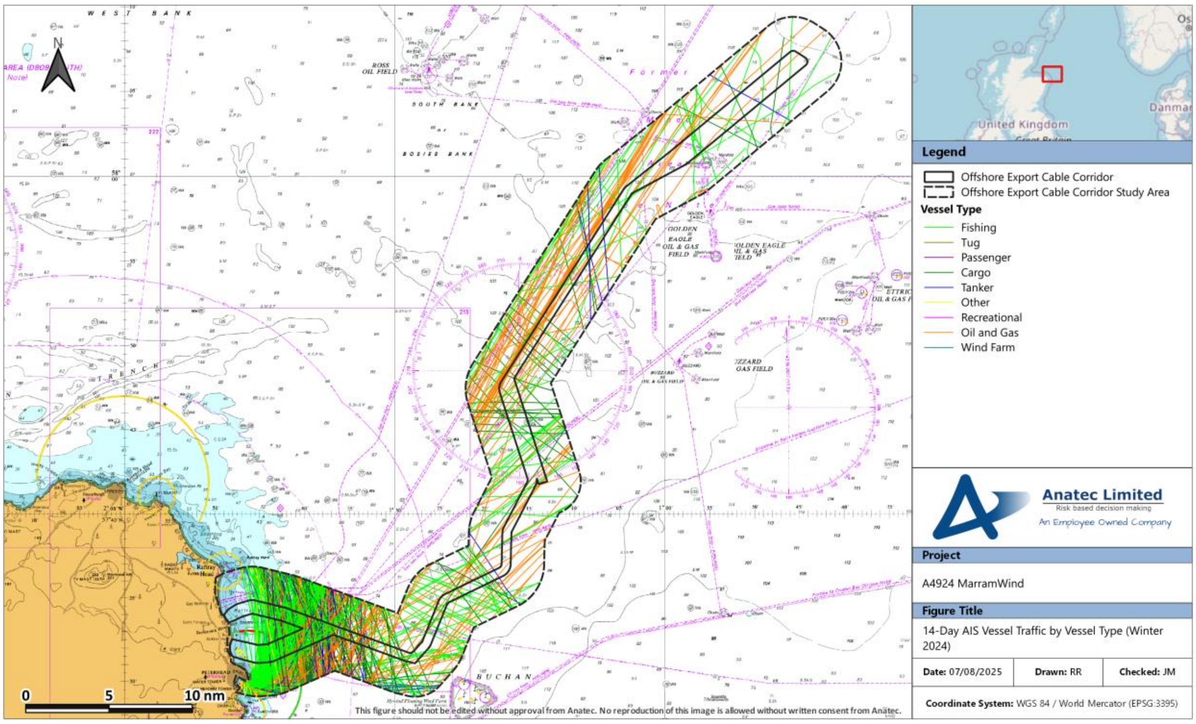


Figure 10-42 14 Days of Vessel Traffic Data by Vessel Type (Winter 2024)

284. A plot of the vessel tracks from the combined Summer and Winter data periods converted to a density heat map is presented in **Figure 10-43**. It is noted that the same density brackets were used for both data periods to allow for direct comparison in vessel density.

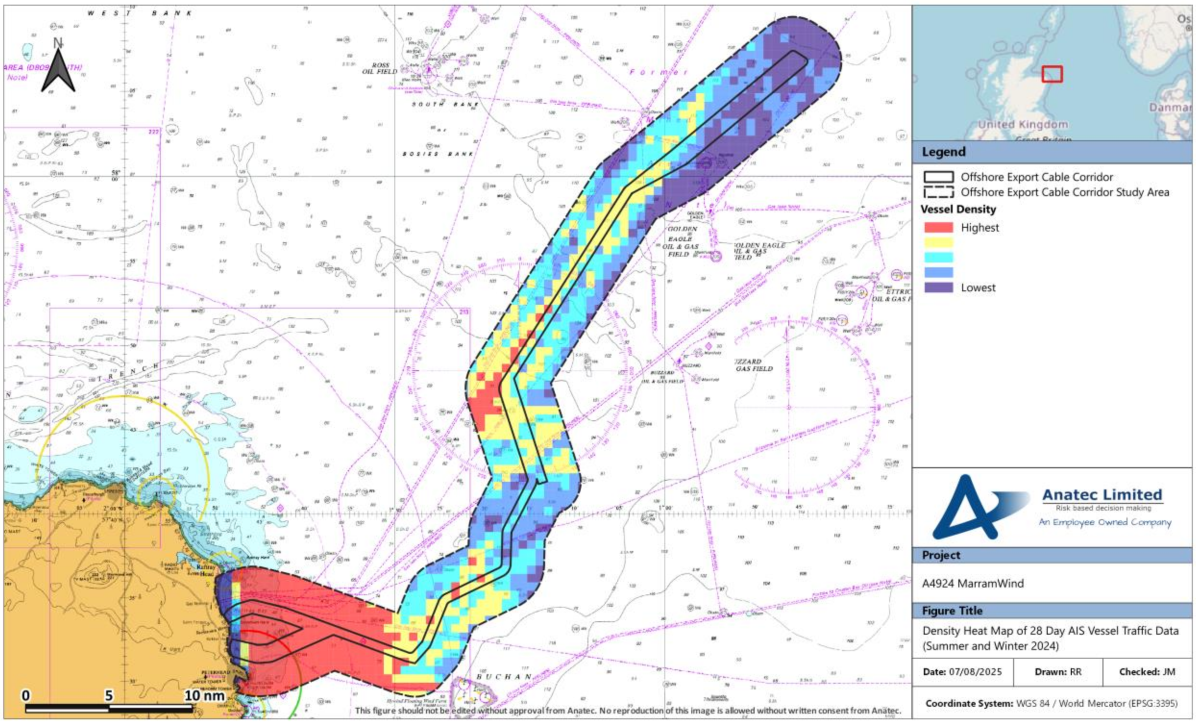


Figure 10-43 Density Heat Map of 28 Days of Vessel Traffic Data (Summer and Winter, 2024)

10.3.1 Vessel Counts

285. The daily number of unique vessels recorded within the offshore export cable corridor study area and offshore export cable corridor area during the Summer data period are presented in **Figure 10-44**.

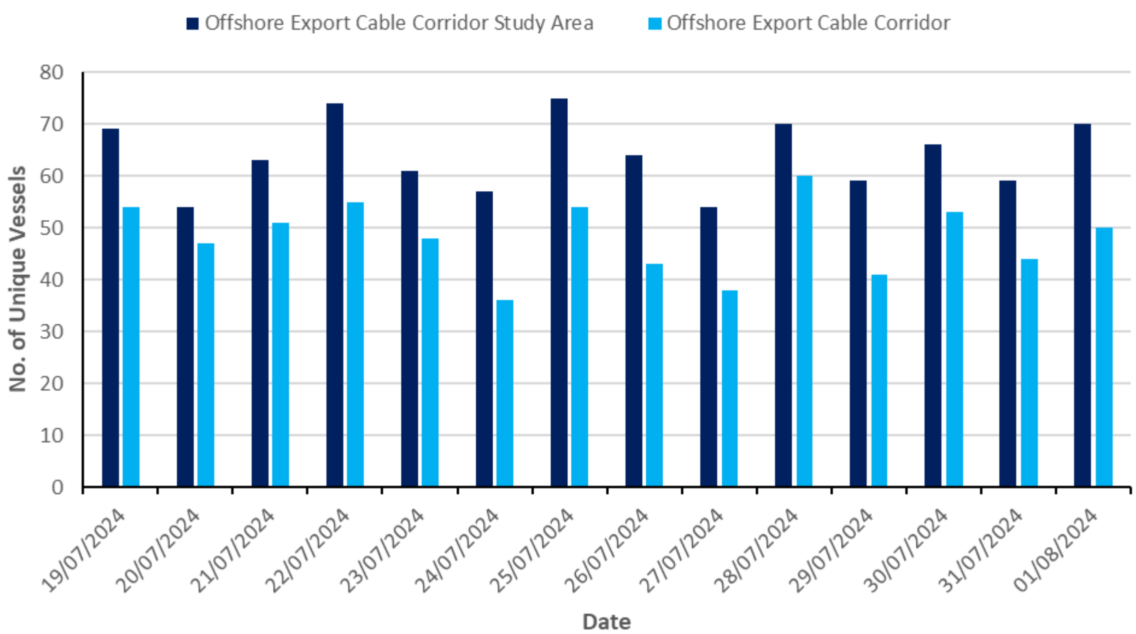


Figure 10-44 Unique Vessels per Day (14 Days, Summer 2024)

286. For the 14 days analysed during the Summer data period, there was an average of 64 unique vessels recorded per day within the offshore export cable corridor study area. In terms of vessels intersecting the offshore export cable corridor area itself, there was an average of 48 unique vessels per day recorded during the data period, or approximately 75% of unique vessel tracks recorded within the offshore export cable corridor study area intersected the offshore export cable corridor.

287. The busiest days recorded within the offshore export cable corridor study area during the Summer data period were 25 July 2024, during which 75 unique vessels were recorded each. The busiest day recorded within the offshore export cable corridor area during the Summer data period was 28 July 2024, on which 60 unique vessels were recorded.

288. The quietest days recorded within the offshore export cable corridor study area during the Summer data period were 20 and 27 July 2024, on which 54 unique vessels were recorded each day. The quietest day recorded within the offshore export cable corridor area during the Summer data period was 24 July 2024, on which 36 unique vessels were recorded.

289. The daily number of unique vessels recorded within the offshore export cable corridor study area and offshore export cable corridor area during the Winter data period are presented in **Figure 10-45**.

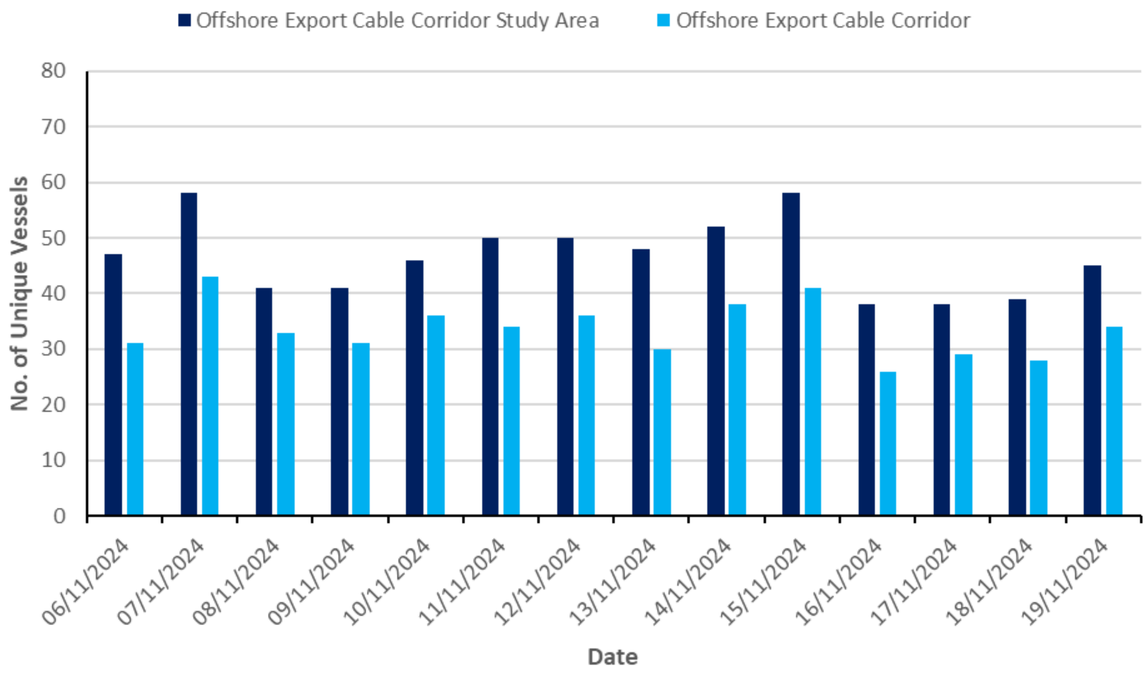


Figure 10-45 Unique Vessels per Day (14 Days, Winter 2024)

290. For the 14 days analysed during the Winter data period, there was an average of 47 unique vessels recorded per day within the offshore export cable corridor study area. In terms of vessels intersecting the offshore export cable corridor area itself, there was an average of 34 unique vessels per day recorded during the data period, or approximately 72% of unique vessel tracks recorded within the offshore export cable corridor study area intersected the offshore export cable corridor area.

291. The busiest days recorded within the offshore export cable corridor study area during the Winter data period were 7 and 15 November 2024, on which 58 unique vessels were recorded each day. The busiest day recorded within the offshore export cable corridor area during the Winter data period was 7 November 2024, on which 43 unique vessels were recorded.

292. The quietest days recorded within the offshore export cable corridor study area during the Winter data period were 16 and 17 November 2024, on which 38 unique vessels were recorded. The quietest day recorded within the offshore export cable corridor area during the Winter data period was 16 November 2024, on which 26 unique vessels were recorded.

10.3.2 Vessel Type

293. All vessels recorded across the data periods were able to be assigned a vessel type. The percentage distribution of the main vessel types recorded passing within the offshore export cable corridor study area as well as intersecting the offshore export cable corridor

during the Summer data period is presented in **Figure 10-46**. The same distribution for the Winter data is presented in **Figure 10-47**.

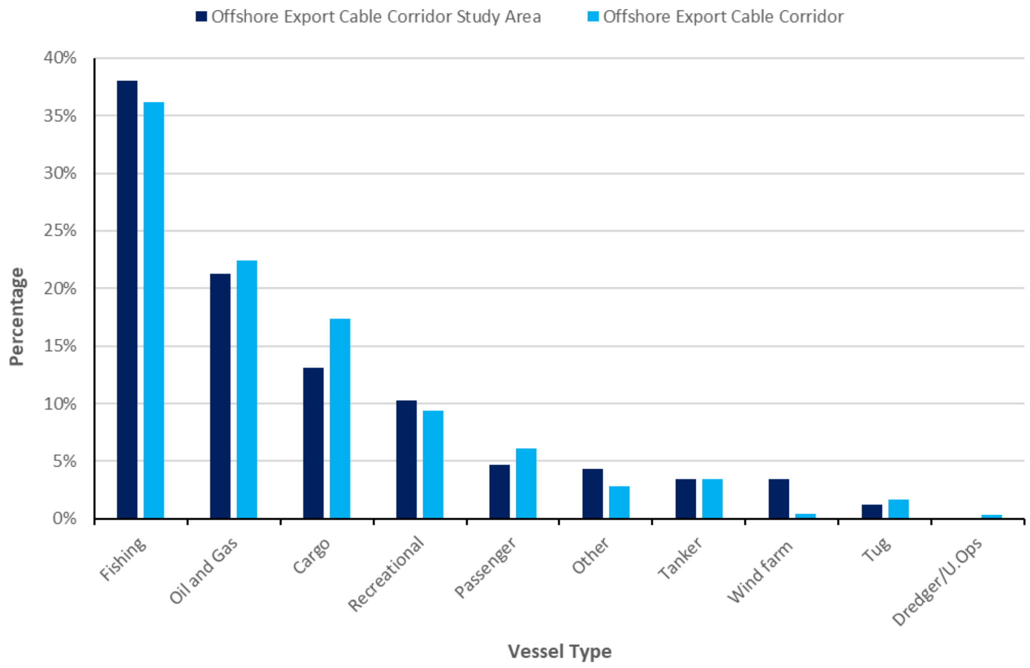


Figure 10-46 Vessel Type Distribution within Offshore Export Cable Corridor Study Area and Offshore Export Cable Corridor (Summer 2024)

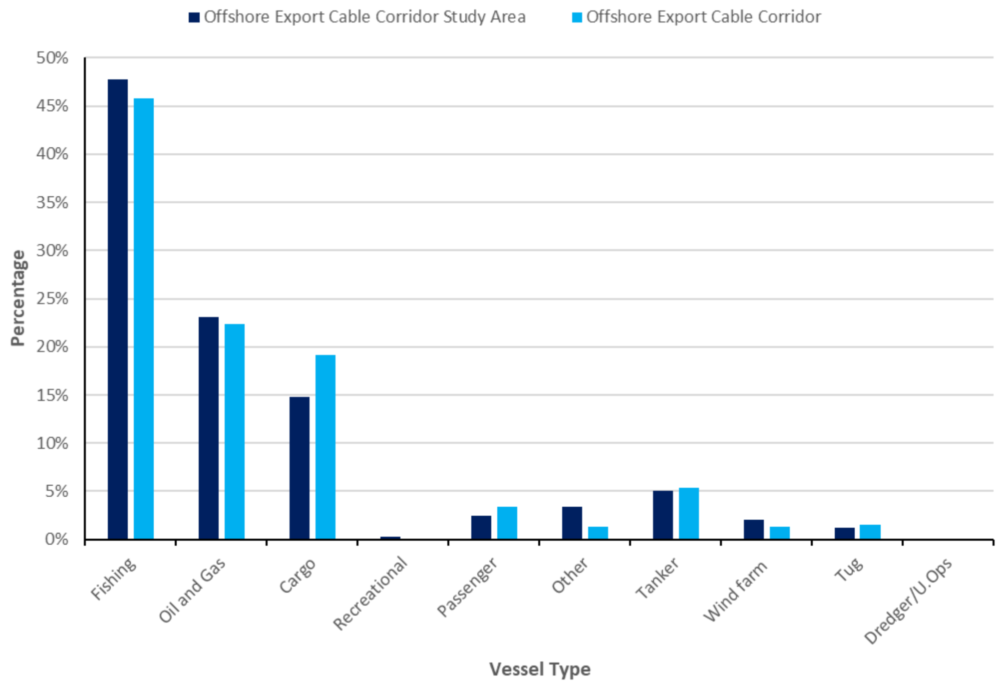


Figure 10-47 Vessel Type Distribution within Offshore Export Cable Corridor Study Area and Offshore Export Cable Corridor (Winter 2024)

294. Throughout the Summer data period, the main vessel types within the offshore export cable corridor study area were fishing vessels which accounted for 38% of all vessels recorded and oil and gas which accounted for 21%. Cargo vessels (13%), recreational vessels (10%), and passenger vessels (5%) were the other types to account for more than 5% of all vessels recorded. There was a similar trend in vessel types intersecting the offshore export cable corridor with fishing vessels (36%), oil and gas vessels (22%), and cargo vessels (17%) being the most commonly recorded.

295. Throughout the Winter data period, the main vessel types within the offshore export cable corridor study area were again fishing vessels which accounted for 48% of all vessels recorded and oil and gas which accounted for 23%. Cargo vessels (15%) and tankers vessels (5%) were the only other types to account for more than 5% of all vessels recorded. There was a similar trend in vessel types intersecting the offshore export cable corridor with fishing vessels (46%), oil and gas vessels (22%), and cargo vessels (19%) being the most commonly recorded. It is noted that only two recreational transits were recorded during the Winter data period (less than 1%).

296. It is noted that pilot vessels operating from Peterhead Port were present in the offshore export cable corridor study area across the data periods, but no pilot vessels intersected the offshore export cable corridor itself.

297. The following subsections consider each of the main vessel types individually.

10.3.2.1 Fishing Vessels

298. The tracks of fishing vessels within the offshore export cable corridor study area throughout the Summer and Winter data periods combined are presented in **Figure 10-48**, colour-coded by average speed for the same justification detailed for the OAA in **Section 10.1.2.2**.

299. It was noted during consultation at the Hazard Workshop by Brown & May Marine that the data, being only AIS, may not capture all inshore potting vessels and so the use of VMS data may be beneficial. To support this, a plot of VMS data spanning the entirety of 2024, covering the offshore export cable corridor study area, has also been shown as a density heat map in **Figure 10-49**, as requested at the Hazard Workshop.

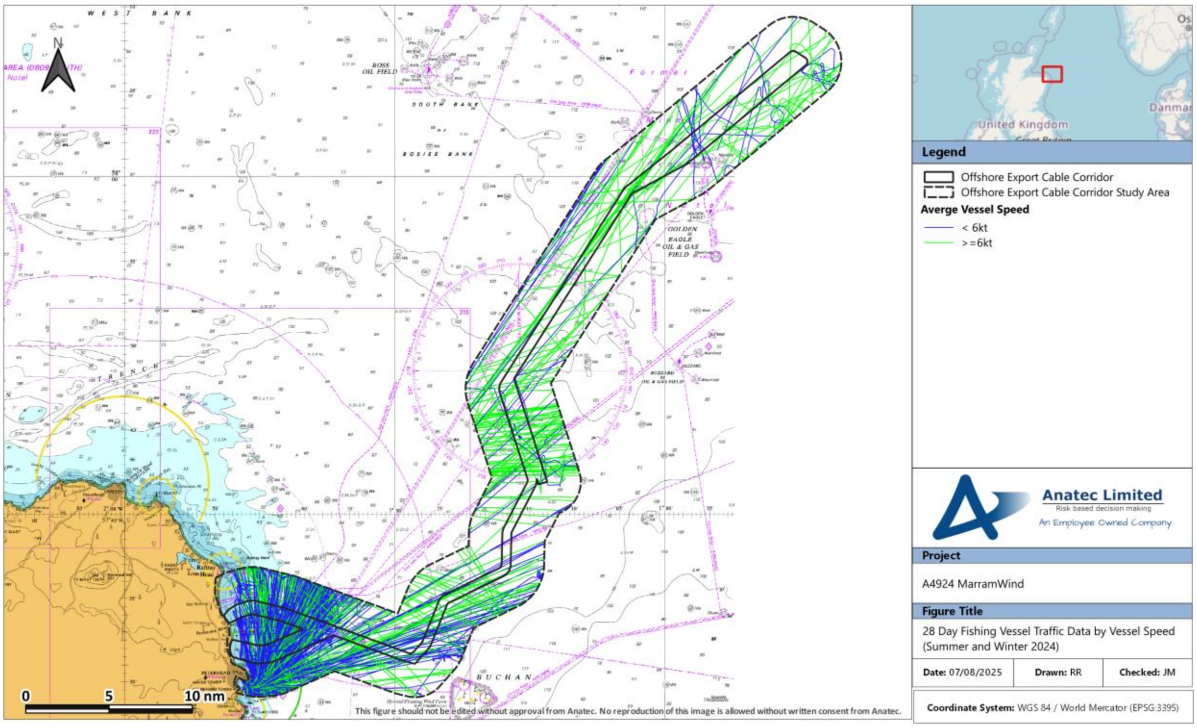


Figure 10-48 28 Days of Fishing Vessel Traffic Data by Vessel Speed (Summer and Winter 2024)

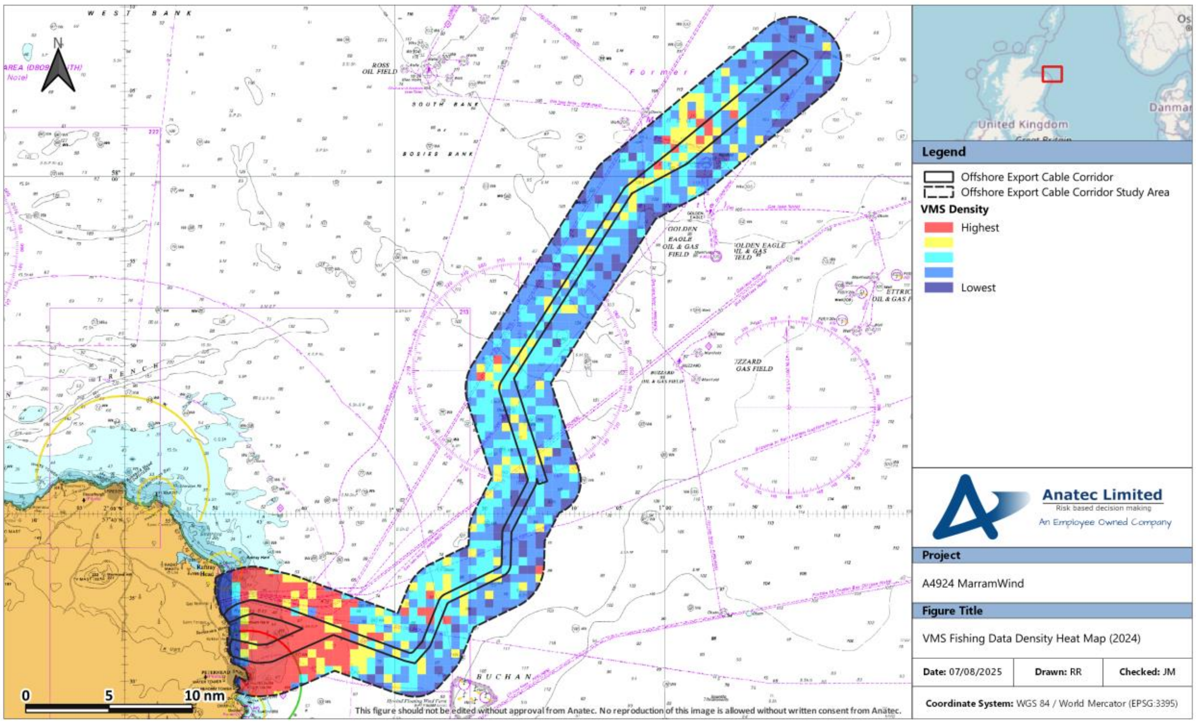


Figure 10-49 VMS Fishing Data Density Heat Map – Offshore Export Cable Corridor (2024)

300. An average of 24 unique fishing vessels per day were recorded within the offshore export cable corridor study area during the 28-day data period, with an average of 17

fishing vessel intersections per day recorded through the offshore export cable corridor. There was no seasonality in fishing vessels and equal counts were recorded across each data period.

301. Fishing vessels were transiting mainly in and out of Peterhead Port to the south of the offshore export cable corridor study area. These vessels were transiting to / from fishing grounds both offshore, particularly to the north-east, as well as several vessels transiting directly east and north. Those vessels which could potentially be actively fishing were recorded mainly to the north-east of the offshore export cable corridor study area, close to the OAA, and were the same trawlers identified in the OAA analysis in **Section 10.1.2.2**. Potential active fishing was also recorded further inshore by a scallop dredger and several smaller pots and traps vessels; this activity also recorded along the coastline. Comparing the vessel traffic data with the VMS data, the high-density band of fishing vessel density inshore aligns with the vessels transiting to / from Peterhead as well as the presence of potential inshore fishing activity.

302. Gear type was able to be identified for approximately 96% of fishing vessels. Of these vessels, the main gear types identified were bottom otter trawls (45%), pots and traps (18%), and bottom pair trawls (15%). Dredgers (6%) and seiners (5%) were also recorded, with dredgers only present during the Summer data period and seiners primarily only during the Winter data period.

303. Nationality was identified for more than 99% of vessels, with 95% of these fishing vessels being registered in the UK. Vessels from the Netherlands, Norway, France and Denmark (each 1%) were also recorded.

304. Further consideration of baseline fishing activity is detailed in **Volume 2, Chapter 14: Commercial Fisheries**.

10.3.2.2 Oil and Gas Vessels

305. The tracks of oil and gas vessels within the offshore export cable corridor study area throughout the combined data periods are presented in **Figure 10-50**.

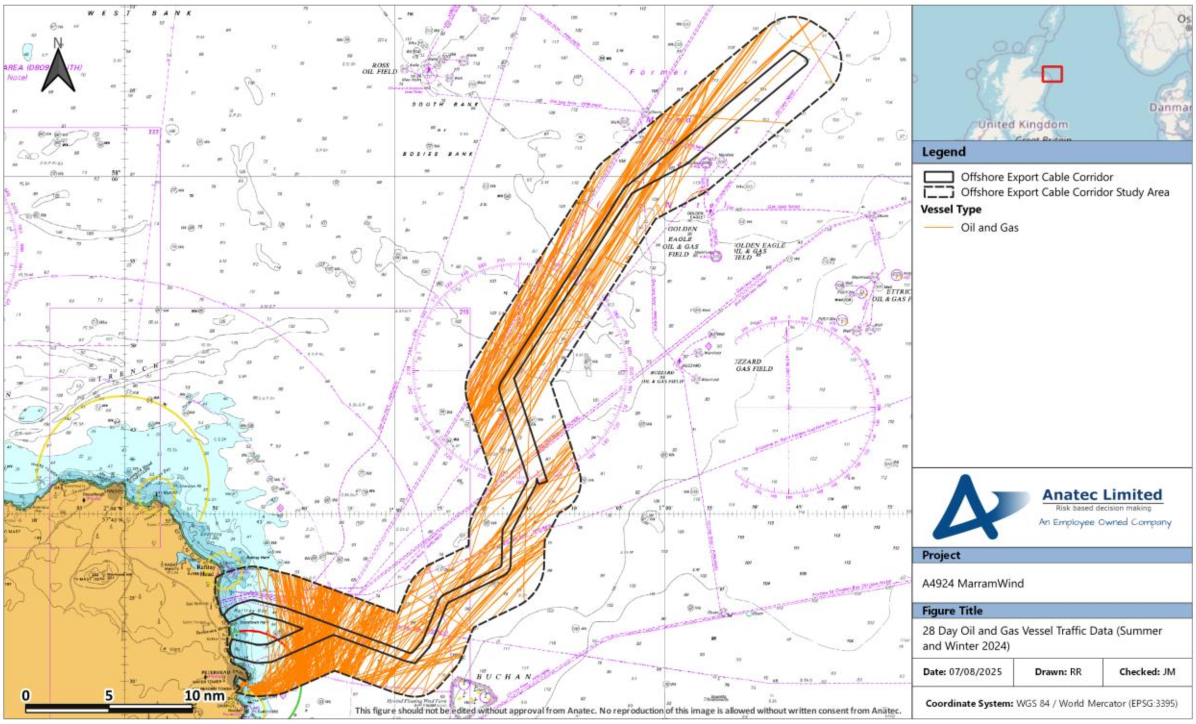


Figure 10-50 28 Days of Oil and Gas Vessel Traffic Data (Summer and Winter 2024)

306. An average of 12 oil and gas vessels were recorded per day during the 28-day data period. An average of nine unique oil and gas vessels intersected the offshore export cable corridor per day during 28-day data period. There was minor seasonality in oil and gas vessels with slightly higher counts recorded during the Summer data period.

307. The majority of oil and gas vessels were on well-defined routes north-east south-west to / from ports on the east Scottish coast, primarily Aberdeen and Peterhead, to oil and gas fields in the North Sea. These transits were detailed in the analysis of the RCP search area Study Area in **Section 10.2.2.2**. Oil and gas vessels were also recorded transiting north south at the west of the offshore export cable corridor study area, inshore following the coastline. These vessels were routeing to Aberdeen to the south and to oil and gas fields in the Outer Moray Firth.

10.3.2.3 Cargo Vessels

308. The tracks of cargo vessels within the offshore export cable corridor study area throughout the combined data periods are presented in **Figure 10-51**.

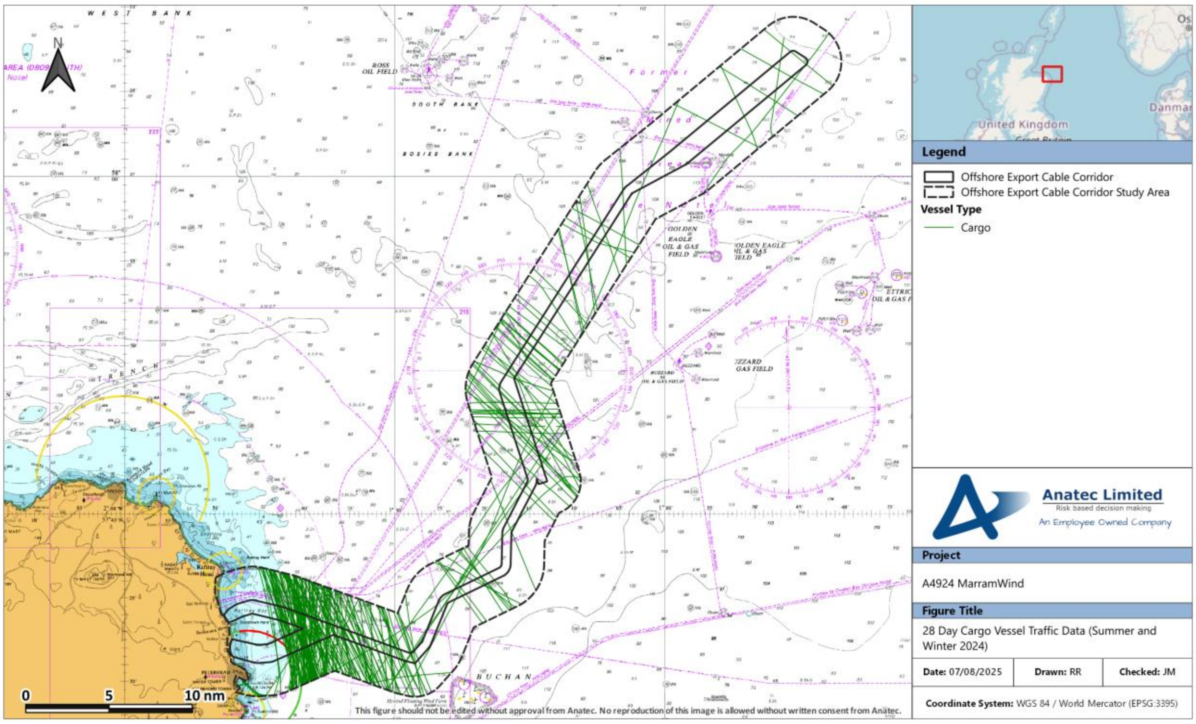


Figure 10-51 28 Days of Cargo Vessel Traffic Data (Summer and Winter 2024)

309. An average of eight cargo vessels were recorded per day during the 28-day data period. An average of eight unique oil and gas vessels intersected the offshore export cable corridor itself per day during 28-day data period. There was no seasonality in cargo vessels and equal counts were recorded across each data period.

310. The majority of cargo vessels were on well-defined routes, particularly inshore routeing around the coastline into the Moray Firth and to / from the Pentland Firth. Cargo vessels routeing further offshore is detailed in the RCP search area Study Area analysis in **Section 10.2.2.3**.

311. Cargo vessel subtypes included general cargo (25%), part containerised (23%), RoRo vessels (15%), container vessels (15%), and bulk carriers (14%) as the most recorded subtypes. Those RoRo vessels recorded were primarily operated by Serco NorthLink Ferries (82%) routeing between Aberdeen and the Northern Isles as outlined in **Section 10.2.2.3**. Smiryl Line operated RoRo vessels (14%) were also recorded routeing between Rotterdam (the Netherlands) and Torlakshofn (Faroe Islands). All commercial ferry routeing was inshore.

10.3.2.4 Other Commercial Vessels

312. The tracks of tanker, passenger, and wind farm vessels within the offshore export cable corridor study area throughout the combined data periods are presented in **Figure 10-52**, colour-coded by vessel type.

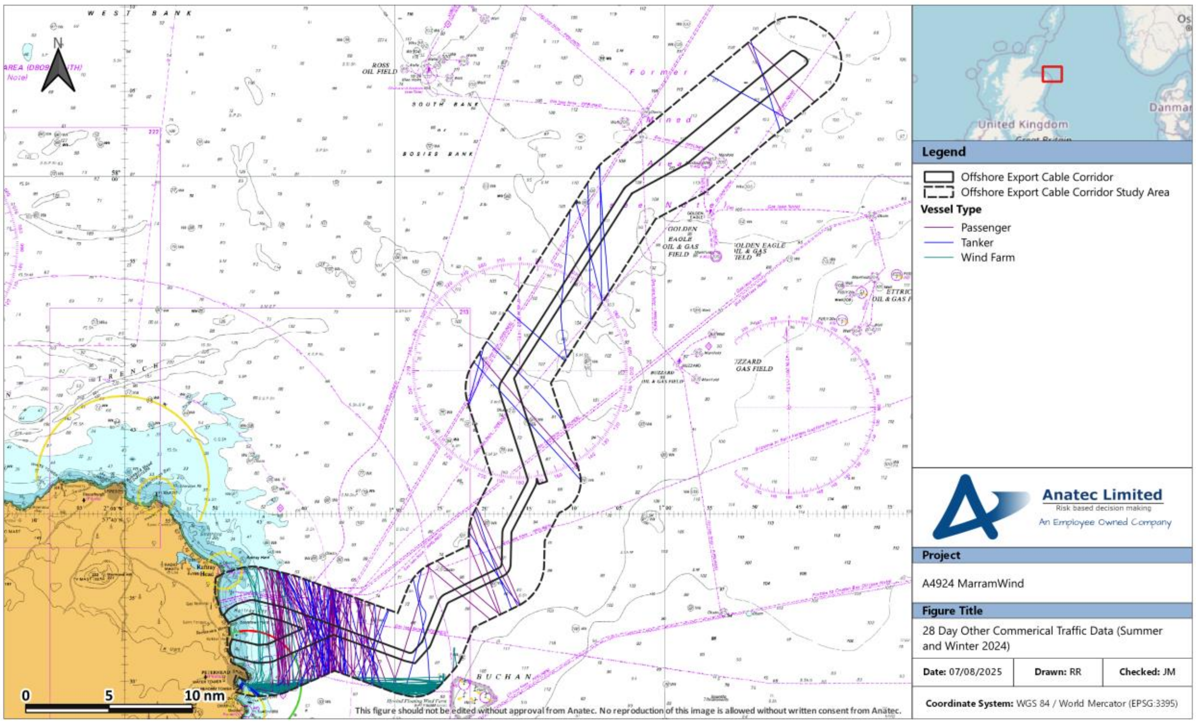


Figure 10-52 28 Days Commercial Vessel Traffic Data by Vessel Type (Summer and Winter 2024)

313. An average of two–three unique tankers per day were recorded within the offshore export cable corridor study area during the 28-day data period, with an average of one–two tankers intersecting the offshore export cable corridor per day. There was no seasonality in tankers and equal counts were recorded across each data period.

314. An average of two unique passenger vessels per day were recorded within the offshore export cable corridor study area during the 28-day data period, with all but one passenger vessel intersecting the offshore export cable corridor; an average of two per day. Passenger vessels were highly seasonal with 73% being recorded within the Summer data period, this aligns with more favourable weather conditions and seasonal cruise liner operations.

315. The majority of passenger vessels recorded were RoPax vessels (47%) and cruise liners (38%). Large yachts were also recorded during the Summer period (4%). RoPax vessels were all operated by Serco NorthLink Ferries routeing between Aberdeen and the Northern Isles (UK) as outlined in the RCP search area study area analysis in **Section 10.2.2.4**.

316. An average of one–two unique wind farm vessels per day were recorded within the offshore export cable corridor study area during the 28-day data period, with an average of one wind farm vessel intersecting the offshore export cable corridor every three days. There was seasonality within wind farm vessels with 70% being recorded during the Summer data period. The majority of wind farm vessels were routeing between Peterhead and Hywind Scotland Pilot Park with several other vessels routeing into the Moray Firth.

10.3.2.5 Recreational Vessels

317. The tracks of recreational vessels within the offshore export cable corridor study area throughout the combined data periods combined are presented in Figure 10-53.

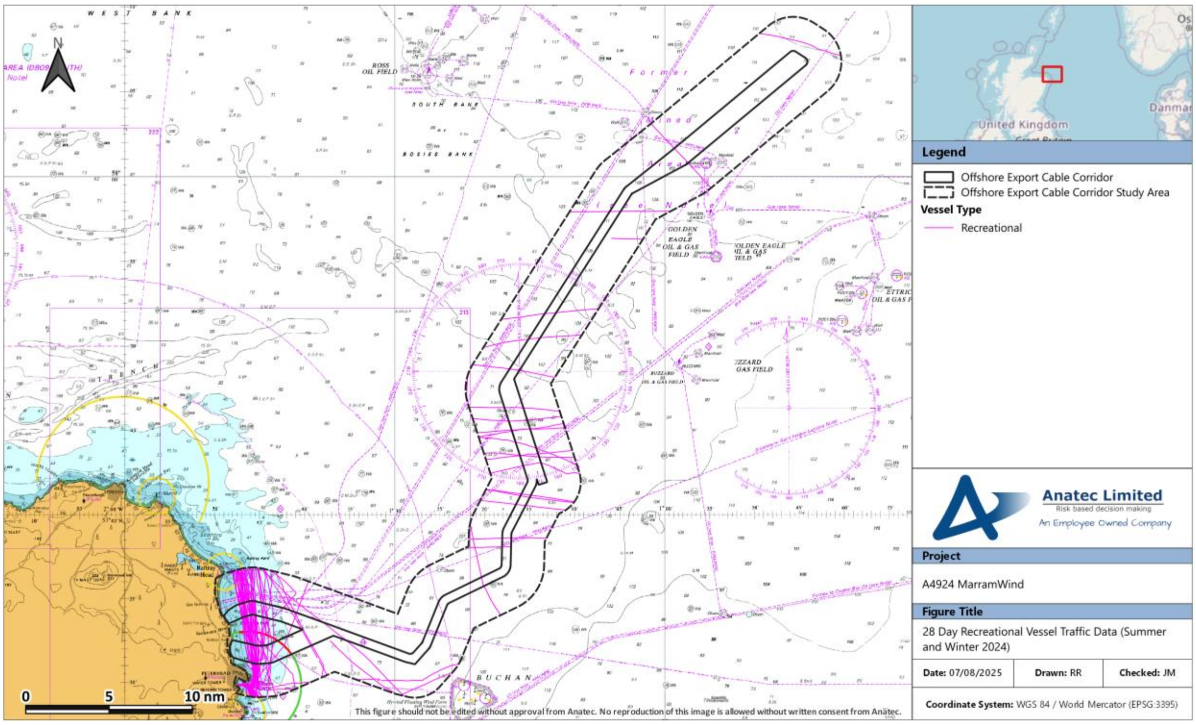


Figure 10-53 28 Days of Recreational Vessel Traffic Data (Summer and Winter 2024)

318. An average of three–four unique recreational vessels per day were recorded within the offshore export cable corridor study area during the 28-day data period, with an average of two–three vessels intersecting the offshore export cable corridor per day. Recreational vessels were highly seasonal with only two unique recreational vessel transits recorded during the Winter data period. This is expected given the more favourable weather and sailing conditions. If only accounting for the Summer data period, an average of six–seven unique vessels per day were recorded within the offshore export cable corridor study area.

319. The majority of recreational vessels were recorded inshore routeing along the coastline, including accessing Peterhead Port which has a marina and is considered a "an attractive option for a short stopover or more extended stay" (Andy Carnduff and Forth Yacht Clubs Association, 2023). Several vessels were recorded further offshore typically transiting east west and were likely on transcontinental sailings.

10.3.3 Vessel Size

10.3.3.1 Vessel Length

320. Vessel LOA was available for approximately 98% of vessels recorded throughout the combined data periods. Those vessels with unspecified LOA have been removed from the analysis where relevant.

321. The combined 28 days data is presented in **Figure 10-54**, colour-coded by LOA. Following this, a distribution of these vessel LOA is presented in **Figure 10-55**.

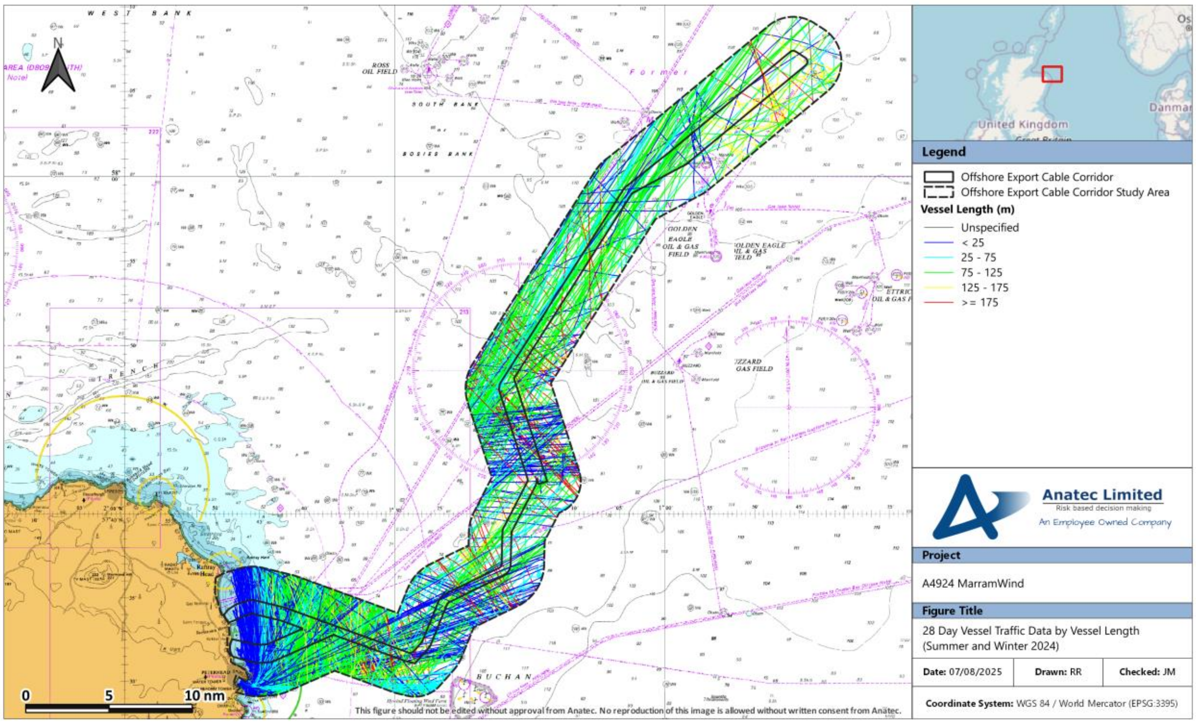


Figure 10-54 28-Day Vessel Traffic Data by Vessel Length (Summer and Winter, 2024)

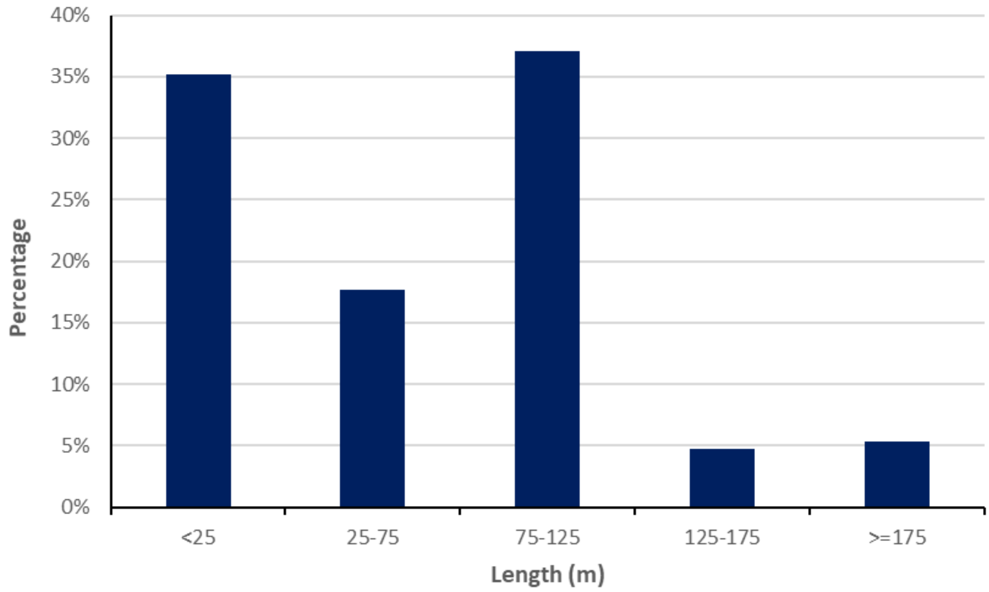


Figure 10-55 Vessel Length Distribution (Summer and Winter, 2024)

322. Of vessels with a valid LOA, the average recorded was 66m. Vessel LOA ranged from 5m for a fishing vessel to 333m for a cruise liner. The greatest portion of vessels had a LOA which ranged between 75–125m (37%) and mainly comprised of oil and gas vessels and fishing vessels. Vessels with greater LOA were primarily cruise liners, cargo vessels, and tankers with those of smaller LOA inshore recreational and fishing vessels.

10.3.3.2 Vessel Draught

323. Vessel draught was available for approximately 66% of all vessels recorded throughout the combined data periods. Vessels with unspecified vessel draughts were primarily inshore fishing vessels and recreational vessels, including those carrying AIS Class B which does not include the broadcast of draughts. Vessels with unspecified draughts have been removed from the analysis where relevant.

324. The combined 28-days vessel traffic data is presented in **Figure 10-56**, colour-coded by vessel draught. Following this, a distribution of these vessel draughts is presented in **Figure 10-57**.

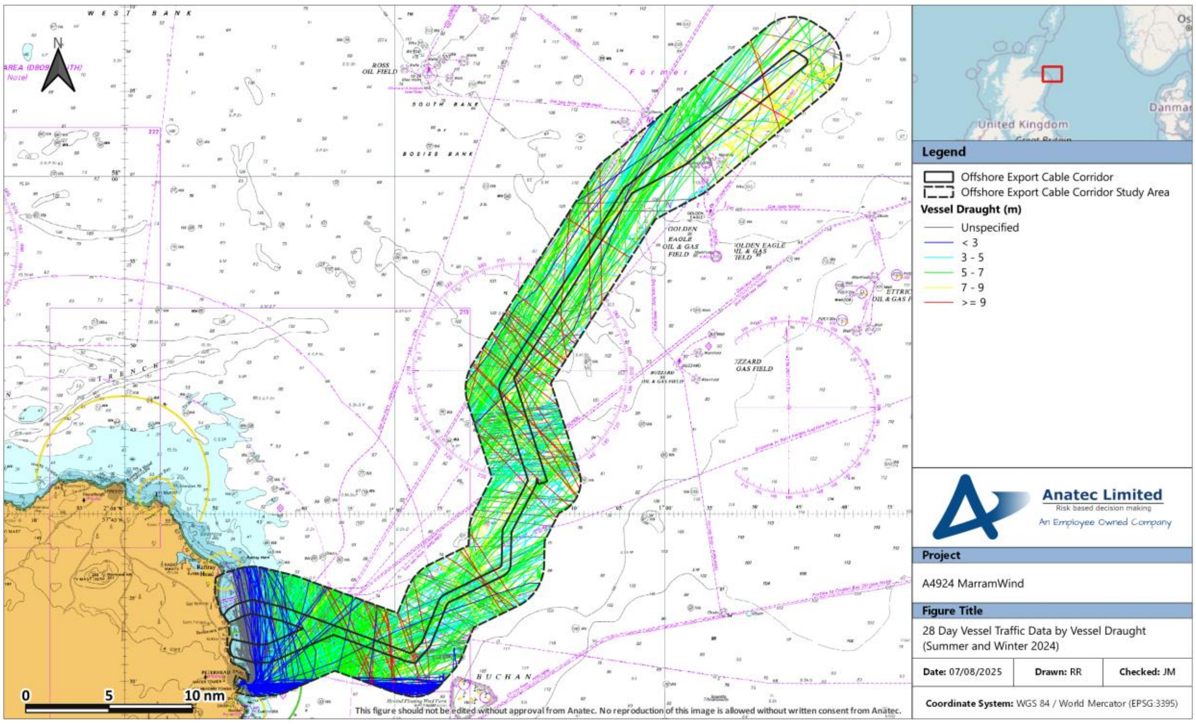


Figure 10-56 28-Day Vessel Traffic Data by Vessel Draught (Summer and Winter, 2024)

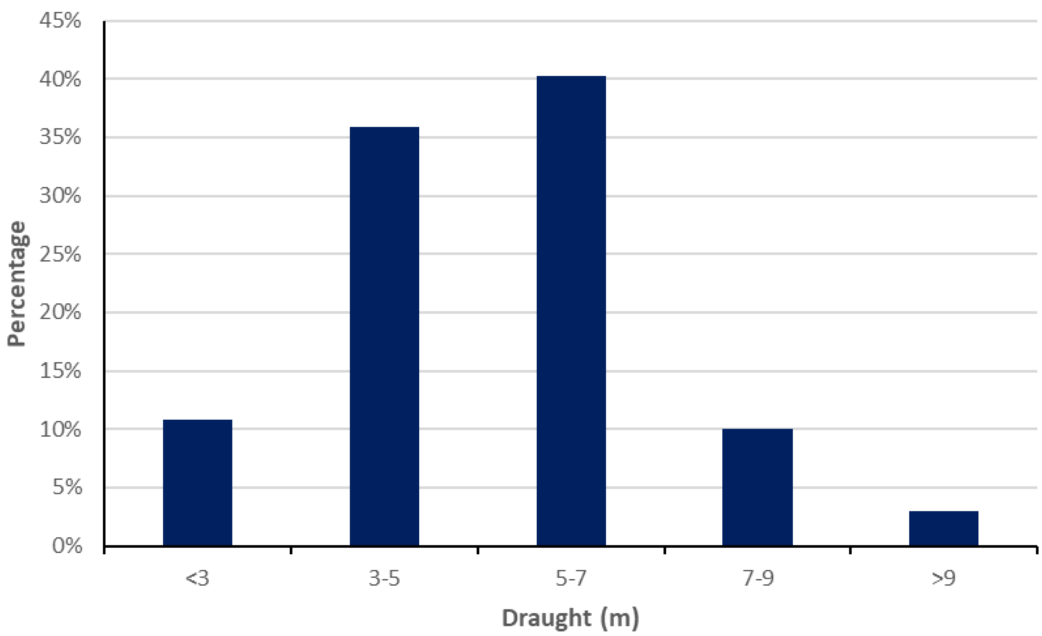


Figure 10-57 Vessel Draught Distribution (Summer and Winter, 2024)

325. Of vessels which broadcast a valid vessel draught, the average draught recorded was 5.1m. Vessel draught ranged from 0.2m for a fishing vessel to 14.7m for a bulk carrier. The deepest draught to intersect the offshore export cable corridor was 13.5m and was a container vessel. The greatest portion of vessels had a vessel draught which ranged between 5–7m (40%) and mainly comprised of oil and gas vessels. Vessels with deeper

draughts were primarily cargo vessels and tankers with those of shallower draught mainly fishing vessels, recreational vessels, as well as wind farm vessels.

10.3.4 Anchoring Activity

326. The same approach to identify anchoring activity which was detailed for the OAA in **Section 10.2.4** was applied to the 28-day vessel traffic data for the offshore export cable corridor study area. Following this, no vessels were deemed to be at anchor within the study area during the data period.

11 Base Case Vessel Routeing

11.1 Definition of a Main Commercial Route

327. Main commercial routes have been identified using the principles set out in MGN 654 (MCA, 2021). Vessel traffic data are assessed and vessels transiting at similar headings and locations are identified as a main route. To help identify main routes, vessel traffic data can also be interrogated to show vessels (by name and / or operator) that frequently transit those routes. The route width is then calculated using the 90th percentile rule from the median line of the potential shipping route as shown in **Figure 11-1**.

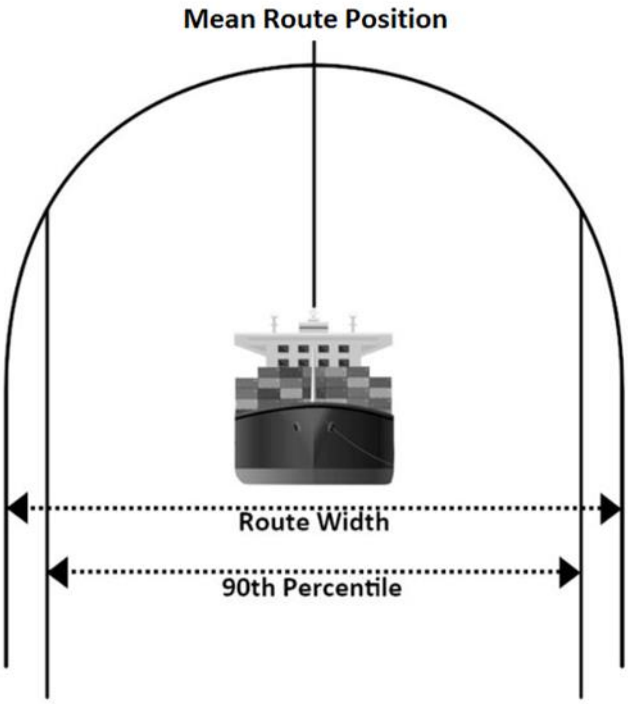


Figure 11-1 Illustration of Main Route Calculation

11.2 Pre Wind Farm Main Commercial Routes

328. A total of 19 main commercial routes were identified within the study area from the vessel traffic survey data. These main commercial routes and corresponding 90th percentiles within the study area are shown relative to the OAA in **Figure 11-2**. To ensure all main commercial routes are captured, the long-term vessel traffic AIS data has been used to validate the main commercial routes identified from the vessel traffic survey data. This also ensured low use routeing was still identified and captured within the modelling (see **Section 15**).

329. A total of 31 main commercial routes were identified within the RCP search area study area from the 12-month AIS data. These main commercial routes and corresponding 90th percentiles within the study area are shown relative to the RCP search area in **Figure 11-3**.

330. Of all those identified, 15 routes were present across both the study area and the RCP search area study area. Only four routes were unique to the study area, and 16 routes were unique to the RCP search area study area.

331. A description of each route is provided in **Table 11.1**, including the average number of vessels per day, start and end locations, and main vessel types, as well as their overlap with the respective study areas for the OAA and RCP Search area. It is noted that the start and end locations are based on the most common destinations transmitted via AIS by vessels on those routes (i.e., there may be vessels on any given route bound for destinations other than those listed).

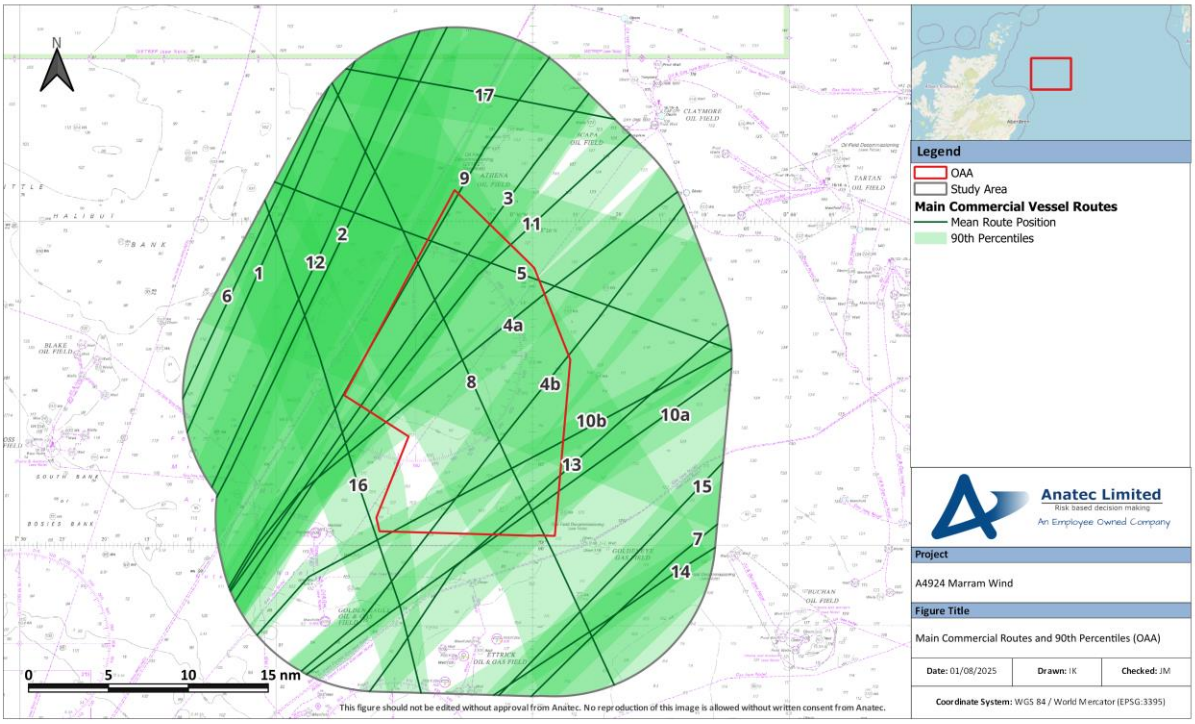


Figure 11-2 Main Commercial Vessel Routes and 90th Percentiles (OAA)

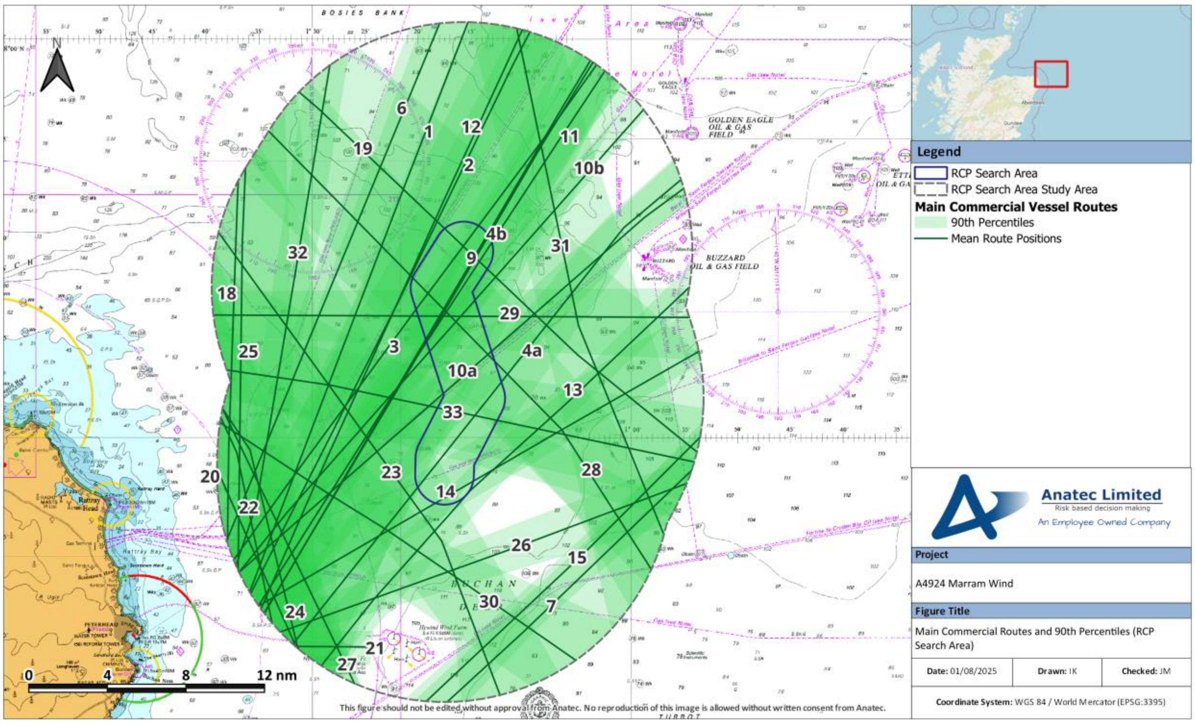


Figure 11-3 Main Commercial Vessel Routes and 90th Percentiles (RCP Search Area)

Table 11.1 Main commercial vessel route descriptions

Route Number	Average Vessels Per Week	Area of Interest		Description
		OAA	RCP	
1	10	✓	✓	**Aberdeen – Penguin / Cormorant Oil Fields**. Oil and gas vessels.
2	10	✓	✓	**Aberdeen – Alywin / Ninian Oil Fields**. Oil and gas vessels.
3	9	✓	✓	**Peterhead – Mariner Oil Field**. Oil and gas vessels.
4a & 4b	8	✓	✓	**Aberdeen – Gryphon / Harding Oil Fields**. Primarily oil and gas vessels. This route typically routes north of the Golden Eagle platform (Route 4a with 66% vessels) but on occasion would also route south of the platform (Route 4b, 33% of vessels).
5	8	✓	×	**Baltic ports – US / Canadian / Irish / north-west UK ports via Pentland Firth.** Commercial vessels.
6	7	✓	✓	**Peterhead – Heather / Thistle / Magnus Oil Fields**. Oil and gas vessels.
7	7	✓	✓	**Aberdeen – Brae Oil Field**. Primarily oil and gas vessels.
8	6	✓	×	**German / Dutch ports – Northern Isle ports**. Commercial vessels.
9	4-5	✓	✓	**Aberdeen – Mariner / Beryl Oil Fields**. Primarily oil and gas vessels.
10a &10b	4-5	✓	✓	**Peterhead – Scott Oil Field.** Oil and gas vessels. This route typically routes south of the Golden Eagle Platform (Route 10a with 80% vessels) but on occasion would also route north of the platform (Route 10ba, 20% of vessels).
11	4-5	✓	✓	**Aberdeen – Claymore Oil Field**. Oil and gas vessels.
12	4	✓	✓	**Aberdeen – Kraken Oil Field (Armada FPSO).** Oil and gas vessels.
13	4	✓	✓	**Aberdeen – Piper Oil Field**. Oil and gas vessels.
14	3-4	✓	✓	**Peterhead – Global Producer III (Dumbarton / Balloch / Lochranza Oil Fields).** Primarily oil and gas vessels.
15	2-3	✓	✓	**Aberdeen – Scott Oil Field**. Primarily oil and gas vessels.

Route Number	Average Vessels Per Week	Area of Interest		Description
		OAA	RCP	
16	1-2	✓	×	**Dutch ports – Icelandic / Faroese ports**. Commercial vessels.
17	1-2	✓	×	**Baltic ports – Irish ports.** Cargo vessels.
18	12	×	✓	**Aberdeen – Kirkwall – Lerwick**. Serco NorthLink Ferries RoRo and RoPax route.
19	8	×	✓	**Germany – US / Canada**. Primarily cargo vessels.
20	8	×	✓	**Dutch ports – Icelandic ports.** Commercial vessels.
21	6-7	×	✓	**Peterhead – Hywind Scotland Pilot Park.** Wind farm vessels.
22	6	×	✓	**Moray Firth ports – Forth Ports**. Commercial vessels with high volume of seasonal cruise liners.
23	5-6	×	✓	**The Netherlands Ports – Glensanda (UK).** Commercial vessels.
24	5	×	✓	**Inverness – Humber Ports.** Commercial vessels.
25	4	×	✓	**Aberdeen – Clair Oil Field**. Primarily oil and gas vessels.
26	3	×	✓	**Peterhead – Alba Oil Field**. Primarily oil and gas vessels.
27	3	×	✓	**Isle of Grain (UK) – Glensanda**. Commercial vessels.
28	2-3	×	✓	**Rotterdam / Belgian ports – Irish / Canadian / north-west UK ports via Pentland Firth**. Commercial vessels.
29	2-3	×	✓	**Inverness (UK) – Scandinavian ports**. Primarily cargo vessels.
30	2	×	✓	**German ports – Cromarty Firth ports.** Commercial vessels with seasonal cruise liners.
31	2	×	✓	**Rotterdam – Faroese / Icelandic Ports.** Commercial vessels.
32	2	×	✓	**Aberdeen – Bleo Holm FPSO (Ross Oil Field).** Oil and gas vessels.
33	1-2	×	✓	**Cromarty Firth ports – Scandinavian Ports.** Commercial vessels.

12 Adverse Weather Vessel Traffic Movements

332. Some vessels and vessel operators may operate alternative routes during periods of adverse weather. This section focuses on vessel movements in adverse weather given the implications if a commercial vessel is unable to make passage or a small craft is unable to access safe havens in adverse weather due to the presence of the Project or activities associated with the Project.

333. Adverse weather includes wind, wave, and tidal conditions as well as reduced visibility due to fog that may hinder a vessel's standard route, speed of navigation and / or 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 depends upon the actual stability parameters, hull geometry, vessel type, vessel size, and speed.

12.1 Identification of Periods of Adverse Weather

334. The vessel traffic survey data has been checked for instances of adverse weather, based on the weather log maintained by the on-site survey vessel. No such instances were recorded during the Summer survey, and several instances of rough seas were recorded during the Winter survey, however, the survey vessel was able to remain on-site during the entirety of the survey period.

335. As for periods of adverse weather during the long-term data period, which covers the same period across the OAA and RCP search area (entirety of 2024), historical weather information provided by the Met Office (Met Office, 2025) has been used to identify periods of adverse weather during 2024. By investigating such identified periods, cases where routes may have been altered or cancelled can then be identified. The key weather events identified, and the overlap with each dataset, are detailed in **Table 12.1**.

Table 12.1 2024 weather events relevant to the Project (Met Office, 2025)

Weather Event	Date	Details
Storm Henk	2 January 2024	Strong winds and heavy rain.
Storm Isha and Storm Jocelyn	21–24 January 2024	Strong winds gusting at 60–70kt. Certain ferry services in Scotland were cancelled.
Storm Kathleen	6–7 April 2024	Strong winds gusting widely at over 50Kt around coastlines. Certain ferry services were disrupted.
Storm Lilian	22–23 August 2024	Strong winds and heavy rain.

Weather Event	Date	Details
Storm Ashley	18 October 2024	Strong winds and heavy rain. Certain ferry services in Scotland were cancelled.
Storm Bert and Storm Conall	22–27 November 2024	Extremely heavy rain, snow and winds. Certain ferry services in Scotland were cancelled.

12.2 Adverse Weather Effects of Vessel Traffic

336. The vessel traffic survey data and the long-term vessel traffic data for the RCP search area was assessed for any vessel movements which could be associated with these periods of adverse weather. This analysis along with consultation has been used to identify potential commercial routeing activity related to adverse weather conditions in proximity to the Project, with the periods outlined in **Table 12.1** and commercial ferries (which can be seen to make similar transits on a very regular basis) studied most closely.

337. Additionally, as part of the Regular Operator consultation, Regular Operators identified from the long-term vessel traffic data were asked "*Whether the presence of the Project poses any safety concerns to your vessels, including in relation to adverse weather routeing*" (**Appendix D**).

12.2.1 Serco NorthLink Ferries

338. From all routes identified in the OAA and RCP search area study areas, only Route 18 contains transits from commercial ferries. Route 18 is the Serco NorthLink regular commercial ferry route operated by two RoRo and two RoPax vessels between Aberdeen and the Northern Isles (Lerwick and Kirkwall) and is only present to the west of the RCP search area study area. Adverse weather transits were identified in the 12-month AIS data for vessels on this route as highlighted in the vessel traffic baseline (see **Sections 10.2.2.3** and **10.2.2.4**). Adverse weather transits were seen to pass further offshore and alter course by 90° before returning to the mean route position, with several of these transits intersecting the RCP search area and on occasion reaching the study area, but only one transit intersected the northern point of the OAA (**Appendix E, Figure E.12**).

339. When aligning these transits with the periods of adverse weather outlined in **Table 12.1**, several transits were recorded on days during Storm Ashley where disruptions were recorded (Shetland News, 2024a) and during Storm Bert and Conall again when disruptions were recorded (Shetland News, 2024b) Several Serco NorthLink Ferry sailings were cancelled also during these periods with sailings cancelled for three days during Storm Henk (Shetland News, 2024c) and several disruptions to ferry sailings were recorded during Storm Isha and Jocelyn (Shetland News, 2024d).

340. Consultation was undertaken with Serco NorthLink Ferries in July 2025 (see **Section 4**). Serco NorthLink confirmed these transits to be adverse weather routeing and highlighted that the sea area near Rattray Head on the Aberdeenshire coast can be particularly rough and so by passing further offshore, Masters are able to make passage more comfortably,

ensuring a good angle for waves and wind is obtained, particularly in south-easterly winds which can cause the vessels to roll. This is also important for RoPax vessels with passengers on board.

341. Serco NorthLink also confirmed that passing further offshore than what has been identified in the vessel traffic data is unlikely given increased mileage, fuel use and that vessels are on timetabled routes. Subsequently, Serco NorthLink confirmed the presence of the OAA is of no concern to this route, even in periods of adverse weather.

342. As for transits in proximity to the RCP search area, Serco NorthLink confirmed that at the time of the RCP installation, new stabilised freight ferries would be in use (by 2029) which should reduce the frequency of such offshore routeing, RoPax vessels already have such stabilisers and so it is not anticipated that the RCP would adversely impact vessels on this route and Serco NorthLink have confirmed this to be the case.

12.2.2 Regular Operator Outreach

343. During the Regular Operator Outreach (see **Section 4**), operators were asked to comment on safety concerns regarding their vessels, including any adverse weather routeing. Out of the operators who responded no operator noted any serious concern regarding adverse weather.

344. Fletcher Group noted in their response that their vessels are already used to navigating through and around various oil and gas assets in the North Sea and this can be exacerbated during adverse weather, but vessels may adjust course and or their speed to combat the effects of the weather.

345. Tidewater Marine noted on behalf of a vessel master routing to oil and gas fields in the northern North Sea, that in certain weather conditions the vessel may use alternative routes but would mostly apply to the Winter season. No other safety concerns were raised.

13 Cumulative and Transboundary Overview

346. Cumulative effects have been considered for activities in combination and cumulatively with the Project. This section provides an overview of cumulative developments screened into the cumulative risk assessment based on the criteria outlined in **Section 3.3**.

347. The outputs of the cumulative risk assessment are then provided in **Section 21**.

13.1 Offshore Wind Farm Developments

348. In addition to the Project, there are several other proposed offshore wind farm projects located in the North Sea. Screened in developments within 50nm of the OAA are detailed in **Table 13.1** along with their associated tier based on the criteria outlined in **Section 3.3**. Following this, these developments are illustrated in **Figure 13-1**. The project statuses listed are as of October 2025.

349. Several offshore wind farms fall within the 50nm buffer of the OAA but have been screened out. Hywind Scotland Pilot Park has been screened out due to this project already being operational and so is part of the baseline assessment. Caledonia and Ayre offshore wind farms have only intersect the edge of the 50nm buffer and along with Broadshore Hub have been screened out due to their lack of interaction with any vessel traffic associated with the Project are not considered relevant. Avalon Offshore Wind Farm, although within the 50nm buffer, has also been screened out due to low data confidence.

Table 13.1 Cumulative screening summary for offshore wind farm developments

Project	Status (as of October 2025)	Distance (nm)			Data Confidence	Tier
		OAA	RCP Search Area	Offshore Export Cable Corridor		
Green Volt	Consented	4.7	15	9.6	High	1
Salamander	Consented	25	0	0.5	High	1
Aspen	Scoped	14	24	22	High	2
Buchan	Under Determination	13	23	16	High	2
Flora	In Planning	32	6.9	7.0	Low	2
Muir Mhòr	Under determination	32	19	10	High	2
Stromar	Scoped	39	41	39	High	2
CampionWind	Scoped	33	34	35	High	2

Project	Status (as of October 2025)	Distance (nm)			Data Confidence	Tier
		OAA	RCP Search Area	Offshore Export Cable Corridor		
Scaraben	Scoped	23	23	20	High	3

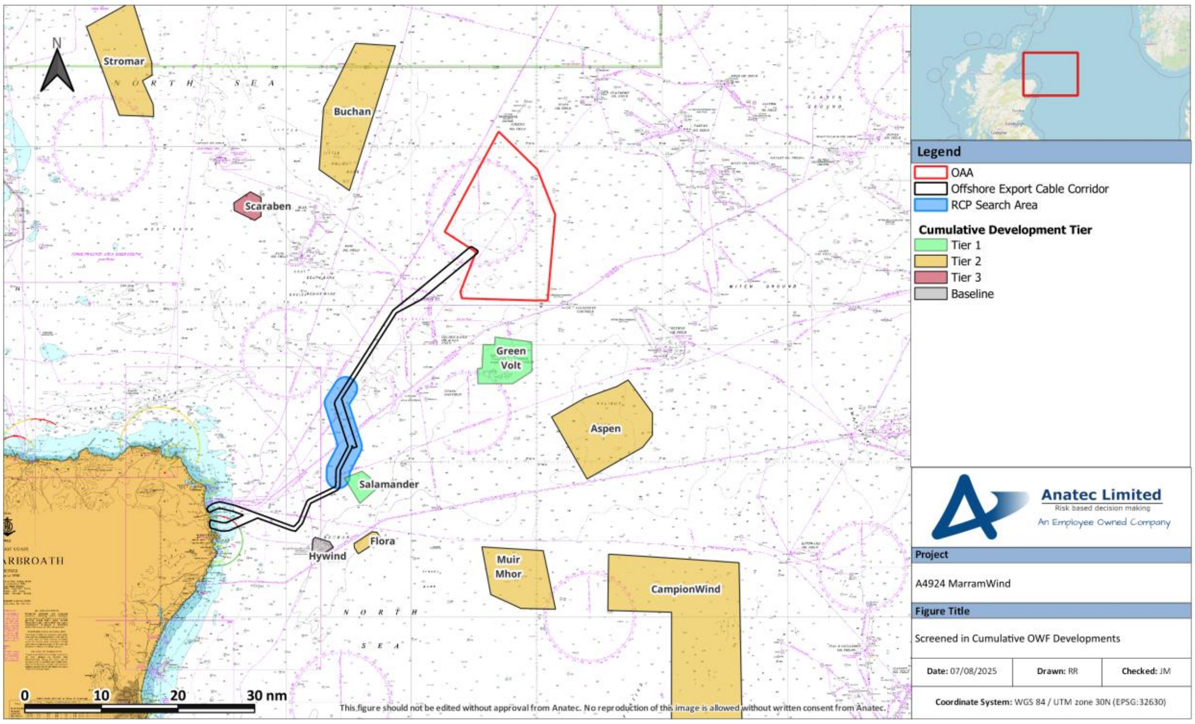


Figure 13-1 Screened in Cumulative offshore wind farm Developments

13.2 Subsea Cable Developments

350. Eastern Green Link 2 (EGL2) is a consented subsea cable which would fall within 2nm of the offshore export cable corridor and would make landfall at Peterhead, although is not anticipated to intersect the offshore export cable corridor itself. In addition, Eastern Green Link 3 (EGL3) is in planning and would pass within 2nm of the offshore export cable corridor again making landfall at Peterhead and not anticipated to intersect the offshore export cable corridor itself.

351. The Spittal to Peterhead HVDC link subsea cable aiming to connect Caithness (Spittal) and Aberdeenshire (Peterhead) is currently in planning and at the time of writing had submitted its Marine Licence to MD-LOT. The subsea cable would fall within 2nm of the offshore export cable corridor as it is anticipated to make landfall at Rattray Head.

352. Both EGL2 and EGL3 and the Spittal to Peterhead HVDC link have been screened into the cumulative risk assessment. These subsea cable developments are detailed in **Table 13.2**.

Table 13.2 Cumulative screening summary for subsea cables

Project	Status (as of September 2025)	Distance (nm)			Data Confidence	Tier
		OAA	RCP Search Area	Offshore Export Cable Corridor		
EGL2	Consented	N/A	N/A	<2	High	3
EGL3	In planning	N/A	N/A	<2	High	3
Spittal to Peterhead HVDC link	Applicated submitted	N/A	N/A	<2	High	3

13.3 Oil and Gas Developments

353. The Golden Eagle Oil Field is the only oil and gas development which falls with the cumulative criterion outlined in **Table 3.4**. The oil field has been operational since 2014 and so there is potential for the field to be decommissioned during the lifetime of the Project. However, no scheduled decommissioning has been proposed at the time of writing and data confidence is low.

354. This development is detailed in **Table 13.3**.

Table 13.3 Cumulative screening summary for oil and gas developments

Project	Status (as of September 2025)	Distance (nm)			Data Confidence	Tier
		OAA	RCP Search Area	Offshore Export Cable Corridor		
Golden Eagle Oil Field (Surface Platform)	Operational	4.9	12	3.3	Low	3

13.4 Other Cumulative Developments

355. Although within proximity to the Project, the Acorn Carbon Capture and Storage Sites; CS011 and CS012, have been screened out of the assessment due to low data confidence.

356. No subsea pipelines, marine aggregate dredging areas, port developments, disposal sites, or wave / tidal developments have been screened into the cumulative assessment.

This is due either to any identified projects already being operational or already active (and thus part of the baseline assessment) or no clear pathway through which a potentially significant hazard may arise.

357. It was noted during the Hazard Workshop that both Peterhead Port and Fraserburgh Harbour are planning to undergo port developments. Fraserburgh Harbour Development submitted their Scoping Report in February 2025, however it was noted during consultation they are still awaiting funding and so there are no updates on progress. At this stage data confidence is low and so both developments have not been scoped into the assessment but have been accounted for as part of the future case vessel traffic (see **Section 14**).

14 Future Case Vessel Traffic

358. The vessel traffic baseline established in **Section 10** is used as input into the risk assessment (from **Sections 18**). However, it is also necessary to consider potential future case vessel traffic in terms of general volume and size changes, port developments which may influence movements, and changes to movements associated with the presence of the Project (the post wind farm scenario).

359. The following subsections outline the future case scenarios which have been used to inform the risk assessment, and which has also been applied to the collision and allision risk modelling in **Section 16**.

360. These increases in vessel traffic were proposed to stakeholders at the Hazard Workshop and no concerns were raised.

14.1 Increases in Commercial Vessel Activity

361. Given future commercial traffic trends are dependent on various factors, and hence are difficult to predict, the NRA has assumed potential increases of 10% and 20% within the commercial traffic allision and collision modelling. The consideration of a range of conservative values is considered as covering potential increases over the course of the Project's operational lifespan. These values were proposed during the Hazard Workshop and no concerns were raised.

362. These values also consider that oil and gas vessels may decrease over time due to the decommissioning of oil and gas structures in the North Sea but may be repurposed across the offshore wind industry and can balance out the reduction in oil and gas movements.

363. At the Hazard Workshop in July 2025, Peterhead Port was in agreement with the 20% increase of vessel traffic as it would be realistic if any port developments in the area went ahead.

364. It was also noted at the Hazard Workshop that Fraserburgh Harbour had submitted the Scoping Report for the Fraserburgh Harbour Masterplan (Fraserburgh Harbour Commissioners, 2025b). However, at the time of writing, funding was still being sourced, and no updates were given.

14.2 Increases in Commercial Fishing Activity

365. Indicative 10% and 20% increases in commercial fishing vessel transits have been considered in the modelling undertaken within the NRA. These values are used due to there again being limited reliable information on future activity levels upon which any firm assumption can be made. It is noted that additional information on commercial fishing trends is contained within **Volume 2, Chapter 14: Commercial Fisheries**.

366. As raised during consultation by the MCA, it has been acknowledged that the long-term agreement by The Specialised Committee on Fisheries (SCF) to allow EU vessels to have continued access to UK waters has been extended until 2038.

14.3 Increases in Recreational Activity

367. There are no known developments which would increase the activity of recreational vessels within the area. Therefore, as with commercial fishing activity, given the lack of reliable information relating to future trends, 10% and 20% increases are considered conservative, and have therefore been applied.

14.4 Increase Associated with Project Activities

368. The anticipated number of vessels associated with the Project during the construction and O&M stages are presented in **Section 6.6**. Base ports have not yet been determined for any stage of the Project and therefore it is not possible to provide any detailed overview of the likely pattern of project vessel movements.

14.5 Commercial Traffic Routeing (Project in Isolation)

14.5.1 Methodology

369. It is not possible to consider all potential alternative routeing options for commercial traffic and therefore alternatives have been based upon worst-case assumptions to ensure exposure to wind farm structures is maximised.

370. Assumptions for re-routeing include:

- All alternative routes maintain a minimum mean distance of 1nm from offshore installations and existing offshore wind farm boundaries in line with industry experience. This distance is considered for shipping and navigation from a safety perspective as explained below; and
- All mean routes take into account known routeing preferences including consideration of banks / shallows, existing oil and gas infrastructure, and AtoNs.

371. Annex 1 of MGN 654 defines a methodology for assessing passing distance from offshore wind farm boundaries, noting that it also states that the methodology is "*not a prescriptive tool but needs intelligent application"* (MCA, 2021).

372. To date, internal and external studies undertaken by Anatec on behalf of the UK Government and individual clients show that vessels do pass consistently and safely within 1nm of established offshore wind farms (including between distinct developments), and these distances vary depending upon the sea room available as well as the prevailing conditions. This evidence also demonstrates that the mariner defines their own safe passing distance based upon the conditions and nature of the traffic at the time, but they are shown to frequently pass 1nm off established developments.

373. The NRA also aims to establish the worst case scenario based on navigational safety parameters. On this basis the most conservative realistic scenario for vessel routeing is considered to be mean route positions passing 1nm off developments. Evidence collected during numerous assessments at an industry level confirms that it is a safe and reasonable distance for vessels to pass; however, it is likely that a large number of vessels would instead choose to pass at a greater distance depending upon their own passage plan and the current conditions.

374. The UK Chamber of Shipping raised at the Hazard Workshop the potential for vessels to pass at greater than 1nm off floating developments given the presence subsea infrastructure. Given the lack of commercial-scale floating developments to date there is inadequate evidence to support an alternative approach, and it is noted that all subsea infrastructure would be contained within the charted boundary of the OAA.

375. This methodology was presented to stakeholders at the Hazard Workshop.

14.5.2 Main Commercial Route Deviations

376. The methodology detailed in **Section 14.5.1** has been applied to potential deviations that may arise to the base case routes identified and discussed in **Section 11.2**.

377. An illustration of the anticipated worst-case shift in the mean route positions of the main commercial routes within the study area following the development of the OAA is presented in **Figure 14-1**. Following this, the shift in the mean route positions of the main commercial routes within the RCP search area study area following the development of the RCP is presented in **Figure 14-2**.

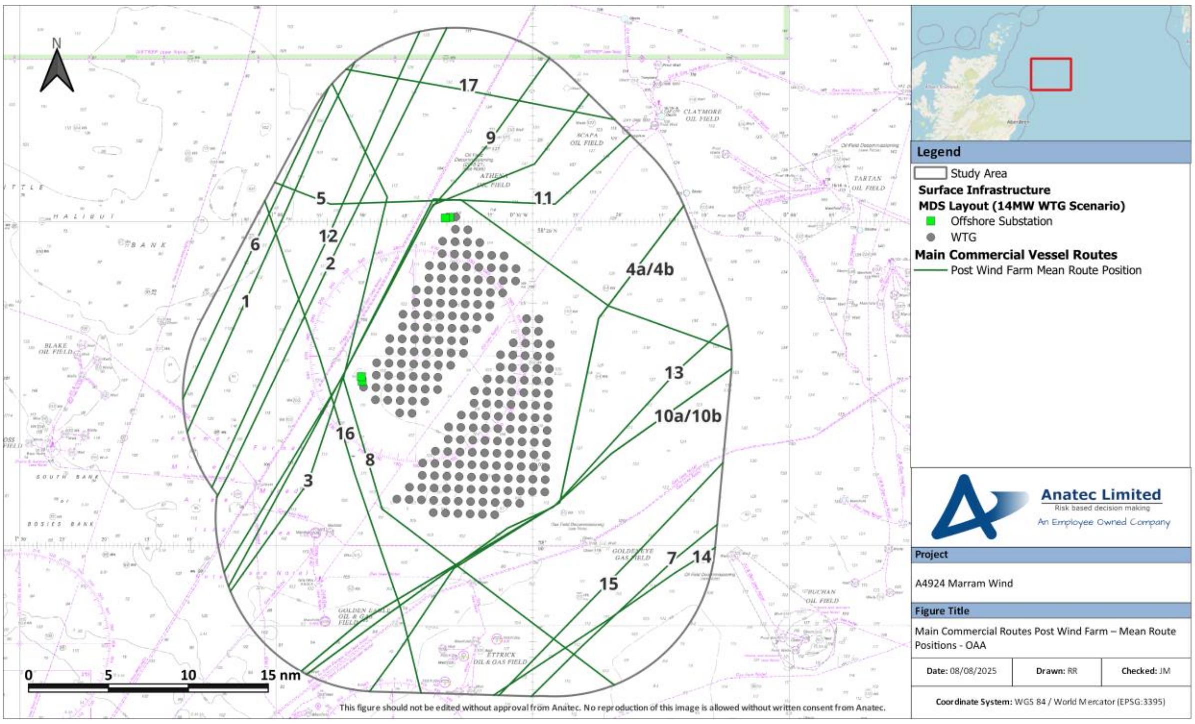


Figure 14-1 Main Commercial Routes Post Wind Farm – Mean Route Positions – OAA

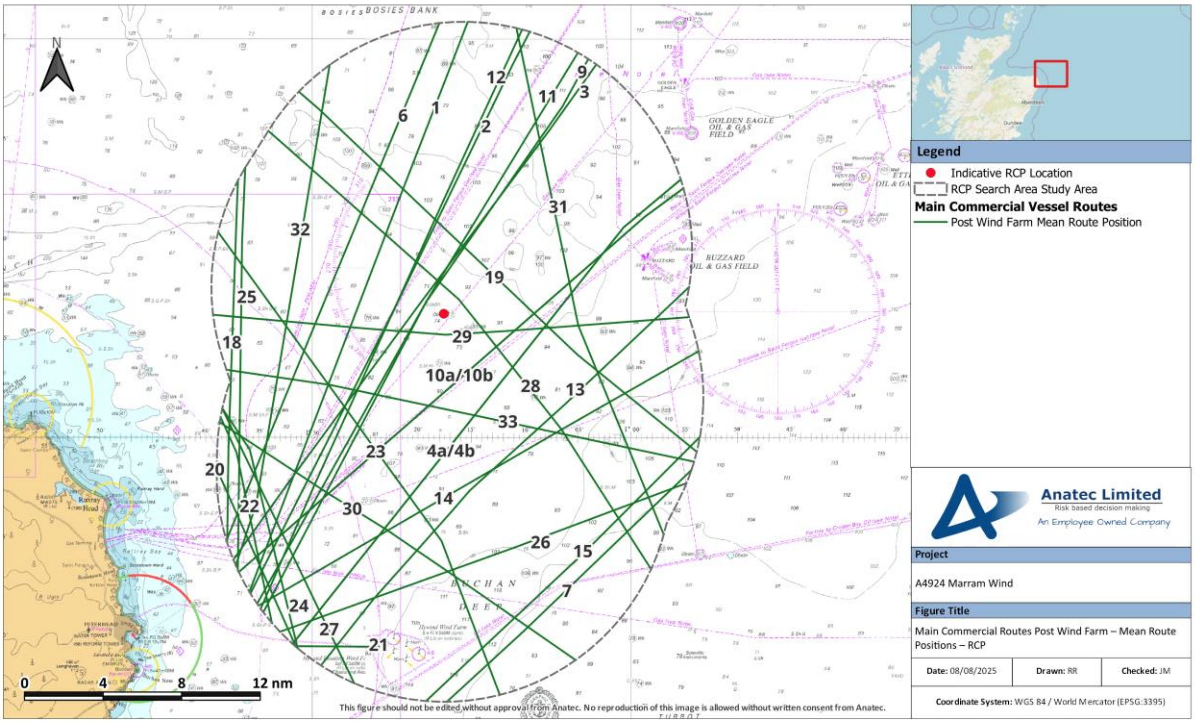


Figure 14-2 Main Commercial Routes Post Wind Farm – Mean Route Positions – RCP

378. Deviations of main commercial routes from the pre wind farm scenario would be required for 12 out the 35 main commercial routes identified across both study areas, with deviations ranging from less than a 0.1% distance increase for Routes 9, 28, and 29

to a 3.6% distance increase for Route 11 between Aberdeen and the Claymore Oil Field, noting this is a particularly short route.

379. A total of ten of the deviated routes require deviation due to the presence of the OAA layout and six due to the presence of the RCP.

380. Deviated routes are detailed further in **Table 14.1**.

Table 14.1 Summary of post wind farm deviated main commercial routes

Route Number	Description	Increase in Route Length (nm)	Percentage Change in Total Route Length (%)	Nature of Deviation
3	Peterhead – Mariner Oil Field.	1.5	0.9	Passing north-west of the OAA.
4a	Aberdeen – Gryphon / Harding Oil Fields	1.2	0.7	Routes 4a and 4b merging and passing south of OAA. Route 4b also passing south-east of RCP.
4b		2.2	1.2	
5	Baltic ports – US / Canadian / Irish / north-west UK ports via Pentland Firth	1.0	0.1	Passing north of the OAA.
8	German / Dutch ports – Northern Isle ports	4.7	0.9	Passing west of the OAA.
9	Aberdeen – Mariner / Beryl Oil Fields	0.2	<0.1	Passing north-west of the OAA and RCP.
10a	Peterhead – Scott Oil Field	0.1	0.1	Routes 10a and 10b merged and passing south of OAA. Route 10b also passing south-east of RCP *Overall route length for 10b decreases due to merging.*
10b		-0.9	-1.2	
11	Aberdeen – Claymore Oil Field	3.5	3.6	Passing north-west of the OAA and RCP.
13	Aberdeen – Piper Oil Field	0.2	0.2	Passing south of the OAA.
28	Rotterdam / Belgian ports – Irish / Canadian / north-west UK ports via Pentland Firth	<0.1	<0.1	Passing north-east of RCP.
29	Inverness – Scandinavian ports.	<0.1	<0.1	Passing south of RCP.

14.6 Commercial Traffic Routeing (Cumulative)

381. An illustration of the anticipated worst-case shift in the mean positions of the main commercial routes within a 50nm buffer following the development of the Project and Tier 1 and Tier 2 cumulative projects (**Section 13.1**) is presented in **Figure 14-3**. Again, these deviations are based on Anatec's assessment of the worst-case and follow the same methodology outlined for deviations due to the Project in isolation (**Section 14.5.1**).

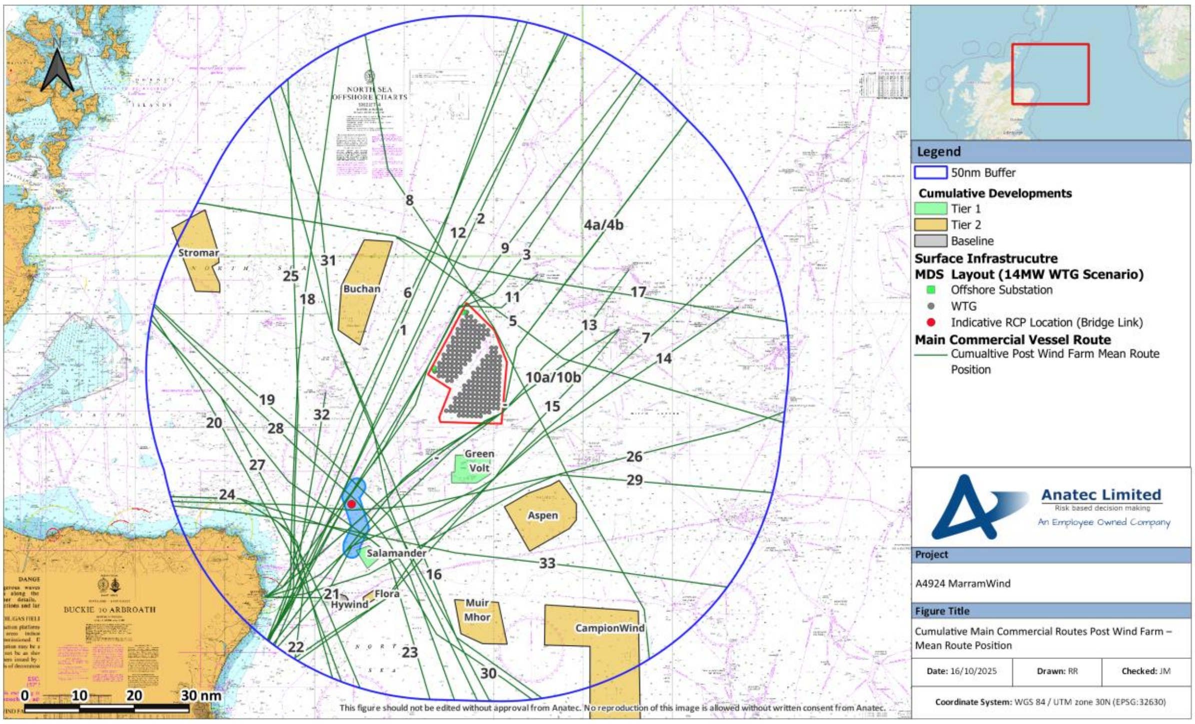


Figure 14-3 Cumulative Main Commercial Routes Post Wind Farm – Mean Route Position

382. At a cumulative level, deviations would be required for 22 of the 35 main commercial routes identified in the pre wind farm scenario, across both study areas.

383. Of these 22 deviations, eight routes would not be further affected by cumulative developments, and the route remains the same as in the post wind farm in isolation scenario, i.e., the presence of the Tier 1 and Tier 2 cumulative projects does not further increase the deviation. These are Routes 3, 4a and 4b, 9, 10a and 10b, 11, and 28.

As noted in **Section 14.5.2**, 12 main commercial routes were deviated due to the presence of the Project in isolation. With the presence of Tier 1 and Tier 2 developments, four of these routes would require additional deviations on top of the already deviated route in isolation. These routes are route 5, 8, 13, and 29. Routes 5, 8, and 29 are impacted by the presence of the OAA and Route 29 is impacted by the presence of the RCP. Due to the nature of the cumulative deviation, Route 8 would require a shorter deviation cumulatively than that seen when deviated in isolation.

384. With the presence of Tier 1 and Tier 2 developments a further ten routes are also impacted. These remaining ten routes deviated at a cumulative level (Routes 7, 14, 15, 16, 17, 19, 23, 26, 30, and 31) are not impacted by the presence of the Project in any scenario. These routes would require a level of deviation, as illustrated in **Figure 14-3**, if the cumulative developments were to be developed even if the Project was not, and so the Project has no direct impact on these routes.

385. A total of 13 routes do not require any deviation both in isolation and at a cumulative level.

386. **Table 14.2** provides a summary of the screened in developments that each main route identified has the potential to interact with assuming pre wind farm routeing patterns.

Table 14.2 Cumulative routeing interaction summary

Route Number	Route Deviated in Isolation		The Project (Cumulative)	Tier 1 Developments		Tier 2 Developments					
	OAA	RCP		Green Volt	Salamander	Buchan	Flora	Aspen	Stromar	Muir Mhòr	CampionWind
1	×	×	×	×	×	×	×	×	×	×	×
2	×	×	×	×	×	×	×	×	×	×	×
3	✓	×	×	×	×	×	×	×	×	×	×
4a	✓	×	×	×	×	×	×	×	×	×	×
4b	✓	✓	×	×	×	×	×	×	×	×	×
5	✓	×	×	×	×	✓	×	×	✓	×	×
6	×	×	×	×	×	×	×	×	×	×	×
7	×	×	×	×	×	×	✓	×	×	×	×
8	✓	×	×	×	×	×	×	✓	×	×	✓
9	✓	✓	×	×	×	×	×	×	×	×	×
10a	✓	×	×	×	×	×	×	×	×	×	×
10b	✓	✓	×	×	×	×	×	×	×	×	×
11	✓	✓	×	×	×	×	×	×	×	×	×
12	×	×	×	×	×	×	×	×	×	×	×
13	✓	×	×	✓	✓	×	×	×	×	×	×
14	×	×	×	✓	✓	×	×	×	×	×	×
15	×	×	×	✓	×	×	✓	×	×	×	×
16	×	×	×	×	×	✓	×	×	×	✓	×

Route Number	Route Deviated in Isolation		The Project (Cumulative)	Tier 1 Developments		Tier 2 Developments					
	OAA	RCP		Green Volt	Salamander	Buchan	Flora	Aspen	Stromar	Muir Mhòr	CampionWind
17	×	×	×	×	×	✓	✓	×	×	×	×
18	×	×	×	×	×	×	×	×	×	×	×
19	×	×	×	×	×	×	×	×	×	✓	✓
20	×	×	×	×	×	×	×	×	×	×	×
21	×	×	×	×	×	×	×	×	×	×	×
22	×	×	×	×	×	×	×	×	×	×	×
23	×	×	×	×	✓	×	✓	×	×	×	×
24	×	×	×	×	×	×	×	×	×	×	×
25	×	×	×	×	×	×	×	×	×	×	×
26	×	×	×	×	✓	×	×	×	✓	×	×
27	×	×	×	×	×	×	×	×	×	×	×
28	×	✓	×	×	×	×	×	×	×	×	×
29	×	✓	×	×	×	×	×	✓	×	×	×
30	×	×	×	×	✓	×	×	×	×	×	×
31	×	×	×	×	×	✓	×	×	×	×	×
32	×	×	×	×	×	×	×	×	×	×	×
33	×	×	×	×	×	×	×	×	×	×	×

15 Navigation, Communication, and Position Fixing Equipment

387. This section discusses the potential effects on the use of navigation, communication and position fixing equipment of vessels that may arise due to the infrastructure associated with the Project.

15.1 Very High Frequency Communications (including Digital Selective Calling)

388. In 2004, trials were undertaken at the North Hoyle Offshore Wind Farm, located off the coast of North Wales. As part of these trials, tests were undertaken to evaluate the operational use of typical small vessel VHF transceivers (including DSC) when operated close to WTGs.

389. The WTGs had no noticeable effect on voice communications within the array or ashore. It was noted that if small craft vessel to vessel and vessel to shore communications were not affected significantly by the presence of WTGs, then it is reasonable to assume that larger vessels with higher powered and more efficient systems would also be unaffected.

390. During this trial, a number of telephone calls were made from ashore, both within and offshore of the array. No effects were recorded using any system provider (MCA and QinetiQ, 2004).

391. Furthermore, as part of SAR trials carried out at the North Hoyle Offshore Wind Farm in 2005, radio checks were undertaken between the Sea King helicopter and both Holyhead and Liverpool coastguards. The aircraft was positioned to offshore of the array and communications were reported as very clear, with no apparent degradation of performance. Communications with the service vessel located within the array were also fully satisfactory throughout the trial (MCA, 2005).

392. In addition to the North Hoyle trials, a desk-based study was undertaken for the Horns Rev 3 Offshore Wind Farm in Denmark in 2014 and it was concluded that there were not expected to be any conflicts between point-to-point radio communications networks and no interference upon VHF communications (Energinet, 2014).

393. Following consideration of these reports and noting that since the trials detailed above there have been no significant issues with regards to VHF observed or reported, the presence of the Project is anticipated to have no significant impact upon VHF communications.

15.2 Very High Frequency Direction Finding

394. During the North Hoyle Offshore Wind Farm trials in 2004, the VHF Direction Finding (DF) equipment carried in the trial boats did not function correctly when very close to WTGs (within approximately 50m). This is deemed to be a relatively small-scale impact

due to the limited use of VHF direction finding equipment and would not impact operational or SAR activities (MCA and QinetiQ, 2004).

395. Throughout the 2005 SAR trials carried out at North Hoyle, the Sea King radio homer system was tested. The Sea King radio homer system utilises the lateral displacement of a vertical bar on an instrument to indicate the sense of a target relative to the aircraft heading. With the aircraft and the target vessel within the array, at a range of approximately 1nm, the homer system operated as expected with no apparent degradation.

396. Since the trials detailed above, no significant issues with regards to VHF DF have been observed or reported, and therefore the presence of the Project is anticipated to have no significant impact upon VHF DF equipment.

15.3 Automatic Identification System

397. No significant issues with interference to AIS transmission from operational offshore wind farms have been observed or reported to date. Such interference was also absent in the trials carried out at the North Hoyle Offshore Wind Farm (MCA and QinetiQ, 2004).

398. In theory there could be interference when there is a structure located between the transmitting and receiving antennas (i.e., blocking line of sight) of the AIS. However, given no issues have been reported to date at operational developments or during trials, no significant impact is anticipated due to the presence of the Project.

15.4 Navigational Telex System

399. The Navigational Telex (NAVTEX) system is used for the automatic broadcast of localised Maritime Safety Information (MSI) and either prints it out in hard copy or displays it on a screen, depending upon the model.

400. There are two NAVTEX frequencies. All transmissions on NAVTEX 518 Kilohertz (kHz), the international channel, are in English. NAVTEX 518 kHz provides the mariner (both recreational and commercial) with weather forecasts, severe weather warnings and navigation warnings such as obstructions or buoys off station. Depending on the user's location, other information options may be available such as ice warnings for high latitude sailing.

401. The 490 kHz national NAVTEX service may be transmitted in the local language. In the UK full use is made of this secondary frequency including useful information for smaller craft, such as the inshore waters forecast and actual weather observations from weather stations around the coast.

402. Although no specific trials have been undertaken, no significant effect on NAVTEX has been reported to date at operational developments, and therefore no significant impact is anticipated due to the presence of the Project.

15.5 Global Positioning Service

403. Global Positioning System (GPS) is a satellite based navigational system. GPS trials were also undertaken throughout the 2004 trials at North Hoyle Offshore Wind Farm, and it was stated that "*no problems with basic GPS reception or positional accuracy were reported during the trials*".

404. The additional tests showed that "*even with a very close proximity of a wind turbine to the GPS antenna, there were always enough satellites elsewhere in the sky to cover for any that might be shadowed by the wind turbine tower*" (MCA and QinetiQ, 2004).

405. Therefore, there are not expected to be any significant impacts associated with the use of GPS systems within or in proximity to the Project, noting that there have been no reported issues relating to GPS within or in proximity to any operational offshore wind farms to date.

15.6 Electromagnetic Interference

406. A compass, magnetic compass or mariner's compass is a navigational instrument for determining direction relative to the earth's magnetic poles. It consists of a magnetised pointer (usually marked on the north end) free to align itself with the Earth's magnetic field. A compass can be used to calculate heading, used with a sextant to calculate latitude, and with a marine chronometer to calculate longitude.

407. Like any magnetic device, compasses are affected by nearby ferrous materials as well as by strong local electromagnetic forces, such as magnetic fields emitted from power cables. As the compass still serves as an essential means of navigation in the event of power loss or as a secondary source, it is important that potential impacts from Electromagnetic Field (EMF) are minimised to ensure continued safe navigation.

408. The vast majority of commercial traffic uses non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by EMF. Therefore, it is considered highly unlikely that any interference from EMF as a result of the presence the Project would have a significant impact on vessel navigation. However, some smaller craft (fishing or leisure) may rely on it as their sole means of navigation.

15.6.1 Subsea Cables

409. The subsea cables for the Project would be Alternating Current (AC) or a combination of both AC and Direct Current (DC) with studies indicating that AC does not emit an EMF significant enough to impact marine magnetic compasses (Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), 2008). Therefore, electromagnetic interference due to AC cables associated with the Project are not considered any further.

410. For DC cables, the Moray Offshore Renewables Environmental Statement (Moray Offshore Renewables, 2012) notes that for both buried and protected DC cables the

magnetic field would decrease exponentially with vertical distance from the seabed and with horizontal distance from the cables (within a few metres), irrespective of whether cables are buried or protected. It states that "*in all cases, where cables are buried to 1m depth, the predicted magnetic field is expected to be below the earth's magnetic field (assumed to be 50 microtesla (µT)). Where DC cables cannot be buried and are instead protected, the magnetic field is expected to be below the earth's magnetic field within 5m from the seabed*".

411. The following are therefore considered to be important factors affecting the likelihood of EMF to affect compass deviation as a result of the presence of cables:

- Water depth;
- Burial depth (or protection);
- Type of current (AC or DC) running through cables; and /or
- Spacing or separation of the cables.

412. **Table 15.1** details assumed EMF mitigation relating to offshore export cables, noting that such an analysis is not provided for array cables since these would be entirely contained within the OAA and therefore are not expected to be subject to regular navigation by third-party vessels.

Table 15.1 EMF mitigation

Mitigation	Reasoning	Percentage of Offshore Export Cable Corridor Applied To
Cables are installed in close proximity / bundled	Industry experiences in cable installation and offshore renewables show that bundled cables or cables closely installed mitigate the effects of EMF (NorthConnect, 2018).	100%
Water depth greater than 10m	Increased water depth (vertical distance) mitigates the effects of EMF.	Approximately 98.2% is within depths greater than 10m below CD.
Water depth greater than 20m	Increased water depth (vertical distance) mitigates the effects of EMF.	Approximately 96.6% is within depths greater than 20m below CD.
Cable burial	Burial depth also increases vertical distance.	At least 80% of offshore export cables would be buried.
Cable route alignment relative to passing traffic	Vessel movements crossing the cables rather than transiting along the cables minimises the temporal effect of EMF.	There are limited instances of vessels navigating along large stretches of the route of the offshore export cable corridor. Cases of transits following only a portion of the offshore export cable corridor route are primarily associated with oil and gas vessels routeing to / from offshore oil and gas fields, but transits were spatially limited as only occurred over a small area when passing across the offshore export cable corridor.

Mitigation	Reasoning	Percentage of Offshore Export Cable Corridor Applied To
		Additionally, this was typically well offshore where depths are in excess of 90m below CD.
Compass deviation study undertaken preconstruction	MCA request a maximum three-degree deviation for 95% of the route and no more than five-degrees for the remaining 5% is acceptable.	100%

413. Given that all offshore export cables and anticipated to buried and more than 98% would be located in water depths of greater than 10m, there are not anticipated to be any effects on compass deviation for the majority of the offshore export cable corridor. This will be verified by the compass deviation study to comply with any MCA requirements post-consent.

15.6.2 Wind Turbine Generators

414. MGN 654 (MCA, 2021) notes that small vessels with simple magnetic steering and hand bearing compasses should be wary of using these close to WTGs as with any structure in which there is a large amount of ferrous material (MCA and QinetiQ, 2004). Potential effects are deemed to be within acceptable levels when considered alongside other mitigation such as the mariner being able to make visual observations (not wholly reliant on the magnetic compass), lighting, sound signals and identification marking in line with MGN 654.

15.6.3 Experience at Operation Offshore Wind Farms

415. No issues with respect to magnetic compasses have been reported to date in any of the trials (MCA and QinetiQ, 2004) undertaken (inclusive of SAR helicopters) nor in any published reports from operational offshore wind farms.

15.7 Marine Radar

416. This section summarises the results of trials and studies undertaken in relation to Radar effects from offshore wind farms in the UK. It is important to note that since the time of the trials and studies discussed, WTG technology has advanced significantly, most notably in terms of the size of WTGs available to be installed and utilised. The use of these larger WTGs allows for a greater spacing between WTGs than was achievable at the time of the studies being undertaken, which is beneficial in terms of Radar interference effects (and surface navigation in general) as detailed below.

15.7.1 Trials

417. During the early years of offshore renewables within the UK, maritime regulators undertook a number of trials (both shore-based and vessel-based) into the effects of WTGs on the use and effectiveness of marine Radar.

418. In 2004, trials undertaken at the North Hoyle Offshore Wind Farm (MCA and QinetiQ, 2004) identified areas of concern regarding the potential impact on marine- and shore-based Radar systems due to the large vertical extents of the WTGs (based on the technology at that time). This resulted in Radar responses strong enough to produce interfering side lobes and reflected echoes (often referred to as false targets or ghosts).

419. Side lobe patterns are produced by small amounts of energy from the transmitted pulses that are radiated outside of the narrow main beam. The effects of side lobes are most noticeable within targets at short range (below 1.5nm) and with large objects. Side lobe echoes form either an arc on the Radar screen similar to range rings, or a series of echoes forming a broken arc, as illustrated in **Figure 15-1**.

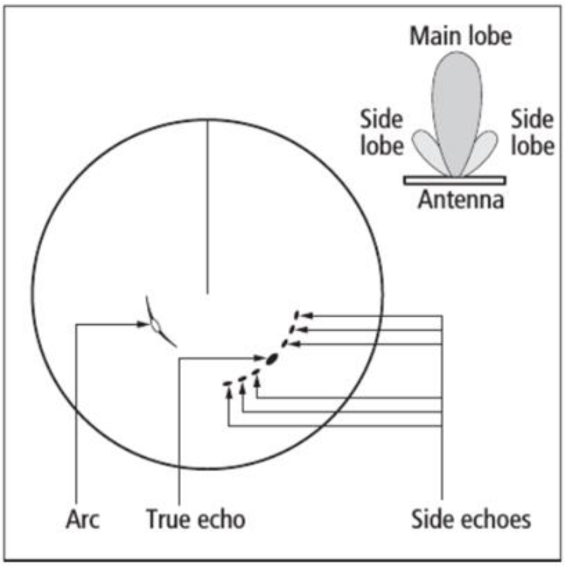


Figure 15-1 Illustration of Side Lobes on Radar Screen

420. Multiple reflected echoes are returned from a real target by reflection from some object in the Radar beam. Indirect echoes or 'ghost' images have the appearance of true echoes but are usually intermittent or poorly defined; such echoes appear at a false bearing and false range, as illustrated in **Figure 15-2**.

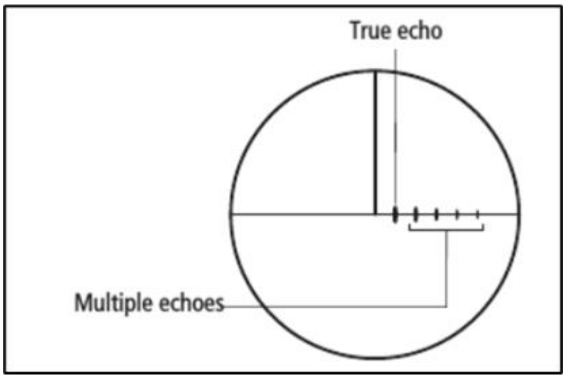


Figure 15-2 Illustration of Multiple Reflected Echoes on Radar Screen

421. Based on the results of the North Hoyle trials, the MCA produced a Shipping Route Template designed to give guidance to mariners on the distances which should be established between shipping routes and offshore wind farms. However, as experience of effects associated with use of marine Radar in proximity to offshore wind farms grew, the MCA refined their guidance, offering more flexibility within the most recent Shipping Route Template contained within MGN 654 (MCA, 2021).

422. A second set of trials conducted at Kentish Flats Offshore Wind Farm in 2006 on behalf of the British Wind Energy Association (BWEA) – now called RenewableUK (BWEA, 2007) – also found that Radar antennas which are sited unfavourably with respect to components of the vessel's structure can exacerbate effects such as side lobes and reflected echoes. Careful adjustment of Radar controls suppressed these spurious Radar returns, but mariners were warned that there is a consequent risk of losing targets with a small Radar cross section, which may include buoys or small craft, particularly yachts or Glass Reinforced Plastic (GRP) constructed craft; therefore, due care should be taken in making such adjustments.

423. Theoretical modelling of the effects of the development of the proposed Atlantic Array Offshore Wind Farm, which was to be located off the south coast of Wales, on marine Radar systems was undertaken by the Atlantic Array project (Atlantic Array, 2012) and considered a wider spacing of WTGs than that considered within the early trials. The main outcomes of the modelling were the following:

- Multiple and indirect echoes were detected under all modelled parameters;
- The main effects noticed were stretching of targets in azimuth (horizontal) and appearance of ghost targets;
- There was a significant amount of clear space amongst the returns to ensure recognition of vessels moving amongst the WTGs and safe navigation;
- Even in the worst-case with Radar operator settings artificially set to be poor, there is significant clear space around each WTG that does not contain any multipath or side lobe ambiguities to ensure safe navigation and allow differentiation between false and real (both static and moving) targets;

- Overall, it was concluded that the amount of shadowing observed was very little (noting that the model considered lattice-type foundations which are sufficiently sparse to allow Radar energy to pass through);
- The lower the density of WTGs the easier it is to interpret the Radar returns and fewer multipath ambiguities are present;
- In dense, target rich environments S-Band Radar scanners suffer more severely from multipath effects in comparison to X-Band Radar scanners;
- It is important for passing vessels to keep a reasonable separation distance between the WTGs in order to minimise the effect of multipath and other ambiguities;
- The Atlantic Array study undertaken in 2012 noted that the potential for Radar interference was mainly a problem during periods of reduced visibility when mariners may not be able to visually confirm the presence of other vessels in proximity (those without AIS installed which are usually fishing and recreational craft). It is noted that this situation would arise with or without WTGs in place; and
- There is potential for the performance of a vessel’s ARPA to be affected when tracking targets in or near the array. Although greater vigilance is required, during the Kentish Flats trials it was shown that false targets were quickly identified as such by the mariners and then by the equipment itself.

424. In summary, experience in UK waters has shown that mariners have become increasingly aware of any Radar effects as more offshore wind farms become operational. Based on this experience, the mariner can interpret the effects correctly, noting that effects are the same as those experienced by mariners in other environments such as in close proximity to other vessels or structures. Effects can be effectively mitigated by “*careful adjustment of Radar controls*”.

425. The MCA has also produced guidance to mariners operating in proximity to OREIs in the UK which highlights Radar issues amongst others to be taken into account when planning and undertaking voyages in proximity to OREIs (MCA, 2008a). The interference buffers presented in **Table 15.2** are based on MGN 654 (MCA, 2021), MGN 371 (MCA, 2008a), MGN 543 (MCA, 2016) and MGN 372 (MCA, 2008b).

Table 15.2 Distance at which impacts of marine radar occur

Distance at which effect occurs (nm)	Identified effects
0.5	▪ Intolerable impacts can be experienced. ▪ X-Band Radar interference is intolerable under 0.25nm. ▪ Vessels may generate multiple echoes on shore-based Radars under 0.45nm.
1.5	▪ Under MGN 654, impacts on Radar are considered to be tolerable with mitigation between 0.5 and 3.5nm. ▪ S-band Radar interference starts at 1.5nm.

Distance at which effect occurs (nm)	Identified effects
	▪ Echoes develop at approximately 1.5nm, with progressive deterioration in the Radar display as the range closes. Where a main vessel route passes within this range considerable interference may be expected along a line of WTGs. ▪ The WTGs produce strong Radar echoes giving early warning of their presence. ▪ Target size of the WTG echo increases close to the WTG with a consequent degradation on both X and S-Band Radars.

426. As noted in **Table 15.2,** the onset range from the WTGs of false returns is approximately 1.5nm, with progressive deterioration in the Radar display as the range closes. If interfering echoes develop, the requirements of the Convention on International Regulations for Preventing Collisions at Sea (COLREGs) Rule 6 Safe Speed are particularly applicable and must be observed with due regard to the prevailing circumstances (IMO, 1972/77). In restricted visibility, Rule 19 Conduct of Vessels in Restricted Visibility applies and compliance with Rule 6 becomes especially relevant. In such conditions mariners are required, under Rule 5 Look-out to take into account information from other sources which may include sound signals and VHF information, for example from a VTS or AIS (MCA, 2016).

15.7.2 Experience from Operational Developments

427. The evidence from mariners operating in proximity to existing offshore wind farms is that they quickly learn to adapt to any effects. **Figure 15-3** presents the example of the Galloper and Greater Gabbard Offshore Wind Farms, which are located in proximity to IMO routeing measures. Despite this proximity to heavily trafficked Traffic Separation Scheme (TSS) lanes, there have been no reported incidents or issues raised by mariners who operate within the vicinity. The interference buffers presented in **Figure 15-3** are as per **Table 15.2**.

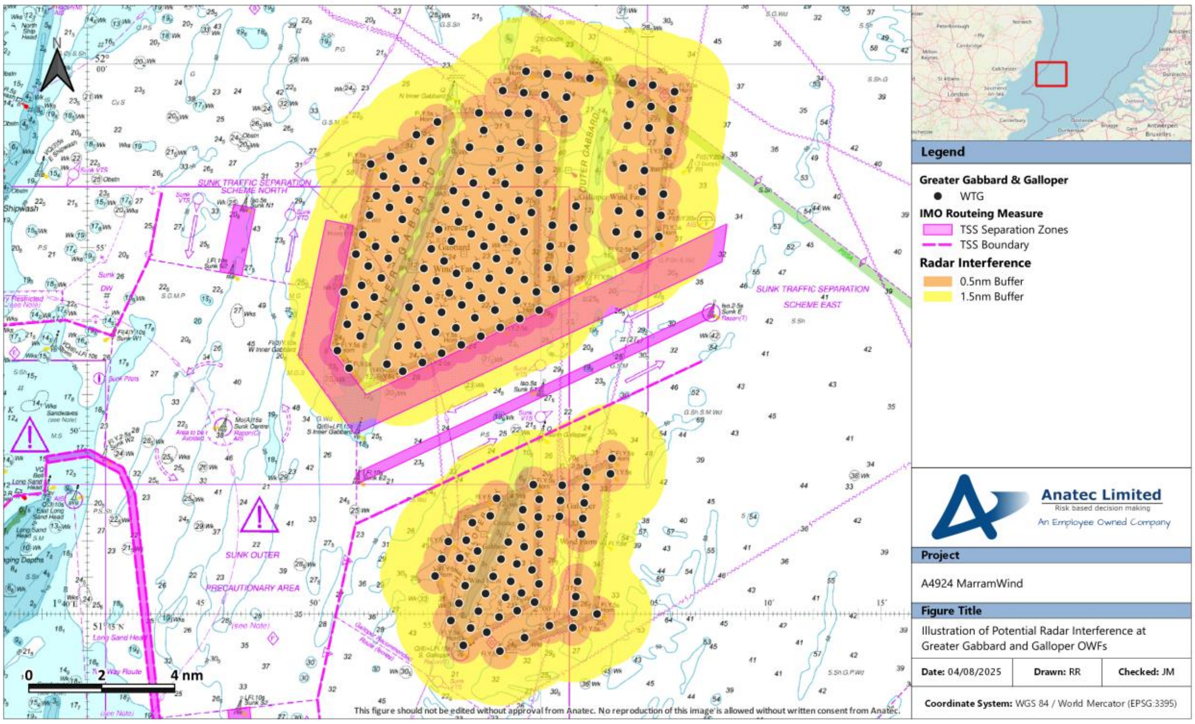


Figure 15-3 Illustration of Potential Radar Interference at Greater Gabbard and Galloper Offshore Wind Farms

428. As indicated by **Figure 15-3**, vessels utilising the TSS lanes would experience some Radar interference based on the available guidance. Both developments are operational, and each of the lanes is used by a minimum of five vessels per day on average. However, to date, there have been no incidents recorded (including any related to Radar use) or concerns raised by the users.

429. AIS information can also be used to verify the targets of larger vessels (generally vessels over 15m LOA – the minimum threshold for fishing vessel AIS carriage requirements). Approximately 4% of the vessel traffic survey data recorded within the study area was under 15m LOA. Throughout the vessel traffic surveys approximately 96% of vessel tracks during the Summer survey period were recorded on AIS and 98% during the Winter survey period, indicating a high level of AIS take-up among vessels for which AIS carriage is not mandatory. However, due to the distance offshore, smaller vessels which would not normally carry AIS are less likely to transit as far from the coast.

430. For any smaller vessels, particularly fishing vessels and recreational vessels, AIS Class B devices are becoming increasingly popular and allow the position of these small craft to be verified when in proximity to an offshore wind farm.

15.7.3 Increased Radar Returns

431. Beam width is the angular width, horizontal or vertical, of the path taken by the Radar pulse. Horizontal beam width ranges from 0.75°–5°, and vertical beam width from 20°–

25°. How well an object reflects energy back towards the Radar depends upon its size, shape and aspect angle.

432. Larger WTGs (either in height or width) will return greater target sizes and / or stronger false targets. However, there is a limit to which the vertical beam width would be affected (20°–25°) dependent upon the distance from the target. Therefore, increased WTG height in the array would not create any effects in addition to those already identified from existing operational wind farms (interfering side lobes, multiple and reflected echoes).

433. Again, when taking into consideration the potential options available to marine users (such as reducing gain to remove false returns) and feedback from operational experience, this shows that the effects of increased returns can be managed effectively.

15.7.4 Fixed Radar Antenna Use in Proximity to an Operational Wind Farm

434. It is noted that there are multiple operational wind farms including Galloper that successfully operate fixed Radar antenna from locations on the periphery of the array. These antennas are able to provide accurate and useful information to onshore coordination centres.

15.7.5 Application to the Project

435. Upon development of the Project, some commercial vessels may pass within 1.5nm of the wind farm structures and therefore may be subject to a minor level of Radar interference. Trials, modelling and experience from existing developments note that any impact can be mitigated by adjustment of Radar controls.

436. **Figure 15-4** presents an illustration of potential Radar interference due to the Project relative to the post-wind farm routeing illustrated in **Section 14.5**. The Radar effects have been applied to the indicative array layout introduced in **Section 6.2.1**.

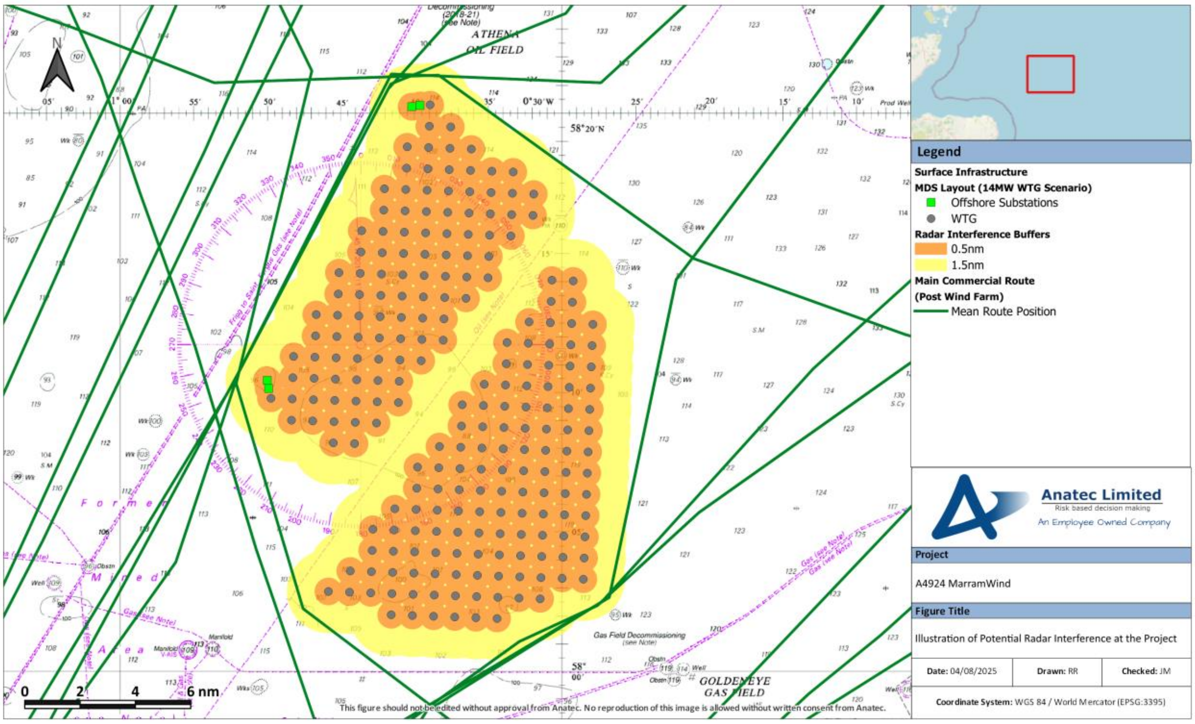


Figure 15-4 Illustration of potential Radar interference at the Project

437. Vessels passing within the array would be subject to a greater level of interference with impacts becoming more substantial in close proximity to WTGs. This would require additional mitigation by any vessels including consideration of the navigational conditions (visibility) when passage planning and compliance with the COLREGs (IMO, 1972/77) will be essential.

438. Overall, the impact on marine Radar is expected to be low and no further impact upon navigational safety is anticipated outside the parameters which can be mitigated by operational controls.

15.8 Sound Navigation and Ranging System

439. No evidence has been found to date with regard to existing offshore wind farms to suggest that Sound Navigation Ranging (SONAR) systems produce any kind of SONAR interference which is detrimental to the fishing industry, or to military systems. No impact is therefore anticipated in relation to the presence of the Project.

15.9 Noise

440. No evidence has been found to date with regard to existing offshore wind farms to suggest that prescribed sound signals are in any way impacted by acoustic noise produced by the wind farm.

15.10 Summary of Potential Effects on Use

441. Based on the detailed technical assessment of the effects due to the presence of the Project on navigation, communication and position fixing equipment in the previous subsections, **Table 15.3** summarises the assessment of frequency and consequence and the resulting risk for each component of this hazard.

Table 15.3 Summary of risk to navigation, communication, and position fixing equipment

Topic	Frequency of Occurrence	Severity of Consequence	Significance of Risk
VHF	Negligible	Minor	Broadly Acceptable
VHF direction finding	Extremely Unlikely	Minor	Broadly Acceptable
AIS	Negligible	Minor	Broadly Acceptable
NAVTEX	Negligible	Minor	Broadly Acceptable
GPS	Negligible	Minor	Broadly Acceptable
EMF	Extremely Unlikely	Negligible	Broadly Acceptable
Marine Radar	Remote	Minor	Broadly Acceptable
SONAR	Negligible	Minor	Broadly Acceptable
Noise	Negligible	Minor	Broadly Acceptable

442. On the basis of these findings, associated risks are screened out of the risk assessment undertaken in **Section 17.1**.

16 Collision and Allision Risk Modelling

16.1 Overview

443. To inform the risk assessment, a quantitative assessment of some of the major hazards associated with the Projects has been undertaken. The following subsections outline the inputs and methodology used for the collision and allision risk modelling.

16.1.1 Scenarios Under Consideration

444. For each element of the quantitative assessment, both a pre and post wind farm scenario with base and future case traffic levels have been considered. As a result, six distinct scenarios have been modelled:

- Pre wind farm with base case traffic levels;
- Pre wind farm future case with a 10% increase on base case traffic levels;
- Pre wind farm future case with a 20% increase on base case traffic levels;
- Post wind farm with base case traffic levels;
- Post wind farm future case with a 10% increase on base case traffic levels; and
- Post wind farm future case with a 20% increase on base case traffic levels.

445. The results of the base case scenarios are detailed in full in the following subsections, with the equivalent results for each future case scenario provided in **Section 16.2.3**.

16.1.2 Hazards Under Consideration

446. Hazards considered in the quantitative assessment are as follows:

- Increased vessel to vessel collision risk;
- Increased powered vessel to structure allision risk;
- Increased drifting vessel to structure allision risk; and
- Increased fishing vessel to structure allision risk.

447. The pre wind farm assessment has been informed by the vessel traffic survey data for the OAA and the long-term vessel traffic data for the RCP search area (see **Section 10**) and other baseline data sources (such as Anatec's ShipRoutes database). Conservative assumptions have been made with regard to route deviations and future shipping growth over the lifetime of the Projects.

16.2 Option Agreement Area

16.2.1 Pre Wind Farm Modelling

16.2.1.1 Vessel to Vessel Encounters

448. An assessment of current vessel to vessel encounters has been undertaken by replaying at high speed the vessel traffic data collected as part of the vessel traffic surveys (**Section 5.2**). The model defines an encounter as two vessels passing within 1nm of each

other within the same minute. This helps to illustrate where existing shipping congestion is highest and therefore where offshore developments, such as an offshore wind farm, could potentially increase congestion and therefore also increase the risk of encounters and collision. No account of whether encounters are head on or stern on are given; only close proximity is accounted for.

449. The identified encounters were manually checked to determine whether there were any clear cases of planned encounters (e.g., towing operations, pair fishing). Any such instances have been removed, and the final encounters are illustrated in **Figure 16-1**, displayed as an encounter density heat map.

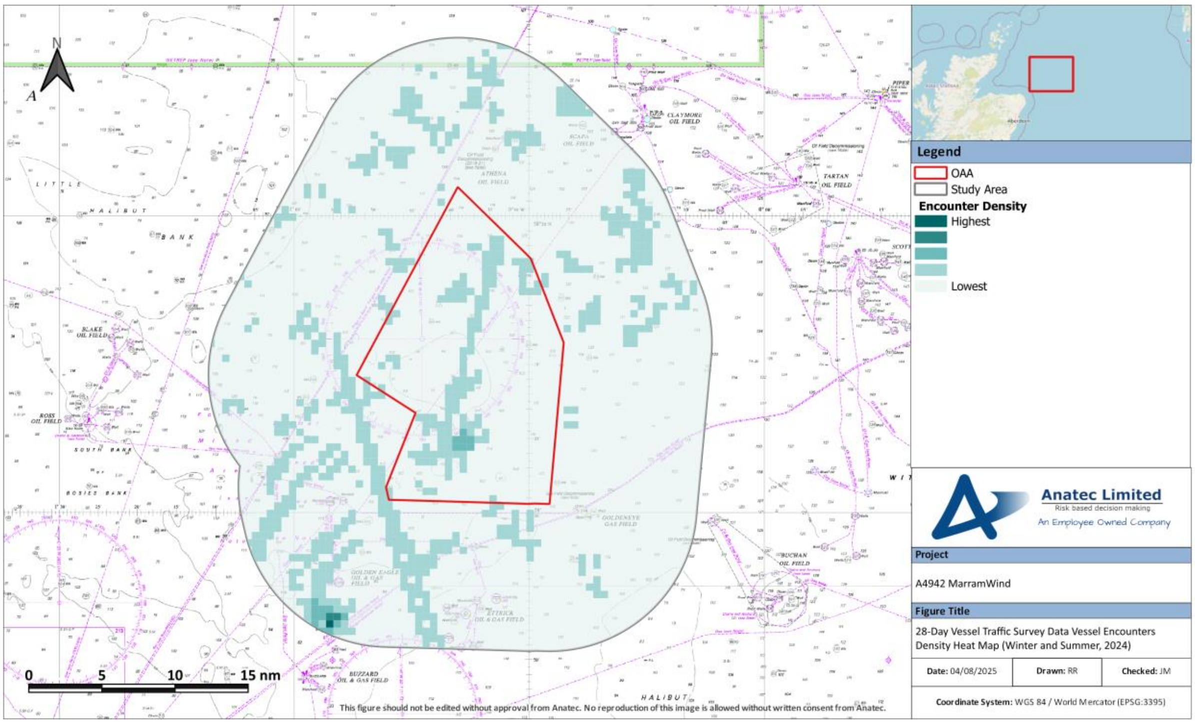


Figure 16-1 28-Day Vessel Traffic Survey Data Vessel Encounters Density Heat Map (Summer and Winter, 2024)

450. A total of 130 encounters were recorded during the combined survey periods resulting in an average of four–five encounter per day within the study area. A total of 76% of encounters occurred in the Summer survey period and 24% of encounters occurred within the Winter survey periods.

451. Fishing vessels were the most common vessel type involved in the encounters recorded at 56% of all vessels recorded. Oil and gas vessels were also common at 36% of all vessels recorded.

452. A total of 22 encounters (or 17% of all encounters) occurred within the OAA, the majority of these vessels being fishing vessels (75%).

453. A high proportion of vessel encounters were also recorded at the south-west of the study area near the oil and gas platforms (48% of all encounters), with 85% of vessels involved in these encounters being oil and gas vessels.

16.2.1.2 Vessel to Vessel Collisions

454. Using the pre wind farm vessel routeing as input, Anatec's COLLRISK model has been run to estimate the existing vessel to vessel collision risk in proximity to the Project.

455. A heat map based upon the geographical distribution of collision risk within a 0.5 × 0.5nm grid for the base case is presented in **Figure 16-2**.

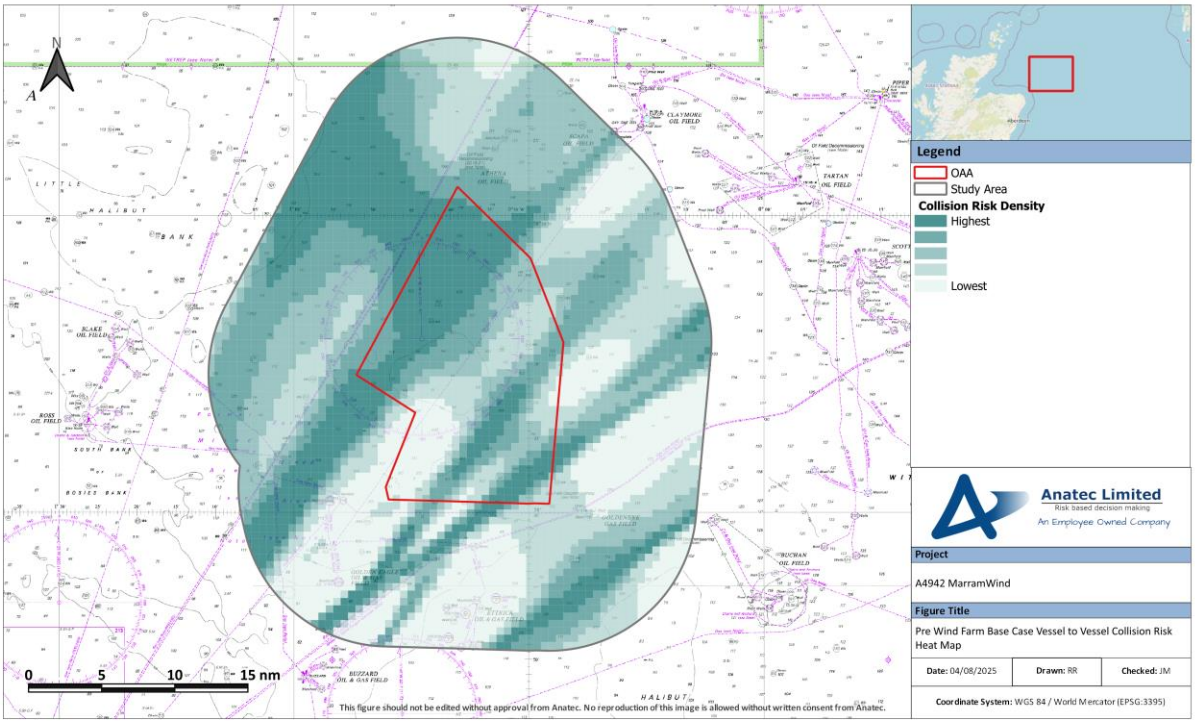


Figure 16-2 Pre Wind Farm Base Case Vessel to Vessel Collision Risk Heat Map

456. Assuming base case vessel traffic levels, the annual collision frequency pre wind farm was estimated to be 8.52×10^{-4}, corresponding to a return period of approximately one in 1,173 years. This is a relatively average return period for a development in the North Sea and is reflective of the moderate to low volumes of traffic on routes somewhat balanced by the relatively large area covered by the study area. It is noted that the model is calibrated based upon major incident data at sea which allows for benchmarking but does not cover all incidents. Other incident data, which includes minor incidents, is presented in **Section 9**.

16.2.2 Post Wind Farm Modelling

16.2.2.1 Simulated Automatic Identification System

457. Anatec's AIS Simulator software was used to gain an insight into the potential re-routed commercial traffic following the installation of the wind farm structures within the OAA. The AIS Simulator uses the mean positions of identified main commercial routes within the study area and the anticipated shift post wind farm, together with the standard deviations and average number of vessels on each main commercial route to simulate tracks.

458. A plot of 28 days of simulated AIS within the study area based on the deviated main commercial routes is presented in **Figure 16-3**.

459. It is noted that the simulated AIS represents a worst-cast scenario based on a mean 1nm passing distance from the OAA surface structure for post-wind farm routes.

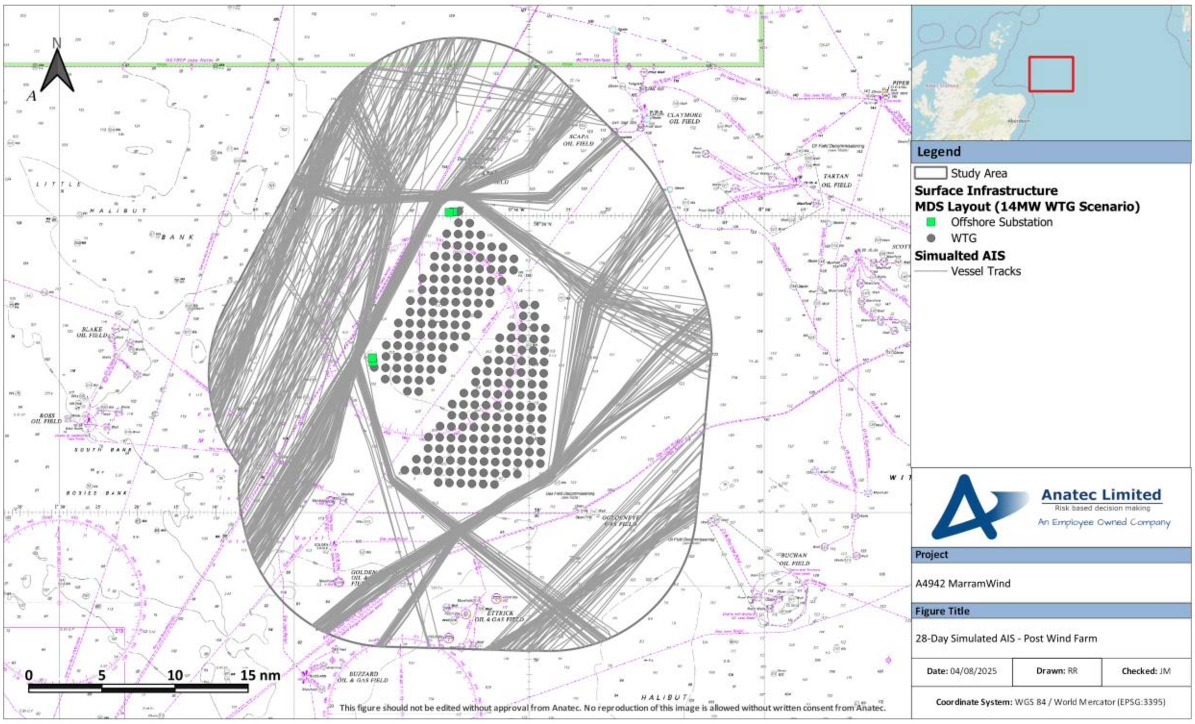


Figure 16-3 28-Days Simulated AIS – Post Wind Farm

16.2.2.2 Vessel to Vessel Collisions

460. Using the post wind farm routeing as input, Anatec's COLLRISK model has been run to estimate the anticipated vessel to vessel collision risk in proximity to the Project.

461. A heat map based upon the geographical distribution of collision risk within a 0.5 × 0.5nm grid for the base case is presented on **Figure 16-4**.

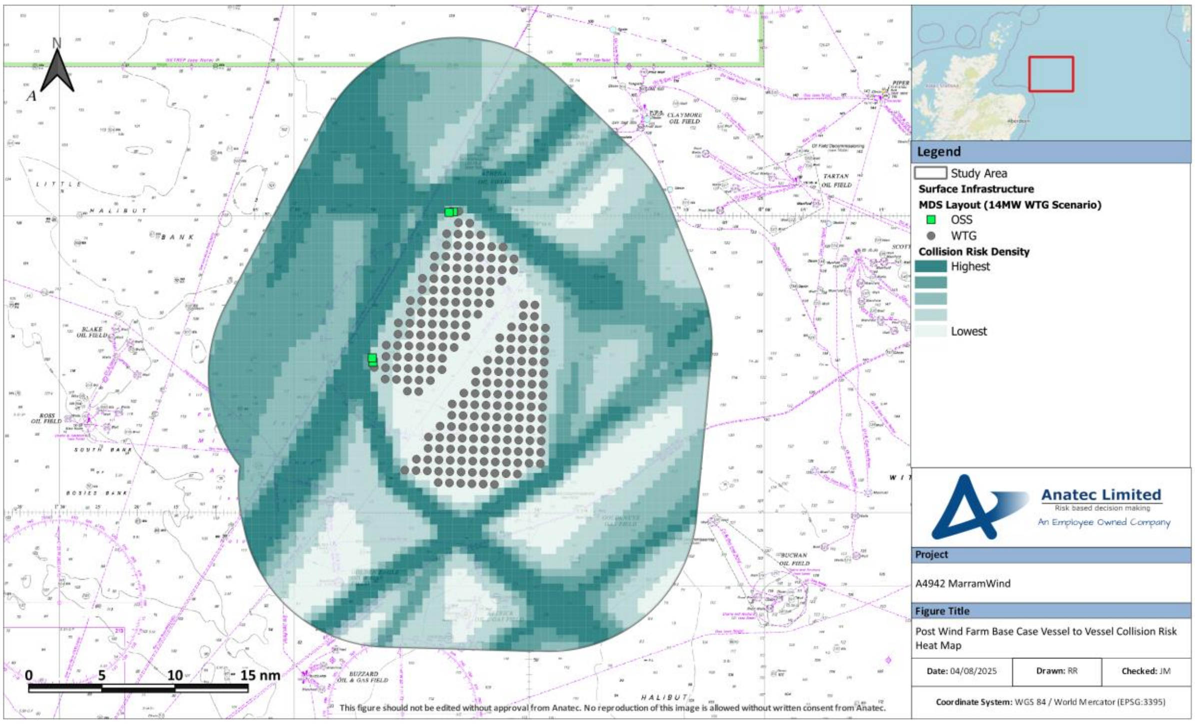


Figure 16-4 Post Wind Farm Base Case Vessel to Vessel Collision Risk Heat Map

462. Assuming base case vessel traffic levels, the annual collision frequency post wind farm was estimated to be 1.45×10^{-3}, corresponding to a return period of approximately one in 688 years. This represents a 71% increase in collision frequency compared to the pre wind farm base case result.

463. The change in vessel to vessel collision risk between the base case pre wind farm and post wind farm scenarios is presented in a heat map on **Figure 16-5**.

464. The greatest change in collision risk is associated with the north-western boundary of the layout where the busiest routes are deviated, as well as the crossing of routes at the corners of the layout. As the deviations are typically minor (only three routes are deviated by more than 2nm), the change in collision risk is local to the areas through which these routes pass.

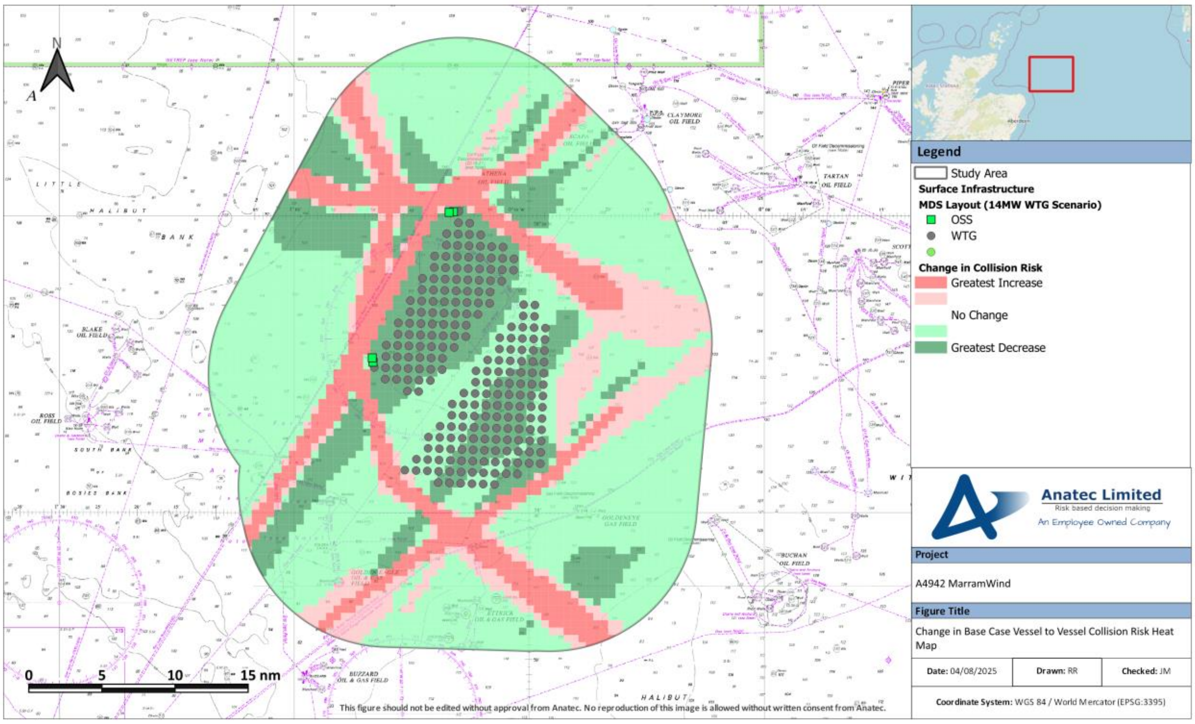


Figure 16-5 Change in Base Case Vessel to Vessel Collision Risk Heat Map

16.2.2.3 Powered Vessel to Structure Allision Risk

465. Based upon the vessel routeing identified in the Study Area, the anticipated re-routeing as a result of the presence of the Project, and assumptions that relevant embedded mitigations are in place (**Section 17**), the frequency of an errant vessel under power deviating from its route to the extent that it came into proximity with a wind farm structure associated with the Project is considered to be low.

466. From consultation with the shipping industry, it is also assumed that commercial vessels would be highly unlikely to navigate between wind farm structures due to the restricted sea room and so would instead be directed by the aids to navigation located in the region and those present at the Project. During the construction and decommissioning stages this would primarily consist of the buoyed construction / decommissioning area, whilst during the O&M stage this would primarily consist of the lighting and marking of the wind farm structures themselves.

467. Using the post wind farm routeing as input, together with the worst-case indicative layout and local meteorological ocean data, Anatec's COLLRISK model was run to estimate the likelihood of a commercial vessel alliding with one of the wind farm structures within the OAA whilst under power. In order to maintain a worst-case scenario, the model did not consider one structure shielding another.

468. A plot of the annual powered allision frequency per structure for the base case is presented in **Figure 16-6** with the chart background removed to increase the visibility of those structures with lower allision frequencies.

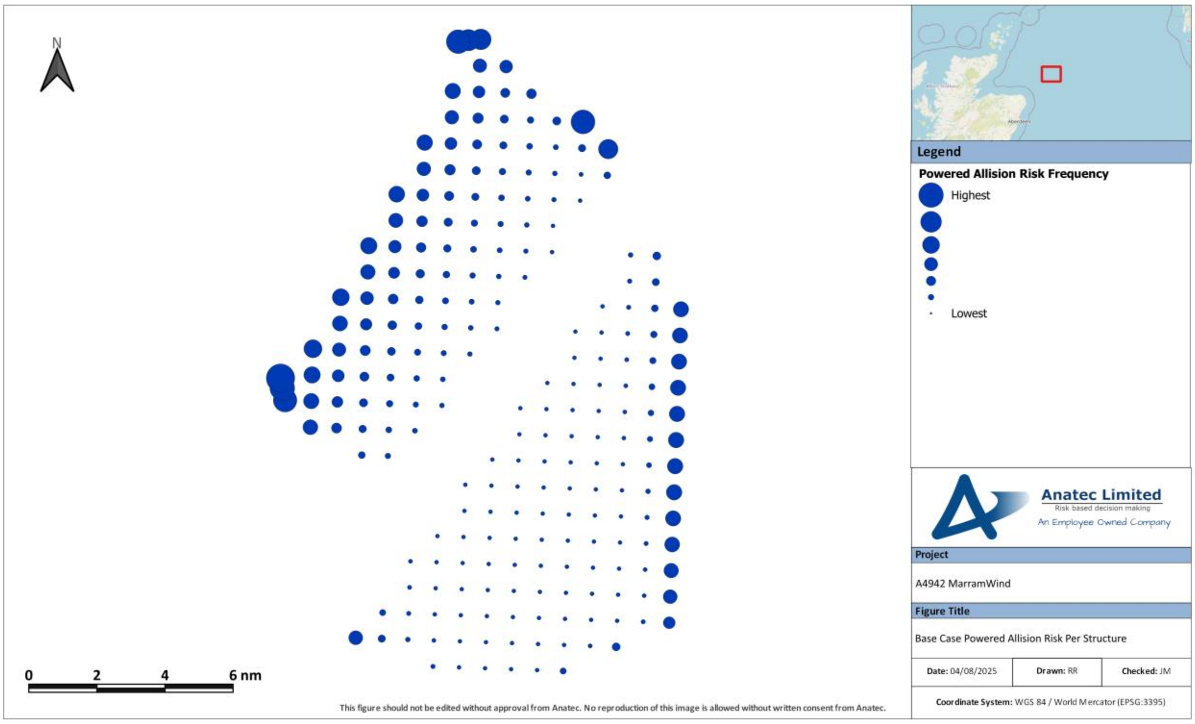


Figure 16-6 Base Case Powered Allision Risk Per Structure

469. Assuming base case vessel traffic levels, the annual powered allision frequency was estimated to be 1.19×10^{-2}, corresponding to a return period of approximately one in 84 years. This return period is higher than the average recorded for powered allision risk in other UK offshore wind farm developments, due to the high volume of deviated vessel traffic routeing in proximity to the layout, number of structures on the perimeter.

470. The greatest powered vessel to structure allision risk was associated with structures at the north-western extent of the OAA, in particular the corners where the offshore substations are set back from the WTGs. The greatest individual powered allision risk was associated the offshore substation on the northern west corner (approximately 7.11×10^{-4} or one in 1,405 years). This is where the busy main commercial routes are deviated around this corner of the layout, including crossings of perpendicular routes.

16.2.2.4 Drifting Vessel to Structure Allision Risk

471. Using the post wind farm routeing as input, together with the worst-case indicative layout and local meteorological ocean data, Anatec's COLLRISK model was run to estimate the likelihood of a drifting commercial vessel alliding with one of the wind farm structures within the OAA. The model is based on the premise that propulsion on a vessel must fail before drifting would occur. The model takes account of the type and size of the vessel, the number of engines and the average time required to repair but does not consider navigational errors caused by human actions.

472. The exposure times for a drifting scenario are based upon the vessel hours spent in proximity to the OAA (up to 10nm from the OAA). These have been estimated based on

the vessel traffic levels, speeds, and revised routeing patterns. The exposure is divided by vessel type and size to ensure that these specific factors, which based upon analysis of historical incident data have been shown to influence incident rates, are taken into account for the modelling.

473. Using this information, the overall rate of mechanical failure in proximity to the OAA was estimated. The probability of a vessel drifting towards a wind farm structure and the drift speed are dependent on the prevailing wind, wave, and tidal conditions at the time of the incident. Therefore, three drift scenarios were modelled, each using the meteorological ocean data provided in **Section 8**:

- Wind;
- Peak spring flood tide; and
- Peak spring ebb tide.

474. The probability of vessel recovery from drift is estimated based upon the speed of the drift and hence the time available before arriving at a wind farm structure. Vessels which do not recover within this time are assumed to allide. Conservatively, no account is made for another vessel (including a project vessel) rendering assistance.

475. After modelling the three drifting scenarios, it was established that the wind dominated scenario produced the worst-case results. A plot of the annual powered allision frequency per structure for the base case is presented on **Figure 16-7**.

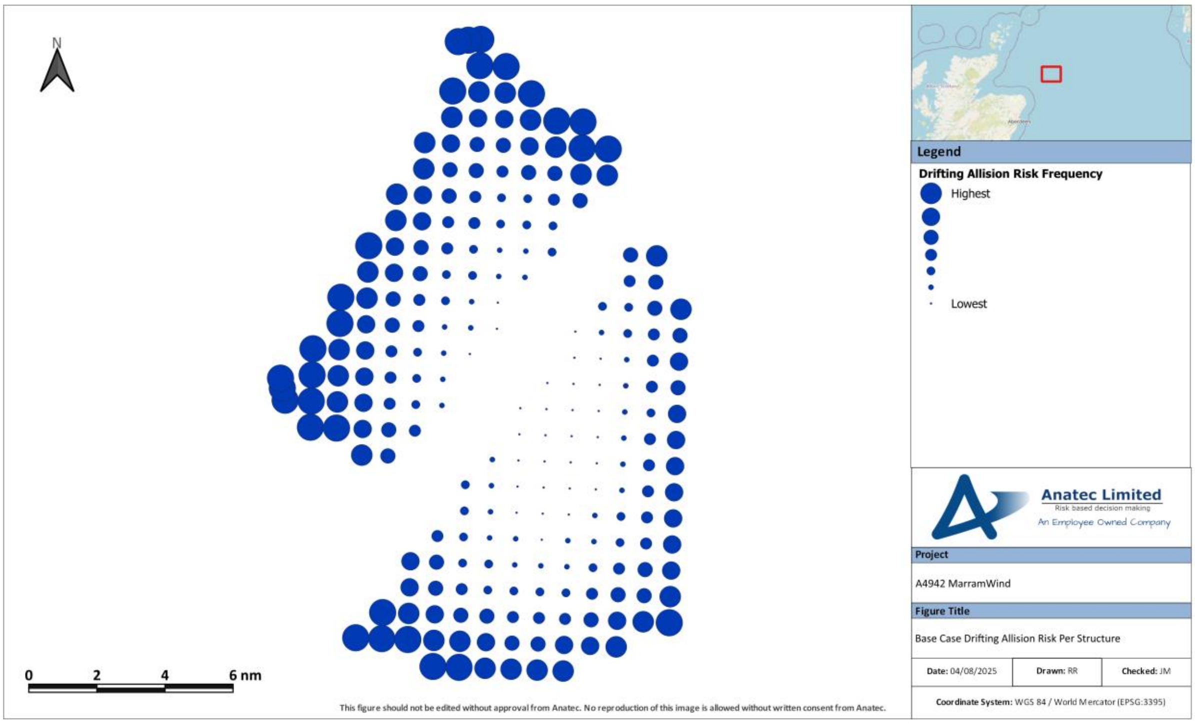


Figure 16-7 Base Case Drifting Allision Risk Per Structure

476. Assuming base case vessel traffic levels, the annual drifting allision frequency was estimated to be 1.84×10^{-4}, corresponding to a return period of approximately one in 5,422 years. This return period is lower than the average recorded for drifting allision risk in other UK offshore wind farm developments, due to the low volume of deviated vessel traffic routeing in proximity to the layout at the south-west (the most frequent wind direction).

477. The greatest drifting vessel to structure allision risk was associated with structures at the west of the OAA. The greatest individual drifting allision risk was associated with a WTG on the southern west corner (approximately 1.43×10^{-5} or one in 70,036 years).

478. It is noted that historically there have been no reported drifting allision incidents with wind farm structures in the UK. Whilst drifting vessels do occur every year in UK waters, in most cases the vessel has been recovered prior to any allision incident occurring (such as by anchoring, restarting engines, or being taken in tow).

16.2.2.5 Fishing Vessel to Structure Allision Risk

479. Using the vessel traffic survey data as input, Anatec's COLLRISK model was run to estimate the likelihood of a fishing vessel alliding with one of the wind farm structures within the OAA.

480. A fishing vessel allision is classified separately from other allisions since, unlike in the case of the commercial traffic characterised using the main commercial routes, fishing vessels may be either in transit or actively fishing within the Study Area. Moreover, fishing vessels could be observed internally within the OAA in addition to externally. Anatec's COLLRISK model uses vessel numbers, sizes (length and beam), array layout and structure dimensions. The likelihood of a major allision incident has been calibrated against historical maritime incident data and historical AIS vessel traffic data within operational offshore wind farm arrays.

481. The model conservatively assumes no change in baseline fishing activity, i.e., no account is made of vessels passing over or in close proximity to structure locations choosing to increase passing distance post wind farm.

482. A plot of the annual fishing vessel allision frequency per structure for the base case is presented on **Figure 16-8**.

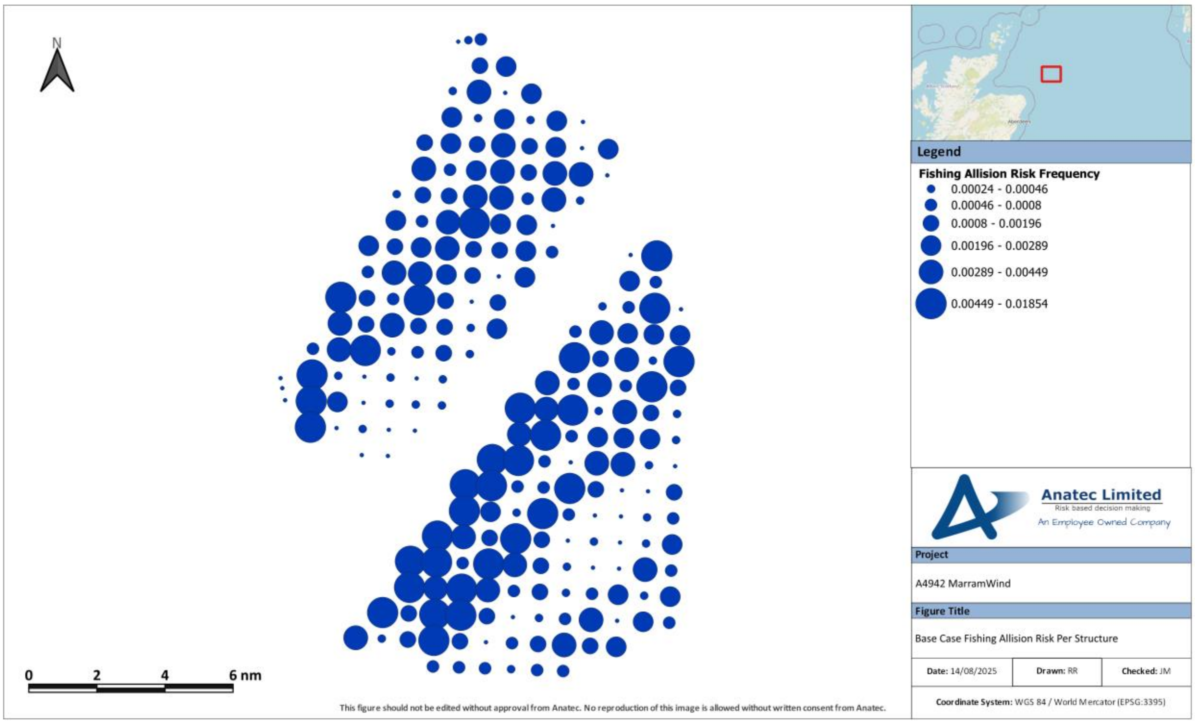


Figure 16-8 Base Case Fishing Allision Risk Per Structure

483. Assuming base case vessel traffic levels, the annual fishing vessel to structure allision frequency was estimated to be 4.9×10^{-1} years, corresponding to a return period of approximately one in 2.05 years. This is a high frequency and reflects the high level of fishing activity present within the OAA (See **Section 10.1.2.2**) and the conservative assumptions that all existing fishing vessel presence within the OAA remains and passing distances from wind farm structures are not increased. The greatest individual allision risk was associated with an internal WTG within the south of the OAA (approximately 1.9×10^{-2} or one in 54 years).

16.2.3 Risk Results Summary

484. The previous sections modelled two scenarios, namely the pre and post wind farm scenarios with base case traffic levels. In order to incorporate the potential for future traffic growth pre and post wind farm scenarios each with future case traffic levels have also been modelled (10% and 20% increases).

485. **Table 16.1** summarises the results of all six scenarios.

Table 16.1 Risk results summary – Option Agreement Area

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Wind Farm	Post Wind Farm	Change
Vessel to vessel collision	Base case	8.52×10^{-4} (1 in 1,173 years)	1.45×10^{-3} (1 in 688 years)	6.02×10^{-4} (1 in 1,661 years)

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Wind Farm	Post Wind Farm	Change
	Future case (10%)	1.02×10^{-3} (1 in 979 years)	1.75×10^{-3} (1 in 571 years)	7.28×10^{-4} (1 in 1,373 years)
	Future case (20%)	1.21×10^{-3} (1 in 828 years)	2.06×10^{-3} (1 in 485 years)	8.55×10^{-4} (1 in 1,169 years)
Powered vessel to structure allision	Base case	N/A	1.19×10^{-2} (1 in 84 years)	1.19×10^{-2} (1 in 84 years)
	Future case (10%)	N/A	1.30×10^{-2} (1 in 77 years)	1.30×10^{-2} (1 in 77 years)
	Future case (20%)	N/A	1.41×10^{-2} (1 in 71 years)	1.41×10^{-2} (1 in 71 years)
Drifting vessel to structure allision	Base case	N/A	1.84×10^{-4} (1 in 5,422 years)	1.84×10^{-4} (1 in 5,422 years)
	Future case (10%)	N/A	2.01×10^{-4} (1 in 4,968 years)	2.01×10^{-4} (1 in 4,968 years)
	Future case (20%)	N/A	2.18×10^{-4} (1 in 4,591 years)	2.18×10^{-4} (1 in 4,591 years)
Fishing vessel to structure allision	Base case	N/A	4.9×10^{-1} (1 in 2.05 years)	4.9×10^{-1} (1 in 2.05 years)
	Future case (10%)	N/A	5.4×10^{-1} (1 in 1.8 years)	5.4×10^{-1} (1 in 1.8 years)
	Future case (20%)	N/A	5.9×10^{-1} (1 in 1.7 years)	5.9×10^{-1} (1 in 1.7 years)
Total	**Base case**	**8.52×10^{-4} (1 in 1,173 years)**	**5.02×10^{-1} (1 in 2.0 years)**	**5.01×10^{-1} (1 in 2.0 years)**
	Future case (10%)	**1.02×10^{-3} (1 in 979 years)**	**5.52×10^{-1} (1 in 1.8 years)**	**5.51×10^{-1} (1 in 1.8 years)**
	Future case (20%)	**1.21×10^{-3} (1 in 828 years)**	**6.03×10^{-1} (1 in 1.7 years)**	**6.02×10^{-1} (1 in 1.7 years)**

16.2.4 Mooring Lines and Dynamic Array Cables

486. This section considers the mooring lines and array cables associated with the floating infrastructure relative to baseline traffic volumes and draughts to determine potential risk associated with under keel interaction. The outputs have been fed into the qualitative risk assessment of under keel interaction undertaken from **Sections 18**.

487. Based on operational experience of existing offshore wind farms and consultation undertaken for the Project, it is likely that commercial vessels would deviate to avoid the OAA. On this basis, considering the vessel types recorded within the OAA (**Section 10.1.2**), the key vessel type that must be considered is fishing. It is noted that recreational vessels were not recorded regularly within the OAA in the vessel traffic survey data and RYA

Scotland confirmed that vessel transits as far offshore as the OAA are less unlikely with any mariners doing so highly experienced.

488. The focus of this assessment on fishing vessels is considered appropriate on the basis that they would also typically have larger draughts than recreational vessels and based on the available information and consultation are more prevalent than other vessel types in the area. The SFF also confirmed that fishing vessels may transit through the OAA as individual passages would be based on Master discretion.

16.2.4.1 Vessel Draught

489. The distribution of fishing vessel draughts recorded within the OAA during the 28-days of vessel traffic survey data, recorded on AIS only, are presented in **Figure 16-9**. Of these fishing vessels recorded on AIS, 18% did not broadcast a valid draught and so are not incorporated into distribution. However, these vessels not broadcasting a valid draught are likely smaller vessels with shallower draughts and so the analysis is considered to be conservative.

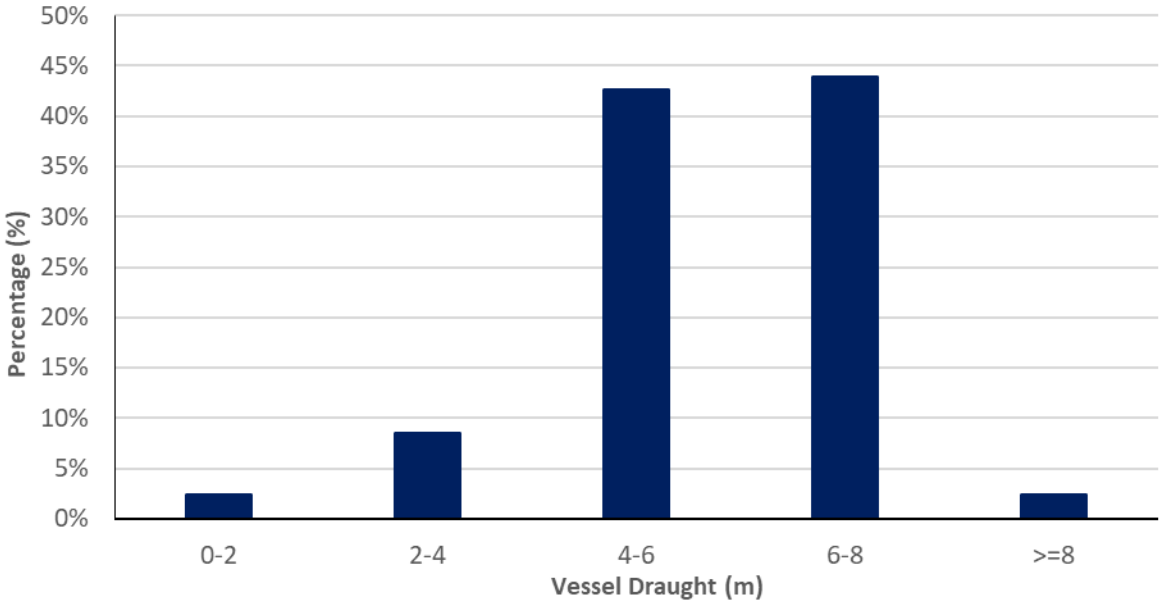


Figure 16-9 28-Day AIS Fishing Vessel Draught Distribution (Winter and Summer, 2023)

490. The maximum draught recorded from fishing vessels within the OAA during the survey periods was 8.8m, with the average being approximately 5.6m. As shown, the significant majority of fishing vessels within the OAA had draughts of between 4 and 8m (80%).

16.2.4.2 Mooring Line Interaction

491. Based on the substructure types and mooring line arrangements under consideration as illustrated in **Figure 6-5** (**Section 6**), the use of taut mooring lines is considered the maximum design scenario for under keel interaction. There is no maximum design scenario foundation type which would increase any risk for mooring lines (since the

horizontal distance is measured from the edge of the floating unit rather than the centre point) and so semi-submersible substructures are used. The mooring lines will connect at base level, estimated at 12m below the waterline.

492. On this basis, the approximate descent of the mooring lines in the vicinity of the floating unit is shown in **Figure 16-10**. The average and maximum fishing vessel draughts recorded in the OAA are shown for reference (**Section 16.2.4.1**) as well as for commercial vessels for comparison. It is noted that the values detailed above have been assumed for the purposes of this interaction assessment and it would be necessary to assess final under keel clearance available post installation.

493. The assessment has been undertaken up to 800m from the floating unit, noting that this is the maximum distance of the mooring line terminus from the edge of the floating unit.

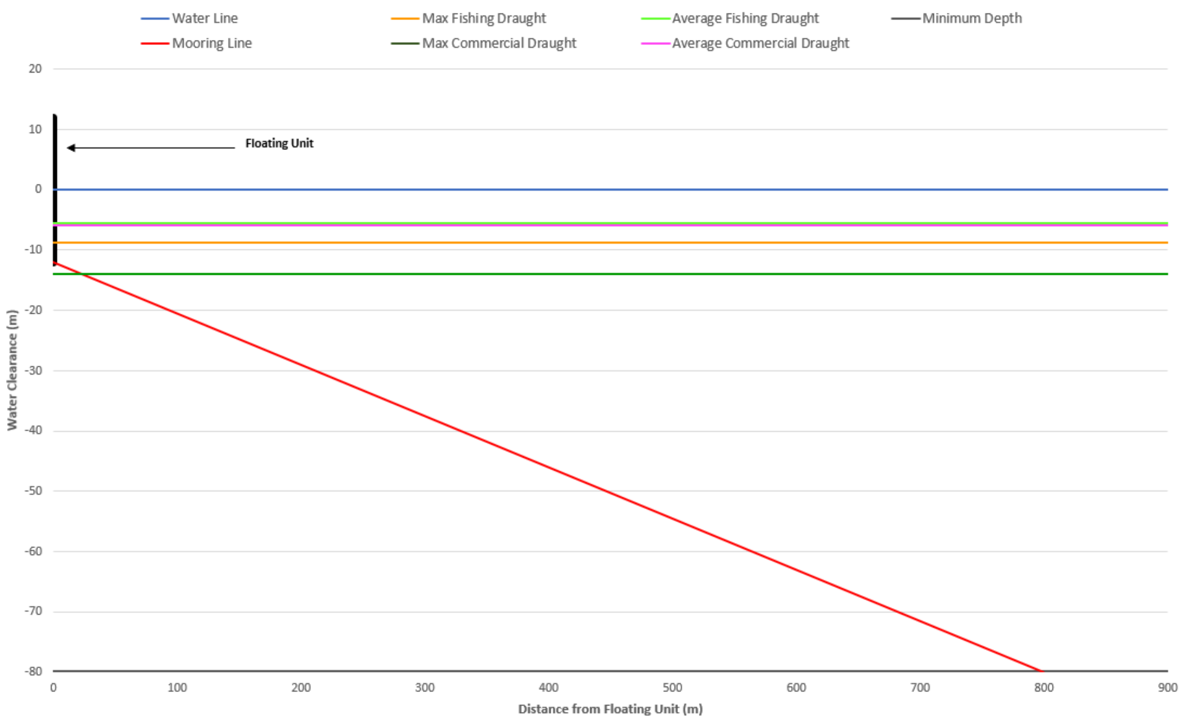


Figure 16-10 Mooring Line Relative to Maximum Vessel Draught

494. As the connection point for the mooring line (12m) is deeper than both the average and maximum fishing vessel draughts recorded (5.6m and 8.8m, respectively), there is not anticipated to be any under keel interaction with fishing vessels and the mooring lines.

495. For completeness, a commercial vessel with the largest draught recorded (13.9m) should avoid an under keel interaction beyond approximately 22.4m from a floating unit. A commercial vessel of average draught (5.8m) is shallower than the connection point for the mooring line and so is not anticipated to results in any under keel clearance interaction.

496. A summary of the available clearance between the mooring lines and the waterline at 200m intervals from the mooring line options is provided in **Table 16.2.**

Table 16.2 Mooring line clearance summary

Distance from Floating Unit (m)	Clearance Below Mooring Line and Waterline (m)
200	-29
400	-46
600	-63
800	-80

16.2.4.3 Array Cables

497. Like mooring lines, there is no worst-case substructure type which would increase any risk for array cables (since the horizontal distance of the array cables is measured from the edge of the floater rather than the centre point). As a worst-case, a hog bend may be incorporated into the design of the array cables. Even so, the minimum depth of the array cable below the sea surface will be 12m located at the connection point and the minimum depth of the hog bend is anticipated to be 30m, achieved at a maximum distance of 35m from the floating unit.

498. The approximate descents of the array cables from the hog bend are not shallower than those parameters shown for the mooring lines in **Figure 16-10** such that any interaction with a vessel (commercial or fishing) is considered highly unlikely.

499. It is again noted that the values detailed above have been assumed for the purposes of this interaction assessment and it would be necessary to assess final under keel clearance available post installation.

16.2.4.4 Approach to Risk Assessment

500. The potential for interaction with the mooring lines and array cables has been assessed within the O&M stage risk assessment in **Section 18.1.1.5** noting the risk is managed via construction and decommissioning mitigations during those stages. The potential that the mooring system would fail leading to a loss of station incident is assessed through all stages of the Project from **Sections 18**.

501. As part of this, consideration has been given in the risk assessment to an ORE Catapult report which investigated potential hazards relating to the use of floating technology including not only mooring lines and dynamic array cables but also wet storage management and towage operations (ORE Catapult, 2023).

16.3 Reactive Compensation Platform Search Area

16.3.1 Pre Wind Farm Modelling

16.3.1.1 Vessel to Vessel Encounters

502. An assessment of current vessel to vessel encounters has been undertaken by replaying at high speed the vessel traffic data collected as part of the long-term vessel traffic data (**Section 5.3.2**).

503. The identified encounters were manually checked to determine whether there were any clear cases of planned encounters (e.g., towing operations, pair fishing). Any such instances have been removed, and the final encounters are illustrated in **Figure 16-11**, displayed as an encounter density heat map.

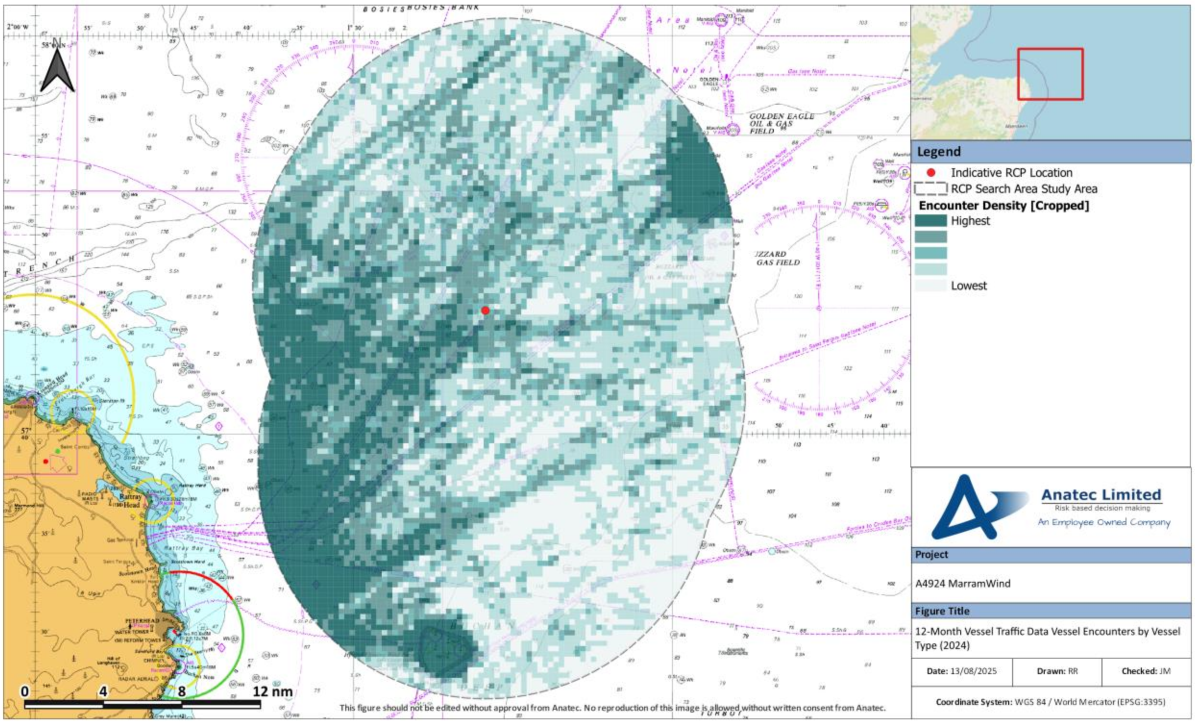


Figure 16-11 12-Month Vessel Traffic Data Vessel Encounters Density Heat Map (2024)

504. A total of 3,495 encounters were recorded during the 12-month long-term data period resulting in an average of ten encounters per day within the RCP search area study area.

505. Average encounters per day were seasonally varied across the data period with higher average encounters per day in the Summer months (average of 17 per day in July) when compared to the Winter months (average of four per day in March and November). This is likely due to the seasonally varied vessel traffic as well as varied O&M taking place at both Hywind Scotland Pilot Park and the Golden Eagle platform.

506. Fishing vessels were the most common vessel type involved in the encounters recorded at 36% of all vessels recorded. Wind farm vessel (27%) and oil and gas vessels (23%) were also common vessel types involved in vessel encounters.

507. A total of 170 encounters (or 0.05% of all encounters) occurred within the RCP search area, the majority of these vessels being fishing vessels (50%) and oil and gas vessels (31%).

508. A high proportion of vessel encounters were also recorded at the south-west at Hywind Scotland Pilot Park as well as at the north-east of the study area near the Golden Eagle platform; the latter being same area of encounters identified for the OAA in **Section 16.2.1.1**.

16.3.1.2 Vessel to Vessel Collisions

509. Using the pre wind farm vessel routeing as input, Anatec's COLLRISK model has been run to estimate the existing vessel to vessel collision risk in proximity to the Project.

510. A heat map based upon the geographical distribution of collision risk within a 0.5 × 0.5nm grid for the base case is presented in **Figure 16-12**.

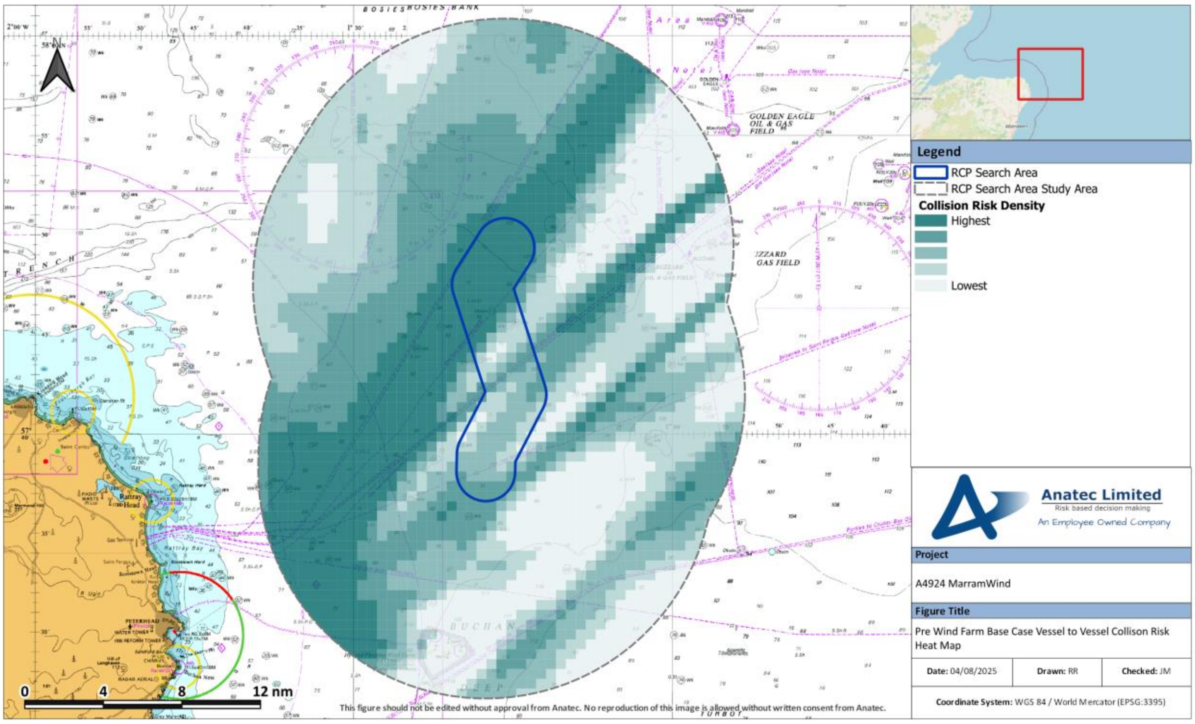


Figure 16-12 Pre Wind Farm Base Case Vessel to Vessel Collision Risk Heat Map

511. Assuming base case vessel traffic levels, the annual collision frequency pre wind farm was estimated to be 1.20×10^{-3}, corresponding to a return period of approximately one in 836 years. This return period is slightly above average for a development in the North Sea

and is reflective of the moderate volumes of traffic sharing similar routes on approach to and from ports in the area (in particular Aberdeen).

512. It is noted that the model is calibrated based upon major incident data at sea which allows for benchmarking but does not cover all incidents. Other incident data, which includes minor incidents, is presented in **Section 9**.

16.3.2 Post Wind Farm Modelling

16.3.2.1 Simulated Automatic Identification System

513. A plot of 28 days of simulated AIS within the study area based on the deviated main commercial routes is presented in **Figure 16-13**.

514. It is noted that the simulated AIS represents a worst-cast scenario based on a mean 1nm passing distance from the RCP surface structure for post wind farm routes.

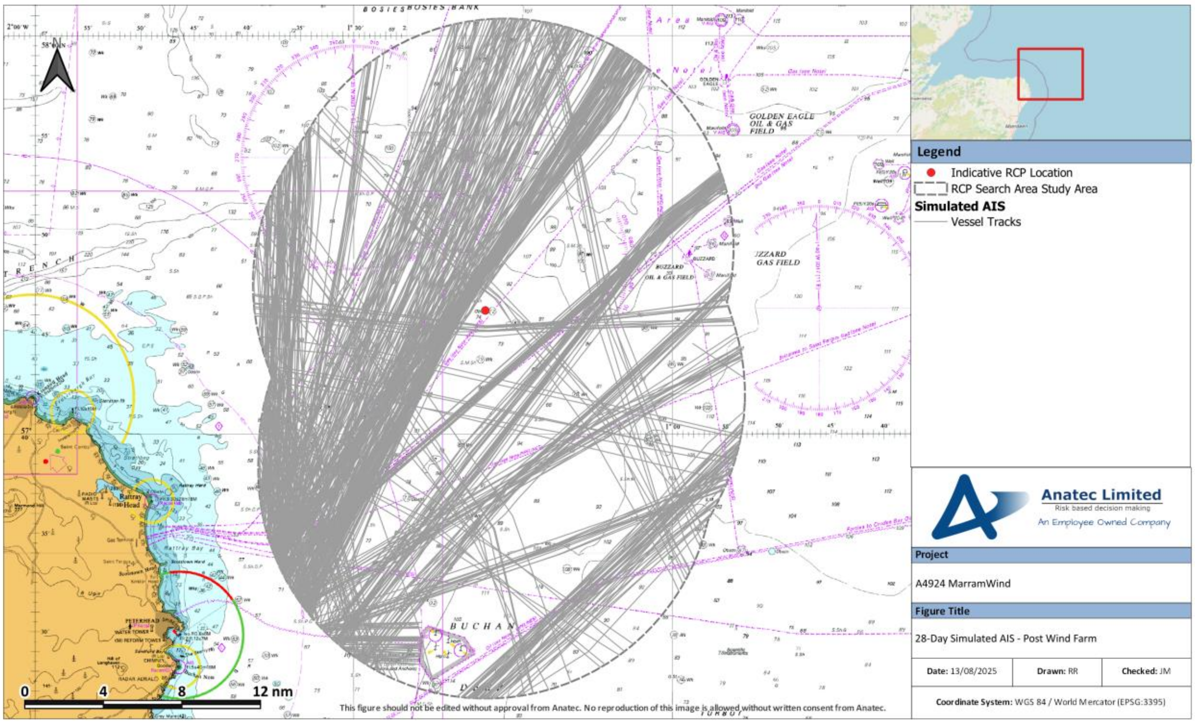


Figure 16-13 28-Days Simulated AIS – Post Wind Farm

16.3.2.2 Vessel to Vessel Collisions

515. Using the post wind farm routeing as input, Anatec's COLLRISK model has been run to estimate the anticipated vessel to vessel collision risk in proximity to the Project.

516. A heat map based upon the geographical distribution of collision risk within a 0.5 × 0.5nm grid for the base case is presented in **Figure 16-14**.

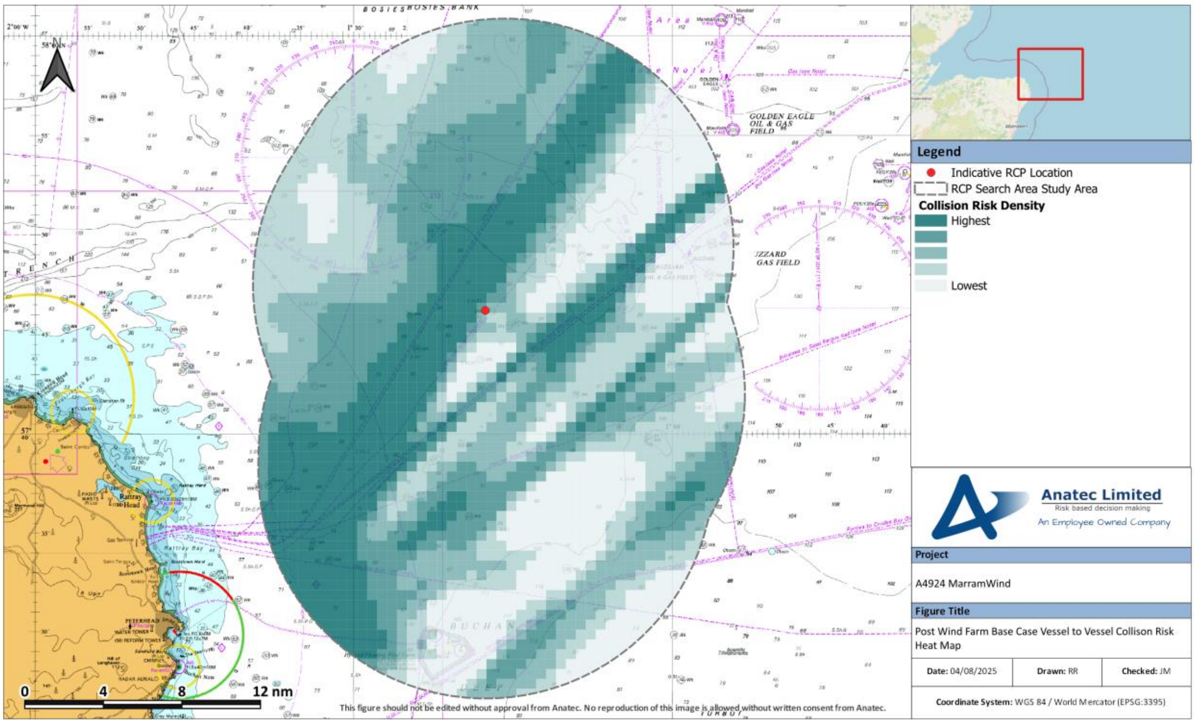


Figure 16-14 Post Wind Farm Base Case Vessel to Vessel Collision Risk Heat Map

517. Assuming base case vessel traffic levels, the annual collision frequency post wind farm was estimated to be 1.24×10^{-3}, corresponding to a return period of approximately one in 806 years. This represents a 3.7% increase in collision frequency compared to the pre wind farm base case result.

518. The change in vessel to vessel collision risk between the base case pre wind farm and post wind farm scenarios is presented in a heat map in **Figure 16-15**.

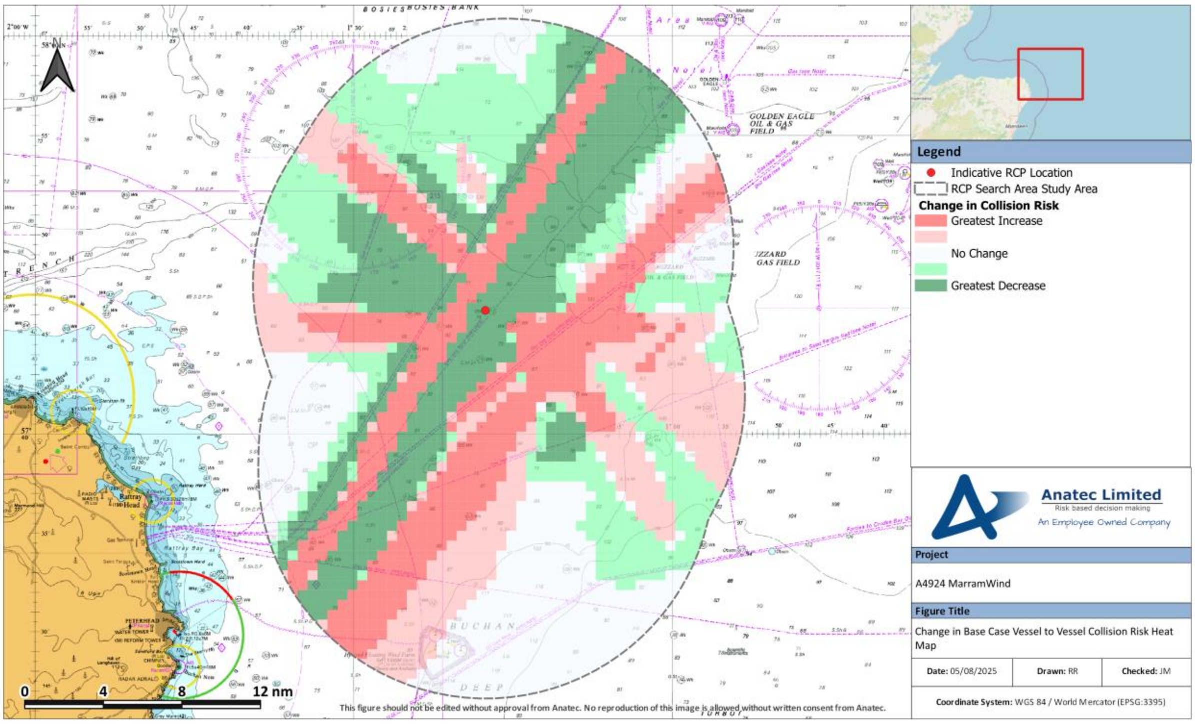


Figure 16-15 Change in Base Case Vessel to Vessel Collision Risk Heat Map

16.3.2.3 Powered Vessel to Structure Allision Risk

519. Using the post wind farm routeing as input, together with the indicative RCP location and local metocean data, Anatec's COLLRISK model was run to estimate the likelihood of a commercial vessel alliding with the RCP whilst under power.

520. Assuming base case vessel traffic levels, the annual powered allision frequency was estimated to be 8.63×10^{-3}, corresponding to a return period of approximately one in 116 years.

16.3.2.4 Drifting Vessel to Structure Allision Risk

521. Using the post wind farm routeing as input, together with the indicative RCP location and local metocean data, Anatec's COLLRISK model was run to estimate the likelihood of a commercial vessel drifting with the RCP.

522. Assuming base case vessel traffic levels, the annual drifting frequency was estimated to be 1.55×10^{-5}, corresponding to a return period of approximately one in 64,574 years

16.3.2.5 Fishing Vessel to Structure Allision Risk

523. Using the long-term data as input, Anatec's COLLRISK model was run to estimate the likelihood of a fishing vessel alliding with the RCP.

524. Assuming base case vessel traffic levels, the annual fishing vessel to structure allision frequency was estimated to be 6.34×10^{-3} years, corresponding to a return period of approximately one in 158 years.

16.3.3 Risk Results Summary

525. The previous sections modelled two scenarios, namely the pre and post wind farm scenarios with base case traffic levels. In order to incorporate the potential for future traffic growth pre and post wind farm scenarios each with future case traffic levels have also been modelled (10% and 20% increases). **Table 16.3** summarises the results of all six scenarios.

Table 16.3 Risk results summary – Reactive Compensation Platform

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Wind Farm	Post Wind Farm	Change
Vessel to vessel collision	Base case	1.20×10^{-3} (1 in 835 years)	1.24×10^{-3} (1 in 806 years)	4.39×10^{-5} (1 in 22,766 years)
	Future case (10%)	1.44×10^{-3} (1 in 696 years)	1.49×10^{-3} (1 in 671 years)	5.29×10^{-5} (1 in 18,913 years)
	Future case (20%)	1.70×10^{-3} (1 in 589 years)	1.76×10^{-3} (1 in 568 years)	6.28×10^{-5} (1 in 15,920 years)
Powered vessel to structure allision	Base case	N/A	8.63×10^{-3} (1 in 116 years)	8.63×10^{-3} (1 in 116 years)
	Future case (10%)	N/A	9.49×10^{-3} (1 in 105 years)	9.49×10^{-3} (1 in 105 years)
	Future case (20%)	N/A	1.03×10^{-2} (1 in 97 years)	1.03×10^{-2} (1 in 97 years)
Drifting vessel to structure allision	Base case	N/A	1.55×10^{-5} (1 in 64,574 years)	1.55×10^{-5} (1 in 64,574 years)
	Future case (10%)	N/A	1.80×10^{-5} (1 in 59,313 years)	1.80×10^{-5} (1 in 59,313 years)
	Future case (20%)	N/A	1.97×10^{-5} (1 in 54,600 years)	1.97×10^{-5} (1 in 54,600 years)
Fishing vessel to structure allision	Base case	N/A	6.34×10^{-3} (1 in 158 years)	6.34×10^{-3} (1 in 158 years)
	Future case (10%)	N/A	6.79×10^{-3} (1 in 143 years)	6.79×10^{-3} (1 in 143 years)
	Future case (20%)	N/A	7.61×10^{-3} (1 in 131 years)	7.61×10^{-3} (1 in 131 years)
Total	**Base case**	**8.52×10^{-4} (1 in 1,173 years)**	**1.62×10^{-2} (1 in 62 years)**	**1.50×10^{-2} (1 in 67 years)**
	Future case (10%)	**1.02×10^{-3} (1 in 979 years)**	**1.80×10^{-2} (1 in 56 years)**	**1.65×10^{-2} (1 in 51 years)**

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Wind Farm	Post Wind Farm	Change
	Future case (20%)	**1.21×10^{-3} (1 in 828 years)**	**1.97×10^{-2} (1 in 51 years)**	**1.80×10^{-2} (1 in 56 years)**

17 Embedded Mitigation Measures

526. As part of the Project design process, a number of embedded mitigation measures have been adopted to reduce the potential for risk to shipping and navigation.

527. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing these measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Project.

528. The embedded mitigation measures within the design relevant to shipping and navigation together with their identification (ID) applied in the Commitments Register (**Volume 3: Appendix 5.2: Commitments Register**) are outlined in **Table 17.1**.

Table 17.1 Embedded mitigation measures relevant to shipping and navigation

ID	Subject Matter	Details	How the Measure Will be Secured
M-029	Development and adherence to a CaP	An Outline CaP has been submitted within this Application (Volume 4), and includes details of the need, type, quantity and installation methods for cabling. A Final CaP will be completed prior to construction commencing and submitted to MD-LOT for approval. The Final CaP will include: a) the vessel types, location, duration and cable laying techniques for export and array cables; b) the finalised location of the export cable route; c) the results of monitoring or data collection work (including geophysical, geotechnical and benthic surveys) d) Technical specification of the cables, including a desk based assessment of attenuation of electromagnetic field strengths and shielding; e) CBRA, to ascertain burial depths and where necessary alternative protection measures; f) Methods to be used to mitigate the effects of EMF; g) Methodologies and timetable for post-construction and operational surveys (including inspection, over trawl, post-lay) for the cables through its operational life; h) Measures to address and report to the Licensing Authority any exposure of cables or risk to users of the sea from cables; and g) Methodologies for cable inspection with measures to address and report to Scottish Minister, any exposure of array cables.	s.36 conditions and marine licences conditions.
M-030	Promulgation of Information	Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing	s.36 conditions and marine licences conditions.

ID	Subject Matter	Details	How the Measure Will be Secured
		distances will be given via Notices to Mariners and Kingfisher Bulletins.	
M-031	Safety Zones	A Safety Zone Statement has been submitted with this Application. An application for and use of rolling Safety Zones of up to 500m during construction and O&M stages will be submitted to MD-LOT for approval. No permanent operational safety zone is proposed. The safety zone application will include the following: - pre-commissioning safety zones: 50m - construction stage: 500m safety zones around active construction works and evidenced by the presence of a construction vessel; - construction stage: 50m safety zones around partially or fully completed structure prior to the overall wind farm commissioning; and - O&M stage: 500m safety zone around the site of major maintenance works. No safety zones are currently proposed for the decommissioning stage, a separate application would be made prior to decommissioning where considered necessary. 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 that poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards.	s.36 conditions and marine licences conditions.
M-033	Development and adherence to a Marine Pollution Contingency Plan (MPCP)	An Outline MPCP (Annex to the Environmental Management Plan (EMP)) has been submitted with this Application (Volume 4). This Outline MPCP outlines details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising from offshore operations relating to the Project. The Final MPCP will be completed prior to construction commencing and submitted to MD-LOT for approval and will include relevant key emergency contact details.	s.36 conditions and marine licences conditions.
M-038	Development and adherence to a Lighting and Marking Plan (LMP)	An Outline LMP has been submitted with this Application (Volume 4). The Final LMP will be completed prior to construction commencing and submitted to MD-LOT for approval. The LMP will confirm compliance with Northern Lighthouse Board requirements and in Line with IALA Recommendation G1162 (IALA, 2021) with regards to shipping, navigation and aviation marking and lighting during construction and O&M stage of the works.	s.36 conditions and marine licences conditions.

ID	Subject Matter	Details	How the Measure Will be Secured
M-039	Development and adherence to a Vessel Management and Navigational Safety Plan (VMNSP)	An Outline VMNSP has been submitted with this Application (Volume 4). The Final Vessel Management and Navigation Safety Plan will be completed prior to construction commencing and submitted to MD-LOT for approval. The Final Plan will confirm the types and numbers of vessels that will be engaged on the Project; consider vessel coordination including indicative transit route planning; describe measures put in place by the Project 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).	s.36 conditions and marine licences conditions.
M-040	Marine coordination	Marine coordination and communication to manage project vessel movements. Proactive Kingfisher notifications and other navigational warnings in a timely manner in addition to distribution to the UKHO.	Company Marine Operations Manual and AtoN Plan, inclusion in Admiralty charts by UKHO; condition on the s.36 consent and / or marine licences.
M-043	Development of and adherence to a Development Specification and Layout Plan (DSLP)	Development of and adherence to a Development Specification and Layout Plan, which will confirm the Project's layout and design parameters. This will be submitted to MD-LOT for approval post-consent.	Company Marine Operations Manual and AtoN Plan, inclusion in Admiralty charts by UKHO; condition on the s.36 consent and / or marine licences.
M-044	Compliance with regulatory expectations on moorings for floating wind and marine devices (HSE and MCA, 2017).	Compliance with regulatory expectations on moorings for floating wind and marine devices (HSE and MCA, 2017).	s.36 conditions and marine licences conditions.
M-045	Compliance with MCA MGN 654 (MCA, 2021) and its annexes where applicable.	Compliance with MCA MGN 654 (MCA, 2021) and its annexes where applicable. MGN 654 includes the completion of a Search and Rescue Checklist.	s.36 conditions and marine licences conditions.

ID	Subject Matter	Details	How the Measure Will be Secured
M-046	Minimum blade tip clearance	There will be a minimum blade tip clearance of at least 22m above mean high water springs.	s.36 conditions and marine licences conditions.
M-047	Appropriate marking on Admiralty Charts	Appropriate marking of the Project on Admiralty and aeronautical charts. All offshore infrastructure structures (WTGs, platforms and other structures) of more than 91.4m in height will be charted on aeronautical charts and reported to the Defence Geographic Centre (DGC). This is to update the UK's database of tall structures (Digital Vertical Obstruction File) and will be submitted at least ten weeks prior to construction. This will include provision of the positions and heights of structures to the UKHO, Civil Aviation Authority, Ministry of Defence (MOD) and Defence Geographic Centre.	s.36 conditions and marine licences conditions.
M-048	Development and adherence to a Fisheries Monitoring, Management and Mitigation Strategy (FMMMS)	An Outline FMMMS has been submitted with this Application (Volume 4). The Final FMMMS will be completed prior to construction commencing and submitted to MD-LOT for approval. The Final FMMMS will set out the means of ongoing fisheries liaison through construction and O&M stages of the Project 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 and Incident Response Policy.	s.36 conditions and marine licences conditions.
M-049	Development and adherence to a Project Environmental Monitoring Programme (PEMP)	An Outline PEMP has been submitted with this Application (Volume 4). The Final PEMP will be completed prior to construction commencing and submitted to MD-LOT for approval. The Final PEMP will set out commitments to environmental monitoring in pre-, during and post-construction stages of the Project.	s.36 conditions and marine licences conditions.
M-054	Cable Burial Risk Assessment (CBRA)	A detailed CBRA will be undertaken to enable informed judgements about burial depth. This should reduce the risk of buried cables reemerging whilst also limiting the amount of sediment disturbance to that which is necessary. The array and export cables will typically be buried at a target burial depth between 1-2m below the seabed surface. The final depth of the cable will be dependent on the seabed mobility and CBRA. The CBRA will manage and mitigate risks from loading and sediment transport across the seabed. The CBRA will be included within the Final CaP.	s.36 conditions and marine licences conditions.
M-106	Development and adherence to a	The development of and adherence to a Decommissioning Programme. The Decommissioning Programme will outline measures for the decommissioning of the Project. The Decommissioning Programme would be submitted prior to	Required under Sections 105 (Energy Act 2004) and Marine

ID	Subject Matter	Details	How the Measure Will be Secured
	Decommissioning Programme.	construction commencing to MD-LOT and approved by Scottish Ministers prior to construction.	Licence consent conditions.
M-118	Buoyed construction area	The construction area will be buoyed, as described in the Vessel Management and Navigation Safety Plan. Buoyage will be defined in consultation with the NLB.	s.36 conditions and marine licences conditions.
M-120	CMS	An Outline Construction Method Statement (CMS) has been submitted with this Application (Volume 4). The Final CMS will be completed prior to construction commencing and submitted to Marine Directorate - Licensing Operations Team (MD-LOT) for approval. The Final CMS will include: a) details of the commence dates, duration and phasing of key elements of construction, working areas, the construction procedures and good working practices; b) details of the roles and responsibilities; and c) details of how the construction related mitigation step proposed are to be delivered.	s.36 conditions and marine licences conditions.
M-122	Offshore O&M Plan (OOMP)	Development of and adherence to a Offshore Operations and Maintenance Plan, which will confirm the Project's operations and maintenance activities. This will be submitted to MD-LOT for approval post-consent.	s.36 conditions and marine licences conditions.

17.1 Marine Aids to Navigation

529. Throughout all stages, AtoNs will be provided in accordance with NLB and MCA requirements, with consideration being given to IALA Recommendation O-139 and G1162 (IALA, 2021) and MGN 654 (MCA, 2021) as per **Volume 4: Outline Lighting and Marking Plan**.

17.1.1 Construction and Decommissioning Stages

530. During the construction and decommissioning stages, buoyed construction and decommissioning areas will be established and marked, where required, in accordance with NLB requirements based on the IALA Maritime Buoyage System. In addition, where advised by NLB, additional marking on structures may also be applied.

17.1.2 Operation and Maintenance Stage

531. Marking during the O&M stage will be agreed in consultation with NLB once the final array layout has been selected post consent; however, the following subsections summarise likely requirements.

17.1.2.1 Marking of Individual Array Structures

532. As per IALA Guideline G1162, each surface structure within the OAA will be painted yellow from the level of Highest Astronomical Tide (HAT) to at least 15m above HAT. Each structure will also be clearly marked with a unique alphanumeric identifier which will be clearly visible from all directions. The MCA will advise post consent on the specific requirements for the identifiers, but a logical pattern with potential for additional visual marks may be considered by statutory stakeholders. Each identifier will be illuminated by a low-intensity light such that the sign is available from a vessel thus enabling the structure to be identified at a suitable distance to avoid an allision incident.

533. The identifiers will be situated such that under normal conditions of visibility and all known tidal conditions, they are clearly readable by an observer (with the naked eye), stationed 3m above sea level and at a distance of at least 150m from the WTG. The light will be either hooded or baffled so as to avoid unnecessary light pollution or confusion with navigational marks.

17.1.2.2 Marking of Array as a Whole

534. The marking of the OAA as a whole will be agreed with NLB once the final array layout has been selected and will be in line with IALA Recommendation O-139 and G1162. As per the IALA guidance, and in consultation with NLB, it will be ensured that:

- All corner structures will be marked as a Significant Peripheral Structure (SPS) and where necessary, to satisfy the spacing requirements between SPSs, additional periphery structures may also be marked as SPSs;
- Structures designated as an SPS will exhibit a flashing yellow five second (flash yellow every five seconds) light of at least 5nm nominal range and omnidirectional fog signals as appropriate and where prescribed by NLB, and will be sounded at least when the visibility is 2nm or less;
- Further periphery structures may be marked as Intermediate Peripheral Structures (IPS) including a flashing yellow light with a distinctly different flash character from those displayed on the SPSs and at least 2nm nominal range;
- All lights will be visible to shipping through 360˚ and if more than one lantern is required on a structure to meet the all-round visibility requirement, then all the lanterns on that structure will be synchronised;
- All lights will be exhibited at the same height at least 6m above HAT and below the arc of the lowest WTG blades;
- Remote monitoring sensors using Supervisory Control and Data Acquisition (SCADA) will be included as part of the lighting and marking scope to ensure a high level of availability for all aids to navigation;
- Aviation lighting will be as per CAA requirements; however, will likely be synchronised Morse “W” at the request of NLB; and
- All lighting will be considered cumulatively with existing aids to navigation to avoid the potential for light confusion to passing traffic.

535. Consideration will also be given to the use of marking via AIS, or other electronic means (such as Racon) to assist safe navigation particularly in reduced visibility. AIS transmitters or virtual buoys could also be considered internally to assist with safe navigation within the OAA.

17.1.2.3 Marking of RCP

536. During the Hazard Workshop, NLB confirmed that the RCPs would be lit and marked as an isolated structure (as per IALA G1162) and be based on existing bridge-linked structures given mariner familiarity with them from the oil and gas industry.

17.1.2.4 Marking of Export Cables

537. No lighting or physical marking would be required during the O&M stage for the export cables.

17.2 Design Specifications Noted in Marine Guidance Note 654

538. The individual WTGs and other structures will have functions and procedures in place for generator shut down in emergency situations, as per MGN 654 (MCA, 2021).

18 Risk Assessment – Construction Stage

18.1 Vessel Displacement and Increased Vessel to Vessel Collision Risk Between Third-Party Vessels

539. Activities associated with the installation of structures and subsea cables may displace third-party vessels from their existing routes or activity, increasing the collision risk with other third-party vessels.

18.1.1 Option Agreement Area

18.1.1.1 Main Commercial Route Displacement

540. During the construction stage, a buoyed construction area would be deployed around the OAA in agreement with NLB. Although there would be no restrictions on entry into the buoyed construction area, other than through active safety zones, based on experience at previously under construction offshore wind farms and consultation, it is anticipated that the majority of commercial vessels would choose not to navigate internally within the buoyed construction area and therefore some main route deviations would be required.

541. Main commercial routes have been identified in line with the principles set out in MGN 654 (MCA, 2021) based primarily on vessel traffic survey data collected during dedicated surveys (28 days in Summer and Winter 2024), the long-term vessel traffic data (2024), and Anatec's ShipRoutes database. Further details of the methodology for main commercial route identification are provided in **Section 11.1**, noting that the vessel traffic survey data has been agreed as appropriate by the MCA. As part of the future case considerations, increases in 10% and 20% of all traffic including commercial vessels is assumed with these values being agreed with stakeholders during the Hazard Workshop. Vessel displacement was not raised as a key concern during the Hazard Workshop.

542. The full methodology for main route deviations is provided in **Section 14.5.1**, with deviations established in line with MGN 654 (MCA, 2021). Due to the presence of the OAA, a deviation would be required for seven of the 10 of the 35 main commercial routes identified across the Project.

543. The largest deviation of a route deviated by the OAA is anticipated to be 3.5nm associated with Route 11 (north-east south-west routeing of oil and gas vessels between Aberdeen and the Claymore Oil Field). This increase equates to a 3.6% increase in route length for the portion of the route deviating north around the OAA, noting that this route is particularly short in nature overall. Only one of the other deviated routes features a distance increase equal to or greater than 1% of the route length; Route 4b at 1.2% with an anticipated deviation of 2.2nm (north-east south-west routeing of oil and gas vessels between Aberdeen and the Gryphon and Harding Oil Fields).

544. The deviated route with the highest vessel traffic volumes was Route 3, with approximately one transit per day, i.e., deviations are expected to be a frequent occurrence. Regular RoRo and RoPax vessels – which are particularly sensitive to deviations given the timetabled services they provide – were only recorded on Route 1, which would not require a deviation due to the presence of the OAA.

545. The most likely consequences of vessel displacement would be increased journey times and distances for affected third-party vessels. The hazard would occur over a local spatial extent given that the buoyed construction area would be deployed around the maximum extent of the OAA.

546. As a worst case, there could be disruption to schedules. However, no timetabled commercial ferry routes are impacted by the OAA and given the international nature of routeing in the region alongside the ability to passage plan, disruptions to schedule are expected to be minimal.

18.1.1.2 Adverse Weather Routeing

547. From the vessel traffic survey data, there were no instances of alternative routeing due to possible adverse weather were recorded, with no adverse weather conditions recorded in the weather logs during the survey periods.

548. During consultation with Serco NorthLink Ferries, they had confirmed that their vessels routeing between Aberdeen and the Northern Isles do on occasion route further offshore during periods of adverse weather in order to avoid particularly rough areas of sea, especially at Rattray Head. This allows the vessel to make passage more comfortably, ensuring a suitable angle for waves and wind is obtained, particularly in south-easterly winds which can cause the vessels to roll. This is particularly important for RoPax vessels containing higher volumes of passengers on board. Adverse weather transits were identified in the 12-month AIS data for vessels on this route on occasion reaching the study area, but no transits intersected the OAA and so the OAA is not anticipated to cause any concern or impact on these adverse weather routeing. This was confirmed by Serco NorthLink with passing further offshore than what has been identified in the vessel traffic data is unlikely given increased mileage, fuel use and that vessels are on timetabled routes.

549. Several Regular Operators responded to the consultation outreach highlighting adverse weather routeing in their response including Tidewater Marine and Fletcher Group. Tidewater Marine noted that in certain weather conditions the vessel may use alternative routes but would mostly apply to the Winter season. Fletcher Group noted in their response that their vessels are already used to navigating through and around various oil and gas assets in the North Sea and this can be exacerbated during adverse weather, but vessels may adjust course and /or their speed to combat the effects of the weather.

550. Both of these operators operate oil and gas vessels and as Fletcher Group has noted, vessels can be on charter and change routes regularly as well as regularly adjusting passage plans to meet new requirements and are used to adapting to new offshore installations. However, as noted by these operators as well as TorCargo also, vessels may be required to further deviate and this can lead to increase in fuel burn, which would be exacerbated during adverse weather.

18.1.1.3 Small Craft Displacement

551. Based on experience at previously under construction offshore wind farms, it is anticipated that fishing vessels and recreational vessels would also choose not to routinely navigate internally within the buoyed construction area. From the vessel traffic survey data (which incorporates Radar and visual observations in addition to AIS) regular transits by commercial fishing vessels were recorded through the OAA noting that displacement of commercial fishing vessels engaged in fishing activity is assessed in **Volume 1**, **Chapter 14: Commercial Fisheries**. During the Hazard Workshop, SFF confirmed that the survey data was representative of transiting fishing vessels this far offshore. SFF also noted that there is a possibility of commercial vessels being displaced into fishing grounds leading to the potential interaction and further displacement of fishing vessels.

552. For recreational vessels there is even less activity in proximity to the OAA with vessels only present in very small volumes during the Summer period on east west transits. It was raised by the RYA Scotland during the Scoping responses that these transits are irregular and would be on passage between Scotland and Scandinavia; however, routes taken would depend on the wind direction and so may vary from year to year, but these vessels are used to transiting in proximity to oil and gas infrastructure in the area. As aforementioned, the vessel traffic survey data incorporates Radar and visual observations in addition to AIS.

553. Any displacement of recreational vessels should also consider the increase of tiredness due to increased voyages. However, displacement would be limited and there is sufficient sea room around the OAA to accommodate any affected recreational vessels and any recreational vessels transiting this far offshore would be expected to undertake due diligence of their intended route (i.e., adequate passage planning) as noted by the NLB during the Hazard Workshop.

18.1.1.4 Collision Risk

554. From historical incident data, no collision incidents between third-party vessels have occurred directly as a result of a UK offshore wind farm.

555. Post wind farm, the collision frequency was estimated at one in 688 years, representing a 71% increase on the pre wind farm scenario. With a future case vessel traffic growth of 20%, this return period increases to one in 485 years. Although this is a high increase, the likelihood of a collision incident remains relatively low and is a result of the convergence of main commercial routes due to the deviation being required for ten

routes due to the presence of the OAA. This in turn increases densities in the surrounding areas, which could lead to an increase in vessel to vessel encounters and therefore an increased risk of collision. The risk of collision was not raised as a key topic during consultation including at the Hazard Workshop.

556. The most likely consequences in the event of an encounter between two or more third-party vessels is the implementation of avoidance action in line with the COLREGs, with the vessels involved able to resume their respective passages with no long-term consequences.

557. Should an encounter develop into a collision incident, it is most likely to involve minor contact resulting in minor damage to the vessels with no harm to people and no substantial reputational risks. As a worst case with very low frequency of occurrence one of the vessels could receive substantial damage or founder with Potential Loss of Life (PLL) and pollution, with this outcome more likely where one of the vessels is a small craft (e.g., fishing vessel, recreational vessel or CTV).

558. During the Hazard Workshop, the MCA acknowledged that any requirement to undertake vessel traffic monitoring will be determined on a case-by-case basis following their discussions with MD-LOT. It is acknowledged that if vessel traffic monitoring is to be undertaken throughout the construction stage, it would aid in the characterisation of identifying changes to routeing patterns. These would then be compared against anticipated deviations to allow a comprehensive review of the embedded mitigation measures applied at the time.

559. From the vessel traffic survey data (which incorporates Radar and visual observations in addition to AIS) regular transits by commercial fishing vessels are frequent. In the event of a collision incident the likelihood of a worst case outcome (the small craft foundering with PLL and pollution) is greater due to the size and likely hull material of the small craft.

18.1.1.5 Promulgation of Information and Passage Planning

560. All vessels operating in the area are expected to comply with international flag state regulations (including the COLREGs and SOLAS) and would have a raised level of awareness of construction and decommissioning activities given the promulgation of information relating to the Project including the charting of the construction areas on relevant nautical charts and the use of safety zones. The buoyed construction areas would also serve to maximise awareness.

561. All vessels are expected to comply with flag state regulations including Regulation 34 of SOLAS Chapter V – which states that "*the voyage plan shall identify a route which… anticipates all known navigational hazards and adverse weather conditions*" (IMO, 1974) – and IMO Resolution A.893(21) on the Guidelines for Voyage Planning (IMO, 1999). The promulgation of information relating to the Project would assist such passage planning.

18.1.2 Offshore Export Cable Corridor

562. Given the location of the offshore export cable corridor, it is considered likely that cable installation will lead to displacement with many commercial vessels routeing north south, in particular to local ports (Peterhead and Aberdeen). However, no concerns were raised over displacement due to cable installation in regard to commercial vessels. Installation activities will be short-term and temporary in nature and cover only a small extent. Therefore, deviations will be manageable, particularly with the promulgation of information allowing mariners to passage plan accordingly.

563. Fishing vessels in transit to Peterhead Port may be affected if approaching from the north when installation activities are occurring. This is of importance as Peterhead Port is the largest fishing port in Europe, and it is vital that vessels are able to maintain landing schedules. Vessels departing Peterhead Port were either on transit to fishing grounds or back to home ports such as Fraserburgh. As raised during the Hazard Workshop by Brown & May Marine, inshore potting vessels are likely to be present in proximity to the offshore export cable corridor noting that displacement of commercial fishing vessels engaged in fishing activity is assessed in **Volume 1**, **Chapter 14: Commercial Fisheries**.

564. For recreational vessels, there are frequent crossings of the offshore export cable corridor in the Summer, and therefore some potential for displacement around installation activities. However, there is sufficient sea room available for this (east and west) and so disruption would be limited. RYA Scotland noted in the Scoping Opinion that the landfall area is not expected to cause any issues for recreational traffic, and so it is unlikely that cable installation would pose any problems for recreational vessels as COLREGs will apply and recreational vessels would safely navigate around ongoing project works.

565. Again, as for commercial vessels, deviations would be manageable for small craft, particularly with the promulgation of information allowing mariners to passage plan accordingly.

566. The most likely consequences are anticipated to be similar for the offshore export cable corridor as they are for the OAA and RCP search area.

18.1.3 Reactive Compensation Platform Search Area

567. As mentioned in **Section 6.2.6**, the RCP(s) may only be required during Phase 2 of the construction of the Project and only if HVDC is utilised within the OAA.

568. During the construction of the RCP within the RCP search area, a buoyed construction area may be deployed around the installations. Although there would be no restrictions on entry into any buoyed construction area, it is anticipated that the majority of commercial vessels would choose not to navigate internally within a buoyed construction area and therefore some main route deviations would be required.

569. As with the OAA, main commercial routes in the vicinity of the RCP search area have been identified from 12-months of long-term AIS data as well as Anatec's ShipRoutes database (see **Section 11.2**).

570. Deviations would be required during construction of the RCP(s) for six main commercial routes. The greatest deviation of these six routes is associated with Route 11 which was detailed in **Section 18.1.1** for the OAA. The majority of increase in route length is associated with the presence of the OAA. This is emphasised by the route deviations wholly associated with the RCP; Routes 28 and 29, which were only deviated by the RCP and their increase in route lengths were <0.1nm.

571. Both the absolute value of deviation, as well as the percentage deviation of the overall route length are relatively small when only considering the RCP and are not expected to materially affect journey times and distances for third-party vessels. Regular RoRo and RoPax vessels were identified on Route 1, but no deviation on this route is required due to the presence of the RCP.

572. As noted in the adverse weather routeing for the OAA (**Section 18.1.1.2**), Serco NorthLink Ferries were recorded during periods of adverse weather routeing further offshore. Adverse weather transits were seen to pass further offshore and alter course by 90° before returning to the mean route position, with several of these transits intersecting the RCP search area. During periods of extreme adverse weather and when sailings are not deemed safe, these scheduled routes are often cancelled as outlined in **Section 12.2.1**. Serco NorthLink also confirmed that at the time of the RCP installation, new stabilised freight ferries would be in use (by 2029) which should reduce the frequency of such offshore routeing, RoPax vessels already have such stabilisers and so it is not anticipated that the RCP would adversely impact vessels on this route and Serco NorthLink have confirmed this to be the case.

573. The most likely consequences of vessel displacement would be increased journey times and distances for affected third-party vessels, the same as proposed for the OAA. However, for the RCP search area, the hazard would occur over a more refined local spatial extent and therefore be less substantial.

574. Post wind farm, the collision frequency was estimated at one in 806 years, representing a 3.7% increase on the pre wind farm scenario. With a future case vessel traffic growth of 20%, this return period increases to one in 568 years. This increase is due to the minor deviations required for the six main commercial routes – especially the convergence of Route 4 and Route 10 options – but overall remains low due to only being a single structure to deviate around. Like the OAA, the risk of collision was not raised as a key topic during consultation including at the Hazard Workshop.

575. The most likely consequences in the event of an encounter between two or more third-party vessels is the implementation of avoidance action in line with the COLREGs, with the vessels involved able to resume their respective passages with no long-term consequences, the same as proposed for the OAA.

18.1.4 Significance of Risk

576. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from vessel displacement and third-party collision risk for each Project component is presented in **Table 18.1**.

Table 18.1 Significance of risk for vessel displacement and third-party collision risk (construction stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Increased journey time / distance which impacts on schedules or compliance with COLREGs, and collision incident occurs with vessel damage, PLL, and / or pollution.	Reasonably Probable	Moderate	**Tolerable with Mitigation**
Offshore export cable corridor		Remote	Moderate	**Tolerable with Mitigation**
RCP search area		Remote	Moderate	**Tolerable with Mitigation**

18.2 Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel

577. The presence of vessels associated with construction activities, may result in increased risk of a collision between a third-party vessel and a project vessel.

18.2.1 Option Agreement Area

578. The construction stage may last for up to 12 years across three continuous phases. The locations of each of these phases are not yet known but will be detailed within the CMS, included as an embedded mitigation measure.

579. Up to 10 project vessels may be on site simultaneously during the construction stage making up to 3,838 individual vessel transits. This would include Restricted in Ability to Manoeuvre (RAM) vessels. It is assumed that construction vessels would be on-site throughout the duration of the construction stage.

580. Based on historical incident data, there has been one instance of a third-party vessel colliding with a project vessel in the UK (**Section 9.5**). During this incident, which occurred in 2011, moderate vessel damage was reported with no harm to persons. Since then, awareness of offshore wind developments and the application of mitigation measures has improved or been refined considerably in the interim, with no further collision incidents reported.

581. Project vessels would be managed by marine coordination through a VMNSP, **Volume 4: Outline Vessel Management and Navigational Safety Plan** It is also noted that Project vessels would carry AIS and comply with Flag State regulations including the COLREGs and SOLAS. This would be particularly important for Project vessels transiting to and from the

OAA, noting that the base port(s) for construction are not yet known. This also refers to where Project vessels transiting between ports and the OAA are undertaking towage of a floating unit, as a failed towage operation could result in the floating unit being adrift and if occurring in a high risk area, there is an increase in collision risk. Towage of a floating unit to the OAA would be subject to a dedicated risk assessment at the time of the towage operation when full specifications relating to the operations is available and this will include consideration of upcoming MCA guidance relating to towage requirements for offshore floating structures.

582. In addition to the buoyed construction area, where project vessels are undertaking construction activities associated with surface structures, safety zones are anticipated. An application for safety zones of 500m would be sought during the construction stage around structures where construction activity is ongoing (e.g., where a construction vessel is present). These would serve to protect Project vessels engaged in construction activities. Minimum advisory passing distances, as defined by risk assessment, may also be applied where safety zones do not apply (e.g., around cable installation vessels) with advanced warning and accurate locations of both safety zones and any minimum advisory passing distances provided by Notifications to Mariners and Kingfisher Bulletins.

583. Third-party vessels may experience restrictions on visually identifying project vessels entering and exiting the array during reduced visibility; however, this hazard would be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and require all vessels operating in reduced visibility to reduce speed to allow more time for reacting to encounters, thus minimising the collision risk.

584. The Project will exhibit lights, marks, sounds, signals and other aids to navigation as required by NLB and MCA, including the buoyed construction area. These navigational aids would further maximise mariner awareness when in proximity, both in day and night conditions including in poor visibility.

585. Should an encounter develop into a collision incident, the most likely consequences would be similar to that outlined for the case of a collision between two third-party vessels, it is likely to be very localised and occur for only a short duration. With collision avoidance action implemented in line with the COLREGs, the vessels involved would likely be able to resume their respective passages and / or activities with no long-term consequences.

586. As an unlikely worst case, one of the vessels could founder resulting in PLL and pollution, with this outcome more likely where one of the vessels is a small craft (e.g., fishing vessel, recreational vessel or CTV). If pollution were to occur in proximity to the Project or involving a project vessel, then pollution planning protocols would be implemented to minimise the environmental risks.

18.2.2 Offshore Export Cable Corridor

587. For the offshore export cable corridor, the impact on increased collision risk between third-party vessels and project vessels is significantly less than other Project components as installation activities would cover a reduced area and be local in extent. Additionally, the open sea room in the vicinity of offshore export cable corridor would allow vessels to safely take avoiding action should an encounter situation arise. The greatest impact to vessels would occur near the landfall location during construction. However, only small craft would likely be affected as larger commercial vessels would be unlikely to route that close to shore. Small craft transits were primarily north south over the offshore export cable corridor inshore and so the extent of exposure in which a vessel would be subject to construction activities is low.

588. As aforementioned, RYA Scotland noted in the Scoping Opinion that the landfall area is not expected to cause any issues for recreational traffic, and so it is unlikely that cable installation would pose any problems for recreational vessels as COLREGs will apply and recreational vessels would work around ongoing project works.

589. The most likely consequences are anticipated to be the same for the offshore export cable corridor as they are for the OAA and RCP search area.

18.2.3 Reactive Compensation Platform Search Area

590. As the RCP search area would include only a maximum of an overall single structure (if two RCPs required, they would be connected via a bridge-link), there would be relatively few project vessels required on-site across the construction stage, associated only with the RCP(s). The likelihood of a project vessel encountering a third-party vessel would therefore be lower in this area. Additionally, the open sea room in the vicinity of the RCP search area would allow vessels to safely take avoiding action should an encounter situation arise.

591. The same mitigations applied to the OAA would be relevant for the RCP search area also, inclusive of lights, marks, sounds, signals and other aids to navigation as required by NLB and MCA, and this may also include a buoyed construction area. These navigational aids will further maximise mariner awareness when in proximity, both in day and night conditions including in poor visibility.

592. The most likely consequences of collision risk between and third-party vessel and a project vessel would be similar to that outlined for the case of a collision between two third-party vessels, it is likely to be very localised and occur for only a short duration, the same as the OAA. With collision avoidance action implemented in line with the COLREGs, the vessels involved will likely be able to resume their respective passages and / or activities with no long-term consequences.

18.2.4 Significance of Risk

593. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from third-party to Project Vessel collision risk for each Project component is presented in **Table 18.2**.

Table 18.2 Significance of risk for increased third-party to project vessel collision risk (construction stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Collision incident occurs with vessel damage, PLL, and / or pollution.	Remote	Moderate	**Tolerable with Mitigation**
Offshore export cable corridor		Extremely Unlikely	Moderate	**Broadly Acceptable**
RCP search area		Extremely Unlikely	Moderate	**Broadly Acceptable**

18.3 Reduced Access to Local Ports and Harbours

594. Construction activities associated with the installation of structures and cables may reduce access to local ports and harbours.

18.3.1 Option Agreement Area

595. Up to 10 construction vessels may be utilised across the construction stage and would include vessels which are RAM. Project vessels would be managed by marine coordination through a VMNSP, **Volume 4: Outline Vessel Management and Navigational Safety Plan**.

596. The closest port or harbour to the OAA is Fraserburgh Harbour, located approximately 42nm to the south-west. Given the relative distance to ports in the area and the anticipated deviations for the main commercial routes, it is not anticipated that there would be any substantial effect due to OAA construction activities on vessel approaches to and from any local ports beyond the deviations already outlined for impacts on vessel displacement (**Section 18.1**), especially since the ports associated with the construction of the Project are also not yet known.

597. However, it is recognised that towage operations for floating units between the assembly port and OAA may cause some disruption given the restricted nature of such activities. Towage operations would be subject to a dedicated risk assessment at the time of the towage operation when full specifications relating to the operations is available. The operation itself would be coordinated in liaison with the statutory harbour authority for the assembly port to ensure any access limitations were minimised.

18.3.2 Offshore Export Cable Corridor

598. For offshore export cable corridor construction activities, there is a greater risk given the proximity to the entrance to Peterhead Port, which is located approximately 1nm south of the offshore export cable corridor. Where cable installation is ongoing vessel displacement is possible; this is particularly of importance to fishing vessels which, as highlighted in the vessel displacement hazard (**Section 18.1**), are likely entering Peterhead Port to land and rely on berth availability and landing schedules. Installation activities for the offshore export cable corridor would be short-term and temporary in nature and cover only a small extent at any given time.

599. Peterhead Marina is a common stopping point for passing recreational vessels. RYA Scotland noted in the Scoping Opinion that the landfall area is not expected to cause any issues for recreational traffic, and so it is unlikely that cable installation would pose any problems for recreational vessels as COLREGs will apply and recreational vessels would work around ongoing project works.

600. A key element of the coordination would be in relation to pilotage activities, but it is noted that the pilot boarding station for Peterhead Port is located well clear of the offshore export cable corridor and during the vessel traffic surveys, and long-term vessel traffic data, no pilot vessels intersected the offshore export cable corridor. Additionally, the Peterhead Port Authority noted that vessel traffic would increase with the future developments at Peterhead Port, as there are plans to extend the quays. A 20% increase of vessel traffic proposed is realistic if planned developments went ahead. Peterhead Port also noted at the Hazard Workshop that port access issues would be on a case-by-case basis but acknowledged that there is good existing working relationship with the Project from previous survey work and Peterhead Port would coordinate with the Project as appropriate in relation to project vessel movements.

601. No further concerns were raised in regard to local port and harbour access in the Hazard Workshop in relation to the offshore export cable corridor. Nevertheless, information would be promulgated prior to any construction activities to allow mariners to passage plan accordingly.

18.3.3 Reactive Compensation Platform Search Area

602. The closest port or harbour to the RCP search area is Peterhead Port, located approximately 16nm to the south-west. Like the OAA, given the relative distance to ports in the area and the anticipated deviations for the main commercial routes, it is not anticipated that there would be any substantial effect due to RCP construction activities on vessel approaches to and from any local ports beyond the deviations already outlined for impacts on vessel displacement (**Section 18.1**), especially since the ports associated with the construction of the Project are also not yet known.

18.3.4 Significance of Risk

603. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from reduced access to local ports and harbours for each Project component is presented in **Table 18.3**.

Table 18.3 Significance of risk for reduced access to local ports and harbours (construction stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and / or berth times.	Extremely Unlikely	Minor	**Broadly Acceptable**
RCP search area		Reasonably Probable	Minor	**Tolerable with Mitigation**
Offshore export cable corridor		Negligible	Minor	**Broadly Acceptable**

18.4 Loss of Station

604. *In the event that the mooring system holding a floating unit fails, the floating substructure may experience loss of station and become a floating hazard to passing vessels.*

605. As this hazard is only relevant to the floating units associated within the OAA; this hazard will only assess the OAA and not the RCP search area or the offshore export cable corridor.

18.4.1 Option Agreement Area

606. Towage of the floating unit to site would be subject to a dedicated risk assessment at the time of the towage operations when full specifications relating to the operations is available. This dedicated risk assessment should cover all elements of the towing operation including in port approaches.

607. The UK Chamber of Shipping noting shared anchors should be used to assess the worst-case scenario for loss of station. During the construction stage while located within the OAA, the OAA would be monitored by vessels on-site at all times ensuring all infrastructure remains in-situ. If a mooring line failure was to arise, a project vessel would be able to respond in a timely manner ensuring a loss of station event does not occur and appropriate arrangements are taken which may include towing the floating unit off-site.

608. On this basis, 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 would have a minimum of three).

609. The main consequence would be failure of a single mooring line leading to a temporary increase in the maximum excursion of the floating unit but without full loss of station.

610. As a worst-case, multiple shared anchor failures could lead to multiple floating units going off station, with potential for collision risk with third-party vessels.

18.4.2 Significance of Risk

611. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from loss of station for the OAA is presented in **Table 18.4**.

Table 18.4 Significance of risk for loss of station (construction stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Total failure of mooring/ shared anchor system or towage operation leads to drifting of multiple floating units with risk of collision with vessels.	Extremely Unlikely	Moderate	**Broadly Acceptable**

19 Risk Assessment – O&M Stage

19.1 Vessel Displacement and Increased Vessel to Vessel Collision Risk Between Third-Party Vessels

612. The presence of structures as well as activities associated with the O&M of structures and subsea cables may displace third-party vessels from their existing routes or activity, increasing the collision risk with other third-party vessels.

19.1.1 Option Agreement Area

19.1.1.1 Main Commercial Route Displacement

613. Based on experience at existing operational offshore wind farms (inclusive of floating offshore wind farms noting Hywind Scotland and Kincardine are currently the only operational UK floating offshore wind farms), it is anticipated that commercial vessels would choose not to navigate internally within the OAA and therefore the main route deviations established for the equivalent construction stage hazard for vessel displacement in line with MGN 654 (MCA, 2021) are again applicable during the O&M stage of the Project (**Section 18.1**).

614. Subsequently, the nature of this hazard for commercial vessels is expected to be broadly similar to that considered for the equivalent construction stage hazard for vessel displacement (**Section 18.1**). The buoyed construction area would no longer serve to assist with guiding vessels around the OAA, but the operational lighting and marking of the array would serve this purpose.

615. Vessels using the deviated routes are typically smaller commercial oil and gas vessels whose master's would be experienced with navigating in close proximity to offshore installations. Therefore, there is potential that depending upon the final layout, these vessels may occasionally choose to navigate internally through the OAA noting that there would be no restrictions on entry, other than active O&M safety zones. However, this is unlikely as outlined by the oil and gas vessel operators response to the Regular Operator outreach (**Section 4.3**).

616. For fishing vessels and recreational vessels, internal navigation within the OAA is considered feasible during the O&M stage, as the minimum spacing is sufficient to accommodate transits by smaller vessels. Additionally, there would be no restrictions on entry into the OAA for any vessel other than through any active 500m major maintenance safety zones. However, it is recognised that , as detailed in Volume 1, Chapter 14: Commercial Fisheries, the presence of wind farm infrastructure, associated safety considerations, and operational constraints may effectively preclude or significantly limit commercial fishing activity within the OAA during operation. As such, while vessel transit is not legally restricted, the opportunity for commercial fishing within the site may be considered sterilised for the purposes of the fisheries assessment.

617. SFF noted during the Hazard Workshop that large pelagic fishing vessels are unlikely to transit within the operational array but would be down to Master discretion, but if they do transit in proximity, the level of relevance to this hazard would be greatest for fishing vessels as would be exposed to the hazard for longer. SFF highlighted if fishing vessels were to transit internally, they would likely do so due to the setback of WTGs in the centre of the OAA as a result of the presence of the subsea pipeline creating a 1.6km gap (noting this gap is not intended as a navigational corridor).

618. It should be expected that some recreational vessel transits could occur within the OAA during operation. Vessels may also enter if avoiding larger commercial vessels. Based on baseline characteristics of recreational vessels, noting RYA Scotland confirmed the vessel traffic survey data to be representative of activity in the area, recreational vessel volumes are very low, and any internal transits or deviations made by recreational vessels would be infrequent and these vessels on intercontinental routes would likely be used to transiting in proximity to developments and oil and gas infrastructure. Again, as noted during the construction stage, any recreational vessels transiting this far offshore would be expected to undertake due diligence of the intended route.

619. The main consequences of vessel displacement during the O&M stage are also considered to be equivalent to the construction stage, in particular potential for increased journey times and distances (**Section 18.1.1**) No notable effects on navigational safety are anticipated.

19.1.1.2 Collision Risk

620. Increased third-party vessel to vessel collision for commercial vessels is expected to be broadly similar to that considered for the equivalent construction stage hazard including mitigation measures (**Section 18.1.1.4**). Although the buoyed construction area would no longer serve to assist with guiding vessels around the OAA, the operational lighting and marking of the array would serve this purpose.

621. An additional factor during the O&M stage is the potential for the view of other vessels to be blocked or hindered due to the presence of structures, particularly for small craft which may choose to navigate internally within the OAA. However, the minimum spacing between WTGs is sufficient to ensure that any notable effects – which would likely arise only along a row of WTGs – occur only where the vessels involved are far apart, i.e., at opposite ends of the row of WTGs a concertina effect occurring along the row of WTGs. Any visual hindrance is very short-term in nature, especially as any vessels which would be visually obscured for the maximum length of time would be parallel to each other and so not on a collision course. As the distance between the vessels closes, any blocking effect would quickly reduce. In adverse weather conditions obtaining a visual of a crossing vessel may be more challenging, but it is anticipated that in such circumstances the COLREGs would be applied in terms of using reduced speeds in limited visibility.

622. This is the same for smaller craft, fishing vessels and recreational vessels, where internal transits within the operational array may be expected. There remains sufficient

open sea room around the OAA during O&M activities to ensure that collision risk (including with a commercial vessel) is minimal.

623. Additionally, the promulgation of information relating to O&M activities and charting of infrastructure would allow vessel Masters (across all vessel types) to passage plan in advance, minimising any displacement and subsequent collision risk. Additionally, information for fishing vessels would be promulgated through ongoing liaison with fishing fleets and fisheries associations via a Fishing Industry Representative.

624. Again, the main consequence of increased third-party collision risk associated with the OAA is expected to be broadly similar to the equivalent construction stage hazard, i.e., increased encounters (**Section 18.1.1.4**).

19.1.2 Offshore Export Cable Corridor

625. The frequency of O&M activities associated with the offshore export cable corridor is expected to be limited, and so potential disruption associated with the offshore export cable corridor would again be limited and any deviations would be minimal and easily manageable with notice of any maintenance being promulgated.

626. Any displacement due to O&M activities within the offshore export cable corridor is not anticipated to affect available sea room such that the risk of a collision between third-party vessels is materially increased.

627. Again, the main consequences of vessel displacement and increased third-party collision risk during the O&M stage are also considered to be equivalent to the construction stage, in particular potential for increased journey times and distances and increased encounters (**Section 18.1.2**). No notable effects on navigational safety are anticipated.

19.1.3 Reactive Compensation Platform Search Area

628. The frequency of O&M activities associated with the RCP(s) is expected to be limited, and so potential disruption associated within the RCP search area would be limited and any deviations would be minimal and easily manageable with notice of any maintenance being promulgated. The main route deviations established for the equivalent construction stage hazard for vessel displacement due to the presence of the RCP(s) are again applicable during the O&M stage of the Project (**Section 18.1**).

629. Subsequently, the nature of this hazard for commercial vessels is expected to be broadly similar to that considered for the equivalent construction stage hazard for vessel displacement (**Section 18.1**). A buoyed construction area would no longer serve to assist with guiding vessels around the RCP(s), but the operational lighting and marking of the structures would serve this purpose. NLB confirmed during the Hazard Workshop that the RCP would be lit and marked as an isolated structure and be based on existing bridge-linked structures (should a bridge link be implemented) as mariners are already familiar with them from oil and gas industry.

630. Again, the main consequences of vessel displacement and increased third-party collision risk during the O&M stage are also considered to be equivalent to the construction stage, in particular potential for increased journey times and distances and increased encounters (**Section 18.1.3**). No notable effects on navigational safety are anticipated.

19.1.4 Significance of Risk

631. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from vessel displacement and third-party collision risk for each Project component is presented in **Table 19.1**.

Table 19.1 Significance of risk for vessel displacement and third-party collision risk (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Increased journey time / distance which impacts on schedules or compliance with COLREGs, and collision incident occurs with vessel damage, PLL, and / or pollution.	Reasonably Probable	Moderate	**Tolerable with Mitigation**
Offshore export cable corridor		Extremely Unlikely	Moderate	**Broadly Acceptable**
RCP search area		Remote	Moderate	**Tolerable with Mitigation**

19.2 Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel

632. The presence of vessels associated with O&M activities may result in increased risk of a collision between a third-party vessel and a project vessel.

19.2.1 Option Agreement Area

633. Up to 364 return trips per year by a peak of seven O&M vessels may be made throughout the O&M stage, including RAM vessels. It is assumed that O&M vessels will be on-site throughout the O&M stage. It is noted that the movement of project vessels during the O&M represents a large decrease in movements in comparison to the construction stage.

634. As with the equivalent construction stage hazard, encounter and collision risk involving a project vessel would be well mitigated, including through marine coordination, carriage of AIS, compliance with Flag State regulations by project vessels, and promulgation of information to fishing fleets. An application for safety zones of 500m radius would be sought during the O&M stage for any ongoing major maintenance within the OAA.

635. During the O&M stage, towage of floating units to and from the OAA for maintenance would be subject to a dedicated risk assessment at the time of the towage operation when

full specifications relating to the operations is available. It is anticipated that a maximum of 364 return trips per year would be carried out for floating unit towage to port. This dedicated risk assessment should cover all elements of the towage operation including in port approaches and internally within the OAA.

636. As stated during the equivalent construction stage hazard, based on historical incident data, there has been one instance of a third-party vessel colliding with a project vessel in the UK (**Section 9.5**), with no further collision incidents reported since.

637. Again, third-party vessels may experience restrictions on visually identifying project vessels entering and exiting the OAA during reduced visibility; however, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and require all vessels operating in reduced visibility to reduce speed to allow more time for reacting to encounters, thus minimising the collision risk.

638. The main consequences between a third-party vessel and a project vessel are expected to be broadly similar to the equivalent construction stage hazard for third-party to project vessel collision risk, noting that towage operations would occur less frequently (**Section 18.2.1**).

19.2.2 Offshore Export Cable Corridor

639. The frequency of O&M activities associated with the offshore export cable corridor is expected to be limited.

640. Again, the main consequences between a third-party vessel and a project vessel are expected to be broadly similar to the equivalent construction stage hazard for third-party to project vessel collision risk (**Section 18.2.2**).

19.2.3 Reactive Compensation Platform Search Area

641. The frequency of O&M activities associated with the RCP(s) is expected to be limited.

642. As with the equivalent construction stage hazard, encounter and collision risk involving a project vessel would be well mitigated, including through marine coordination, carriage of AIS, compliance with Flag State regulations by project vessels, and promulgation of information to fishing fleets.

643. Again, the main consequences between a third-party vessel and a project vessel are expected to be broadly similar to the equivalent construction stage hazard for third-party to project vessel collision risk (**Section 18.2.3**).

19.2.4 Significance of Risk

644. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from third-party to Project Vessel collision risk for each Project component is presented in **Table 19.2**.

Table 19.2 Significance of risk for increased third-party to project vessel collision risk (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Collision incident occurs with vessel damage, PLL, and / or pollution.	Remote	Moderate	**Tolerable with Mitigation**
Offshore export cable corridor		Negligible	Moderate	**Broadly Acceptable**
RCP search area		Extremely Unlikely	Moderate	**Broadly Acceptable**

19.3 Reduced Access to Local Ports and Harbours

645. O&M activities associated with the O&M of structures and cables may reduce access to local ports and harbours.

19.3.1 Option Agreement Area

646. Up to 364 return trips per year by a peak of seven O&M vessels may be made throughout the O&M stage, including RAM vessels. It is assumed that O&M vessels would be on-site throughout the O&M stage. It is noted that the movement of project vessels during the O&M represents a large decrease in movements in comparison to the construction stage. As per the construction stage, project vessels will be managed by marine coordination through a VMNSP, **Volume 4: Outline Vessel Management and Navigational Safety Plan**.

647. Given the extent of the OAA would be similar to during the construction stage, this element of the hazard is considered broadly similar. This includes in relation to any towage operations for floating units between a maintenance port and the OAA which may cause some disruption but would be coordinated in liaison with the statutory harbour authority to minimise access limitations.

648. The main consequences would be broadly similar to the equivalent construction stage hazard for reduced access to local ports, harbours, and marinas (**Section 18.3.1**).

19.3.2 Offshore Export Cable Corridor

649. As noted in the construction stage hazard, there is a greater risk given the proximity to Peterhead Port and importance of access for fishing vessels. However, the frequency of O&M activities is expected to be limited, and so potential disruption would be further limited with information promulgated in advance to allow mariners to passage plan accordingly if required.

650. Again, the main consequences would be broadly similar to the equivalent construction stage hazard for reduced access to local ports, harbours, and marinas (**Section 18.3.2**).

19.3.3 Reactive Compensation Platform Search Area

651. Given the extent of the RCP(s) would be similar to during the construction stage, this element of the hazard is considered broadly similar.

652. Again, the main consequences would be broadly similar to the equivalent construction stage hazard for reduced access to local ports, harbours, and marinas (**Section 18.3.3**).

19.3.4 Significance of Risk

653. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from reduced access to local ports and harbours for each Project component is presented in **Table 19.3**.

Table 19.3 Significance of risk for reduced access to local ports and harbours (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and / or berth times.	Extremely Unlikely	Minor	**Broadly Acceptable**
Offshore export cable corridor		Remote	Minor	**Broadly Acceptable**
RCP search area		Negligible	Minor	**Broadly Acceptable**

19.4 Loss of Station

654. In the event that the mooring system holding a floating substructure fails, the floating substructure may experience loss of station and become a floating hazard to passing vessels.

655. As per the construction stage hazard, this hazard is only relevant to the floating units associated within the OAA; this hazard will only assess the OAA and not the RCP search area or the offshore export cable corridor.

19.4.1 Option Agreement Area

656. The MCA require under their Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017) that developers arrange third-party verification (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.

657. 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 unit experiences total loss of station and drifts outside of its alarm zone, the Applicant would be made aware and be able to track its position and make the necessary emergency arrangements, which will depend upon the design of the floating unit and any predefined emergency response protocols. These protocols will also include recovery of a deliberately sunken floating unit should this be deemed a necessary option.

658. 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 three).

659. The main consequences will be broadly similar to the equivalent construction stage hazard for loss of station (Section 18.4). There is also potential for the lighting and marking of the OAA to be compromised should a loss of station lead to the loss of a key AtoN as highlighted by NLB during consultation, especially for the peripheral structures. The LMP; **Volume 4: Outline Lighting and Marking Plan** will ensure that this issue is addressed appropriately, which may include deployment of a guard vessel. RYA Scotland also raised in response to the Hazard Workshop that loss of station should cover the loss of station by buoy. Again, the LMP; **Volume 4: Outline Lighting and Marking Plan** will ensure that this issue is addressed appropriately through monitoring and emergency procedures (via a set protocol) in the event of a loss of station.

19.4.2 Significance of Risk

660. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from loss of station for the OAA is presented in **Table 19.4**.

Table 19.4 Significance of risk for loss of station (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Total failure of mooring / shared anchor system or towage operation leads to drifting of multiple floating structures with risk of collision with vessels.	Remote	Moderate	**Tolerable with Mitigation**

19.5 Creation of Vessel to Structure Allision Risk

661. The presence of structures within the OAA or RCP search area may lead to the creation of powered, drifting and internal allision risk for vessels.

662. This hazard is only relevant to the surface structures associated within the OAA and RCP search area, this hazard will only assess the OAA and RCP search area and not the offshore export cable corridor. Additionally, this hazard is scoped out of the risk assessment for the construction and decommissioning stages given the embedded mitigation measures which would be in place including the buoyed construction / decommissioning area. With this mitigation, the risk in these stages is considered to be ALARP.

19.5.1 Option Agreement Area

663. The spatial extent of the hazard is small given that a vessel must be in close proximity to a surface structure for an allision incident to occur. Each allision element is considered in turn with the frequency of occurrence, severity of consequence, and resulting significance of 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.

19.5.1.1 Powered Allision Risk

664. Based on the quantitative assessment undertaken for the indicative OAA layout (**Section 16.2.2.3**), the base case annual powered vessel to structure allision return period was estimated to be one in 84 years. With a future case vessel traffic growth of 20%, this return period increases to one in 71 years. This return period is higher than the average recorded for powered allision risk in other UK offshore wind farm developments, due to the high volume of deviated vessel traffic routeing in proximity to the layout, overall number of structures.

665. Based on historical incident data, there have been two reported instances of a third-party vessel alliding with an operational offshore wind farm structure in the UK (in the Irish Sea and Southern North Sea). Both of these incidents involved a fishing vessel, with an RNLI lifeboat attending on both occasions and a helicopter deployed in one case.

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

667. Should a powered allision occur, the consequences would depend on multiple factors including the energy of the contact, structural integrity of the vessel involved, and sea state at the time of the contact. Fishing vessels and recreational vessels are considered

most vulnerable to the impact given the potential for a non-steel construction. With consideration of lessons learned the most likely consequences are minor damage with the vessel able to resume passage and undertake a full inspection at the next port of call. As an unlikely worst-case, the vessel could founder resulting in a PLL and pollution. If pollution were to occur, then the MPCP would be implemented; **Volume 4: Outline Marine Pollution Contingency Plan**.

19.5.1.2 Drifting Allision Risk

668. Based on the quantitative assessment undertaken for the indicative OAA layout (**Section 16.2.2.4**), the base case annual drifting vessel to structure allision frequency was estimated to be 1.84×10^{-4}, corresponding to a return period of approximately one in 5,422 years. With a future case vessel traffic growth of 20%, this return period increases to one in 4,591 years. This is a low return period compared to that estimated for other UK offshore wind farm developments and again reflects the low volume of deviated vessel traffic routeing in proximity to the layout at the south-west (the most frequent wind direction). The low return period is also reflected when considering future case traffic levels.

669. Based on historical incident data, there have been no instances of a third-party vessel alliding with an operational offshore wind farm structure whilst Not Under Command (NUC) (**Section 9.5**). The MAIB incident data reviewed in proximity to the Project indicates that three instances of machinery failure incidents occurred in proximity to the OAA over a 10-year period and so there is some potential for a vessel to be adrift in the area, although it should be noted that machinery failure incidents may not relate to the vessel being NUC.

670. A vessel adrift may only develop into an allision situation if in proximity to a surface structure. This is only the case where the adrift vessel is located internally within or in close proximity to the OAA and the direction of the wind and /or tide directs the vessel towards a structure.

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

672. Noting the considerable water depth within and in proximity to the OAA, deployment of the anchor may not be possible, particularly for small craft. In such circumstances, any project vessels on-site may be able to render assistance in liaison with the MCA and in line with SOLAS obligations (IMO, 1974), particularly in the Summer months when O&M activities are likely to be more frequent. This response would be managed via HM

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.

673. Should a drifting allision occur, the consequences would be similar to those noted for the case of a powered allision including the unlikely worst-case of foundering, PLL, and pollution. However, a drifting vessel is likely to be moving 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.

19.5.1.3 Internal Allision Risk

674. As noted previously, based on experience at existing operational offshore wind farms, it is anticipated that commercial vessels would be unlikely to navigate internally within the OAA. Therefore, the likelihood of an internal allision involving a commercial vessel is anticipated to be negligible.

675. Fishing and recreational vessels may be more likely to transit through although are less likely to do so at a floating site such as the Project compared to fixed sites due to the presence of mooring infrastructure associated with floating units.

676. Based on the quantitative assessment undertaken for the indicative OAA layout (**Section 16.2.2.4**), the base case annual drifting vessel to structure allision frequency was estimated to be 4.9×10^{-1}, corresponding to a return period of approximately one in 2.05 years. With a future case vessel traffic growth of 20%, this return period increases to one in 1.7 years. This is a high frequency and reflects the high level of fishing activity present within the OAA (See **Section 10.1.2.2**) and the conservative assumptions that all existing fishing vessel presence within the OAA remains and passing distances from structures are not increased. This is a very conservative assumption, particularly for a floating site, noting internal transits by larger pelagic fishing vessels are unlikely to occur based on consultation feedback from SFF at the Hazard Workshop as would be down to Master discretion.

677. The estimated return period also does not take account of the nature of any allision incident. The worst consequences reported for vessels involved in an allision incident involving a UK offshore wind farm development has been flooding, with no life-threatening injuries to persons reported (the model is calibrated against known incidents).

678. The minimum spacing between structures (500m between WTGS and offshore substations and 800m between WTGs) is considered sufficient for safe internal navigation, i.e., for vessels to keep clear of the offshore wind farm structures within the OAA. Moreover, the final layout – agreed with MCA and NLB post consent – would be compliant with the requirements of MGN 654 (MCA, 2021).

679. As with any passage, any vessel navigating within the OAA is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974) and promulgation of information by the Project would ensure that such vessels have good awareness of the presence of surface structures. Operational marine lighting and marking would be in place as required by, and agreed with, NLB and MCA. Given the size of the OAA, it is unlikely that a mariner would become disoriented when navigating internally; nevertheless, marking would include unique identification marking of each structure in an easily understandable pattern.

680. 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, 2008a) 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. It was raised during the Hazard Workshop that recreational vessels may be at higher risk of allision as there is not always someone keeping a watch, especially in adverse weather conditions. However, at this stage in their journey and when transiting around surface structures, mariners should be alert and it is assumed that mariners are compliant with best practice i.e., passage planning and COLREGs.

681. For recreational vessels with a mast there is an additional allision risk when navigating internally within the array associated with the WTG blades. However, the minimum blade tip clearance of 22m above MHWS is what RYA Scotland recommend for minimising allision risk (RYA Scotland, 2019 (b)) and which is also noted in MGN 654 (MCA, 2021).

682. Should an internal allision occur, the consequences would be similar to those noted for the case of a powered allision, including the determining factors. However, as with a drifting allision, the speed at which the contact occurs would likely be lower than for an external allision (given that the vessel would knowingly be navigating in an area with allision hazards), resulting in reduced allision energy and a reduced likelihood of the worst-case consequences arising.

19.5.2 Reactive Compensation Platform Search Area

683. Based on the post wind farm modelling, the base case annual powered vessel to structure allision frequency was estimated at one every 116 years. With a future case vessel traffic growth of 20%, this return period increases to one in 97 years.

684. For the base case annual drifting vessel to structure allision this was one every 64,574 years. With a future case vessel traffic growth of 20%, this return period increases to one in 54,600 years.

685. For the base case annual fishing vessel to structure internal allision this was one every 158 years. With a future case vessel traffic growth of 20%, this return period increases to one in 131 years.

686. Again, allision risk is heavily dependent upon the number of surface piercing structures. With the RCP search area having a maximum of two individual RCPs connected via a bridge-link resulting in a single overall structure, the likelihood of an allision incident may be reduced. However, traffic volumes are generally greater in the region containing the RCP search area and a single structure is more exposed than a structure forming part of an array since there is no element of shielding by other structures or alternative aid to navigation presence in the event of a lighting failure.

687. Should a second RCP be required, and so a bridge-link present between RCPs, then there is an additional allision risk should a vessel choose to navigate under the bridge link and between platforms. Given the maximum separation and length of a bridge-link of 150m between platforms it is considered highly unlikely that a vessel would choose to navigate under a bridge-link, particularly given the height of the bridge-link of 20m above sea level. Additionally, the specific lighting and marking requirements for bridge links would be agreed with NLB to ensure that allision risk for vessels (including project vessels and recreational vessels) is minimised. NLB confirmed at the Hazard Workshop that the RCPs would be lit and marked as a single structure and be based on existing bridge-linked structures as mariners are already familiar with them from the oil and gas industry.

688. SFF noted during the Hazard Workshop that fishing vessels would likely transit in proximity to the RCP since there is no legal obligation to avoid, potentially increasing allision risk. However, as previously it is assumed that mariners will be compliant with best practice i.e. passage planning and COLREGs.

689. The RCP search area carries increased allision risk and consequences due to the greater size and resistant force. Embedded mitigation measures applicable to the OAA are again relevant, including operational lighting (inclusive of availability standards in line with IALA guidance).

19.5.3 Significance of Risk

690. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from creation of vessel to structure allision risk for each Project component is presented in **Table 19.5**.

Table 19.5 Significance of risk for the creation of vessel to structure allision risk (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA		Remote	Moderate	**Tolerable with Mitigation**

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
RCP	Allision event occurs involving vessel damage, PLL and / or pollution.	Remote	Moderate	**Tolerable with Mitigation**

19.6 Reduction of Under Keel Clearance as a Result of Cable Protection, Dynamic Cables, and Mooring Lines

691. The presence of mooring lines, buoyant array cables, or protection over subsea cables may reduce charted water depths leading to increased risk of under keel interaction for passing vessels.

692. The spatial extent of the hazard is small given that a vessel must be in close proximity to a mooring line, array cable or subsea cable with cable protection for a reduction to occur. Since there are no subsea cables associated with the RCP search area (any subsea cables within this area would be export cables) this hazard does not apply in this circumstance and only applies to the OAA and offshore export cable corridor.

19.6.1 Option Agreement Area

693. Vessels navigating in proximity to the floating units may be at risk of interaction with the mooring lines or array cables associated with floating units. The level of risk would depend on the clearance available above the subsea elements of the substructures.

694. There would be a maximum of nine mooring lines per floating unit used to secure the substructures to the seabed. The highest risk areas in terms of potential under keel clearance interaction would be the areas in the immediate vicinity of the floating substructures where the mooring lines are closest to the surface. As noted in the maximum design scenario for shipping and navigation (**Section 6.2.4**), the mooring lines will connect below the waterline at a minimum depth of 12m. All mooring arrangements inclusive of anchors, will be fully within the OAA boundary with a margin of space between arrangements and the perimeter.

695. As previously noted, it is unlikely that commercial vessels would enter the OAA. Moreover, experience indicates that commercial vessels frequently pass 1nm or more off 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 OAA let alone in sufficiently close proximity to the WTGs for an under keel interaction to arise as this would also create allision risk with the floating unit.

696. An analysis of under keel interaction for vessel draughts local to the area has been undertaken in **Section 16.2.4**. This analysis found that as the connection point for the mooring line (12m) is deeper than both the average and maximum fishing vessel draughts recorded in the vessel traffic data (5.6m and 8.8m, respectively), there is not anticipated

to be any under keel interaction with fishing vessels and the mooring lines. For commercial vessels, compared against the maximum draught recorded in the vessel traffic data (13.9m) – the horizontal distance over which an under-keel interaction could occur associated with the mooring lines was 22.4m for commercial vessels. However, no commercial vessel would be expected to navigate this close proximity to a WTG given the allision risk associated with the WTG blades. The minimum blade length proposed would be 115m and at 115m from the WTG, the clearance depth is 24.8m and so it is not anticipated that any commercial vessel would experience any under keel clearance interaction.

The final design of mooring lines and array cables will be confirmed with MCA and NLB as part of the DSLP process. It would 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. Nevertheless, based on feedback given by the MCA during the Hazard Workshop it is unlikely that that mooring lines or dynamic cables will pose a risk to under keel clearance.

697. For the array cables, as a worst-case, a hog bend may be incorporated into the design of the array cables. Even so, the minimum depth of the array cable below the sea surface would be 12m located at the connection point and the minimum depth of the hog bend is anticipated to be 30m, achieved at a maximum distance of 35m from the floating unit. The approximate descents of the array cables from the hog bend are not shallower than those parameters identified for the mooring lines. Therefore, any interaction with a vessel (commercial or fishing) is again considered highly unlikely.

698. Up to 225 array cables will be installed within the OAA with a maximum overall length of 367nm; final length dependant on final agreed layout post-consent. Array cables would have a maximum length of 1.6nm in the water column with a maximum of 570m of cable remaining on the seabed. Where available the primary means of cable protection would be by seabed burial. The extent and method by which the subsea cables would be buried would depend on the results of a detailed seabed survey of the final cable routes and associated CBRA. The array cables will have a typical burial depth of 1.0 – 2.0m. Where cable burial is not possible, alternative cable protection methods such as rock placement or mattresses may be deployed which would again be determined within the CBRA. The maximum height of any cable protection will be 2.0m. The minimum depth recorded in the OAA is 80 and so a reduction by 2.0m at the shallowest point (2.5% reduction in overall water depth) would not result in an under keel interaction and adheres to MGN 654 requirements of cable protection not changing the navigable water depth by more than 5%. It is also noted that there are up to six assumed subsea cable crossings for the array cables. Cable burial and protection is captured in the CaP.

699. There is the potential for between five and eight array cables to connect to a SDC with a maximum of 45 SDCs being installed within the OAA. Each SDC would be situated on the

seabed within the OAA boundary and have a maximum height of 5m into the water column, thus reducing the minimum water depth to 75m (6.25% reduction). Although this does not adhere to MGN 654 requirements, based on the vessel draughts in the area this would not result in an under-keel interaction. If taken forward, this would be assessed further in the associated CBRA and discussed with the MCA and NLB should the navigable water depth be reduced by more than 5%.

700. 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.

701. Details of the infrastructure would be promulgated to maximise awareness of the Project and any potential under keel interaction risk. The locations of the floating units will be clearly shown on appropriate nautical charts, and the Applicant will also provide the locations of the anchors and mooring lines to the UKHO for charting purposes.

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

19.6.2 Offshore Export Cable Corridor

703. There is a greater risk of an under keel clearance interaction occurring within the offshore export cable corridor due to the reduced water depths, especially inshore near the landfall locations. At these reduced water depths, typically only small craft would be transiting over the export cables, and these vessels tend to have shallower draughts. These vessels were highlighted in the vessel traffic movements analysis (**Section 10.3.2**) to primarily be transiting the area in a north south bearing and so the exposure to the risk is minimised.

704. Up to five export cable trenches, each potentially containing more than one export cable, may be required each with a total length of up to 76nm and would be installed within the offshore export cable corridor.

705. Export cables would have a typical burial depth of 1.0 – 2.0m. As aforementioned, where cable burial is not possible, alternative cable protection methods may be deployed which will be determined within the CBRA. The maximum height of any cable protection will be 2.0m. It is noted that there are 16 known cable crossings and up to six additional anticipated for the offshore export cables. The Applicant intends to follow the guidance contained in MGN 654 in relation to cable protection, namely that cable protection would not change the charted water depth by more than 5%, unless otherwise agreed with the MCA and NLB. This aligns with the RYA Scotland'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 Scotland, 2019). With this guidance adhered to, the likelihood of an underwater allision is considered very low.

706. Should this percentage be exceeded, further assessment including consultation with the MCA and NLB may be required to determine whether any additional mitigation measures (e.g., post consent lighting and marking, charting, etc.) are necessary to ensure the safety of navigation. Cable burial and protection is captured in the CaP.

707. Should an underwater allision occur, the consequences are the same as set out for cable protection associated with array cables, with grounding of the vessel more likely inshore. Minor damage incurred is the most likely consequence, and foundering of the vessel resulting in a PLL and pollution are the unlikely worst case consequences, with the environmental risks of the latter minimised by the implementation of the pollution planning protocols.

19.6.3 Significance of Risk

708. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from reduction of under keel clearance as a result of cable protection, dynamic cables, and mooring lines is presented in **Table 19.6**.

Table 19.6 Significance of risk for reduction of under keel clearance as a result of cable protection, dynamic cables, and mooring lines (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Interaction with dynamic cable, mooring line, or cable protection resulting in vessel damage, injury to person and / or pollution (including spillage of potential hazardous cargo.	Negligible	Moderate	**Broadly Acceptable**
Offshore export cable corridor	Interaction with cable protection resulting in vessel damage, grounding, injury to person and / or pollution (including spillage of potential hazardous cargo.	Extremely Unlikely	Moderate	**Broadly Acceptable**

19.7 Anchor Interaction with Mooring Lines and Subsea Cables

709. The presence of mooring lines and subsea cables may increase the risk of anchor interaction.

710. The spatial extent of the hazard is small given that a vessel must be in close proximity to a mooring line or subsea cable for an interaction to occur. Since there are no subsea cables associated with the RCP search area (any subsea cables within this area would be

export cables) this hazard does not apply in this circumstance and only applies to the offshore export cable corridor.

19.7.1 Option Agreement Area

711. 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.

712. 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 (where scale of chart is appropriate) would inform the decision of a vessel to anchor, as per Regulation 34 of SOLAS (IMO, 1974).

713. No anchored vessels were observed within the study area for the OAA during the survey periods or long-term vessel traffic data. Risk of interaction with an array cable or mooring line on a planned anchoring or dragged anchoring basis is therefore anticipated to be extremely low and is compounded by the limited number of third-party vessels anticipated to navigate internally within the OAA. In terms of emergency anchoring, this may be used as an option to avoid an allision incident with a WTG, although the water depths may be a limiting factor, particularly for small craft.

714. The most likely consequences in the event of a vessel anchoring over an array cable is that no interaction occurs given the protection applied to the cable (by burial or other means). Should an interaction occur, historical incident data suggests that the consequences would be negligible, with no damage caused to the vessel or subsea cable. As a worst case, a snagging incident could occur to a commercial fishing vessel with damage caused to the anchor and / or the cable, compromising the stability of the vessel as well as damage to the mooring line, compromising stability of the floating unit.

19.7.2 Offshore Export Cable Corridor

715. The export cables may be crossed frequently by vessels on passage following the coastline as outlined in the vessel traffic movements analysis (**Section 10.3.2**). Given that an interaction risk exists only where the anchoring occurs in proximity to a subsea cable, the hazard is local in nature and has a short temporal overlap – vessels enroute would be located over the export cables for only a short period of time.

716. However, several *in-situ* subsea cables run parallel with the offshore export cable corridor in sections, with up to 16 known cable crossings and six additional anticipated.

Therefore, the spatial extent of the interaction risk would be greater for these sections of the offshore export cable corridor.

717. Again, no anchored vessels were observed within the offshore export cable corridor study area during the data periods and there is no charted anchorage areas located in proximity to the offshore export cable corridor. The burial of the export cables and use of external cable protection as informed by the CBRA with a typical burial depth of 1.0 – 2.0m would minimise the likelihood of an interaction occurring. The CBRA would also account for traffic volume and sizes. Cable burial and protection is captured in the CaP.

718. It is anticipated that the charting of infrastructure including all subsea cables would inform the decision to anchor, as per Regulation 34 of SOLAS (IMO, 1974). This includes in an emergency situation with general feedback from mariners indicating that even where time for decision-making is limited a key priority for the bridge crew whilst the anchor is being readied would be to check charts.

719. Anchor dragging features a relatively wider extent than planned or unplanned anchoring. However, from the vessel traffic data, the likelihood of a vessel dragging anchor close enough to interact with a subsea cable is very low. In such a circumstance, it is likely that the anchor dragging would be stopped prior to any interaction with a subsea cable becoming possible.

720. Should an anchor interaction occur, the consequences are the same set out for the mooring lines and array cables, with the likelihood increased due to reduced water depths and exposure.

19.7.3 Significance of Risk

721. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from anchor interaction with mooring lines and subsea cables is presented in **Table 19.7**.

Table 19.7 Significance of risk for anchor interaction with mooring lines and subsea cables (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Vessel anchors on or drags anchor over a subsea cable or mooring line with interaction occurring resulting in damage to the cable, protection, mooring line, and / or anchor and affecting the stability of the vessel or floating unit.	Negligible	Minor	**Broadly Acceptable**

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Offshore export cable corridor	Vessel anchors on or drags anchor over a subsea cable or with interaction occurring resulting in damage to the cable, protection, and / or anchor and affecting the stability of the vessel.	Extremely Unlikely	Minor	**Broadly Acceptable**

19.8 Reduction of Emergency Response Capability Including SAR Access

722. *The presence of surface structures and O&M activities associated with the Project may result in an increased likelihood of an incident occurring which requires an emergency response and may reduce access for surface and air responders, including SAR assets.*

723. This hazard has been assessed for the Project as a whole. For the construction and decommissioning stages, given the greater presence of Project vessels on site with self-help capability, as well as complying with SOLAS obligations (IMO, 1974), the likelihood of an incident occurring and requiring external emergency response resources is lower. Moreover, given third-party vessels are not anticipated to navigate within the buoyed construction/ decommissioning area the likelihood of SAR access being required within the OAA is also lower. In combination with the embedded mitigation measures described below for the O&M stage (which are applicable to the construction/ decommissioning stages) the significance of risk associated with this hazard for the construction and decommissioning stages is considered to be ALARP.

19.8.1 Emergency Response Resources

724. The O&M stage may last for up to 35 years per phase with up to seven O&M vessels located on-site simultaneously and making up to 364 annual round trips. With a full build out of the OAA, these vessels would increase the likelihood of an incident requiring an emergency response and subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability.

725. However, with project vessels to be managed through marine coordination and in compliance with Flag State regulations, the likelihood of an incident is minimised. Additionally, should an incident occur, project vessels would likely be well equipped to assist, either through self-help capability or through SOLAS obligations (IMO, 1974), noting this would be undertaken in liaison with the MCA, most likely as the first responder given the distance offshore. This is reflected in past experience, with 12 known instances of a vessel (or persons on a vessel) being assisted by an industry vessel for a nearby UK offshore wind farm. For a pollution incident, the MPCP will also be implemented. Given the distance offshore, it is likely that in the event of an emergency response incident associated with the OAA a project vessel would be the first responder.

726. There are various emergency response resources serving the region, including RNLI stations (closest at Fraserburgh approximately 43nm to the south-west) and SAR helicopter bases (closest at Sumburgh approximately 94nm to the north). Given the distances which would be travelled in the event of an emergency response incident in proximity to the OAA, this hazard covers a regional spatial extent.

727. From historical incident data, there is a low rate of incidents in the region, with the likelihood of an incident relating to the Projects occurring at the same time being unlikely. Additionally, based on the number of collision and allision incidents associated with UK offshore wind farms reported to date, there is an average of one incident per 1,265 operational WTG years (as of September 2025). Therefore, the Project is not expected to result in a marked increase in the frequency of incidents requiring an emergency response.

728. The most likely consequences in the event of an incident in the region requiring an emergency response is that emergency responders are able to assist without any limitations on capability. As a worst case, there could be a delay to a response request due to a simultaneous incident associated with the Project leading to PLL, pollution, and vessel damage. However, this worst case scenario is highly unlikely.

19.8.2 Search and Rescue Access

729. The physical presence of the Project may restrict access for SAR responders, especially within the OAA, due to the incident in question obstructing the most effective path to an incident (likely further offshore). Access issues are more likely to be a concern in adverse weather conditions. The Applicant would work within the parameters of MGN 654 to minimise risks.

730. From recent SAR helicopter taskings data, the frequency of UK SAR operations in proximity to the Project is low, with no SAR helicopter incidents occurring within the OAA and several of those incidents reported in proximity related to the Golden Eagle and Buzzard platforms which are located inshore of the OAA. Due to these being further offshore than the RCP search area, the presence of the RCP may hinder these platforms due to the necessity of a longer flight path. However, the possibility remains of a SAR responder being able to fly over or around a single structure, particularly in suitable weather conditions, with the overall increase in flight path remaining low. Consideration of third-party helicopter access to / from oil and gas platforms is given in **Volume 1, Chapter 31: Civil and Military Aviation**.

731. Given the distances that may be covered by air-based SAR support (the SAR helicopter base at Sumburgh is located approximately 94nm from the OAA) and the total area covered by the OAA being around 198nm^2, represents a relatively large area to search compared to other offshore wind farms, the spatial extent of this hazard is considered large. It is unlikely that a SAR operation would require the full extent of the OAA to be searched; it is much more likely that a search could be restricted to a specific portion of

the OAA depending upon the information available regarding the casualty location (inclusive of any assumptions on the drift of the casualty).

732. The minimum spacing between structures (500m between WTGS and offshore substations and 800m between WTGs) is similar to many other consented offshore wind farms in the UK. The OAA layout includes a grid pattern with multiple lines of orientation but if a SLoO was taken forward, then a safety justification would be completed, including consideration of accessibility for SAR operations.

733. More fully, the final array layout would be agreed with the MCA and NLB post consent. However, the final array layout would be compliant with the requirements of MGN 654 (MCA, 2021), including:

- Safety justification for a SLoO (if taken forward);
- Inclusion of Helicopter Refuge Areas (HRA) as deemed necessary;
- Completion of a SAR Checklist;
- Completion of an ERCoP; and
- Application of unique identification marking of structures in an easily identifiable pattern.

734. The ERCoP will remain live documents throughout the O&M stage.

735. The most likely consequences in the event of a SAR operation are that SAR assets are able to fulfil their objectives without any limitations on capability. As a worst case, it may not be possible to undertake an effective search. However, given compliance with MGN 654 for the final array layout, this is considered highly unlikely.

19.8.3 Existing Aids to Navigation

736. An indirect pathway to increasing the likelihood of an incident occurring which requires an emergency response is a risk to the use of existing AtoN due to the presence of the Project.

737. There are no existing AtoNs located within the OAA, RCP search area, or offshore export cable corridor. Any existing AtoNs in proximity to the Project are not anticipated to be obscured by the presence of the Project, noting there is also no surface piercing structures in the offshore export cable corridor which could hinder, and coastal AtoNs Peterhead Port also raised no concerns over their AtoNs in proximity to the offshore export cable corridor. This element of the hazard is therefore not considered notable.

19.8.4 Significance of Risk

738. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from reduction of emergency response capability including SAR access is presented in **Table 19.8**.

Table 19.8 Significance of risk reduction of emergency response capability including sar access (O&M Stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
The Project	Delay to emergency response request leading to vessel damage, PLL and /or pollution including due to cumulative developments.	Remote	Serious	**Tolerable with Mitigation**

20 Risk Assessment – Decommissioning Stage

20.1 Vessel Displacement and Increased Vessel to Vessel Collision Risk Between Third-Party Vessels

739. Activities associated with the decommissioning of structures and subsea cables may displace third-party vessels from their existing routes or activity, increasing the collision risk with other third-party vessels.

20.1.1 All Project Components

740. Since the methods used to remove structures and subsea cables are expected to be similar to those used to install them, the risk pathway for this hazard is expected to be similar in nature to the equivalent construction stage hazard for vessel displacement and third-party collision risk (**Section 18.1**) .This includes the use of a buoyed decommissioning area for the OAA and RCP search area.

741. Given the broadly similar nature of decommissioning activities when compared to construction activities, the main consequences of vessel displacement and third-party collision risk during the decommissioning stage for all Project Components are equivalent to that highlighted for the construction stage hazard, in particular potential for increased journey times and distances and increased encounters, as well as the unlikely worst-case of foundering resulting in PLL and pollution. No notable effects on navigational safety are anticipated.

20.1.2 Significance of Risk

742. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from vessel displacement and third-party collision risk for each Project component is presented in **Table 20.1**.

Table 20.1 Significance of risk for vessel displacement and third-party collision risk (decommissioning stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Increased journey time / distance which impacts on schedules or compliance with COLREGs, and collision incident occurs with vessel damage, PLL, and / or pollution.	Reasonably Probable	Moderate	**Tolerable with Mitigation**
Offshore export cable corridor		Remote	Moderate	**Tolerable with Mitigation**
RCP search area		Remote	Moderate	**Tolerable with Mitigation**

20.2 Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel

743. The presence of vessels associated with decommissioning activities may result in increased risk of a collision between a third-party vessel and a project vessel.

20.2.1 All Project Components

744. 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, the risk pathway for this hazard is expected to be similar in nature to the equivalent construction stage hazard for third-party to project vessel collision risk (**Section 18.2**), including the number of return trips by project vessels and the use of a buoyed decommissioning area for the OAA and (if deemed necessary the) RCP search area.

745. Given the broadly similar nature of decommissioning activities when compared to construction activities, the main consequences in the event of an encounter or collision are considered to be equivalent to that highlighted for the construction stage hazard for third-party to project vessel collision risk, including a worst-case of foundering, PLL, and pollution.

20.2.2 Significance of Risk

746. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from third-party to Project Vessel collision risk for each Project component is presented in **Table 20.2**.

Table 20.2 Significance of risk for increased third-party to project vessel collision risk (decommissioning stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Collision incident occurs with vessel damage, PLL, and / or pollution.	Remote	Moderate	**Tolerable with Mitigation**
Offshore export cable corridor		Extremely Unlikely	Moderate	**Broadly Acceptable**
RCP search area		Extremely Unlikely	Moderate	**Broadly Acceptable**

20.3 Reduced Access to Local Ports and Harbours

747. Decommissioning activities associated with the removal of structures and cables may reduce access to local ports and harbours.

20.3.1 All Project Components

748. Since the methods used to remove structures and subsea cables are expected to be similar to those used to install them, the risk pathway for this hazard is expected to be similar in nature to the equivalent construction stage hazard for reduced access to local ports and harbours (**Section 18.3**), including the number of return trips by decommissioning vessels.

749. Given the broadly similar nature of decommissioning activities when compared to construction activities, the main consequences during the decommissioning stage are considered to be equivalent to that highlighted for the construction stage hazard for reduced access to local ports and harbours, in particular minor disruption to port access, particularly associated with the offshore export cable corridor and towage operations from the OAA.

20.3.2 Significance of Risk

750. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from reduced access to local ports and harbours for each Project component is presented in **Table 20.3**.

Table 20.3 Significance of risk for reduced access to local ports and harbours (decommissioning stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and / or berth times.	Extremely Unlikely	Minor	**Broadly Acceptable**
Offshore export cable corridor		Reasonably Probable	Minor	**Tolerable with Mitigation**
RCP search area		Negligible	Minor	**Broadly Acceptable**

20.4 Loss of Station

751. *In the event that the mooring system holding a floating substructure fails, the floating substructure may experience loss of station and become a floating hazard to passing vessels.*

752. As this hazard is only relevant to the floating units associated within the OAA; this hazard will only assess the OAA and not the RCP search area or the offshore export cable corridor.

20.4.1 All Project Components

753. Since the methods used to remove structures are expected to be similar to those used to install them, the risk pathway for this hazard is expected to be similar in nature to the equivalent construction stage hazard for loss of station (**Section 18.4**).

754. Given the broadly similar nature of decommissioning activities when compared to construction activities, the main consequences during the decommissioning stage are considered to be equivalent to that highlighted for the construction stage hazard for loss of station.

20.4.2 Significance of Risk

755. The frequency of occurrence, severity of consequence, and resulting significance of risk resulting from loss of station for the OAA is presented in **Table 20.4**.

Table 20.4 Significance of risk for loss of station (decommissioning stage)

Project Component	Worst Case Consequences	Frequency of Occurrence	Severity of Consequence	Significance of Risk
OAA	Total failure of mooring / shared anchor system or towage operation leads to drifting of multiple floating structures with risk of collision with vessels.	Extremely Unlikely	Moderate	**Broadly Acceptable**

21 Cumulative Risk Assessment

756. This section provides a qualitative and quantitative risk assessment using FSA for the hazards identified due to the Project cumulatively with those other developments identified from the cumulative screening (**Section 13**). The same inputs outlined for the in isolation risk assessment are applicable.

757. The hazards assessed are as per the in isolation risk assessment, with the exception of loss of station; reduction of under keel clearance as a result of cable protection, dynamic cables, and mooring lines; and anchor interaction with mooring lines or subsea cables. Each of these has been scoped out of the cumulative risk assessment due to the localized nature of the hazards which results in a limited pathway by which the hazard could become cumulative in nature.

758. A concluding risk statement is provided in **Section 24.6** and the assessment is summarised in **Volume 1, Chapter 33: Cumulative Effects Assessment**.

21.1 Vessel Displacement and Increased Vessel to Vessel Collision Risk Between Third-Party Vessels

759. Construction/decommissioning activities and the presence of structures and subsea cables as well as activities associated with the O&M stage may displace third-party vessels from their existing routes or activity, increasing the collision risk with other third-party vessels at a cumulative level.

21.1.1 Vessel Displacement

21.1.1.1 Tier 1

760. As noted in **Section 14.5.2**, 12 main commercial routes were deviated due to the presence of the Project in isolation. At a cumulative level, four of these routes would require additional deviations in addition to the already deviated route in isolation (Routes 5, 8, 13, and 29). The other eight routes would not be further affected by cumulative developments, and the route remains the same as in the post wind farm in isolation scenario.

761. With the presence of Tier 1 developments; Green Volt and Salamander, a further five routes are also impacted at a cumulative level (Routes 14, 15, 23, 26, and 30). It is therefore anticipated that 17 routes would be affected by the cumulative presence of the Project and Tier 1 developments. These routes are deviated to pass at a mean distance of 1 nm off the Tier 1 developments and given the nature of these routes, deviations are not considered large.

762. The five routes further affected by Tier 1 developments are not deviated as a result of the in isolation scenario or by the Project as a result of other cumulative developments. If the cumulative developments were to be progressed and the Project was not, these

routes would still require the same deviation and so the Project has no direct impact on these routes.

763. Of the remaining routes, only one is further deviated due to the presence of Green Volt (Route 13) as the route is being displaced further north towards the OAA by both Green Volt and Salamander but south by the OAA and so a cumulative deviation around all three developments is required. The MCA noted during the Hazard Workshop that there was no concern over the proximity of Green Volt to the Project and the gap between the OAA and Green Volt is not considered a navigational corridor. As for Salamander, the MCA also noted that although ranked high on the cumulative tiering (given the project status and proximity to the RCP), there is ample sea room around Salamander for route displacement, even with the presence of the RCP.

764. Although an increase in route length would be required, the deviations illustrated in **Section 14.6** are a conservative worst-case, with the greatest impact to those vessels routeing between port locations on the east coast of Scotland and the offshore oil and gas fields due to the shorter distance, leading to an overall greater percentage increase. However, these vessels are typically smaller commercial vessels and will likely take a more direct approach between destinations given their experience navigating in proximity to offshore infrastructure. During the Regular Operator outreach consultation (**Section 4.1**), oil and gas operator Fletcher Group noted that vessels may have to change routes but vessels and crews are used to navigating through and around the various oil and gas assets already in the North Sea with Gardline also noting their vessels do not rely on specific routes and therefore developments are unlikely to impact on future routeing. For routes requiring deviation further inshore, there is ample sea room further inshore which will allow a more direct route if preferred.

765. In terms of adverse weather routeing, Serco NorthLink confirmed that there were no material concerns with their adverse weather options including passing further offshore from Rattray Head (**Section 12.2.1**) despite the cumulative presence of the RCP and Salamander (in addition to Hywind). Additionally, Serco NorthLink confirmed new stabilised freight ferries would be in use by the times of development undergoing construction which should reduce the frequency of such offshore routeing.

766. No concerns were raised by small craft representatives regarding the cumulative displacement of vessel traffic; however, SFF did note that there is a possibility of commercial vessels being displaced into fishing grounds leading to the potential interaction and further displacement of fishing vessels which was addressed with the Project in isolation (**Section 18.1.3**), and could be further emphasised by the presence of cumulative developments. The majority of fishing vessels were routeing between offshore fishing grounds and fishing ports / harbours; Peterhead and Fraserburgh and so any further displacement would be limited and there is sufficient sea room around the developments resulting in any deviation being minor.

767. The same main consequences (increased journey times and distances) and mitigation measures relevant for each stage of the equivalent hazard for the Project in isolation are

again applicable, including promulgation of information and marking on relevant nautical charts. Given the greater length of deviations compared to the in isolation scenario, the severity of consequence is greater, although remains within moderate parameters given the increased distances relative to the length of routes as a whole.

21.1.1.2 Tier 2

768. With the presence of Tier 2 developments; Aspen, Buchan, Flora, Muir Mhòr, and Stromar, a further five routes in addition to those identified in **Section 21.1.1.1** for Tier 1, are also impacted at a cumulative level alone (Routes 7, 16, 17, 19, and 31). Again, like those routes identified for Tier 1 development, if the cumulative developments were to be progressed and the Project was not, these routes would still require the same deviation and so the Project has no direct impact on these routes. Only one of the 17 routes identified as being displaced for Tier 1 developments is not also displaced by any Tier 2 developments (Route 30). It is therefore anticipated that 21 routes would be affected by the cumulative presence of the Project and Tier 2 developments, with those five routes aforementioned above not also affected by any Tier 1 developments.

769. Of these five routes, three are deviated west of Muir Mhòr (Routes 16, 19 and 31), two of which are also deviated to the west of Buchan (Routes 16 and 31). Another route is deviated to the north of both Stromar and Buchan (Route 17) and the final route deviated south of Flora (Route 7). The latter of these routes is also affected by the Tier 1 Green Volt and the same measures that have been addressed for Tier 1 developments also apply. It is noted that no deviations occur due to the presence of Aspen.

770. The same impacts for smaller craft as detailed for Tier 1 developments is also considered for Tier 2 developments, although several Tier 2 developments are further offshore and not in proximity to the Project and so any impact would be due to the Tier 2 developments only.

21.1.1.3 Tier 3

771. For this hazard there is no direct link between the Project and Tier 3 offshore wind farm, subsea cable, and oil and gas decommissioning developments due to the distance from the Project and the lack of interaction with any main commercial routes associated with the Project or lack of data available. Therefore, no additional assessment of risk has been undertaken.

21.1.2 Collision Risk

21.1.2.1 Tier 1 / 2

772. Tier 1 and Tier 2 developments are considered together given that the reduction in navigable sea room resulting from the presence of developments will be greater with Tier 1 and Tier 2 developments present and will consider the same cumulative vessel routeing applicable for Tier 1 and Tier 2 developments combined.

773. Vessels displaced south of the OAA may be subject to a greater collision risk given the presence of Green Volt and subsequent limited navigable sea room. However, given the frequency of vessels which would be displaced closer to Green Volt and the spatial overlap of the hazard, the overall increase in encounter levels is anticipated to be low. Vessels on these routes are smaller oil and gas commercial vessels which have experience routeing around oil and gas structures and other developments in the North Sea, as agreed with by oil and gas operators during the Regular Operator outreach as aforementioned (**Section 4.1**). Again, the MCA noted during the Hazard Workshop there was no concern over the gap width in regard to shipping and when considering the guidance outlined in the Shipping Route Template (MCA, 2021) in regard to the distances which should be established between shipping routes and offshore wind farm, the gap (4.7nm) is low risk and so broadly acceptable tolerability. Should an encounter occur, there is sufficient sea room available to allow collision avoidance in compliance with COLREGs (IMO, 1972/77).

774. The deviation of multiple routes north and east of Salamander, and to the west of Muir Mhòr could increase collision risk given that the ability to approach this gap is constrained by the presence of several oil and gas structures to the north-east and the RCP to the north-west. However, given the volumes and sizes of traffic associated with these routes, the increase is anticipated to be limited and there is sea room available to ensure vessels are able to pass each other safely in compliance with the COLREGs (IMO, 1972/77) should an encounter arise. Vessels may also choose to pass inshore of these developments, especially in periods of good weather.

775. Serco NorthLink raised a cumulative concern over their regular commercial ferry route given that the Tier 1 and Tier 2 developments may displace other routeing inshore where there remains open sea room. This may increase collision risk although given the extent of open sea room and compliance with the COLREGs (IMO, 1972/77), it is anticipated that encounter situations are unlikely and can be safely managed should they arise.

776. For small craft, the option to pass between the Project and other Tier 1 and Tier 2 developments is feasible. This may allow small craft to avoid commercial routeing and thus minimise collision risk, noting that the consequences should a small craft collide with a larger vessel would likely be exacerbated. The risk of collision was not raised as a key topic during consultation including at the Hazard Workshop.

21.1.2.2 Tier 3

777. Again, there is no direct link between the Project and Tier 3 offshore wind farm, subsea cable, and oil and gas decommissioning developments due to the distance from the Project and the lack of interaction with any main commercial routes associated with the Project or lack of data available. Therefore, no additional assessment of risk has been undertaken.

21.1.3 Significance of Risk

778. For all stages the frequency of occurrence in relation to cumulative vessel displacement and increased third-party vessel to vessel collision risk is considered **frequent** and the severity of consequence is considered **moderate**.

779. Overall, for all stages it is predicted that the significance of risk due to cumulative vessel displacement and increased third-party vessel to vessel collision risk is **Tolerable with Mitigation**.

21.2 Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel

780. *The presence of vessels associated with construction / decommissioning and O&M activities may result in increased risk of a collision between a third-party vessel and a project vessel at a cumulative level*.

21.2.1 Tier 1 / 2 / 3

781. All cumulative developments are considered together given that the presence of project vessels will be greater with all tiers of development present.

782. There is the potential that the same base port(s) or similarly located ports could be used by cumulative developments for construction, O&M, 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, details of base ports are not currently available (across all cumulative tiers) and so a detailed risk assessment is not possible.

783. However, the greatest risk is likely to be where export cables cross or converge closer to landfall, especially with the proximity to Peterhead Port. It was raised by NLB during the Hazard Workshop that future interlink cables are planned to make landfall in a similar location to the offshore export cable corridor which will increase complexity; these include EGL2, EGL3, Spittal to Peterhead HVDC link and the known planned export cables routes for Muir Mhòr and Salamander, with Green Volt and Buchan anticipated to be slightly further north on the north-east coast but still south of Rattray Head. Any Project or cumulative activities undertaken in the area would cover a limited area and therefore the hazard would be local in extent and only small craft would likely be affected as larger commercial vessels would be unlikely to route that close to shore. Additionally, the open sea room would allow vessels to safely take avoiding action should an encounter situation arise. RYA Scotland noted in the Scoping Opinion that the landfall area is not expected to cause any issues for recreational traffic, and so it is unlikely that cable activities would pose any problems for recreational vessels as COLREGs (IMO, 1972/77) will apply and recreational vessels would work around ongoing project works, even at a cumulative level.

784. All developers – including the Applicant – are expected to establish appropriate vessel management systems including through marine coordination and as such any encounters

will be managed, including by COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974). This may include close liaison between the developers, particularly where sharing base ports (with liaison including with the relevant port authority(s)) and the use of specific entry/exit points for each array may be beneficial for minimising interactions with third party vessels, especially when considering Green Volt given its proximity to the OAA. Specific entry/exit points will be considered as part of the VMNSP for the respective developments, as required. In addition, promulgation of information from each respective project will inform mariners of project operations.

21.2.2 Significance of Risk

785. For all stages, the frequency of occurrence is considered to be **remote**. For all stages the severity of consequence in relation to cumulative third-party to project vessel collision risk is considered to be **moderate**.

786. Overall, for all stages it is predicted that the significance of risk due to cumulative third-party to project vessel collision risk is **Tolerable with Mitigation**.

21.3 Reduced Access to Local Ports and Harbours

787. *Construction / decommissioning and O&M activities associated with the installation, removal and presence of structures and cables may reduce access to local ports and harbours at a cumulative level*.

21.3.1 Tier 1 / 2 / 3

788. All cumulative developments are considered together given that the reduction in navigable sea room resulting from the presence of developments and potential for overlapping programmes will be greater with all cumulative developments present.

789. 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 hazards relating to vessel displacement. This assumes that the duration and nature of such activities are analogous to that considered for the Project, especially for the areas on approach to the offshore export cable corridor landfall. However, as discussed in relation to collision risk, there is the potential that the same or similarly located base ports could be used by cumulative developments for construction, maintenance 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. This is of particular interest at Peterhead Port, where multiple export cables will be making landfall north of the port entrance.

790. There is also no current known programmes of construction or cable installation activities associated with cumulative developments that will overlap temporally with the Project. However, in the event this did occur, 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 Project in isolation, promulgation of information to allow mariners to passage plan accordingly is key. Peterhead Port noted at the Hazard Workshop that port access issues would be on a case-by-case basis but acknowledged that there is good existing working relationship with the Project from previous survey work and Peterhead Port would coordinate with the Project as appropriate in relation to project vessel movements.

791. It is recognised that towage operations for floating units between the assembly or maintenance port and OAA or other cumulative floating developments may cause some increased disruption given the restricted nature of such activities in isolation. Towage operations for all cumulative developments including the Project would be subject to a dedicated risk assessment at the time of the towage operation when full specifications relating to the operations is available. The operation itself would be coordinated in liaison with the statutory harbour authority for the assembly port to ensure any access limitations were minimised and this would include consideration of simultaneous towage operations across developments.

21.3.2 Significance of Risk

792. For the construction and decommissioning stages, the frequency of occurrence in relation to cumulative reduced access to local ports and harbours is considered to **be reasonably probable**. For the operation and maintenance stage, the frequency of occurrence is considered to be **remote**. For all stages the severity of consequence in relation to cumulative reduced access to local ports and harbours is considered to be **minor**.

793. Overall, for all stages it is predicted that the significance of risk due to cumulative reduced access to local ports and harbours **Tolerable with Mitigation**.

21.4 Creation of Vessel to Structure Allision Risk

794. The presence of structures within the OAA or RCP search area and other cumulative developments in the region may lead to the creation of powered, drifting and internal allision risk for vessels.

21.4.1 Tier 1

795. Given the localised nature of vessel to structure allision risk, cumulative risk is limited. However, given that vessels may choose to navigate between the OAA and nearby Tier 1 development Green Volt, there is some potential cumulative allision risk. However, the gap between the developments was not raised as a concern even such the MCA noted during the Hazard Workshop that they had no concern over the proximity and the gap is not considered a navigational corridor. The sea room is considered adequate to allow safe navigation developments and is sufficient to allow vessels to approach safely and avoid additional allision risk beyond that associated with the Project in isolation. When considering the guidance outlined in the Shipping Route Template (MCA, 2021) in regard

to the distances which should be established between shipping routes and offshore wind farm, the gap of 4.7nm is low risk and of broadly acceptable tolerability.

796. The NLB will give due consideration to cumulative lighting and marking requirements across both the Project and other developments. All developments will be required to implement marine lighting and marking in agreement with NLB and in compliance with IALA G1162 (IALA, 2021), meaning the localised risk is managed. NLB confirmed at the Hazard Workshop that the RCPs would be lit and marked as a single structure and be based on existing bridge-linked structures as mariners are already familiar with them from the oil and gas industry. However, the only cumulative development in proximity to the RCP search area which could pose cumulative concern is Salamander if the RCP were to be placed in the southern portion of the RCP search area. Again, any specific lighting and marking requirements for the RCP and / or Salamander when considered cumulative will be determined by NLB as part of the lighting and marking process post consent.

21.4.2 Tier 2 / 3

797. The distance between the OAA or RCP and Tier 2 or Tier 3 developments is sufficient that no potential cumulative allision risk is considered and therefore Tier 2 and Tier 3 developments are considered together for this hazard.

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

21.4.3 Significance of Risk

799. For the operations and maintenance stage, the frequency of occurrence in relation to cumulative vessel to structure allision risk is considered to be **remote** and the severity of consequence is considered to be **moderate**.

800. Overall, for the operations and maintenance stage it is predicted that the significance of risk due to cumulative vessel to structure allision risk is **Broadly Acceptable**.

21.5 Reduction of Emergency Response Capability Including SAR Access

801. The presence of surface structures and activities associated with additional cumulative development may further increase the likelihood of an incident occurring which requires an emergency response and may reduce access for surface and air responders, including SAR assets.

21.5.1 Tier 1 / 2 / 3

802. With cumulative developments in situ an increase in the likelihood of an incident will also lead to a subsequent increase in the likelihood of multiple incidents occurring simultaneously, adding additional stress on emergency responders.

803. As for the Project in isolation, it is assumed that cumulative developments will have mitigation measures in place to reduce the likelihood of emergency response capability being compromised. This includes marine coordination for project vessels and compliance with Flag State regulations. SOLAS (IMO, 1974) obligations will also be applicable to all cumulative developments and may have a positive effect, e.g., a project vessel for any other nearby offshore wind developments may be able to assist with an incident associated with the Project, or vice-versa. This may be particularly relevant for an incident associated with the Project (at the OAA) and Green Volt given the proximity of the two. Nevertheless, the presence of structures and associated activities across multiple developments will increase the likelihood of an incident occurring that requires an emergency response.

804. Given that the OAA is not immediately adjacent to any cumulative development, there is not considered to be any cumulative risk associated with SAR access at the OAA, noting that a 1nm separation is required by MGN 654 (the separation from Green Volt is 4.7nm). In regard to SAR base locations, based on Inverness SAR base due to responding to 80% of SAR taskings associated with the Project (**Section 9.2**), there is no obstruction by any other cumulative development over the flight path to the Project.

21.5.2 Significance of Risk

805. The frequency of occurrence in relation to cumulative reduction of emergency response capability including SAR is considered to be **remote** and the severity of consequence is considered to be **serious**.

806. Overall, it is predicted that the significance of risk due to cumulative reduction of emergency response capability including SAR is **Tolerable with Mitigation**.

22 Risk Control Log

807. Table 22.1 presents a summary of the assessment of shipping and navigation hazards risk assessed. This includes the proposed embedded mitigation measures, frequency of occurrence, severity of consequence and significance of risk, per hazard. It is noted that embedded mitigation measures are listed for each hazard but may not apply for all Project components considered.

808. Subsequent residual significance of risk is considered in **Section 24**.

Table 22.1 Risk control log

Hazard	Component	Stage	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Vessel displacement and increased vessel to vessel collision risk between third-party vessels	OAA	Construction	▪ Development of and adherence to a DSLP ▪ Development of and adherence to a VMNSP ▪ Development of and adherence to a CaP ▪ Will undertake CBRA ▪ Development and adherence to a MPCP ▪ Development and adherence to a PEMP ▪ Development and adherence to a FMMS ▪ Guard vessels (as defined by risk assessment) ▪ Promulgation of information ▪ Appropriate marking on Admiralty charts ▪ Compliance with MGN 654 and its annexes ▪ Lighting and marking ▪ Buoyed construction area ▪ Adherence to decommissioning programme ▪ OOMP ▪ CMS	Reasonably Probable	Moderate	Tolerable with Mitigation
		O&M		Reasonably Probable	Moderate	Tolerable with Mitigation
		Decommissioning		Reasonably Probable	Moderate	Tolerable with Mitigation
	Offshore Export Cable Corridor	Construction		Remote	Moderate	Tolerable with Mitigation
		O&M		Extremely Unlikely	Moderate	Broadly Acceptable
		Decommissioning		Remote	Moderate	Tolerable with Mitigation
	RCP search area	Construction		Remote	Moderate	Tolerable with Mitigation
		O&M		Remote	Moderate	Tolerable with Mitigation
		Decommissioning		Remote	Moderate	Tolerable with Mitigation
Third-party with project vessel collision risk	OAA	Construction	▪ Development of and adherence to a DSLP ▪ Development of and adherence to a VMNSP ▪ Development and adherence to a MPCP ▪ Development and adherence to a PEMP ▪ Development and adherence to a FMMS	Remote	Moderate	Tolerable with Mitigation
		O&M		Remote	Moderate	Tolerable with Mitigation
		Decommissioning		Remote	Moderate	Tolerable with Mitigation

Hazard	Component	Stage	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
	Offshore Export Cable Corridor	Construction	▪ Development of and adherence to a CaP ▪ Will undertake CBRA ▪ Marine coordination of project vessels ▪ Guard vessels (as defined by risk assessment) ▪ Promulgation of information ▪ Appropriate marking on Admiralty charts ▪ Compliance with MGN 654 and its annexes ▪ Lighting and marking ▪ Buoyed construction area ▪ Adherence to decommissioning programme ▪ OOMP ▪ CMS	Extremely Unlikely	Moderate	**Broadly Acceptable**
		O&M		Negligible	Moderate	**Broadly Acceptable**
		Decommissioning		Extremely Unlikely	Moderate	**Broadly Acceptable**
	RCP search area	Construction		Extremely Unlikely	Moderate	**Broadly Acceptable**
		O&M		Extremely Unlikely	Moderate	**Broadly Acceptable**
		Decommissioning		Extremely Unlikely	Moderate	**Broadly Acceptable**
Reduced access to local port, harbours, and marinas	OAA	Construction	▪ Development of and adherence to an MPCP ▪ Development of and adherence to an PEMP ▪ Development and adherence to a FMMS ▪ Development of and adherence to a VMNSP ▪ Promulgation of information ▪ Compliance with MGN 654 and its annexes ▪ Marine coordination of project vessels ▪ Development and adherence to a decommissioning programme ▪ OOMP ▪ CMS	Extremely Unlikely	Minor	**Broadly Acceptable**
		O&M		Extremely Unlikely	Minor	**Broadly Acceptable**
		Decommissioning		Extremely Unlikely	Minor	**Broadly Acceptable**
	Offshore Export Cable Corridor	Construction		Reasonably Probable	Minor	**Tolerable with Mitigation**
		O&M		Remote	Minor	**Broadly Acceptable**
		Decommissioning		Reasonably Probable	Minor	**Tolerable with Mitigation**
	RCP search area	Construction		Negligible	Minor	**Broadly Acceptable**
		O&M		Negligible	Minor	**Broadly Acceptable**
		Decommissioning		Negligible	Minor	**Broadly Acceptable**

<table>
<tr><th>Hazard</th><th>Component</th><th>Stage</th><th>Embedded Mitigation Measures</th><th>Frequency of Occurrence</th><th>Severity of Consequence</th><th>Significance of Risk</th></tr>
<tr><td rowspan="3">Loss of station</td><td rowspan="3">OAA</td><td>Construction</td><td rowspan="3">Development and adherence to a VMNSP
Development and adherence to a FMMS
Guard vessels (defined by risk assessment)
Promulgation of information
Lighting and marking
Compliance with regulatory floating guidance
Minimum blade tip clearance
Development and adherence to a decommissioning programme
OOMP
CMS</td><td>Extremely Unlikely</td><td>Moderate</td><td>Broadly Acceptable</td></tr>
<tr><td>O&M</td><td>Remote</td><td>Moderate</td><td>Tolerable with Mitigation</td></tr>
<tr><td>Decommissioning</td><td>Extremely Unlikely</td><td>Moderate</td><td>Broadly Acceptable</td></tr>
<tr><td rowspan="2">Creation of vessel to structure allision risk</td><td>OAA</td><td rowspan="2">O&M</td><td rowspan="2">Development of and adherence to a DSLP
Development of and adherence to an MPCP
Development of and adherence to an PEMP
Development and adherence to a FMMS
Development of and adherence to a VMNSP
Application for safety zones
Promulgation of information
Marine coordination of project vessels
Compliance with MGN 654 and its annexes
Lighting and marking
Marking on Admiralty charts
Minimum blade tip clearance
OOMP</td><td>Remote</td><td>Moderate</td><td>Tolerable with Mitigation</td></tr>
<tr><td>RCP search area</td><td>Remote</td><td>Moderate</td><td>Tolerable with Mitigation</td></tr>
</table>

Hazard	Component	Stage	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Reduction of under keel clearance as a result of cable protection, dynamic cables, and mooring lines	OAA	O&M	▪ Development of and adherence to a DSLP ▪ Development of and adherence to a CaP ▪ Development and adherence to a MPCP ▪ Development and adherence to a PEMP ▪ Development and adherence to a FMMS ▪ Will undertake CBRA ▪ Guard vessels (as defined by risk assessment) ▪ Compliance with MGN 654 and its annexes ▪ Compliance with regulatory floating guidance ▪ Appropriate marking on Admiralty charts ▪ OOMP	Negligible	Moderate	**Broadly Acceptable**
	Offshore export cable corridor	O&M		Extremely Unlikely	Moderate	**Broadly Acceptable**
Anchor interaction with mooring lines or subsea cables	OAA	O&M	▪ Development of and adherence to a DSLP ▪ Development of and adherence to a CaP ▪ Development of and adherence to a VMNSP ▪ Development and adherence to a MPCP ▪ Development and adherence to a PEMP ▪ Development and adherence to a FMMS ▪ Will undertake CBRA ▪ Compliance with regulatory floating guidance ▪ Guard vessel (s) via risk assessment ▪ Promulgation of information ▪ Appropriate marking on Admiralty charts ▪ Compliance with MGN 654 and its annexes ▪ OOMP	Negligible	Minor	**Broadly Acceptable**
	Offshore export cable corridor	O&M		Extremely Unlikely	Minor	**Broadly Acceptable**

Hazard	Component	Stage	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Reduction of emergency response capability including SAR	Project as a whole	O&M	▪ Development of and adherence to a DSLP ▪ Development of and adherence to a VMNSP ▪ Development and adherence to a MPCP ▪ Development and adherence to a PEMP ▪ Marine coordination of project vessels ▪ Compliance with MGN 654 and its annexes ▪ Lighting and marking ▪ Appropriate marking on Admiralty charts ▪ OOMP	Remote	Serious	**Tolerable with Mitigation**

23 Through Life Safety Management

23.1 Quality, Health, Safety and Environment

809. QHSE documentation including a Safety Management System (SMS) will be in place for the Project and would be continually updated throughout the development process. The following subsections provide an overview of this documentation and how it would be maintained and reviewed with reference, where required, to specific marine documentation.

810. Monitoring, reviewing, and auditing would be carried out on all procedures and activities and feedback actively sought. Any designated person (identified in QHSE documentation), managers, and supervisors are to maintain continuous monitoring of all marine operations and determine if all required procedures and processes are being correctly implemented.

23.2 Incident Reporting

811. After any incidents, including near misses, an incident report form will be completed in line with the Project QHSE documentation. This would then be assessed for relevant outcomes and reviewed for possible changes required to operations.

812. The Applicant will maintain records of investigation and analyse incidents in order to:

- Determine underlying deficiencies and other factors that may be causing or contributing to the occurrence of incidents;
- Identify the need for corrective action;
- Identify opportunities for preventative action;
- Identify opportunities for continual improvement; and
- Communicate the results of such investigations.

813. All investigations shall be performed in a timely manner.

814. A database of lessons learnt from all marine incidents will be developed. It will include the outcomes of investigations and any resulting actions. The Applicant will promote awareness of incident occurrence and provide information to assist monitoring, inspection and auditing of documentation.

815. When appropriate, the designated person (noted within the ERCoP) should inform the MCA of any exercise or incidents including any implications on emergency response. If required, the MCA should be invited to take part in incident debriefs.

23.3 Review of Documentation

816. The Applicant would be responsible for reviewing and updating all documentation including the risk assessments, ERCoP, SMS and, if required, would convene a review panel of stakeholders to quantify risk.

817. Reviews of the risk register should be made after any of the following occurrences:

- Changes to the development, conditions of operation and prior to decommissioning;
- Planned reviews; and
- Following an incident or exercise.

818. A review of potential risks should be carried out annually. A review of the response charts should be undertaken annually to ensure that response procedures are up to date and should include any amendments from audits, incident reports and identified deficiencies.

23.4 Inspection of Resources

819. All vessels, facilities, and equipment necessary for marine operations are to be subject to appropriate inspection and testing to determine fitness for purpose and availability in relation to their performance standards. This would include monitoring and inspection of all aids to navigation to determine compliance with the performance standards specified by NLB.

23.5 Audit Performance

820. Auditing and performance review are the final steps in QHSE management systems. The feedback loop enables an organisation to reinforce, maintain and develop its ability to reduce risks to the fullest extent, and to ensure the continued effectiveness of the system. The Applicant will carry out audits and periodically evaluate the efficiency of the marine safety documentation.

821. The audits and possible corrective actions should be undertaken in accordance with standard procedures and results of the audits and reviews should be brought to the attention of all personnel having responsibility in the area involved.

23.6 Safety Management System

822. The Applicant will manage the risk associated with the activities undertaken at the Project. An integrated SMS, which ensures that the safety and environmental risks of those activities are ALARP, would be established. This includes the use of remote monitoring and switching for aids to navigation to ensure that if a light is faulty a quick fix can be instigated, which would allow IALA availability requirements to be met.

23.7 Cable Monitoring

823. The subsea cable routes will be subject to periodic inspection post-construction to monitor the condition of the cable, any installed cable protection, and cable burial depths. Maintenance of the cable protection would be undertaken as necessary.

824. If exposed cables or ineffective cable protection measures are identified during post-construction monitoring, these would be promulgated to relevant sea users including via Notifications to Mariners and Kingfisher Bulletins. Where immediate risk was observed, the Applicant would also employ additional temporary measures (such as a guard vessel or temporary buoyage) until such time as the risk was adequately mitigated.

825. Details will be included in full within the assessment of cable burial and protection document, to be produced post-consent.

23.8 Vessel Traffic Monitoring

826. During the Hazard Workshop, the MCA acknowledged that vessel traffic monitoring is not necessary to incorporate as an embedded mitigation measure but any requirement to undertake vessel traffic monitoring will be determined on a case-by-case basis following discussions with MD-LOT. It is anticipated that should vessel traffic monitoring be required it will be via AIS and consist of annual reports during the construction stage plus annual reports for up to three years post construction.

23.9 Hydrographic Surveys

827. As required by Annex 4 of MGN 654, detailed and accurate hydrographic surveys will be undertaken periodically at intervals agreed with the MCA.

23.10 Decommissioning Programme

828. A Decommissioning Programme will be developed post consent. With regards to hazards to shipping and navigation, this will also include consideration of the scenario where upon decommissioning and completion of removal operations, an obstruction is left on-site (attributable to the Project) which is considered to be a danger to navigation and which it has not proved possible to remove. Such an obstruction may result is a requirement for the Applicant to implement marking until such time as it is either removed or no longer considered a danger to navigation.

24 Summary

829. This NRA has been undertaken in compliance with MGN 654 (MCA, 2021) which requires that an NRA is undertaken to "*inform the shipping and navigation chapter of the EIA Report*". This includes Annex 1 which defines the methodology for assessing navigational safety risks.

24.1 Consultation

830. The NRA process has included consultation with shipping and navigation stakeholders across the scoping process, direct liaison, Regular Operator outreach and the Hazard Workshop. Stakeholders consulted include:

- MCA;
- NLB;
- UK Chamber of Shipping;
- RYA Scotland;
- Peterhead Port Authority;
- Fraserburgh Harbour Commissioners;
- SFF;
- Serco NorthLink Ferries;
- Tidewater;
- Fletcher Group;
- Gardline (Boskalis);
- Sentinel Marine; and
- TorCargo.

24.2 Baseline

24.2.1 Navigational Features

831. Key nearby features to the Project include other offshore wind farms and oil and gas infrastructure. The Hywind Scotland Pilot Park is located approximately 2.5nm south of the offshore export cable corridor and 7nm south of the RCP search area. The closest surface platform is the Golden Eagle platform, approximately 5nm to the south-west of the OAA. There are various subsea pipelines and subsea cables in the region, including the Hywind Scotland Pilot Park offshore export cable which crosses the southern landfall option of the offshore export cable corridor.

24.2.2 Vessel Traffic Movements

832. From the 14 days of vessel traffic survey data recorded for the OAA study area in Summer 2024 there was an average of 27 unique vessels per day, and in Winter 2024 an average of 24 unique vessels per day. Across both survey periods the most common vessel types were oil and gas vessels, fishing vessels and cargo vessels. No recreational vessels

were recorded during the Winter survey period. A total of 19 main commercial routes were identified, although only five featured an average of more than one vessel per week.

833. From the 14 days of vessel traffic data recorded for the offshore export cable corridor study area in Summer 2024 there was an average of 64 unique vessels per day, and in Winter 2024 an average of 47 unique vessels per day. Across both data periods the most common vessel types were fishing vessels, oil and gas vessels and cargo vessels.

834. From the 12 months of vessel traffic data recorded for the RCP search area study area in 2024 there was an average of 35 unique vessels per day. The most common vessel types were fishing vessels, oil and gas vessels, cargo vessels and wind farm vessels. A total of 31 main commercial routes were identified, with the busiest consisting of an average of 12 vessels per week.

24.2.3 Maritime Incidents

835. From DfT SAR helicopter taskings data recorded between April 2015 and March 2024 there was an average of three–four SAR taskings per year across the combined study areas, with 'Rescue / recovery' the most common type.

836. From RNLI incident data recorded between 2014 and 2023 there was an average of eight incidents per year across the combined study areas, with the majority recorded within 3nm of the coastline. The most common incident types where unspecified followed by machinery failure and person in danger.

837. From MAIB incident data recorded between 2014 and 2023 there was an average of four incidents per year across the combined study areas, with the majority recorded within 3nm of the coastline. The most common incident types were machinery failure, accident to person and fire / explosion.

24.3 Future Case Vessel Traffic

838. Of the 35 main commercial routes identified, it is anticipated that 12 would require a deviation due to the presence of the OAA and / or RCP(s). The largest increase in route length was 4.7m for a route between German / Dutch and Northern Isle ports. In terms of overall change in route length, the largest increase was 3.6% for a route between Aberdeen and the Claymore Oil Field.

839. In terms of future traffic trends, there are various factors and limited reliable information on future activity levels upon which any firm assumptions can be made. Therefore, potential increases of 10% and 20% in traffic volumes have been assumed for commercial vessels, commercial fishing vessels, and recreational vessels.

24.4 Collision and Allision Risk Modelling

840. The NRA process included quantitative modelling of the change in collision and allision frequency as a result of the presence of the Project, with consideration given to future cases in terms of potential traffic growth.

841. For the OAA it was estimated that the return period of a third-party vessel being involved in a collision post wind farm was approximately one in 688 years assuming base case traffic levels. This represents a 71% increase in collision frequency compared to the pre wind farm base case result.

842. The powered allision return period post wind farm was estimated at approximately one in 84 years assuming base case traffic levels. The corresponding drifting allision return period post wind farm was estimated at approximately one in 5,422 years. For fishing vessel allision return period post wind farm was estimated at approximately one in 2.05 years.

843. For the RCP(s) it was estimated that the return period of a third-party vessel being involved in a collision post wind farm was approximately one in 806 years assuming base case traffic levels. This represents a 3.7% increase in collision frequency compared to the pre wind farm base case result.

844. The powered allision return period post wind farm was estimated at approximately one in 116 years assuming base case traffic levels. The corresponding drifting allision return period post wind farm was estimated at approximately one in 64,574 years. For fishing vessel allision return period post wind farm was estimated at approximately one in 158 years.

24.5 Risk Assessment

845. Based on the consultation feedback, baseline and quantitative modelling, the following hazards were taken forward to the risk assessment:

- Vessel displacement and increased vessel to vessel collision risk between third-party vessels;
- Increased vessel to vessel collision risk between a third-party vessel and a project vessel;
- Reduced access to local ports and harbours;
- Loss of station;
- Creation of vessel to structure allision risk (including powered, drifting and internal);
- Reduction of under keel clearance as a result of cable protection, dynamic cables, and mooring lines;
- Anchor interaction with mooring lines and subsea cables; and
- Reduction of emergency response capability including SAR access.

846. These hazards have been assessed in line with the methodology outlined in Annex 1 of MGN 654 (MCA, 2021) and with consideration of embedded mitigation measures which have been adopted to reduce the potential for risk to relevant users.

24.6 Risk Statement

847. The risk assessment concluded that there would be no significant risks (not ALARP) arising from the Project in isolation with embedded mitigation measures in place during the construction, O&M, or decommissioning stage. The significance of risk for all hazards across the in isolation and cumulative risk assessments were predicted to be of **broadly acceptable** or **tolerable with mitigation** and ALARP assuming the implementation of the embedded mitigation measures identified.

848. The risk assessment concluded that there would be no significant risks (not ALARP) arising from the Project cumulatively with those other developments identified from the cumulative screening (**Section 13**) with embedded mitigation measures in place during the construction, O&M, or decommissioning stage. The significance of risk for all hazards across the in isolation and cumulative risk assessments were predicted to be of broadly acceptable or tolerable with mitigation and ALARP assuming the implementation of the embedded mitigation measures identified.

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Appendix A MGN 654 Checklist

849. The MGN 654 Checklist can be divided into two distinct checklists, one considering the main MGN 654 guidance document and one considering the Methodology for Assessing Marine Navigational Safety and Emergency Response Risks of OREIs (MCA, 2021) which serves as Annex 1 to MGN 654.

850. The checklist for the main MGN 654 guidance document is presented in **Table A-1**. Following this, the checklist for the MCA's methodology annex is presented in **Table A-2**. For both checklists, references to where the relevant information and /or assessment is provided in the NRA is given.

Table A-1 MGN 654 checklist for main document

Issue	Compliance	Comments
Site and Installation Coordinates. Applicants are responsible for ensuring that formally agreed coordinates and subsequent variations of site perimeters and individual OREI structures are made available, on request, to interested parties at relevant project stages, including application for consent, development, OAA variation, operation and decommissioning. This should be supplied as authoritative Geographical Information System (GIS) data, preferably in Environmental Systems Research Institute (ESRI) format. Metadata should facilitate the identification of the data creator, its date and purpose, and the geodetic datum used. For mariners' use, appropriate data should also be provided with latitude and longitude coordinates in WGS84 (European Terrestrial Reference System 1989 (ETRS89)) datum.		
Traffic Survey. Includes:		
All vessel types.	✓	**Section 10: Vessel Traffic Movements** All vessel types are considered with specific breakdowns by vessel type given within the study areas.
At least 28 days duration, within either 12 or 24 months prior to submission of the EIA Report.	✓	**Section 4.3: Data Sources** A total of 28 full days of vessel traffic survey data from two seasonal periods in 2024 has been assessed within the study area.
Multiple data sources.	✓	**Section 4.3: Data Sources** The vessel traffic survey data includes AIS, Radar and visual observations to maximise coverage of vessels not broadcasting on AIS. Geophysical survey data consisting of non-AIS visual observations and long-term vessel traffic data recorded on AIS have also been considered.
Seasonal variations.	✓	**Section 4.3: Data Sources** A total of 28 full days of vessel traffic survey data from two seasonal periods in 2024 has been assessed within the study area. **Appendix E: Long-Term Vessel Traffic Movements** To assist with the assessment of seasonal variation a long-term AIS dataset covering 12 months in 2024 has also been assessed.
MCA consultation.	✓	**Section 4: Consultation**

Issue	Compliance	Comments
		The MCA has been consulted as part of the NRA process including through the Hazard Workshop.
General Lighthouse Authority (GLA) consultation.	✓	**Section 4: Consultation** NLB has been consulted as part of the NRA process including through the Hazard Workshop.
UK Chamber of Shipping consultation.	✓	**Section 4: Consultation** The UK Chamber of Shipping has been consulted as part of the NRA process including through a follow up of the Hazard Workshop.
Recreational and fishing vessel organisations consultation.	✓	**Section 4: Consultation** The RYA Scotland and SFF have been consulted as part of the NRA process including through the Hazard Workshop.
Port and navigation authorities consultation, as appropriate.	✓	**Section 4: Consultation** Peterhead Port Authority and Fraserburgh Harbour have been consulted as part of the NRA process including through the Hazard Workshop.
Assessment of the cumulative and individual effects of (as appropriate):		
i. Proposed OREI site relative to areas used by any type of marine craft.	✓	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Project has been analysed. **From Sections 18: Introduction to Risk Assessment** The hazards due to the Project have been assessed for each stage – from **Sections 18.** **Section 21: Cumulative Risk Assessment** The hazards due to the Project and cumulative developments have been assessed for each stage.
ii. Numbers, types and sizes of vessels presently using such areas.	✓	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Project has been analysed and includes breakdowns of daily vessel count, vessel type and vessel size.
iii. Non-transit uses of the areas, e.g., fishing, day cruising of leisure craft, racing, aggregate dredging, personal watercraft, etc.	✓	**Section 10: Vessel Traffic Movements** Non-transit users were identified in the vessel traffic survey data and included fishing vessels engaged in fishing activities and oil and gas vessels engaged in O&M activities.
iv. Whether these areas contain transit routes used by coastal or deep-draught vessels on passage.	✓	**Section 11: Base Case Vessel Routeing** Main commercial routes have been identified using the principles set out in MGN 654 in proximity to the Project, with these routes taking into account coastal, deep-draught and internationally scheduled vessels.
v. Alignment and proximity of the site relative to adjacent shipping lanes.	✓	**Section 7: Navigational Features** No IMO routeing measures were in proximity to the Project.

Issue	Compliance	Comments
vi. Whether the nearby area contains prescribed routeing schemes or precautionary areas.	✓	**Section 7: Navigational Features** No IMO routeing measures were in proximity to the Project.
vii. Proximity of the site to areas used for anchorage (charted or uncharted), safe haven, port approaches and pilot boarding or landing areas.	✓	**Section 7: Navigational Features** Section 7.3 identifies port approaches and pilot boarding stations in proximity to the Project. No anchorage areas are in proximity to the Project.
viii. Whether the site lies within the jurisdiction of a port and / or navigation authority.	✓	**Section 7: Navigational Features** Section 7.3 identifies the locations of ports in proximity to the Project.
ix. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	✓	**Section 10: Vessel Traffic Movements** Fishing vessel movements are considered within the study area. Detailed analysis of dedicated fishing vessel activities is undertaken in **Volume 1, Chapter 14: Commercial Fisheries**.
x. Proximity of the site to offshore firing / bombing ranges and areas used for any marine military purposes.	✓	**Section 7: Navigational Features** Military PEXAs in proximity to the Project are identified in **Section 7.7**.
xi. Proximity of the site to existing or proposed submarine cables or pipelines, offshore oil / gas platforms, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Areas or other exploration / exploitation sites.	✓	**Section 7: Navigational Features** There are no marine aggregate dredging areas in proximity to the Project and **Section 7.5** identifies the charted wrecks in proximity to the Project.
xii. Proximity of the site to existing or proposed OREI developments, in cooperation with other relevant developers, within each round of lease awards.	✓	**Section 7: Navigational Features** **Section 7.1** Identifies other offshore wind farm developments in proximity to the Project. **Section 13: Cumulative and Transboundary Overview** Considers other OREI sites in proximity to the Project cumulatively.
xiii. Proximity of the site relative to any designated areas for the disposal of dredging spoil or other dumping ground.	✓	**Section 7: Navigational Features** **Section 7.7** identifies spoil and dumping rounds in proximity to the Project.
xiv. Proximity of the site to AtoNs and / or VTS in or adjacent to the area and any impact thereon.	✓	**Section 7: Navigational Features** **Section 7.3** identifies VTS areas in proximity to the Project and **Section 7.4** identifies AtoNs in proximity to the Project.
xv. Researched opinion using computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas	✓	**Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Project including pinch (or choke) points in proximity to the Project.

Issue	Compliance	Comments
of high traffic density and nearby or consented OREI sites not yet constructed.		
xvi. With reference to xv. above, the number and type of incidents to vessels which have taken place in or near to the proposed site of the OREI to assess the likelihood of such events in the future and the potential impact of such a situation.	✓	**Section 9: Emergency Response and Incident Overview** Historical vessel incident data published by DfT (**Section 9.1),** RNLI (**Section 9.2**) and MAIB (**Section 9.4**) in proximity to the Project has been considered alongside historical offshore wind farm incident data throughout the UK (**Section 9.5**).
xvii. Proximity of the site to areas used for recreation which depend on specific features of the area.	✓	**Section 10: Vessel Traffic Movements** Non-transit users were identified in the vessel traffic data and included recreational activities.
Predicted effect of OREI on traffic and interactive boundaries. Where appropriate, the following should be determined:		
a. The safe distance between a shipping route and OREI boundaries.	✓	**Section 14: Future Case Vessel Traffic** A methodology for post wind farm routeing is outlined and includes a minimum distance of 1nm from offshore installations and existing offshore wind farm boundaries.
b. The width of a corridor between sites or OREIs to allow safe passage of shipping.	✓	**Section 21: Cumulative Risk Assessment** Not directly applicable to the Project although the safe passage of shipping between developments is discussed cumulatively.
OREI Structures. The following should be determined:		
a. Whether any feature of the OREI, including auxiliary platforms outside the main generator site, mooring and anchoring systems, inter-device and export cabling could pose any type of difficulty or danger to vessels underway, performing normal operations, including fishing, anchoring and emergency response.	✓	**Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Project. **From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of users such as commercial vessels, commercial fishing vessels in transit, recreational vessels, anchored vessels and emergency responders – from **Sections 18**.
b. Clearances of fixed or floating WTG blades above the sea surface are not less than 22m (above MHWS for fixed). Floating turbines allow for degrees of motion.	✓	**Section 6: Project Description Relevant to Shipping and Navigation** **Section 6.2** outlines the shipping and navigation maximum design scenario for WTGs.
c. Underwater devices: i. Changes to charted depth; ii. Maximum height above seabed; and iii. Under keel clearance.	✓	**Section 6: Project Description Relevant to Shipping and Navigation** **Section 6.3** outlines the shipping and navigation maximum design scenario for subsea cables including the cable burial specifications.

Issue	Compliance	Comments
d. Whether structures block or hinder the view of other vessels or other navigational features.	✓	**From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of the potential for vessels navigating in proximity to structures to be visually obscured or inhibit the use of existing AtoNs – from **Sections 18**.
The effect of tides, tidal streams and weather. It should be determined whether:		
a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide, i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.	✓	**Section 6: Project Description Relevant to Shipping and Navigation** **Section 6.1** outlines the shipping and navigation maximum design scenario for the Project and includes the range of existing water depths. **Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Project relating to various states of the tide. **Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Project has been analysed including vessel draught. **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Project including accounting for tidal conditions.
b. The set and rate of the tidal stream, at any state of the tide, has a significant effect on vessels in the area of the OREI site.	✓	**Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Project relating to various states of the tide. **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Project including accounting for tidal conditions and assessment of whether machinery failure could cause vessels to be set into danger.
c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.	✓	
d. The set is across the major axis of the layout at any time, and, if so, at what rate.	✓	
e. In general, whether engine failure or other circumstance could cause vessels to be set into danger by the tidal stream, including unpowered vessels and small, low speed craft.	✓	**Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Project relating to various states of the tide. **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Project including accounting for tidal conditions
f. The structures themselves could cause changes in the set and rate of the tidal stream.	✓	**Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Project relating to various states of the tide and notes that no effects are anticipated.
g. The structures in the tidal stream could be such as to	✓	**Section 8: Meteorological Ocean Data**

Issue	Compliance	Comments
produce siltation, deposition of sediment or scouring, affecting navigable water depths in the wind farm area or adjacent to the area.		**Section 8.4** provides meteorological data in proximity to the Project relating to various states of the tide. **From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of potential for reduction in under keel clearance – from **Sections 18**..
h. The site, in normal, bad weather, or restricted visibility conditions, could present difficulties or dangers to craft, including sailing vessels, which might pass in close proximity to it.	✓	**Section 8: Meteorological Ocean Data** Provides meteorological data in proximity to the Project relating to weather and visibility. **Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Project has been analysed including recreational vessels. **Section 12: Adverse Weather Vessel Traffic Movements** **Section 12.2** identifies potential alternative vessel routeing in proximity to the Project in adverse weather. **From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of adverse weather routeing – from **Sections 18**..
i. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	✓	**From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of internal allision risk for vessels under sail – from **Sections 18**.
j. In general, taking into account the prevailing winds for the area, whether engine failure or other circumstances could cause vessels to drift into danger, particularly if in conjunction with a tidal set such as referred to above.	✓	**Section 8: Meteorological Ocean Data** Provides meteorological data in proximity to the Project relating to wind direction and various states of the tide. **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Project including accounting for weather conditions and assessment of whether machinery failure could cause vessels to be set into danger. **From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of drifting allision risk – from **Sections 18**.
Assessment of access to and navigation within, or close to, an OREI. To determine the extent to which navigation would be feasible within the OREI site itself by assessing whether:		
a. Navigation within or close to the site would be safe:		
i. For all vessels.	✓	**Section 4: Consultation** **Section 4.1** outlines Regular Operator consultation undertaken following the vessel traffic surveys.

Issue	Compliance	Comments
ii. For specified vessel types, operations and / or sizes. iii. In all directions or areas. iv. In specified directions or areas. v. In specified tidal, weather or other conditions.		**Section 12: Adverse Weather Vessel Traffic Movements** **Section 12.2** identifies potential alternative vessel routeing in proximity to the Project in adverse weather. **Section 16: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Project including accounting for weather and tidal conditions. **From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of internal allision risk – from **Sections 18**.
b. Navigation in and / or near the site should be prohibited or restricted:		
i. For specified vessel types, operations and / or sizes.	✓	**Section 15: Navigation, Communication and Position Fixing Equipment** Assesses potential hazards on navigation of the different communications and position fixing devices used in and around offshore wind farms. **Section 14: Future Case Vessel Traffic** A methodology for post wind farm routeing is outlined and includes a minimum distance of 1nm from offshore installations and existing offshore wind farm boundaries, i.e., it is assumed that commercial vessels would avoid the OAA. **From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of vessel displacement – from **Sections 18**.
ii. In respect of specific activities.	✓	
iii. In all areas or directions.	✓	
iv. In specified areas or directions.	✓	
v. In specified tidal or weather conditions.	✓	
c. Where it is not feasible for vessels to access or navigate through the site it could cause navigational, safety or routeing problems for vessels operating in the area, e.g., by preventing vessels from responding to calls for assistance from persons in distress.	✓	**From Sections 18: Risk Assessment** The hazards due to the Project have been assessed for each stage and include consideration of vessel displacement and emergency response capability – from **Sections 18**.
d. Guidance on the calculation of safe distance of OREI boundaries from shipping routes has been considered.	✓	**Section 14: Future Case Vessel Traffic** A methodology for post wind farm routeing is outlined and includes consideration of the Shipping Route Template.
SAR, maritime assistance service, counter pollution and salvage incident response.		

Issue	Compliance	Comments
The MCA, through HM Coastguard, is required to provide SAR and emergency response within the sea area occupied by all OREIs in UK waters. To ensure that such operations can be safely and effectively conducted, certain requirements must be met by Applicants and operators.		
a. An ERCoP will be developed for the construction, O&M and decommissioning stages of the OREI.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which includes the provision of an ERCoP.
b. The MCA's guidance document *Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response* (MCA, 2021) for the design, equipment and operation requirements will be followed.	✓	**Section 2: Guidance and Legislation** Outlines the guidance and legislation used within the NRA including Annex 5 of MGN 654. **Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 and its annexes.
c. A SAR Checklist will be completed to record discussions regarding the requirements, recommendations and considerations outlined in Annex 5 (to be agreed with MCA).	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which includes the completion of the SAR Checklist.
6. Hydrography. In order to establish a baseline, confirm the safe navigable depth, monitor seabed mobility and to identify underwater hazards, detailed and accurate hydrographic surveys are included or acknowledged for the following stages and to MCA specifications:		
i. Pre-construction: The proposed generating assets area and proposed cable route.	✓	**Section 23: Through Life Safety Management** Confirms that hydrographic surveys will be undertaken in agreement with the MCA.
ii. On a pre-established periodicity during the life of the development.	✓	
iii. Post construction: Cable route(s).	✓	
iv. Post decommissioning of all or part of the development: the installed generating assets area and cable route.	✓	
Communications, Radar and positioning systems. To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether:		
a. The structures could produce radio interference such as shadowing, reflections or phase changes, and emissions with respect to any frequencies used for marine positioning, navigation and timing (PNT) or communications, including GMDSS and AIS, whether ship borne, ashore or fitted to any of the proposed structures, to:		

Issue	Compliance	Comments
i. Vessels operating at a safe navigational distance.	✓	**Section 15: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Project including in relation to radio interference.
ii. Vessels by the nature of their work necessarily operating at less than the safe navigational distance to the OREI, e.g., support vessels, survey vessels, SAR assets.	✓	
iii. Vessels by the nature of their work necessarily operating within the OREI.	✓	
b. The structures could produce Radar reflections, blind spots, shadow areas or other adverse effects:		
i. Vessel to vessel.	✓	**Section 15: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Project including in relation to marine Radar.
ii. Vessel to shore.	✓	
iii. VTS Radar to vessel.	✓	
iv. Racon to / from vessel.	✓	
c. The structures and generators might produce SONAR interference affecting fishing, industrial or military systems used in the area.	✓	**Section 15: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Project including in relation to SONAR.
d. The site might produce acoustic noise which could mask prescribed sound signals.	✓	**Section 15: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Project including in relation to noise.
e. Generators and the seabed cabling within the site and onshore might produce EMFs affecting compasses and other navigation systems.	✓	**Section 15: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Project including in relation to electromagnetic interference.
Risk mitigation measures recommended for OREI during construction, O&M and decommissioning.		
Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the EIA. The specific measures to be employed will be selected in consultation with the MCA and will be listed in the Applicant's ES. These will be consistent with international standards contained in, for example, SOLAS Chapter V (IMO, 1974), and could include any or all of the following:		
i. Promulgation of information and warnings through notices to mariners and other appropriate MSI dissemination methods.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including promulgation of information.
ii. Continuous watch by multi-channel VHF, including DSC.	✓	**Section 17: Embedded Mitigation Measures**

Issue	Compliance	Comments
		Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including marine coordination.
iii. Safety zones of appropriate configuration, extent and application to specified vessels[3].	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the application for Safety Zones.
iv. Designation of the site as an ATBA.	✓	There are no plans to designate the Project as an ATBA.
v. Provision of aids to navigation as determined by the GLA.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including lighting and marking in accordance with NLB and MCA requirements.
vi. Implementation of routeing measures within or near to the development.	✓	There are no plans to implement any new routeing measures in proximity to the Project.
vii. Monitoring by Radar, AIS, Closed Circuit Television (CCTV) or other agreed means.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including traffic monitoring.
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of Safety Zones.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the application for Safety Zones and use of guard vessels, which will be considered in further detail in the Safety Zone Application, submitted post consent.
ix. Creation of an ERCoP with the MCA's SAR Branch for the construction stage onwards.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which include the provision of an ERCoP.
x. Use of guard vessels, where appropriate.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the use of guard vessels.
xi. Update NRAs every two years, e.g. at testing sites.	✓	Not applicable to the Project.
xii. Device-specific or OAA-specific NRAs.	✓	**Section 6: Project Description Relevant to Shipping and Navigation**

[3] As per SI 2007 No 1948 "The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

Issue	Compliance	Comments
		All offshore elements of the Project have been considered in this NRA including all infrastructure (surface and subsea) within the OAA, RCP search area, and offshore export cable corridor.
xiii. Design of OREI structures to minimise risk to contacting vessels or craft.	✓	There is no additional risk posed to craft compared to previous offshore wind farms and so no additional measures are identified.
xiv. Any other measures and procedures considered appropriate in consultation with other stakeholders.	✓	**Section 17: Embedded Mitigation Measures** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards. **Section 23: Through life safety management** Outlines how QHSE documentation will be maintained and reviewed.

Table A-2 MGN 654 Annex 1 checklist

Item	Compliance	Comments
A risk claim is included that is supported by a reasoned argument and evidence.	✓	**From Sections 18: Risk Assessment** The risk assessment provides a risk claim for a range of hazards based on a number of inputs including (but not limited to) baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments – from **Sections 18**.
Description of the marine environment.	✓	**Section 7: Navigational Features** Relevant navigational features in proximity to the Project have been described including (but not limited to) other offshore wind farm developments, ports, harbours and related facilities, AtoNs subsea cables, oil and gas infrastructure, and charted wrecks. **Section 13: Cumulative and Transboundary Overview** Potential future developments have been screened into the cumulative risk assessment where a cumulative or in combination activity has been identified based upon the location and distance from the Project, including consideration of other offshore wind farms and oil and gas infrastructure.
SAR overview and assessment.	✓	**Section 9: Emergency Response and Incident Overview** Existing SAR resources in proximity to the Project are summarised including the UK SAR operations contract, RNLI stations and assets and HM Coastguard stations **From Sections 18: Risk Assessment** The risk assessment includes an assessment of how activities associated with the Project may restrict emergency response capability of existing resources – from **Sections 18**.

Item	Compliance	Comments
Description of the OREI development and how it changes the marine environment.	✓	**Section 6: Project Description Relevant to Shipping and Navigation** The maximum extent of the Project for which any shipping and navigation hazards are assessed is provided, construction stage programme and indicative vessel and helicopter numbers during the construction and O&M stages. **Section 14: Future Case Vessel Traffic** Worst case alternative routeing for commercial traffic has been considered.

Appendix B Hazard Log

Table B.1 Hazard log

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
Vessels Displacement (Including Adverse Weather)																						
Commercial vessels	Option Agreement Area	C/D	Development of and adherence to VMNSP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on schedules or compliance with COLREGs	5	1	1	1	2	1.3	Tolerable with Mitigation	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	2	1	2	1	3	1.8	Broadly Acceptable		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels. MCA noted no issues in regard to commercial routeing in the presence of Green Volt emphasising there is ample sea room for oil and gas vessels. MCA noted that the need for vessel traffic monitoring will be discussed with MD-LOT and should not be assumed as an embedded mitigation measure. NorthLink Ferries confirmed new stabilised freight ferries will be in use (by 2029), which should reduce the frequency of such offshore (adverse weather) routeing. Passenger ferries already have such stabilisers.
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Visual interference associated with a third-party vessel exiting the Option Agreement Area Presence of cumulative developments	Increased journey time/ distance but does not impact on schedules or compliance with COLREGs	5	1	1	1	2	1.3	Tolerable with Mitigation	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	2	1	2	1	3	1.8	Broadly Acceptable		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels. MCA noted no issues in regard to commercial routeing in the presence of Green Volt emphasising there is ample sea room for oil and gas vessels. UK Chamber of Shipping noted that the passing distance from a floating array may be greater than the standard mean 1nm assumed. MCA noted that the need for vessel traffic monitoring will be discussed with MD-LOT and should not be assumed as an embedded mitigation measure. NorthLink Ferries confirmed new stabilised freight ferries will be in use (by 2029) which should reduce the frequency of such offshore (adverse weather) routeing,

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk		
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
																						passenger ferries already have such stabilisers.
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to decommissioning programme	Adverse weather Construction/ decommissioning vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on schedules or compliance with COLREGs	3	1	1	1	1	1.0	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	2	1	2	1	2	1.5	Broadly Acceptable		
	Offshore export cable corridor	O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Adverse weather Maintenance vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on schedules or compliance with COLREGs	2	1	1	1	1	1.0	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	1	1	2	1	2	1.5	Broadly Acceptable		
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are restricted in their ability to manoeuvre (RAM) Presence of cumulative developments	Increased journey time/ distance but does not impact on schedules or compliance with COLREGs	4	1	1	1	1	1.0	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	1	1	2	1	2	1.5	Broadly Acceptable		MCA noted that given the scale of the RCP, including in the presence of Salamander, there is ample sea room for deviations. NorthLink Ferries confirmed new stabilised freight ferries will be in use (by 2029) which should reduce the frequency of such offshore (adverse weather) routeing, passenger ferries already have such stabilisers.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on schedules or compliance with COLREGs	4	1	1	1	1	1.0	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	1	1	2	1	2	1.5	Broadly Acceptable		MCA noted that given the scale of the RCP, including in the presence of Salamander, there is ample sea room for deviations. NorthLink Ferries confirmed new stabilised freight ferries will be in use (by 2029) which should reduce the frequency of such offshore (adverse weather) routeing, passenger ferries already have such stabilisers.
Commercial fishing vessels in transit	Option Agreement Area	C/D	Development of and adherence to a VMNSP Development and adherence to a FMMS Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on transits or impact compliance with COLREGs	5	1	1	1	4	1.8	Tolerable with Mitigation	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	2	1	2	1	4	2.0	Broadly Acceptable		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels. MCA noted that the need for vessel traffic monitoring will be discussed with MD-LOT and should not be assumed as an embedded mitigation measure.
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Visual interference associated with a third-party vessel exiting the Option Agreement Area Presence of cumulative developments	Increased journey time/ distance but does not impact on transits or impact compliance with COLREGs	4	1	1	1	4	1.8	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	2	1	2	1	4	2.0	Broadly Acceptable		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels. SFF noted fishing vessels will unlikely use the pipeline gap within the OAA for transiting but will be mariner preference. UK Chamber of Shipping noted that the passing distance from a floating array may be greater than the standard mean 1nm assumed. MCA noted that the need for vessel traffic monitoring will be discussed with MD-LOT and should not be assumed as an embedded mitigation measure.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a FMMS Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to decommissioning programme	Adverse weather Construction/ decommissioning vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on transits or impact compliance with COLREGs	3	1	1	1	2	1.3	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	1	1	2	1	2	1.5	Broadly Acceptable		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a FMMS Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Adverse weather Maintenance vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on transits or impact compliance with COLREGs	2	1	1	1	2	1.3	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	1	1	2	1	2	1.5	Broadly Acceptable		
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on transits or impact compliance with COLREGs	4	1	1	1	2	1.3	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	2	1	2	1	2	1.5	Broadly Acceptable		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Presence of cumulative developments	Increased journey time/ distance but does not impact on transits or impact compliance with COLREGs	4	1	1	1	2	1.3	Broadly Acceptable	Increased journey time/ distance which impacts on schedules or compliance with COLREGs including due to cumulative developments.	2	1	2	1	2	1.5	Broadly Acceptable		
Recreational vessels (2.5 to 24m length)	Option Agreement Area	C/D	Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	3	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Visual interference associated with a third-party vessel exiting the Option Agreement Area Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	3	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to decommissioning programme	Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Development of and adherence to a CaP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	1	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme																			
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		
Increased Vessel to Vessel Collision Risk Between Third-Party Vessels due to Vessel Displacement																						
Commercial vessels	Option Agreement Area	C/D	Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	3	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	4	4	5	4.3	Tolerable with Mitigation		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels. MCA noted no issues in regard to commercial routeing in the presence of Green Volt emphasising there is ample sea room for oil and gas vessels.
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Visual interference associated with a third-party vessel exiting the	Displacement results in an increase in encounters and potential for low impact collision to occur	3	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	4	4	5	4.3	Tolerable with Mitigation		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels. MCA noted no issues in regard to commercial routeing in the presence of Green Volt emphasising there is ample sea room for oil and gas vessels.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk		
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
			Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Option Agreement Area Presence of cumulative developments																		
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to decommissioning programme	Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	4	4	5	4.3	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	1	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	4	4	5	4.3	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	4	4	5	4.3	Tolerable with Mitigation		MCA noted that given the scale of the RCP, including in the presence of Salamander, there is ample sea room for deviations.
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	4	4	5	4.3	Tolerable with Mitigation		MCA noted that given the scale of the RCP, including in the presence of Salamander, there is ample sea room for deviations.
Commercial fishing vessels in transit	Option Agreement Area	C/D	Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	4	2	2	2	3	2.3	Tolerable with Mitigation	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	2	5	3	5	4	4.3	Tolerable with Mitigation		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			Adherence to decommissioning programme																			
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Visual interference associated with a third-party vessel exiting the Option Agreement Area Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	4	2	2	2	3	2.3	Tolerable with Mitigation	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	2	5	3	5	4	4.3	Tolerable with Mitigation		SFF noted oil and gas vessels may deviate into fishing grounds leading to potential interaction or displacement of fishing vessels. SFF noted fishing vessels will unlikely use the pipeline gap within the OAA for transiting but will be mariner preference.
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to decommissioning programme	Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	5	3	5	4	4.3	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a FMMS Development and	Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	1	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including	1	5	3	5	4	4.3	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes										due to cumulative developments.									
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	5	3	5	4	4.3	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	2	2	3	2.3	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	5	3	5	4	4.3	Tolerable with Mitigation		
		C/D	Development of and adherence to a VMNSP Development and	Presence of buoyed construction area Adverse weather	Displacement results in an increase in encounters and	3	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and	1	4	3	4	3	3.5	Broadly Acceptable		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	potential for low impact collision to occur								potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.									
Recreational vessels (2.5 to 24m length)		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Visual interference associated with a third-party vessel exiting the Option Agreement Area Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	3	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to	Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
			decommissioning programme																			
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Development of and adherence to a CaP Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	1	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654	Presence of surface structures Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative developments	Displacement results in an increase in encounters and potential for low impact collision to occur	2	2	1	2	2	1.8	Broadly Acceptable	Displacement results in an increase in encounters and potential for high impact collision to occur involving vessel damage, PLL, and/or pollution including due to cumulative developments.	1	4	3	4	3	3.5	Broadly Acceptable		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences					Risk		Frequency	Consequences					Risk		
							People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
			and its annexes Lighting and marking																			
Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel																						
Commercial vessels	Option Agreement Area	C/D	Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Presence of buoyed construction area Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	3	1	1	1	2	1.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	1	1	1	2	1.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable	Increased encounters resulting in a low impact collision event	3	1	1	1	2	1.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			Marine coordination of project vessels Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to decommissioning programme	sea room Presence of cumulative project vessels																		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	1	1	1	2	1.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	3	1	1	1	2	1.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			decommissioning programme																			
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	1	1	1	2	1.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		
Commercial fishing vessels in transit	Option Agreement Area	C/D	Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	4	2	2	2	3	2.3	Tolerable with Mitigation	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	2	5	3	5	4	4.3	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	4	2	2	2	3	2.3	Tolerable with Mitigation	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	2	5	3	5	4	4.3	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking																			
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to decommissioning programme	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	2	2	2	3	2.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	5	3	5	4	4.3	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	1	2	2	2	3	2.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	5	3	5	4	4.3	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
			Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes																			
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	2	2	2	3	2.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	5	3	5	4	4.3	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a FMMS Development and adherence to a MPCP Development and adherence to a PEMP Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	2	2	2	3	2.3	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	5	3	5	4	4.3	Tolerable with Mitigation		
Recreational vessels (2.5 to 24m length)	Option Agreement Area	C/D	Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Application and use of safety zones	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable	Increased encounters resulting in a low impact collision event	3	2	1	2	2	1.8	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	3	4	5	4.0	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	sea room Presence of cumulative project vessels																		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Application and use of safety zones Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	3	2	1	2	2	1.8	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	3	4	5	4.0	Tolerable with Mitigation		
	Offshore export cable corridor	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Adherence to	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	2	1	2	2	1.8	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	3	4	5	4.0	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Conseque	Risk	Further Mitigation Required	Additional Comments
			decommissioning programme																			
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Development of and adherence to a CaP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Application and use of safety zones Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	1	2	1	2	2	1.8	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	3	4	5	4.0	Tolerable with Mitigation		
	Reactive Compensation Platform	C/D	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking Buoyed construction area Adherence to decommissioning programme	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Construction/ decommissioning vessels which are RAM Reduction of navigable sea room Presence of cumulative project vessels	Increased encounters resulting in a low impact collision event	2	2	1	2	2	1.8	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	3	4	5	4.0	Tolerable with Mitigation		
		O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Guard vessels (as defined by	Project vessels in transit including towage operation Lack of third-party awareness Adverse weather Maintenance vessels which are RAM Reduction of navigable sea room	Increased encounters resulting in a low impact collision event	2	2	1	2	2	1.8	Broadly Acceptable	Increased encounters results in a high impact collision event with vessel damage, PLL, and/or pollution	1	4	3	4	5	4.0	Tolerable with Mitigation		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes Lighting and marking	Presence of cumulative project vessels																		
Reduced Access to Local Ports, Harbours, and Marinas																						
Commercial vessels	Option Agreement Area	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on schedules or berth times	2	1	1	1	2	1.4	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and/ or berth times	1	1	2	1	4	2.0	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
Commercial vessels	Option Agreement Area	O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels	Maintenance vessel use of local ports Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on schedules or berth times	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and/ or berth times	1	1	2	1	4	2.0	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
Commercial vessels	Offshore export cable corridor	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Construction/ decommissioning vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on schedules or berth times	4	1	2	1	2	1.5	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and/ or berth times	2	1	2	1	4	2.0	Broadly Acceptable		Peterhead Port noted port access issues will be on a case-by-case basis but acknowledged there is good existing working relationship with MarramWind and Peterhead Port will coordinate with MarramWind as appropriate. Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead. NLB noted that multiple cable projects making landfall in a similar area will increase complexity including Green Link interconnectors. NorthLink Ferries noted export

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences								Worst Case Consequences	Realistic Worst Case Consequences								Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk			Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk			
												Broadly Acceptable									Broadly Acceptable			cables may lead to some disruption but good communications as to when and where lay activity is planned should mitigate any issues.
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels	Maintenance vessel use of local ports Maintenance vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on schedules or berth times	3	1	1	1	2	1.3	Broadly Acceptable		Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and/ or berth times	1	1	2	1	4	2.0	Broadly Acceptable			Peterhead Port noted port access issues will be on a case-by-case basis but acknowledged there is good existing working relationship with MarramWind and Peterhead Port will coordinate with MarramWind as appropriate. Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead. NorthLink Ferries noted export cables may lead to some disruption but good communications as to when and where lay activity is planned should mitigate any issues.
	Reactive Compensation Platform	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Construction/ decommissioning vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on schedules or berth times	3	1	1	1	2	1.3	Broadly Acceptable		Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and/ or berth times	2	1	2	1	4	2.0	Broadly Acceptable			Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels	Maintenance vessel use of local ports Maintenance vessels which are RAM Presence of cumulative developments	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on schedules or berth times	2	1	1	1	2	1.3	Broadly Acceptable		Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on schedules and/ or berth times	1	1	2	1	4	2.0	Broadly Acceptable			Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
Commercial fishing vessels in transit	Option Agreement Area	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS	Construction/ decommissioning vessel use of local ports Presence of cumulative developments and project vessels	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily	3	1	1	1	2	1.3	Broadly Acceptable		Presence of project vessels operating within and in proximity to port or harbour restricts	2	1	2	1	4	2.0	Broadly Acceptable			Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	potentially utilising same ports	but does not impact on routines								access and impacts on routines									
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels	Maintenance vessel use of local ports Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	3	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	2	1	2	1	4	2.0	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
	Offshore export cable corridor	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Construction/ decommissioning vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	4	1	2	1	2	1.5	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	3	1	2	1	4	2.0	Broadly Acceptable		Peterhead Port noted port access issues will be on a case-by-case basis but acknowledged there is good existing working relationship with MarramWind and Peterhead Port will coordinate with MarramWind as appropriate. Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead. NLB noted that multiple cable projects making landfall in a similar area will increase complexity including Green Link interconnectors.
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels	Maintenance vessel use of local ports Maintenance vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	3	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	2	1	2	1	4	2.0	Broadly Acceptable		Peterhead Port noted port access issues will be on a case-by-case basis but acknowledged there is good existing working relationship with MarramWind and Peterhead Port will coordinate with MarramWind as appropriate. Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
	Reactive Compensation Platform	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Construction/ decommissioning vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	3	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	2	1	2	1	4	2.0	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels	Maintenance vessel use of local ports Maintenance vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	2	1	2	1	4	2.0	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
Recreational vessels (2.5 to 24m length)	Option Agreement Area	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Presence of cumulative developments	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	1	1	2	1	3	1.8	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes	Maintenance vessel use of local ports Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	1	1	2	1	3	1.8	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			Marine coordination of project vessels																			
	Offshore export cable corridor	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Construction/ decommissioning vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	3	1	2	1	2	1.5	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	2	1	2	1	3	1.8	Broadly Acceptable		Peterhead Port noted port access issues will be on a case-by-case basis but acknowledged there is good existing working relationship with MarramWind and Peterhead Port will coordinate with MarramWind as appropriate. Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead. NLB noted that multiple cable projects making landfall in a similar area will increase complexity including Green Link interconnectors.
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels	Maintenance vessel use of local ports Maintenance vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	1	1	2	1	3	1.8	Broadly Acceptable		Peterhead Port noted port access issues will be on a case-by-case basis but acknowledged there is good existing working relationship with MarramWind and Peterhead Port will coordinate with MarramWind as appropriate. Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
	Reactive Compensation Platform	C/D	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes Marine coordination of project vessels Development and adherence to a decommissioning programme	Construction/ decommissioning vessel use of local ports Construction/ decommissioning vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	1	1	2	1	3	1.8	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.
		O	Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Promulgation of information Compliance with MGN 654 and its annexes	Maintenance vessel use of local ports Maintenance vessels which are RAM Presence of cumulative developments and project vessels potentially utilising same ports	Presence of project vessels operating within and in proximity to port or harbour restricts access temporarily but does not impact on routines	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessels operating within and in proximity to port or harbour restricts access and impacts on routines	1	1	2	1	3	1.8	Broadly Acceptable		Development of Peterhead Port would increase vessel traffic and a 20% increase is realistic if planned developments go ahead.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
			Marine coordination of project vessels																			
Creation of Vessel to Structure Allision Risk (Including Powered, Drifting and Internal)																						
Commercial vessels	Option Agreement Area	O	Development of and adherence to a DSLP Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Application for safety zones Promulgation of information Marine coordination of project vessels Compliance with MGN 654 and its annexes Lighting and marking Marking on Admiralty charts Minimum blade tip clearance	Presence of surface structures Human/ navigational error Mechanical/ technical failure Adverse weather Aid to navigation failure Presence of cumulative developments	Vessel passes at an unsafe distance resulting in a need to make a late adjustment to course/ speed, or drifts towards a structure but is able to regain power prior to an allision event	2	1	2	2	2	1.8	Broadly Acceptable	Allision event occurs involving vessel damage, PLL and/ or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		MCA noted no issues in regard to commercial routeing in the presence of Green Volt emphasising there is ample sea room for oil and gas vessels. UK Chamber of Shipping noted that the passing distance from a floating array may be greater than the standard mean 1nm assumed.
	Reactive Compensation Platform	O	Development of and adherence to a DSLP Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Application for safety zones Promulgation of information Marine coordination of project vessels Compliance with MGN 654 and its annexes Lighting and marking Marking on Admiralty charts Minimum blade tip clearance	Presence of surface structures Human/ navigational error Mechanical/ technical failure Adverse weather Aid to navigation failure Presence of cumulative developments	Vessel passes at an unsafe distance resulting in a need to make a late adjustment to course/ speed, or drifts towards a structure but is able to regain power prior to an allision event	3	1	1	2	2	1.5	Broadly Acceptable	Allision event occurs involving vessel damage, PLL and/ or pollution	1	4	4	4	5	4.3	Tolerable with Mitigation		
Commercial fishing vessels in transit	Option Agreement Area	O	Development of and adherence to a DSLP Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS Development of and adherence to a VMNSP Application for safety zones Promulgation of information Marine coordination of	Presence of surface structures Human/ navigational error Mechanical/ technical failure Adverse weather Aid to navigation failure Presence of cumulative developments	Vessel passes at an unsafe distance resulting in a need to make a late adjustment to course/ speed, or drifts towards a structure but is able to regain power prior to an allision event	4	1	2	2	2	1.8	Broadly Acceptable	Allision event occurs involving vessel damage, PLL and/ or pollution	2	5	4	5	5	4.8	Tolerable with Mitigation		SFF noted allision incidents occur more often than what is being reported and there is chance for multiple fatalities to occur. SFF noted fishing vessels will unlikely use the pipeline gap within the OAA for transiting but will be mariner preference. UK Chamber of Shipping noted that the passing distance from a floating array may be greater than the standard mean 1nm assumed.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			project vessels Compliance with MGN 654 and its annexes Lighting and marking Marking on Admiralty charts Minimum blade tip clearance																			
	Reactive Compensation Platform	O	Development of and adherence to a DSLP Development of and adherence to an MPCP Development of and adherence to an PEMP Development and adherence to a FMMS Development of and adherence to a VMNSP Application for safety zones Promulgation of information Marine coordination of project vessels Compliance with MGN 654 and its annexes Lighting and marking Marking on Admiralty charts Minimum blade tip clearance	Presence of surface structures Human/ navigational error Mechanical/ technical failure Adverse weather Aid to navigation failure Presence of cumulative developments	Vessel passes at an unsafe distance resulting in a need to make a late adjustment to course/ speed, or drifts towards a structure but is able to regain power prior to an allision event	5	1	1	2	2	1.5	Tolerable with Mitigation	Allision event occurs involving vessel damage, PLL and/ or pollution	2	5	4	5	5	4.8	Tolerable with Mitigation		SFF noted fishing vessels will likely transit in proximity to the RCP if no legal obligation to avoid, i.e. no safety zones implemented, potentially increasing allision risk.
Recreational vessels (2.5 to 24m length)	Option Agreement Area	O	Development of and adherence to a DSLP Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP Application for safety zones Promulgation of information Marine coordination of project vessels Compliance with MGN 654 and its annexes Lighting and marking Marking on Admiralty charts Minimum blade tip clearance	Presence of surface structures Human/ navigational error Mechanical/ technical failure Adverse weather Aid to navigation failure Presence of cumulative developments	Vessel passes at an unsafe distance resulting in a need to make a late adjustment to course/ speed, or drifts towards a structure but is able to regain power prior to an allision event	3	1	1	2	1	1.3	Broadly Acceptable	Allision event occurs involving vessel damage, PLL and/ or pollution	2	5	3	5	4	4.3	Tolerable with Mitigation		Brown & May Marine Limited noted that recreational vessels may be high risk as there is not always someone keeping a watch, especially in adverse weather. UK Chamber of Shipping noted that the passing distance from a floating array may be greater than the standard mean 1nm assumed.
	Reactive Compensation Platform	O	Development of and adherence to a DSLP Development of and adherence to an MPCP Development of and adherence to an PEMP Development of and adherence to a VMNSP	Presence of surface structures Human/ navigational error Mechanical/ technical failure Adverse weather Aid to navigation failure	Vessel passes at an unsafe distance resulting in a need to make a late adjustment to course/ speed, or drifts towards a structure but is able	3	1	1	2	1	1.3	Broadly Acceptable	Allision event occurs involving vessel damage, PLL and/ or pollution	2	5	3	5	4	4.3	Tolerable with Mitigation		Brown & May Marine Limited noted that recreational vessels may be high risk as there is not always someone keeping a watch, especially in adverse weather.

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation Required	Additional Comments
						Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		Frequency	Consequences: People	Environment	Property	Business	Average Consequence	Risk		
			Application for safety zones Promulgation of information Marine coordination of project vessels Compliance with MGN 654 and its annexes Lighting and marking Marking on Admiralty charts Minimum blade tip clearance	Presence of cumulative developments	to regain power prior to an allision event																	
Reduction of Under Keel Clearance as a Result of Cable Protection, Dynamic Cables, and Mooring Lines																						
All vessels	All subsea cables	O	Development of and adherence to a DSLP Development of and adherence to a CaP Development and adherence to a MPCP Development and adherence to a PEMP Development and adherence to a FMMS Guard vessels (as defined by risk assessment) Compliance with MGN 654 and its annexes Compliance with regulatory floating guidance Appropriate marking on Admiralty charts	Presence of cable protection, dynamic cables, and mooring lines which reduces water depth Human/ navigational error	Vessel transits over an area of reduced clearance and a light contact occurs with the vessel able to continue passage	2	2	1	1	2	1.5	Broadly Acceptable	Interaction with dynamic cable, mooring line, or cable protection resulting in vessel damage, grounding (cable protection only) injury to person and/or pollution (including spillage of potential hazardous cargo	1	1	3	4	4	3.0	Broadly Acceptable		MCA noted that the shallowest draught (12m) for project infrastructure occurs next to the foundation so it will unlikely pose a risk to under keel clearance and most vessels will likely avoid OAA transits. NLB noted that multiple cable projects making landfall in a similar area will increase complexity including Green Link interconnectors.
Anchor Interaction with Mooring Lines and Subsea Cables																						
All vessels	All subsea cables	O	Development of and adherence to a DSLP Development of and adherence to a CaP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Development and adherence to a FMMS Compliance with regulatory floating guidance Guard vessel (defined by risk assessment) Promulgation of information Appropriate marking on Admiralty charts Compliance with MGN 654 and its annexes	Presence of mooring lines Presence of subsea cables Mooring line design Insufficient cable burial/ protection Human/ navigational error Mechanical/ technical failure	Vessel anchors on or drags anchor over a subsea cable or mooring line and a light contact occurs with the vessel able to continue passage	4	1	1	1	1	1.0	Broadly Acceptable	Vessel anchors on or drags anchor over a subsea cable or mooring line with interaction occurring resulting in damage to the cable, protection, mooring line, and/ or anchor	2	3	2	3	3	2.8	Broadly Acceptable		NLB noted that multiple cable projects making landfall in a similar area will increase complexity including Eastern Green Link interconnectors.
Loss of Station																						

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
All Vessels	Option Agreement Area (WTGs only)	C/D	Development and adherence to a VMNSP Development and adherence to a FMMS Guard vessels (defined by risk assessment) Promulgation of information Lighting and marking Compliance with regulatory floating guidance Minimum blade tip clearance	Damage to or failure of mooring line(s) Damage to or failure of tow during WTG towage operation Loss of buoy	Failure of a single mooring line leads to temporary increase in the maximum excursion of the floating structure but not full loss of station	3	2	2	3	3	2.5	Broadly Acceptable	Total failure of mooring/ shared anchor system or towage operation leads to drifting of multiple floating structures with risk of collision with vessels	2	4	4	5	5	4.5	Tolerable with Mitigation		NLB noted management of wreck response including for a sunken off station structure requires consideration. Shared anchors have been assumed for this hazard in agreement with UK Chamber of Shipping. UK Chamber of Shipping highlighted that towing objects will further increase risk. MCA noted that towing guidance is expected to be published before the end of 2025.
		O	Development and adherence to a VMNSP Development and adherence to a FMMS Guard vessels (defined by risk assessment) Promulgation of information Lighting and marking Compliance with regulatory floating guidance Minimum blade tip clearance	Damage to or failure of mooring line(s) Damage to or failure of tow during WTG towage operation Loss of buoy	Failure of a single mooring line leads to temporary increase in the maximum excursion of the floating structure but not full loss of station	3	2	2	3	3	2.5	Broadly Acceptable	Total failure of mooring/ shared anchor system or towage operation leads to drifting of multiple floating structures with risk of collision with vessels	2	4	4	5	5	4.5	Tolerable with Mitigation		NLB noted management of wreck response including for a sunken off station structure requires consideration. Shared anchors have been assumed for this hazard in agreement with UK Chamber of Shipping. UK Chamber of Shipping highlighted that towing objects will further increase risk. MCA noted that towing guidance is expected to be published before the end of 2025.
Interference with Communications and Position Fixing Equipment from the Development																						
All vessels	Option Agreement Area	O	Compliance with MGN 654 and its annexes Lighting and marking Appropriate marking on Admiralty charts Promulgation of information	Human error relating to adjustment of Radar controls Presence of surface structures	Structures have no effect upon the Radar, communication and position fixing equipment on a vessel	4	1	1	1	1	1.0	Broadly Acceptable	Structures have minor but manageable levels of Radar interference on a vessel	3	1	1	1	1	1.0	Broadly Acceptable		
	Offshore export cable corridor	O	Development of and adherence to a CaP Compliance with MGN 654 and its annexes Lighting and marking Appropriate marking on Admiralty charts Promulgation of information	Presence of subsea infrastructure producing EMF	Cables have no effect upon the Radar, communication and position fixing equipment on a vessel	5	1	1	1	1	1.0	Tolerable with Mitigation	Cables have minor but manageable levels of EMF interference on a vessel	4	1	1	1	1	1.0	Broadly Acceptable		
	Reactive Compensation Platform	O	Compliance with MGN 654 and its annexes Lighting and marking Appropriate marking on Admiralty charts	Human error relating to adjustment of Radar controls Presence of surface structures	Structures have no effect upon the Radar, communication and position fixing	4	1	1	1	1	1.0	Broadly Acceptable	Structures have minor but manageable levels of Radar interference on a vessel	3	1	1	1	1	1.0	Broadly Acceptable		

User	Project Component(s)	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Worst Case Consequences	Realistic Worst Case Consequences: Frequency	Consequences: People	Consequences: Environment	Consequences: Property	Consequences: Business	Consequences: Average Consequence	Risk	Further Mitigation Required	Additional Comments
			Promulgation of information		equipment on a vessel																	
Reduction of Emergency Response Capability including SAR Access																						
Emergency responders	Project	O	Development of and adherence to a DSLP Development of and adherence to a VMNSP Development and adherence to a MPCP Development and adherence to a PEMP Marine coordination of project vessels Compliance with MGN 654 and its annexes Lighting and marking Appropriate marking on Admiralty charts	Option Agreement Area does not facilitate emergency responder access Adverse weather Presence of Project and associated vessels may increase incident rates in the area Limited resource capability Presence of cumulative developments	Delay to emergency response request	3	1	1	1	2	1.3	Broadly Acceptable	Delay to emergency response request leading to vessel damage, PLL and/or pollution including due to cumulative developments.	1	5	5	5	5	5.0	Tolerable with Mitigation		

Appendix C Consequences

C.1 Introduction

851. This appendix presents an assessment of the consequences of collision and allision incidents, in terms of people and the environment, due to the presence of the Project.

852. The significance of the risk due to the presence of the Project is also assessed based on risk evaluation criteria and comparison with historical incident data in UK waters[4].

C.2 Risk Evaluation Criteria

C.2.1 Risk to People

853. Regarding the assessment of risk to people two measures are considered, namely:

- Individual risk; and
- Societal risk.

C.2.2 Individual Risk

854. Individual risk considers whether the risk from an incident to a particular individual changes significantly due to the presence of the Project. Individual risk considers not only the frequency of the incident and the consequences (e.g., likelihood of death), but also the individual's fractional exposure to that risk, i.e. the probability of the individual being in the given location at the time of the incident.

855. The purpose of estimating the individual risk is to ensure that individuals who may be affected by the presence of the Project are not exposed to excessive risks. This is achieved by considering the significance of the change in individual risk resulting from the presence of the Project relative to the UK background individual risk levels.

856. Annual risk levels to crew (the annual risk to an average crew member) for different vessel types are presented in **Figure C.1,** which also includes the upper and lower bounds for risk acceptance criteria as suggested in IMO Maritime Safety Committee 72 / 16 (IMO, 2001). The annual individual risk level to crew falls within the ALARP region for each of the vessel types presented.

[4] For the purposes of this assessment, UK waters are defined as the UK EEZ and UK territorial waters refers to the 12nm limit from the British Isles, excluding the Republic of Ireland.

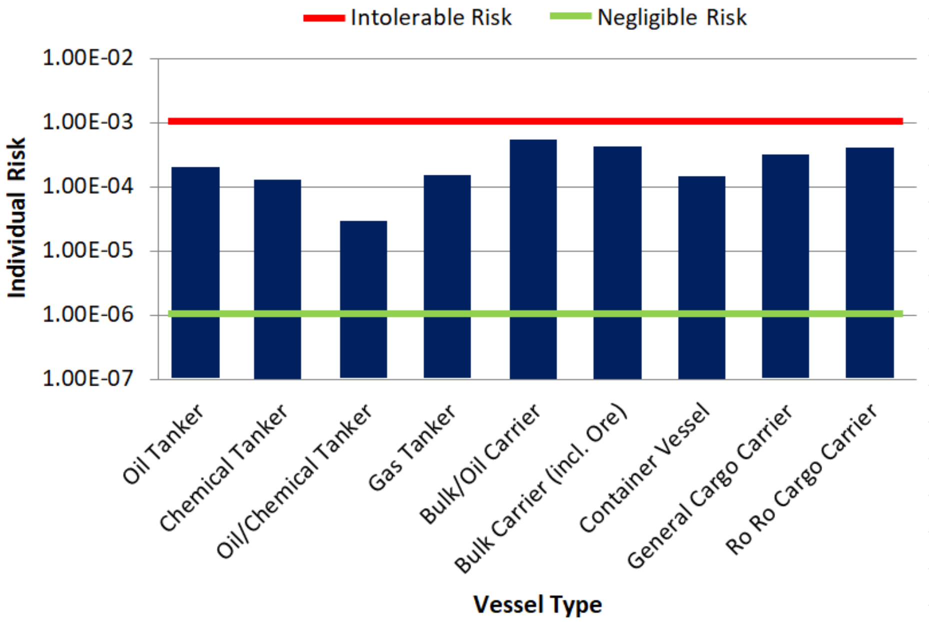

Figure C.1 Individual Risk Levels and Acceptance Criteria per Vessel Type

857. The typical bounds defining the ALARP regions for decision making within shipping are presented in 857. For a new vessel, the target upper bound for ALARP is set lower since new vessels are expected to benefit (in terms of design) from changes in legislation and improved maritime safety.

Table C.1 Individual Risk ALARP Criteria

Individual	Lower Bound for ALARP	Upper Bound for ALARP
To crew member	10^{-6}	10^{-3}
To passenger	10^{-6}	10^{-4}
Third-party	10^{-6}	10^{-4}
New vessel target	10^{-6}	Above values reduced by one order of magnitude

858. On a UK basis, the MCA have presented individual risks for various UK industries based on HSE data from 1987–1991. The risks for different industries are presented in **Figure C.2**.

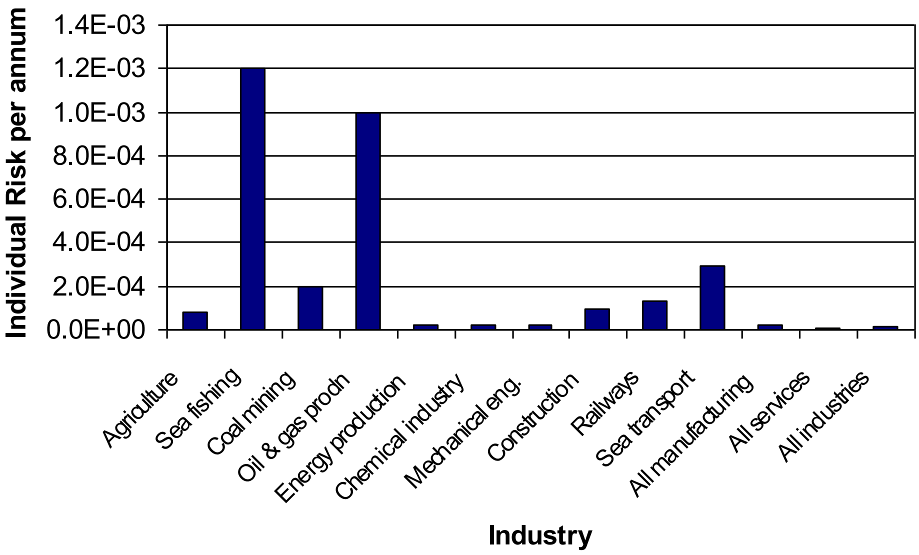

Figure C.2 Individual Risk per Year for Various UK Industries

859. The individual risk for sea transport of 2.9×10^{-4} per year is consistent with the worldwide data presented in **Figure C.2**, whilst the individual risk for sea fishing of 1.2×10^{-3} per year is the highest across all of the industries included.

C.2.3 Societal Risk

860. Societal risk is used to estimate risks of incidents affecting many persons (catastrophes) and acknowledging risk adverse or neutral attitudes. Societal risk includes the risk to every person, even if a person is only exposed to risk on one brief occasion. For assessing the risk to a large number of affected people, societal risk is desirable because individual risk is insufficient in evaluating risks imposed on large numbers of people.

861. Within this assessment, societal (navigation based) risk can be assessed for the Project, giving account to the change in risk associated with each incident scenario cause by the introduction of the wind farm structures. Societal risk may be expressed as:

- Annual fatality rate where frequency and fatality are combined into a convenient one-dimensional measure of societal risk (also known as PLL); and
- F-N diagrams showing explicitly the relationship between the cumulative frequency of an accident and the number of fatalities in a multi-dimensional diagram.

862. When assessing societal risk this study focuses on PLL, which accounts for the number of people likely to be involved in an incident (which is higher for certain vessel types) and assesses the significance of the change in risk compared to the UK background risk levels.

C.2.4 Risk to Environment

863. For risk to the environment the key criteria considered in terms of the risk due to the Project is the potential quantity of oil spilled from a vessel involved in an incident.

864. It is recognised that there will be other potential pollution, e.g., hazardous containerised cargoes; however, oil is considered the most likely pollutant, and the extent of predicted oil spills will provide an indication of the significance of pollution risk due to the Project compared to UK background pollution risk levels.

C.3 Marine Accident Investigation Branch Incident Data

C.3.1 All Incidents in UK Waters

865. All UK flagged commercial vessels are required to report incidents to the MAIB. Non-UK flagged vessels do not have to report an incident to the MAIB unless located at a UK port or within 12nm territorial waters and carrying passengers to a UK port. There are no requirements for non-commercial recreational craft to report incidents to the MAIB; however, a significant proportion of such incidents are reported to and investigated by the MAIB.

866. The MCA, harbour authorities and inland waterway authorities also have a duty to report incidents to the MAIB. Therefore, whilst there may be a degree of underreporting of incidents with minor consequences, those resulting in more serious consequences, such as fatalities, are likely to be reported.

867. Only incidents occurring in UK waters have been considered within this assessment for which the MAIB data is most comprehensive. It is also noted that incidents occurring in ports / harbours and rivers / canals have been excluded since the causes and consequences may differ considerably from an incident occurring offshore, which is the location of most relevance to the Project.

868. Accounting for these criteria, a total of 11,773 accidents, injuries and hazardous incidents were reported to the MAIB in the 20-year period between 2002 and 2021 involving 13,415 vessels (some incidents, such as collisions, involved more than one vessel).

869. The location of all incidents in proximity to the UK are presented in **Figure C.3**. The majority of incidents occur in coastal waters.

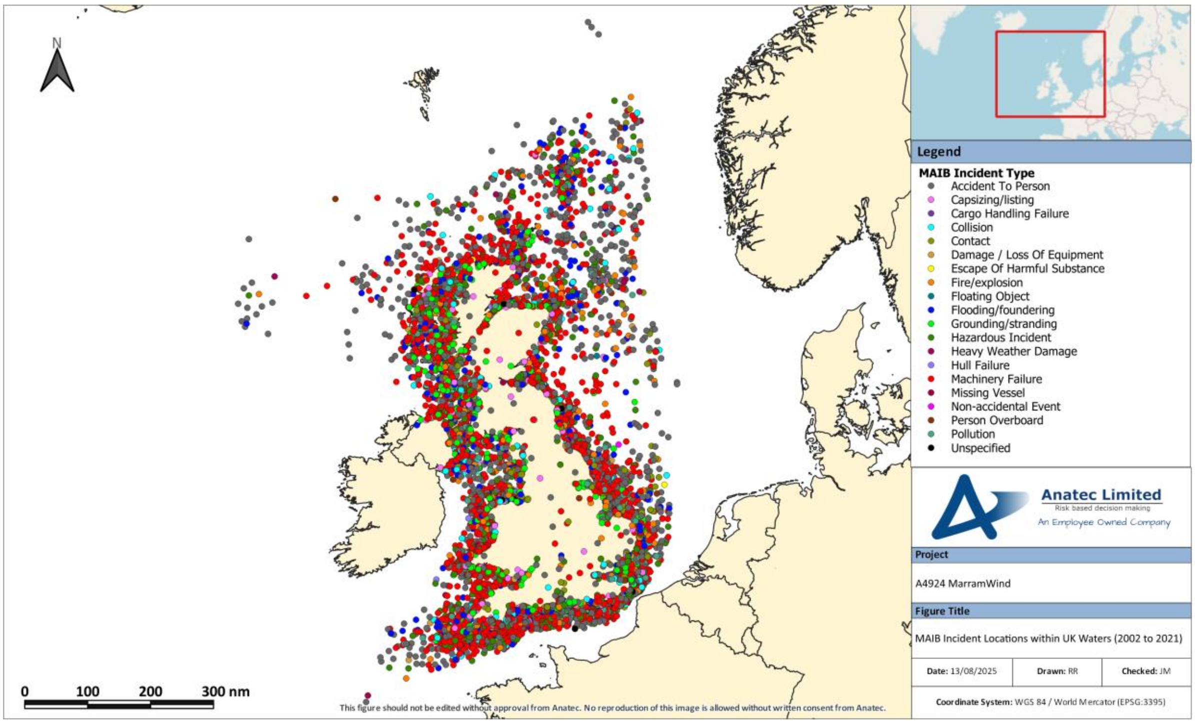

Figure C.3 MAIB Incident Locations within UK Waters (2002 –2021)

870. The distribution of incidents by year in UK waters is presented in **Figure C.4**.

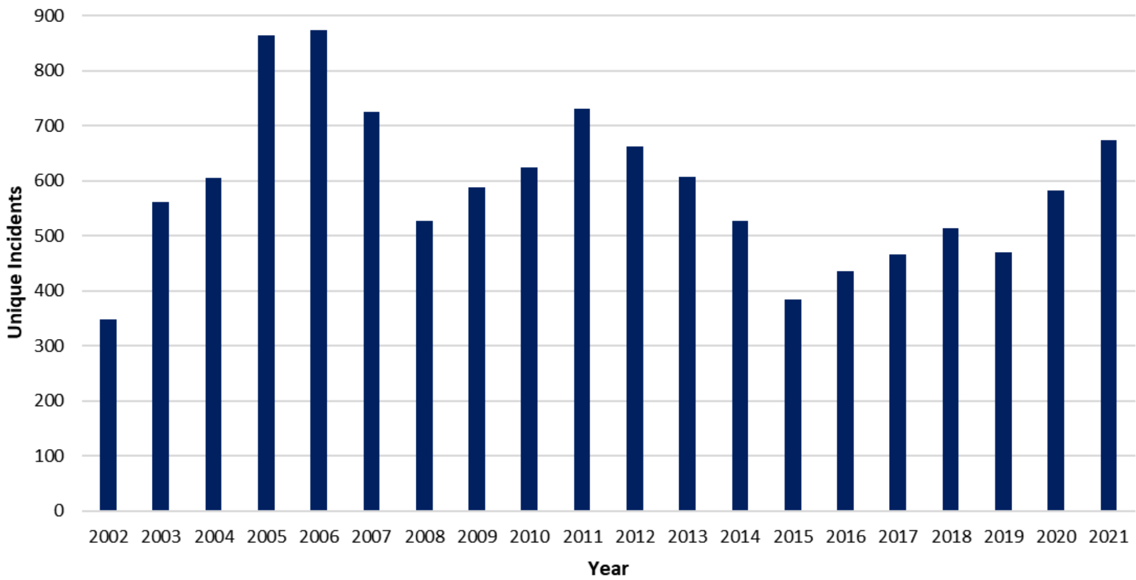

Figure C.4 MAIB Unique Incidents per Year within UK Waters (2002–2021)

871. The average number of unique incidents per year was 589. There has generally been a fluctuating trend in incidents over the 20-year period.

872. The distribution of incidents in UK waters by incident type is presented in **Figure C.5**.

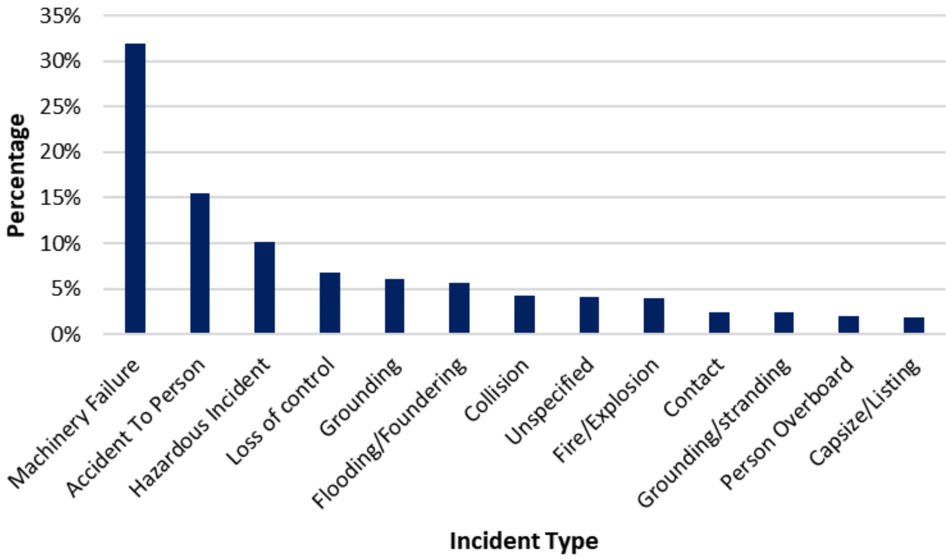

Figure C.5 MAIB Incident Types Breakdown within UK Waters (2002 –2021)

873. The most frequent incident types were "*machinery failure*" (32%), "*accident to person*" (16%) and "*hazardous incident*" (10%). "*Collision*" and "*contact*" incidents represented 4% and 2% of total incidents, respectively.

874. The distribution of incidents in UK waters by vessel type is presented in **Figure C.6**.

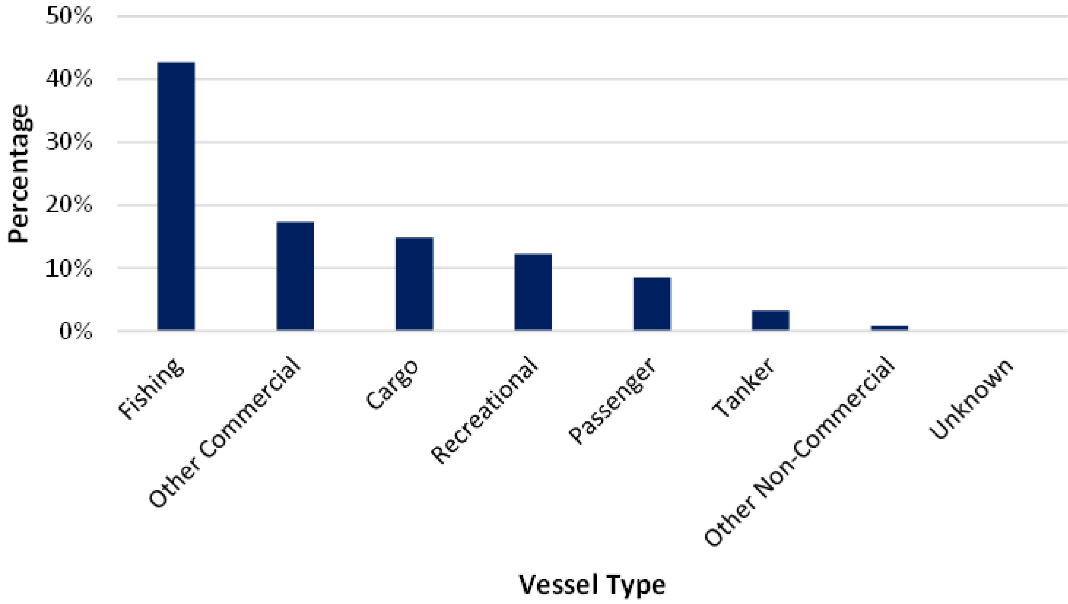

Figure C.6 MAIB Incident Types Breakdown within UK Waters (2002 –2021)

875. The most frequent vessel types involved in incidents were fishing vessels (43%), other commercial vessels (17%) (including offshore industry vessels, tugs, workboats and pilot vessels) and cargo vessels (15%).

876. A total of 414 fatalities were reported in the MAIB incidents within UK waters between 2002 and 2021, corresponding to an average of 21 fatalities per year.

877. The distribution of fatalities in UK waters by vessel type and person category (crew, passenger and other) is presented in **Figure C.7**.

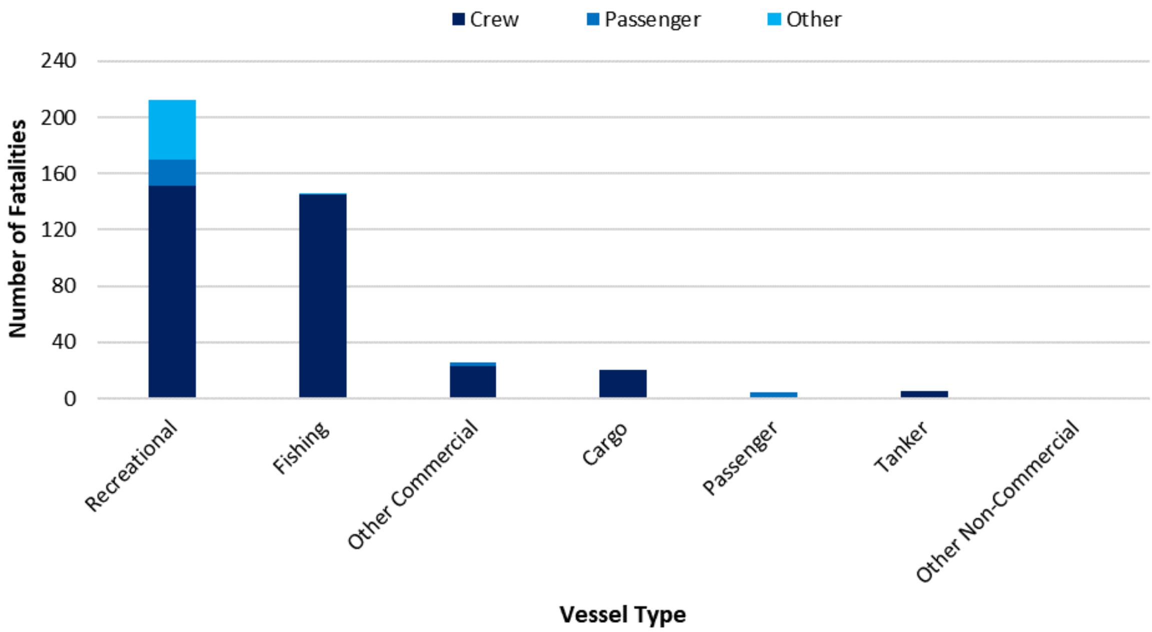

Figure C.7 MAIB Fatalities by Vessel Type within UK Waters (2002 –2021)

878. The majority of fatalities occurred to recreational vessels (51%) and fishing vessels (35%), with crew members the main people involved (83%).

C.3.2 Collision Incidents

879. The MAIB define a collision incident as "*ships striking or being struck by another ship, regardless of whether the ships are underway, anchored or moored*" (MAIB, 2013).

880. A total of 481 collision incidents were reported to the MAIB in UK waters between 2002 and 2021 involving 1,068 vessels (in a small number of cases the other vessel involved was not logged).

881. The locations of collision incidents reported in proximity to the UK are presented in **Figure C.8**.

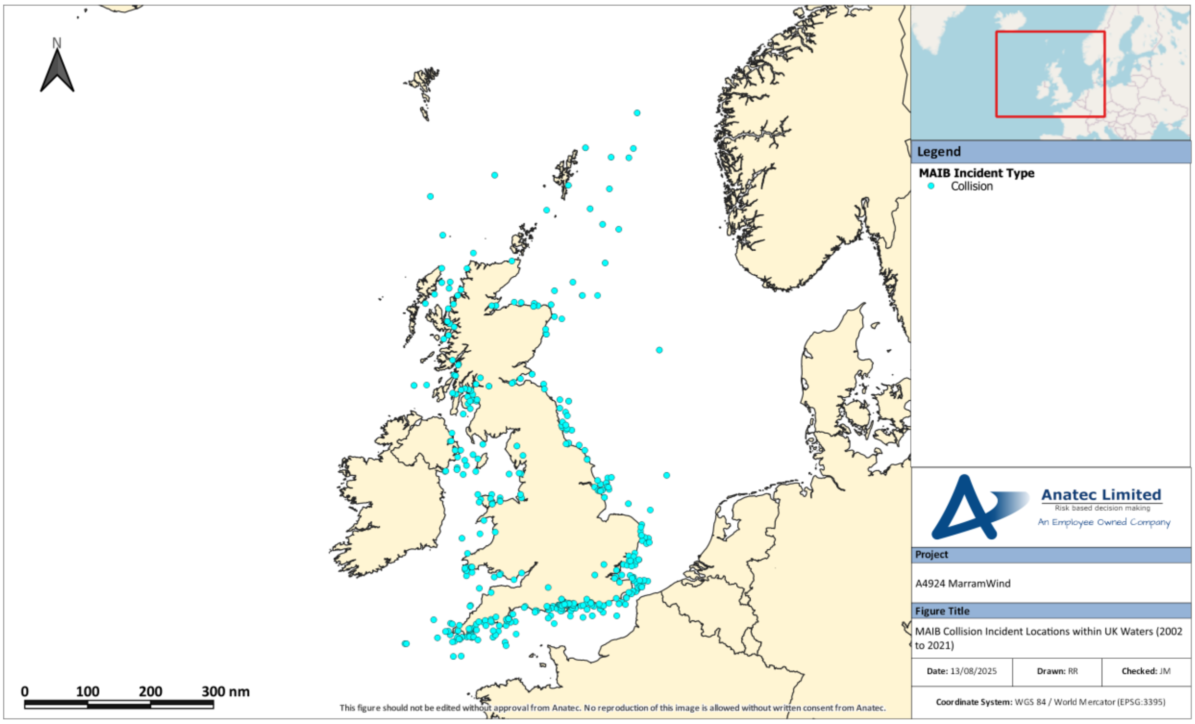

Figure C.8 MAIB Collision Incident Locations within UK Waters (2002 –2021)

882. The distribution of collision incidents per year is presented in **Figure C.9**.

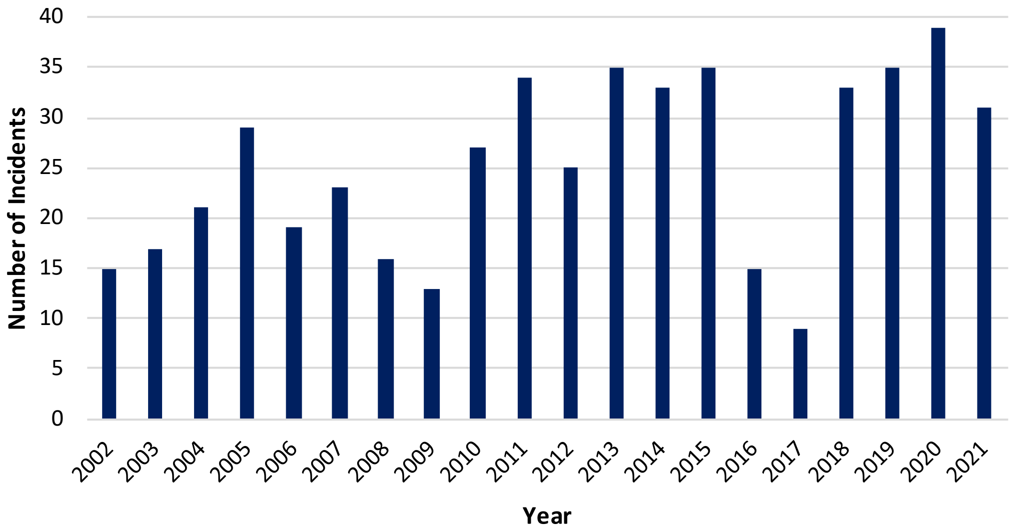

Figure C.9 MAIB Annual Collision Incidents within UK Water (2002–2021)

883. The average number of collision incidents per year was 25. There has been an overall slight increasing trend in collision incidents over the 20-year period, which may be due to better reporting of less serious incidents in recent years.

884. The most frequent vessel types involved in collision incidents were recreational vessels (29%), fishing vessels (26%), other commercial vessels (24%) and cargo vessels (13%).

885. A total of five fatalities were reported in MAIB collision incidents within UK waters between 2002 and 2021. Details of each of these fatal incidents reported by the MAIB are presented in **Table C.2**.

Table C.2 Description of Fatal MAIB Collision Incidents (2002 –2021)

Date	Description	Fatalities
July 2005	Collision between two powerboats at night. Both vessels were unlit and both helmsmen had consumed alcohol. One of the helmsmen died.	1
October 2007	Collision between fishing vessel and coastal general cargo vessel following failure to keep an effective lookout. Fishing vessel sank with three of the four crew members abandoning ship into a life raft, but the fourth crew member was not recovered.	1
August 2010	Collision between passenger ferry and fishing vessel. Fishing vessel sank with one of the two crew members recovered from the sea, but the other member was not recovered despite an extensive search.	1
June 2015	Collision between RIB and yacht. Believed that around a dozen persons were onboard the motorboat with the majority taken ashore by lifeboat. One person seriously injured and airlifted to hospital before being pronounced dead later.	1
June 2018	Collision between power boats during a race. One of the vessels overturned with the pilot pronounced dead at the scene.	1

C.3.3 Allision Incidents

886. The MAIB define a contact incident as "*ships striking or being struck by an external object. The objects can be: floating object (cargo, ice, other or unknown); fixed object, but not the sea bottom; or flying object*" (MAIB, 2013). In line with the NRA as a whole, an allision is considered to involve a moving object and a stationary object at sea, with port infrastructure excluded from consideration; the MAIB contact incidents have been individually inspected and filtered in line with the NRA definition.

887. A total of 119 allision incidents were reported to the MAIB within UK waters between 2002 and 2021 involving 119 vessels.

888. The locations of allision incidents reported in proximity to the UK are presented in **Figure C.10**.

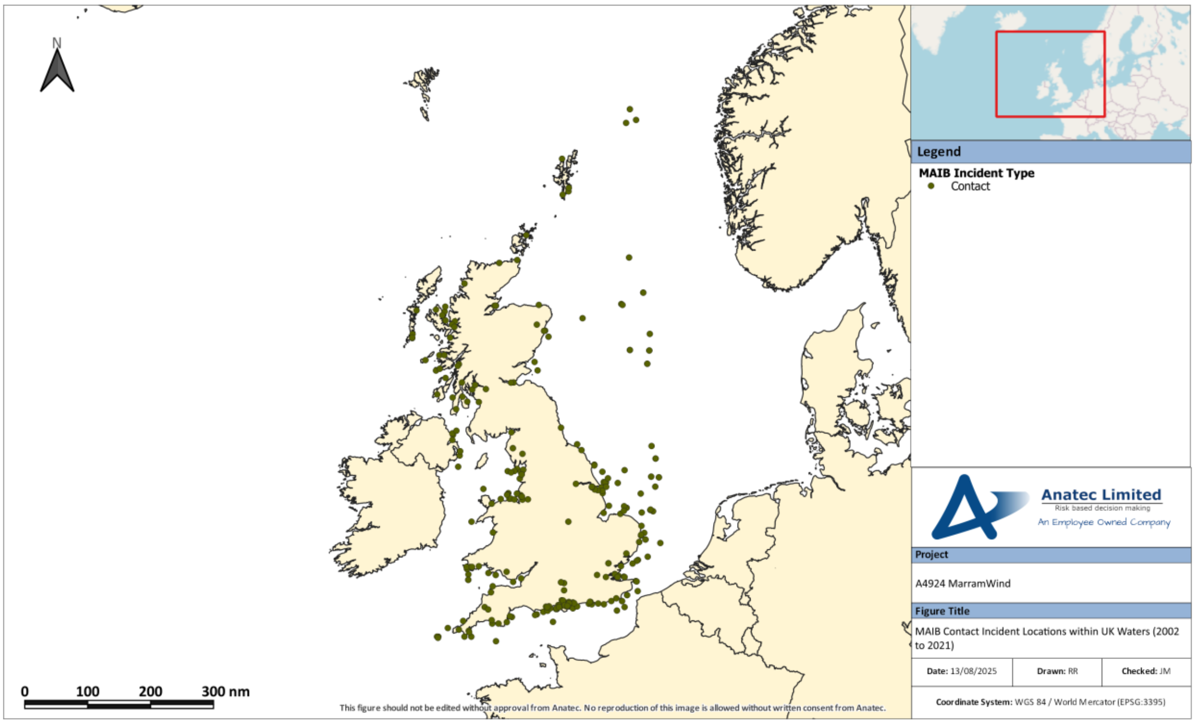

Figure C.10 MAIB Allision Incident Locations within UK waters (2002 –2021)

889. The distribution of allision Incidents per year is presented in **Figure C.11**.

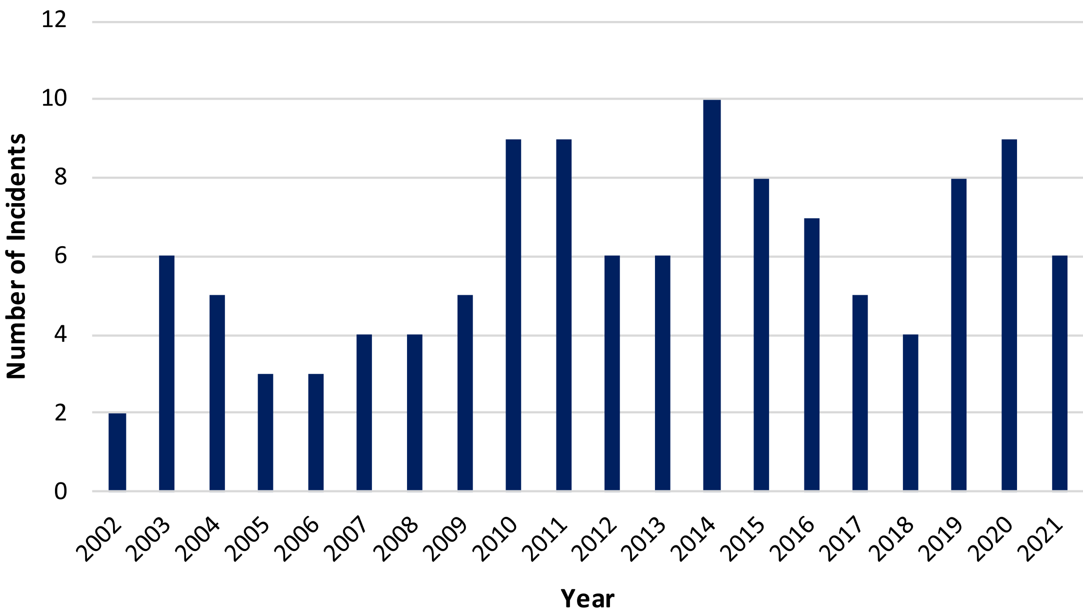

Figure C.11 MAIB Contact Incidents per Year within UK Waters (2000 –2019)

890. The average number of allision incidents per year was six. As with collision incidents, there has been an overall slight increasing trend in allision incidents over the 20-year period, which may be due to better reporting of less serious incidents in recent years.

891. The distribution of vessel types involved in allision incidents is presented in **Figure C.12**.

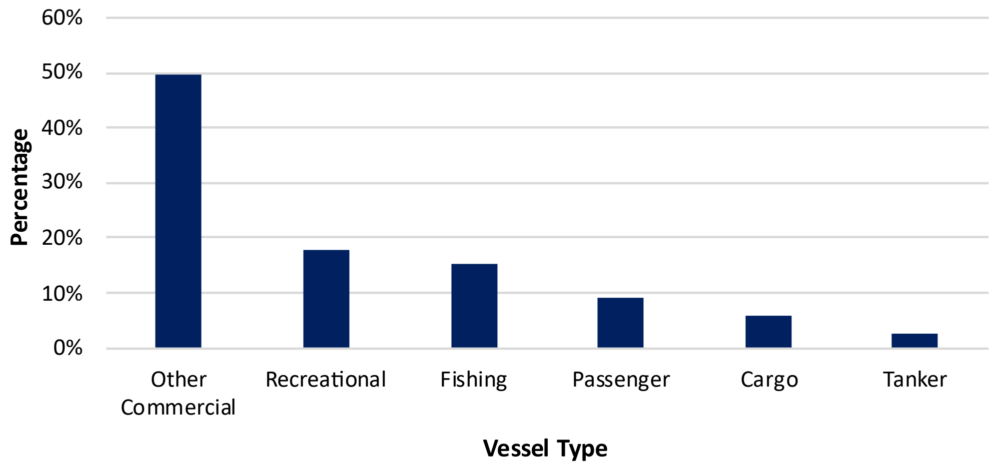

Figure C.12 MAIB Allision Incidents by Vessel Type within UK Waters (2002 –2021)

892. The most frequent vessel types involved in allision incidents were other commercial vessels (50%), recreational vessels (18%) and fishing vessels (15%).

893. No fatalities were reported in MAIB allision incidents within offshore UK waters between 2002 and 2021.

C.4 Fatality Risk

C.4.1 Incident Data

894. This section uses the MAIB incident data along with information on average manning levels per vessel type to estimate the probability of a fatality in a maritime incident associated with the Project.

895. The Project is assessed to have the potential to affect the following incidents:

- Vessel to vessel collision;
- Powered vessel to structure allision;
- Drifting vessel to structure allision; and
- Fishing vessel to structure allision.

896. Of these incident types, only vessel to vessel collisions match the MAIB definition of collisions and hence the fatality analysis presented in **Section C.4.2** is considered directly applicable to these types of incidents.

897. The other scenarios of powered vessel to structure allision, drifting vessel to structure allision and fishing vessel to structure allision are technically contacts since they would involve a vessel striking an immobile object in the form of a WTG, offshore substation, or

RCP. Additionally, none of the allision incidents reported by the MAIB between 2002 and 2021 resulted in a fatality.

898. As the mechanics involved in a vessel contacting a wind turbine may differ in severity from hitting, for example, a buoy, quayside, or moored vessel, the MAIB collision fatality risk rate has also been conservatively applied for the allision incident types.

C.4.2 Fatality Probability

899. Five of the 504 collision incidents reported by the MAIB within UK waters between 2002 and 2021 resulted in one or more fatalities. This gives a 0.99% probability that a collision incident will lead to a fatal accident.

900. To assess the fatality risk for personnel onboard a vessel (crew, passenger or other) the number of persons involved in the incidents needs to be estimated. **Table C.3** presents the average number of person on board (POB) estimated for each category of vessel navigating in proximity to the Project. For passenger vessels this is based upon information available for the specific vessels recorded in the long-term data analysis. For other vessel categories, this is based upon information available from the MAIB incident data.

Table C.3 Estimated Average POB by Vessel Category

Vessel Category	Sub Categories	Source of Estimated Average POB	Estimated Average POB
Cargo / freight	Dry cargo, other commercial, service ship, etc.	MAIB incident data	15
Tanker	Tanker / combination carrier	MAIB incident data	23
Passenger	Ro-Ro passenger, cruise liner, etc.	Vessel traffic survey data / online information	2,182
Fishing	Trawler, potter, dredger, etc.	MAIB incident data	3.3

901. It is recognised that these average POB numbers can be substantially higher or lower on an individual vessel basis depending upon the size, subtype, etc. but applying reasonable averages is considered sufficient for this analysis.

902. Using the average POB, along with the vessel type information involved in collision incidents reported by the MAIB there was an estimated 132,194 POB the vessels involved in the collision incidents.

903. Based upon five fatalities during the period 2002–2021, the overall fatality probability in a collision for any individual onboard is approximately 3.78×10^{-5} per collision.

904. It is considered inappropriate to apply this rate uniformly as the statistics indicate that the fatality probability associated with smaller craft, such as fishing vessels and recreational vessels, is higher. Therefore, the fatality probability has been subdivided into three categories of vessel as presented in **Table C.4**.

905. In addition, due to zero fatalities resulting from commercial vessel collisions between 2002 and 2021, the time period used to assess the fatality probability for commercial vessels has been extended by five years to ensure a meaningful probability is captured.

Table C.4 Collision Incident Fatality Probability by Vessel Category

Vessel Category	Sub Categories	Fatalities	People Involved	Fatality Probability	Time Period
Commercial	Dry cargo, passenger, tanker, etc.	1	40,646	2.46×10^{-5}	1997–2021 (25 years)
Fishing	Trawler, potter, dredger, etc.	2	927	2.2×10^{-3}	2002 –2021 (20 years)
Recreational	Yacht, small commercial motor yacht, etc.	3	1,023	2.9×10^{-3}	2002 –2021 (20 years)

C.4.3 Fatality Risk Due to the Project

906. The base case and future case annual collision frequency levels pre and post wind farm for the OAA are summarised in **Table 16.1**, where change refers to the increase in collision and allision frequency due to the presence of the Project; estimated at overall 5.02×10^{-1}, equating to an additional collision or allision every 2.0 years for the base case.

907. The base case and future case annual collision and allision frequency levels pre and post wind farm for the RCP are summarised in **Table 16.3**, with increase in collision and allision frequency due to the presence of the Project; estimated at overall 1.63×10^{-2}, equating to an additional collision or allision every 62 years for the base case.

908. From the detailed results of the collision and allision risk modelling, the distribution of the predicted change in annual collision and allision frequency by vessel type due to the OAA for the base case and future cases are presented in **Figure C.13**. This figure for the RCP search area is presented in **Figure C.14**.

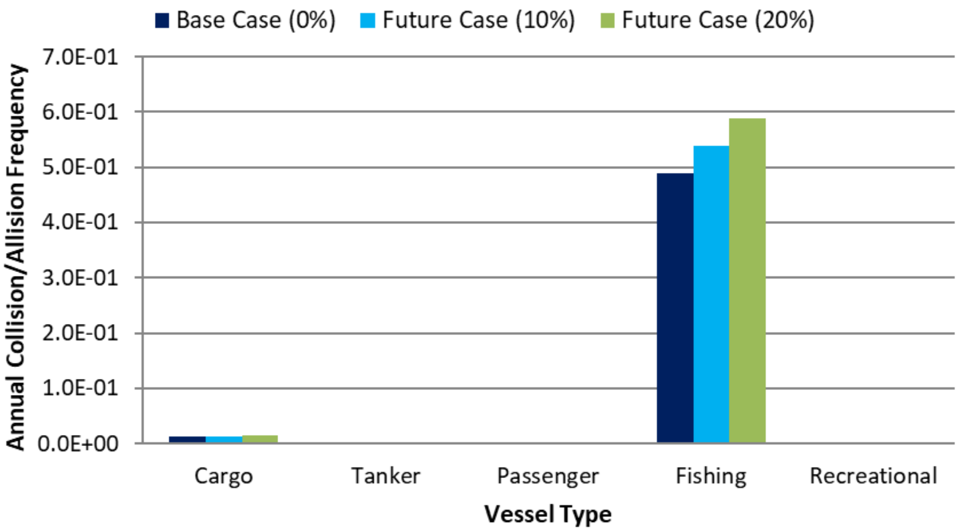

Figure C.13 Estimated Change in Annual Collision and Allision Frequency by Vessel Type (OAA)

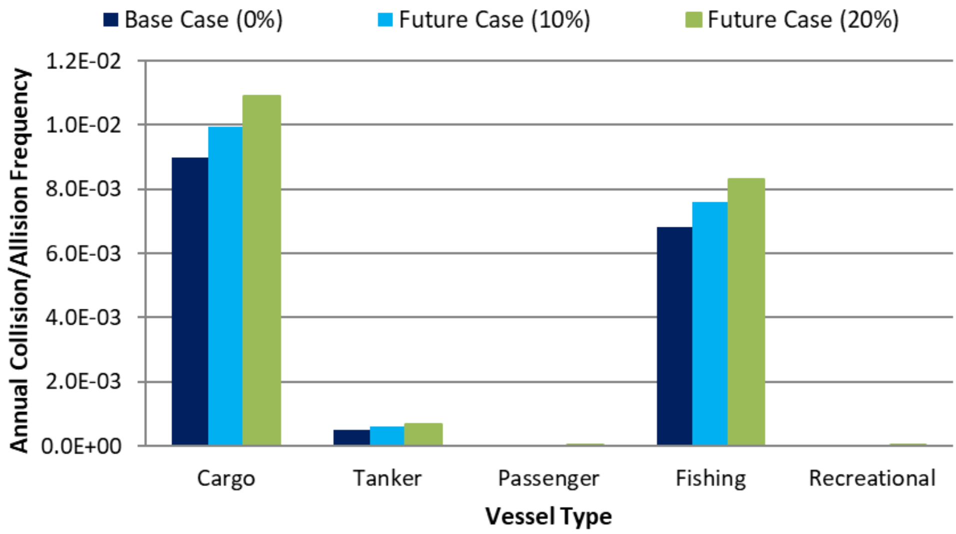

Figure C.14 Estimated Change in Annual Collision and Allision Frequency by Vessel Type (RCP Search Area)

909. It can be seen that for the OAA the majority of change in collision and allision frequency is associated with fishing vessels, due to the level of internal fishing activity and the conservative nature of Anatec's COLLRISK model for fishing vessel allisions. For the RCP, the greatest proportion of collision and allision risk frequency is associated with cargo vessel, owing to the greater volume of commercial traffic in closer proximity to the RCP search area.

910. Combining the annual collision and allision frequency, estimated number of POB for each vessel type, and estimated fatality probability for each vessel category, the total

annual increase in PLL due to the presence of the OAA for the base case is estimated to be 3.30×10^{-3}, equating to one additional fatality every 303 years.

911. Combining the annual collision and allision frequency, estimated number of POB for each vessel type, and estimated fatality probability for each vessel category, the total annual increase in PLL due to the presence of the RCP search area for the base case is estimated to be 5.13×10^{-5}, equating to one additional fatality every 19,512 years.

912. The estimated incremental increases in PLL due to the OAA, distributed by vessel type for the base and future cases, are presented in **Figure C.15**. These values for the RCP search area are presented in **Figure C.16**.

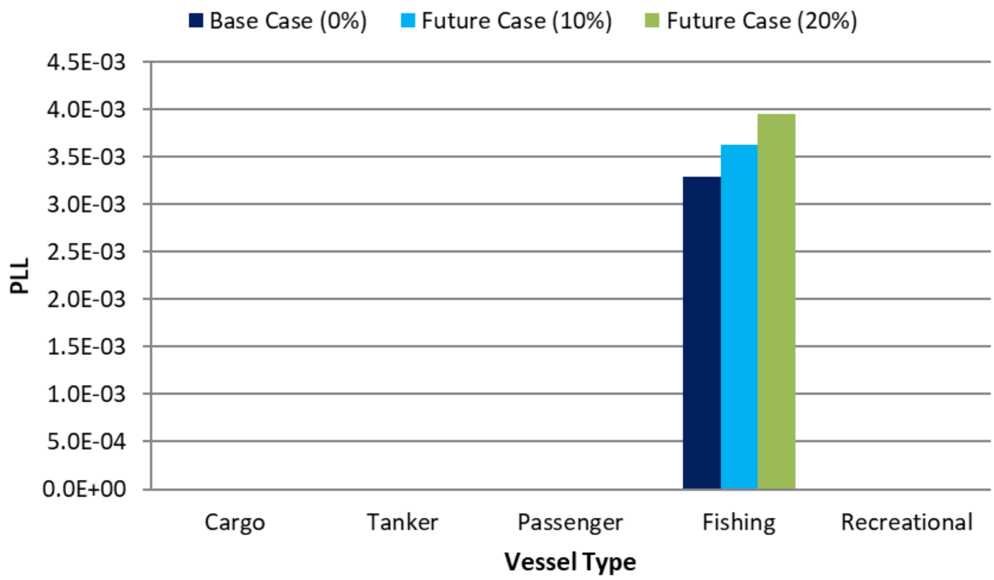

Figure C.15 Estimated Change in Annual PLL by Vessel Type (OAA)

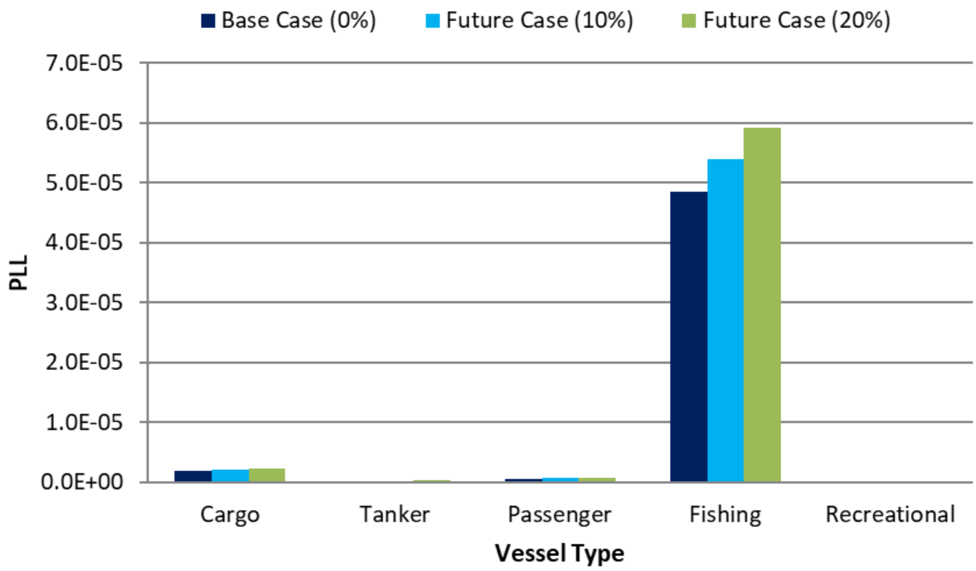

Figure C.16 Estimated Change in Annual PLL by Vessel Type (RCP Search Area)

913. It can be seen that the majority of the change in annual PLL is associated with fishing vessels for both the OAA and for the RCP search area.

914. Converting the PLL to individual risk based upon the average number of people exposed by vessel type, the results for the OAA are presented in **Figure C.17**, and for the RCP search area are presented in **Figure C.18**.

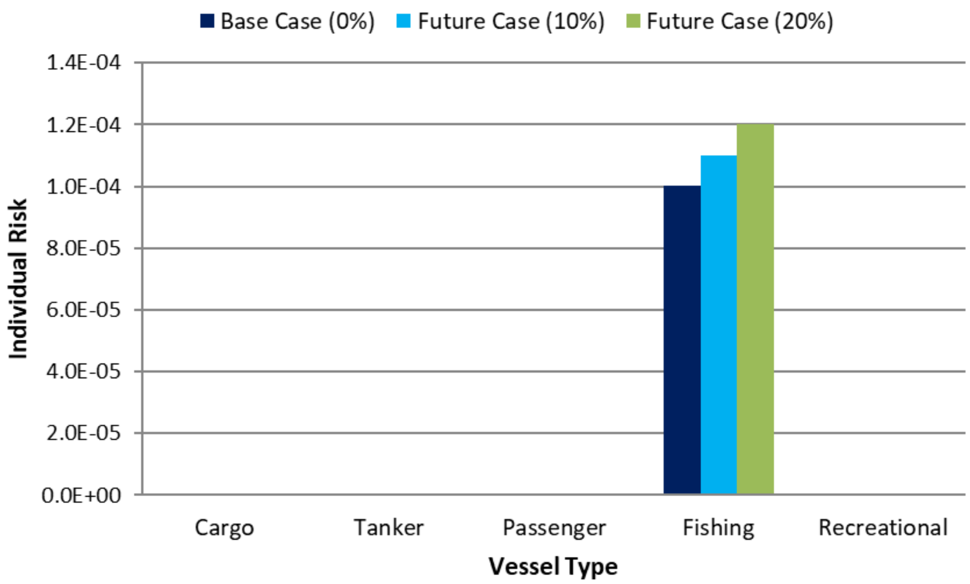

Figure C.17 Estimated Change in Individual Risk by Vessel Type (OAA)

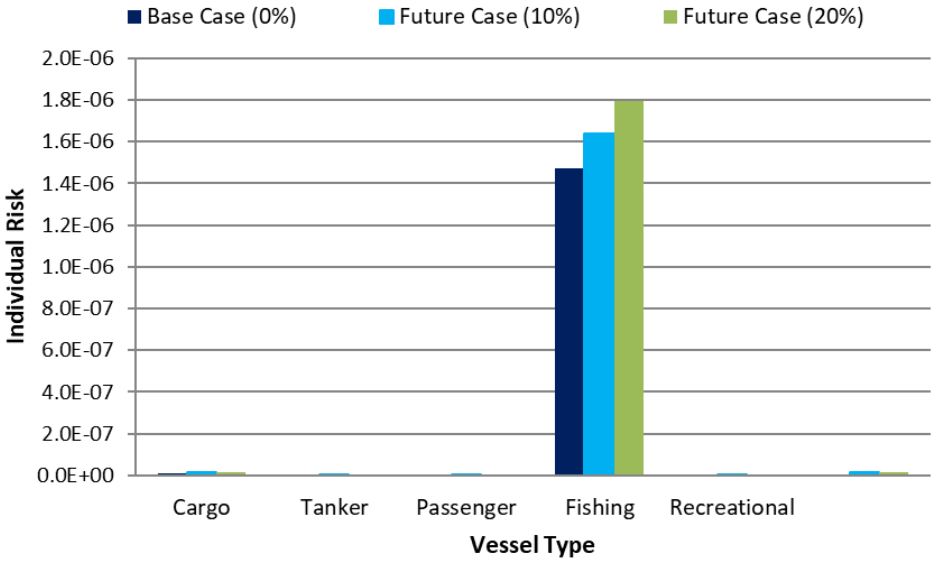

Figure C.18 Estimated Change in Individual Risk by Vessel Type (RCP Search Area)

915. It can be seen that the individual risk is highest for people on fishing vessels in both the OAA and RCP search area, which reflects the higher probability of a fatality occurring in the event of an incident involving a fishing vessel.

C.4.4 Significance of Increase in Fatality Risk

916. In comparison to MAIB statistics, which indicate an average of 18–19 fatalities per year in UK territorial waters during the 20-year period between 2002 and 2021, the overall increase for the base case in PLL of one additional fatality per 303 years for the OAA, and one additional fatality per 19,512 years for the RCP search area, representing a small change.

917. In terms of individual risk to people, the change for commercial vessels attributed to the Project (approximately 1.4×10^{-8} for the OAA for the base case and 1.3×10^{-8} for the RCP search area) is significantly lower compared to the background risk level for the UK sea transport industry of 2.9×10^{-4} per year.

918. For fishing vessels, the change in individual risk attributed to the Project (approximately 1.00×10^{-4} for the OAA for the base case and 1.5×10^{-6} for the RCP search area is lower compared to the background risk level for the UK sea fishing industry of 1.2×10^{-3} per year.

C.5 Pollution Risk

C.5.1 Historical Analysis

919. The pollution consequences of a collision in terms of oil spill depend upon the following criteria:

- Spill probability (i.e., the likelihood of outflow following an incident); and

- Spill size (quantity of oil).

920. Two types of oil spill are considered in this assessment:

- Fuel oil spills from bunkers (all vessel types); and
- Cargo oil spills (laden tankers).

921. The research undertaken as part of the DfT's Marine Environmental High Risk Areas (MEHRAs) Project (DfT, 2001) has been used it was comprehensive and based upon worldwide marine oil spill data analysis. From this research, the overall probability of a spill per incident was calculated based upon historical incident data for each incident type as presented in **Figure C.19**.

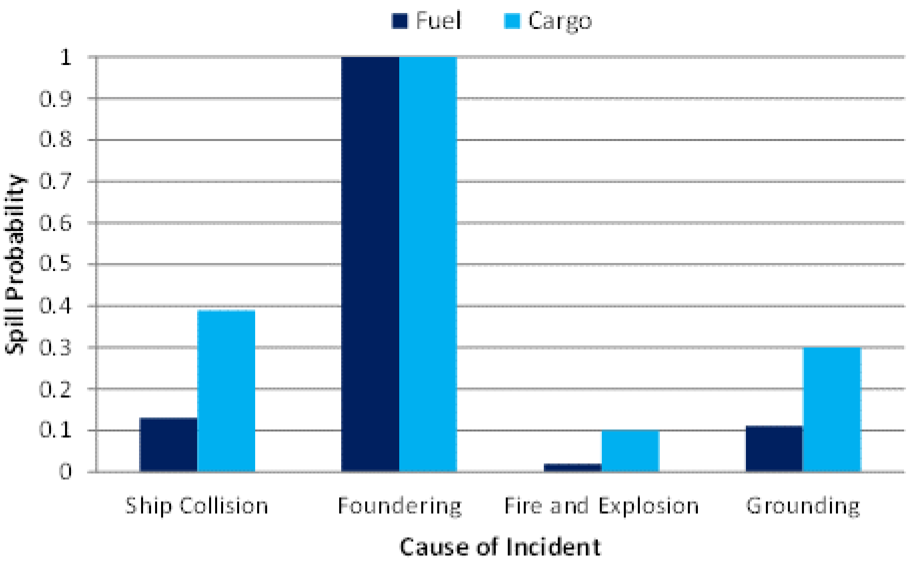

Figure C.19 Probability of an Oil Spill Resulting from an Accident

922. Therefore, it was estimated that 13% of vessel collisions result in a fuel oil spill and 39% of collisions involving a laden tanker result in a cargo oil spill.

923. In the event of a bunker spill, the potential outflow of oil depends upon the bunker capacity of the vessel. Historical bunker spills from vessels have generally been limited to a size below 50% of bunker capacity, and in most incidents much lower.

924. For the types and sizes of vessels exposed to the Project, an average spill size of 100 tonnes of fuel oil is considered a conservative assumption.

925. For cargo spills from laden tankers, the spill size can vary significantly. The ITOPF reported the following spill size distribution for tanker collisions between 1974 and 2004:

- 31% of spills below seven tonnes;
- 52% of spills between seven and 700 tonnes; and
- 17% of spills greater than 700 tonnes.

926. Based upon this data and the tankers transiting in proximity to the Project, an average spill size of 400 tonnes is considered a conservative assumption.

927. For fishing vessel collisions, comprehensive statistical data is not available. Consequently, it is conservatively assumed that 50% of all collisions involving fishing vessels will lead to oil spill with the quantity spilled being on average five tonnes. Similarly for recreational vessels, due to a lack of data 50% of collisions are conservatively assumed to lead to a spill with an average size of one tonne.

C.5.2 Pollution Risk due to the Project

928. Applying the above probabilities to the annual collision and allision frequency by vessel type and the average spill size per vessel, the amount of oil spilled per year due to the impact of the OAA is estimated to be 1.52 tonnes for the base case. For the future case scenarios, this estimate increases to 1.67 tonnes and 1.82 tonnes for traffic increases of 10% and 20%, respectively. The amount of oil spilled per year due to the impact of the RCP search area is estimated to be 0.21 tonnes for the base case. For the future case scenarios, this estimate increases to 0.24 tonnes and 0.27 tonnes for traffic increases of 10% and 20%, respectively.

929. The estimated increase in tonnes of oil spilled, distributed by vessel type, for the base case and future case for the OAA are presented in **Figure C.20**. These values for the RCP search area are presented in **Figure C.21**.

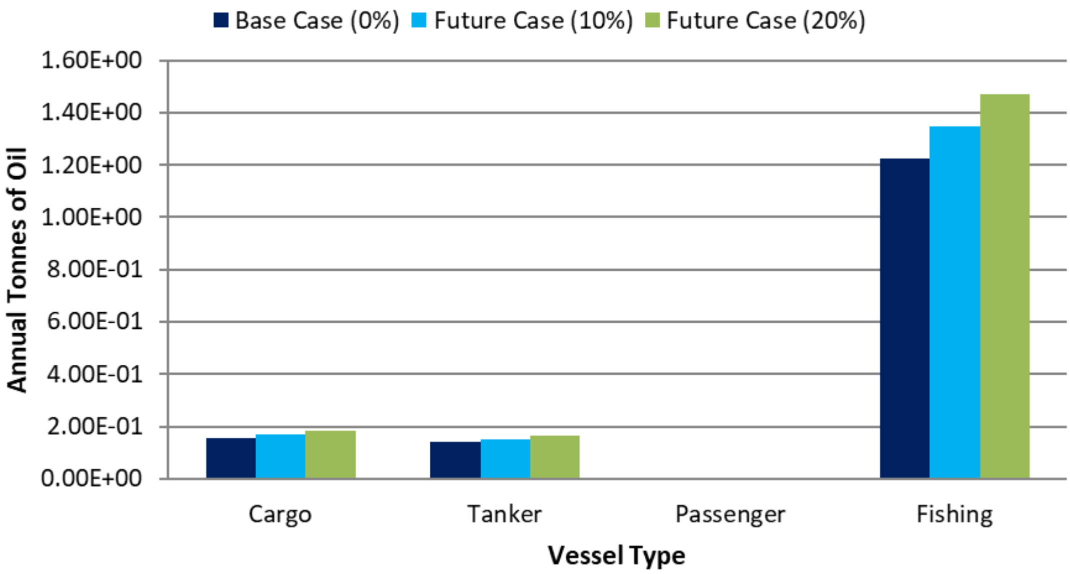

Figure C.20 Estimated Change in Pollution by Vessel Type (OAA)

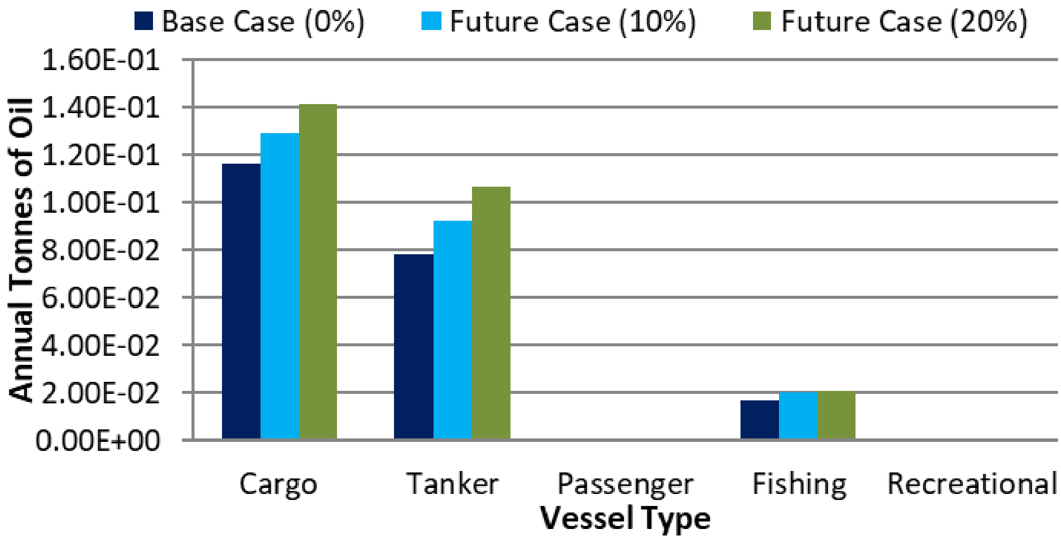

Figure C.21 Estimated Change in Pollution by Vessel Type (RCP Search Area)

930. The annual oil spill results are dominated by fishing vessels for the OAA due to their high associated annual collision and allision frequency. For the RCP search area, the greatest contributor was cargo vessels with tankers following, due to the high annual allision frequency as well as reflecting the greater oil spill volume per incident associated with tankers.

C.5.3 Significant of Increase in Pollution Risk

931. To assess the significance of the increased pollution risk from vessels caused by the Project, historical oil spill data for the UK has been used as a benchmark.

932. From the MEHRAs research, the annual average tonnes of oil spilled in UK waters due to maritime incidents in the 10-year period from 1989–1998 was 16,111. This is based upon a total of 146 reported oil pollution incidents of greater than one tonne (smaller spills are excluded as are incidents which occurred within port or harbour areas or resulting from operational errors or equipment failure). Commercial vessel spills accounted for approximately 99% of the total while fishing vessel incidents accounted for less than 1%.

933. The overall increase in pollution estimated due to the OAA of 1.52 tonnes per year for the base case represents a 0.009% increase compared to the historical average pollution quantities from maritime incidents in UK waters. The overall increase in pollution estimated due to the RCP search area of 0.21 tonnes per year for the base case represents a 0.001% increase compared to the historical average pollution quantities from maritime incidents in UK waters

C.6 Conclusion

934. This appendix has quantitively assessed the fatality and pollution risk associated with the Project in the event of a collision or allision incident occurring. The assessment indicates that the fatality and pollution risk associated with fishing vessels is greatest for the OAA, with commercial vessels such as cargo and tankers for the RCP search area.

935. Overall, the impact of the Project on people and the environment is relatively low compared to the existing background risk levels in UK waters. However, this is the localised impact of a single offshore wind farm development and there will be additional maritime risks associated with other offshore wind farm developments in the North Sea and the UK as a whole.

936. Discussion of relevant mitigation measures and monitoring is provided in **Section 17** of the NRA.

Appendix D Regular Operator Consultation

937. As part of the consultation process for the Project, Regular Operators identified (from the vessel traffic survey data) in proximity to the OAA, and the RCP were consulted via email. An example of the correspondence sent to the Regular Operators is presented below.

MarramWind
A joint venture between ScottishPower and Shell UK

MarramWind Ltd
Registered office
50 Lothian Road, Festival Square,
Edinburgh, Scotland, EH3 9WJ
Internet: https://www.marramwind.co.uk
13 June 2025

Dear Stakeholder,

Reference: **Stakeholder Consultation on Impacts Relating to Shipping and Navigation for the Proposed MarramWind Offshore Wind Farm**

MarramWind Ltd (the 'Applicant'), a joint venture between ScottishPower and Shell UK, is the developer of the proposed MarramWind Offshore Wind Farm (the 'Project'), which is to be located in the North Sea approximately 40 nautical miles (nm) off the northeast coast of Scotland and will comprise of up to 225 floating turbines and four fixed substations located within the Project Array Area and up to two fixed Reactive Compensation Platforms (RCPs) located within the RCP Corridor, itself located wholly within the Offshore Cable Corridor. Further information relating to the Project is available here, and an overview of the Project is provided in Figure 1.

Following a Scoping Report for the Project submitted to Marine Scotland in January 2023 (see here), the Applicant is proceeding to create the Navigational Risk Assessment (NRA) which will inform the shipping and navigation assessment undertaken for the application.

As part of the NRA process, we wish to ensure that comprehensive consultation is undertaken and identify any potential impacts that the Project may have upon shipping and navigation. To analyse shipping movements within and in the vicinity of the Project Array Area, Automatic Identification System (AIS) data, Radio Detection and Ranging (Radar) data and visual observations obtained from traffic surveys undertaken during 2024 have been collected and assessed and will feed into the NRA as required by the Maritime and Coastguard Agency (MCA). In addition to this dedicated vessel traffic survey data, a review of 12-months AIS data from the entirety of 2024 has been analysed in proximity to the Project Array Area and the RCP Corridor.

According to the assessment of the available datasets, your company has been identified as a regular operator navigating in the vicinity of the Project Array Area and/or the RCP Corridor. Consequently, your company has been identified as a potential marine stakeholder for the Project. We therefore invite your feedback on the Project including any impact it may have upon the navigation of your vessels.

It is acknowledged that MarramWind is one of various offshore wind farm developments being developed as part of the ScotWind leasing round. A cumulative overview of other offshore wind farm developments is presented in Figure 2, including developments which are at different stages of operation, construction, and planning (across the Forth Zone, ScotWind, and Innovation and Targeted Oil & Gas (INTOG)).

MarramWind
A joint venture between ScottishPower and Shell UK

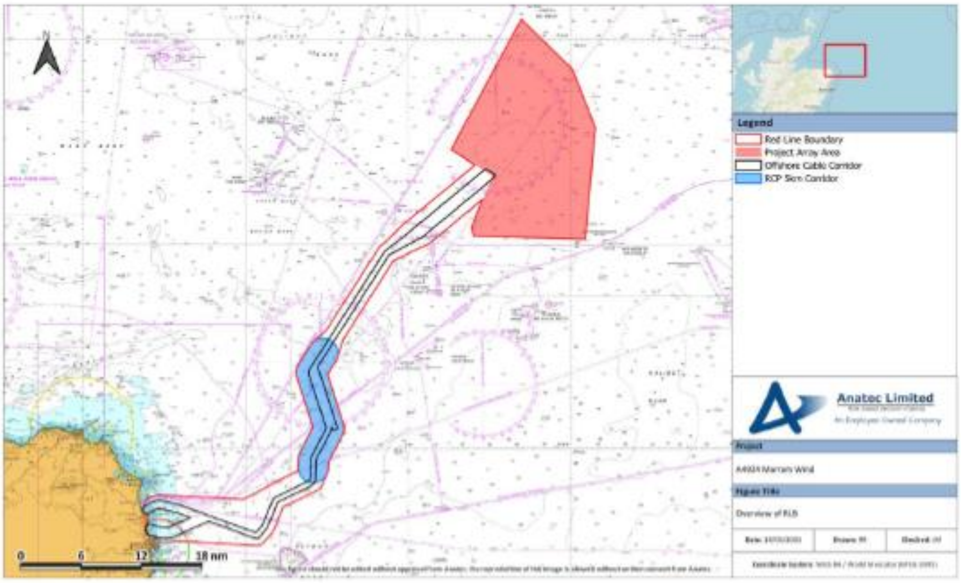

FIGURE 1 OVERVIEW OF PROJECT

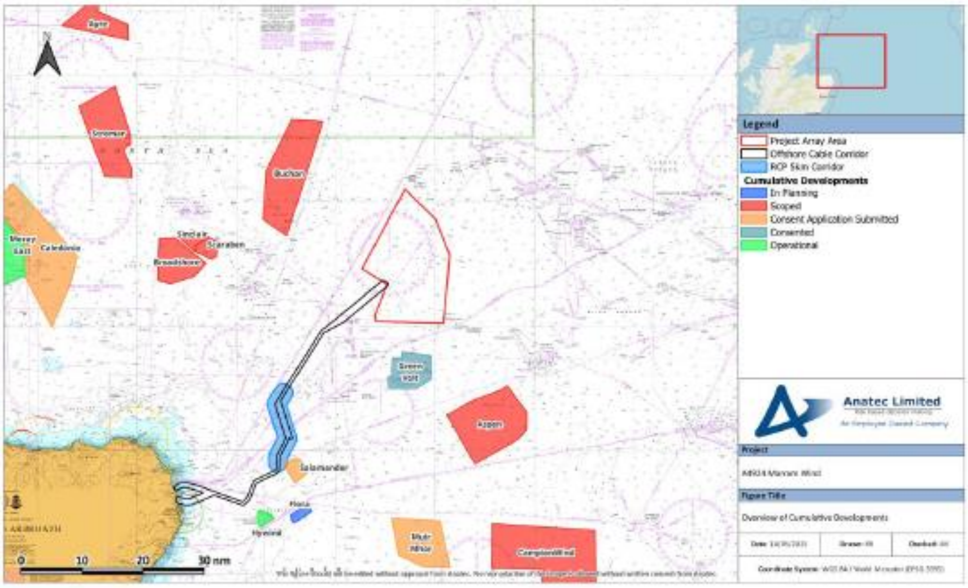

FIGURE 2 CUMULATIVE OVERVIEW

MarramWind Limited: 50 Lothian Road, Edinburgh
Registered in Scotland: SC719634

2

MarramWind
A joint venture between ScottishPower and Shell UK

We would be grateful if you could provide us with any comments or feedback that you may have by **Friday 4th July**. This will allow us to assess your feedback as part of the NRA which is currently being undertaken. We would also be grateful if you could forward a copy of this information to any other vessel operators/owners you feel may be interested in commenting.

In particular, we are keen to receive comments related to the following:

1. Whether the proposal to construct the Project (inclusive of the Project Array Area, Offshore Cable Corridor, and RCP) is likely to impact the routeing of any specific vessels, including the nature of any change in regular passage;
2. Whether any aspect of the Project poses any safety concerns to your vessels, including any adverse weather routeing;
3. Whether you would choose to make passage internally through the array of floating structures;
4. Whether you would view floating turbines any differently from fixed turbines from a passing vessel perspective;
5. Whether you wish to be retained on our list of marine stakeholders and consulted throughout the NRA process; and
6. Whether you wish to attend a Hazard Workshop in Edinburgh at The Edinburgh Training and Conference Venue (or remotely via Microsoft Teams) on **Thursday 3rd July** where impacts related to shipping and navigation will be discussed. If so, an invite can be sent out to your organisation.

Responses should be sent via email to [redacted] Should you have any queries about the published information or require any further information to support your review, please do not hesitate to contact us.

Your sincerely,

[redacted]

[redacted]
Development Manager

Appendix E Long-Term Vessel Traffic Movements

938. This appendix assesses additional long-term vessel traffic data for the Project. As required under MGN 654 (MCA, 2021), the NRA considers 28 days of AIS, Radar and visual observation data as the primary vessel traffic data source. However, it should be considered that studying a 28-day period in isolation may exclude certain activities or periods of pertinence to shipping and navigation. Therefore, in line with good practice assessment procedures, this NRA has also considered a longer term dataset covering all of 2022 to ensure a comprehensive characterisation of vessel traffic movements can be established, including the capture of any seasonal variation.

939. The key aims of this appendix are to identify seasonal variations and any other movements or activities not represented by the vessel traffic survey data.

E.1 Methodology

E.1.1 Study Area

940. This appendix has assessed the long-term vessel traffic data within the same 10nm buffer study area surrounding the OAA as introduced in **Section 3.4**.

E.1.2 Data Period and Temporary Vessel Traffic

941. The long-term dataset was collected from terrestrial, offshore, and satellite receivers between 1 January and 31 December 2024 (the ‘data period’). Overall, there was good coverage of the study area during the data period.

942. As per the vessel traffic surveys, a number of vessel tracks recorded during the data period were classified as temporary (non-routine) and have been excluded from the characterisation of the vessel traffic baseline. This includes temporary jack-up vessels supporting oil and gas platforms or engaged in decommissioning work; noted at the Ettrick and Golden Eagle fields to the south of the Project. Vessels also engaged in survey or research activities were removed, inclusive of the dedicated survey vessel which undertook the two seasonal vessel traffic surveys for the Project in 2024 as well other vessels undertaking geophysical and geotechnical survey work for the consented Green Volt Offshore Wind Farm to the south of the Project. Several guard vessels were also removed which were undertaking guard duties at the Golden Eagle field as well as for the Shetland HVDC Link which was under construction at the time of data collection.

943. It is also noted that the Golden Eagle platform was broadcasting on AIS but as it is stationary and permanent it has been removed from the analysis and not included in the temporary traffic analysis.

944. Overall, valid temporary traffic equated to approximately 10% of all vessel traffic recorded across the data period.

E.1.3 Automatic Identification System Carriage

945. General limitations associated with the use of AIS data (for example, carriage requirements) are discussed in full within **Section 5.4.1**.

E.2 Long-Term Vessel Traffic Movements

946. A plot of the vessel tracks recorded within the study area during the data period, colour-coded by vessel type and excluding temporary traffic, is presented in **Figure E.1**. Following this, the same data is illustrated in a density heat map in **Figure E.2.**

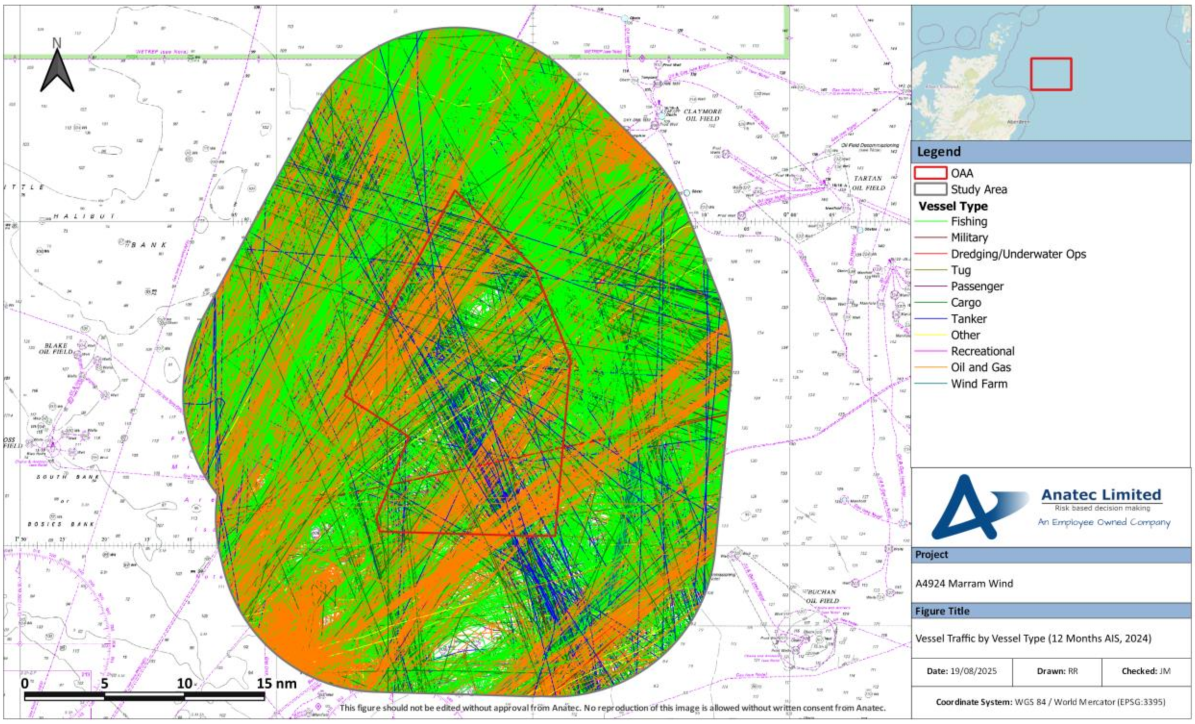

Figure E.1 Vessel Traffic by Vessel Type (12 Months AIS, 2024)

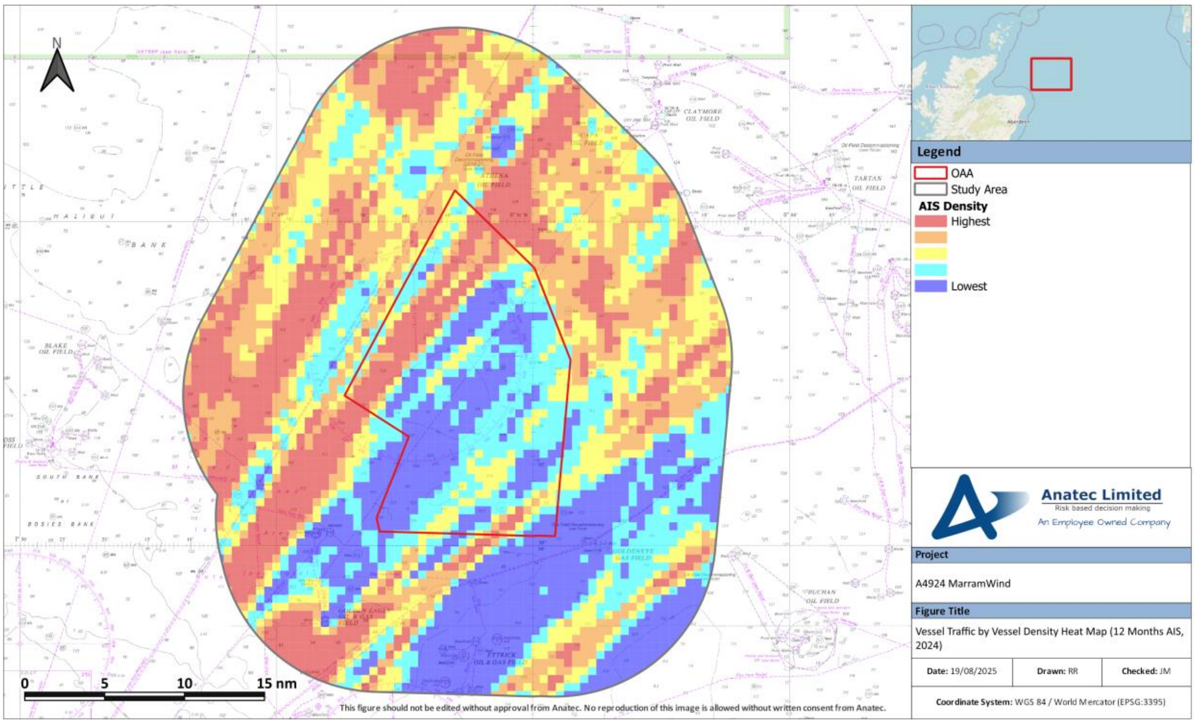

Figure E.2 Vessel Traffic by Density Heat Map (12 Months AIS, 2024)

E.2.2 Vessel Counts

947. The average number of unique vessels recorded per day for each month of the data period within the study area, and intersecting the OAA, is presented in **Figure E.3**.

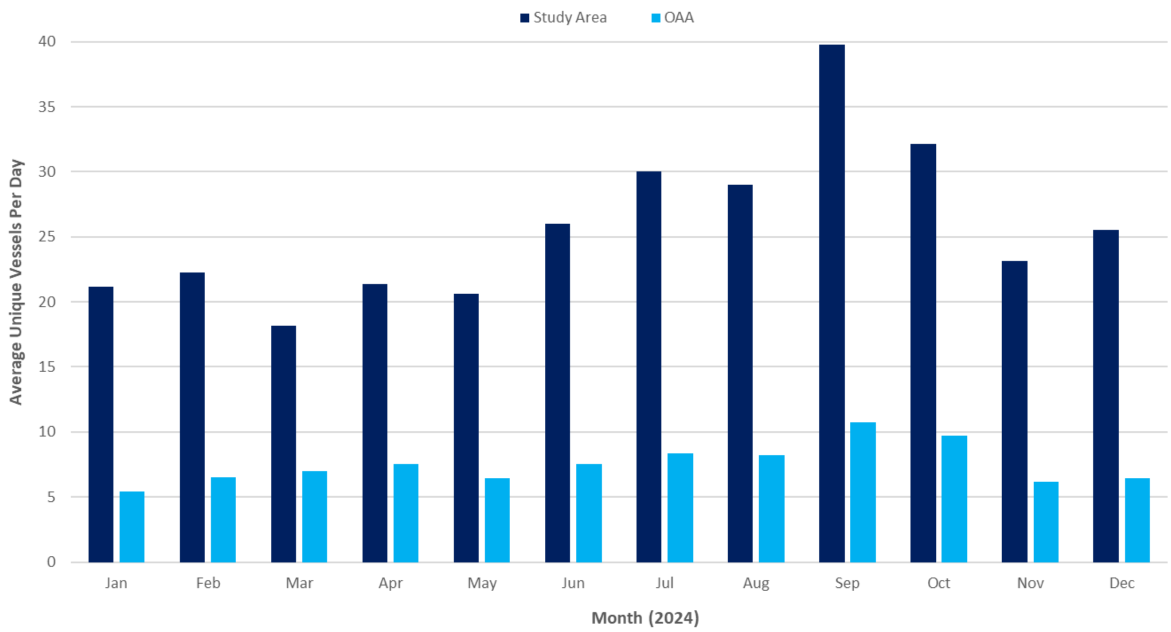

Figure E.3 Average Unique Vessel Counts per Day per Month (2024)

948. There was an overall average of 26 unique vessels per day recorded within the study area across the data period. The busiest month was September 2024, due to a peak in fishing vessels, during which an average of 40 unique vessels per day were recorded within the study area. The quietest month was March 2024 which recorded an average of 18 unique vessels per day within the study area.

949. There was an overall average of seven–eight unique vessels per day recorded intersecting the OAA across the data period. The busiest month was again September 2024 during which an average of 11 unique vessels per day were recorded within the OAA. The quietest month was January 2024 which recorded an average of five–six unique vessels per day.

E.2.3 Vessel Type

950. The distribution of the main vessel types recorded during the long-term vessel traffic dataset are presented in **Figure E.4** for vessels within the study area and in **Figure E.5** for vessels intersecting the OAA.

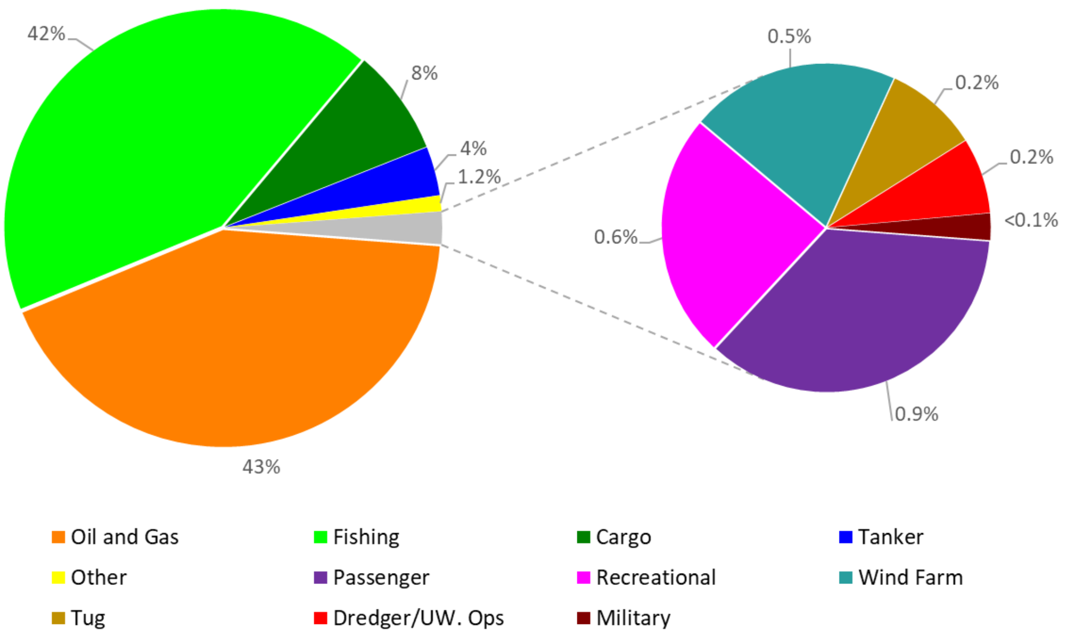

Figure E.4 Vessel Type Distribution within the Study Area (2024)

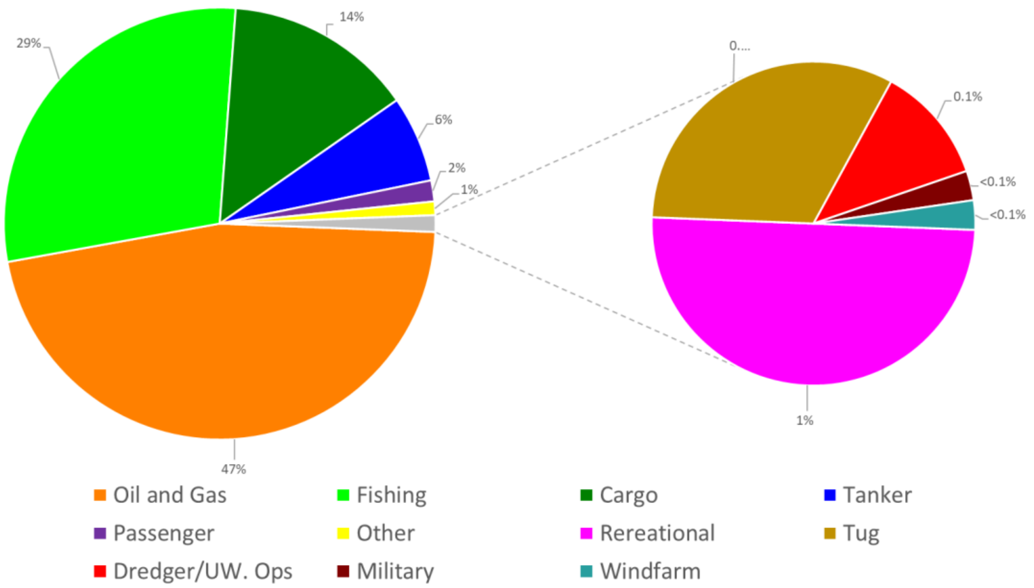

Figure E.5 Vessel Type Distribution within the OAA (2024)

951. The most common vessel types recorded within the study area during the data period were oil and gas vessels (43%) and fishing vessels (42%). The only other vessel type which accounted for more than 5% of all vessels recorded was cargo vessels (8%).

952. As for vessels intersecting the OAA, oil and gas vessels accounted for the majority of vessel types within the OAA, at 47%. These were followed by fishing vessels (29%), cargo vessels (14%), and tankers (6%).

953. These trends correlate with the vessel traffic survey data analysed in **Section 10.1.2**.

E.2.3.2 Oil and Gas Vessels

954. **Figure E.6** presents the oil and gas vessels recorded within the study area during the data period. Following this, **Figure E.7** illustrates the unique average counts per day per month for oil and gas vessels.

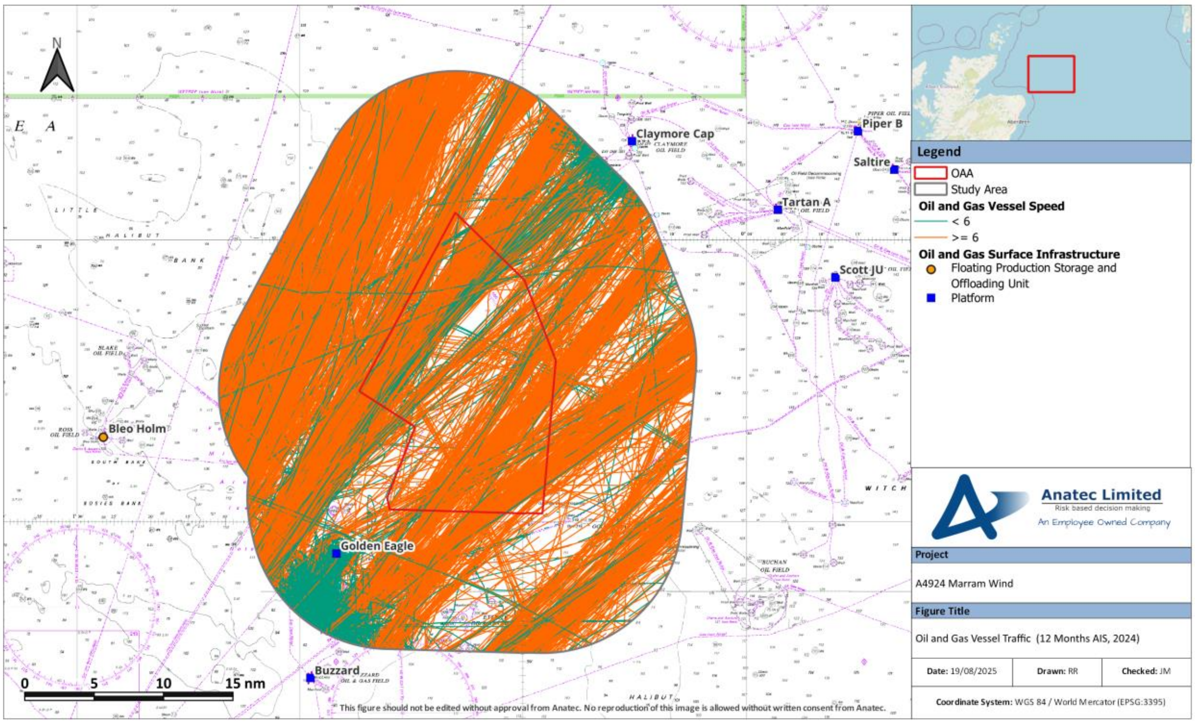

Figure E.6 Oil and Gas Vessel Traffic Data (12 Months AIS, 2024)

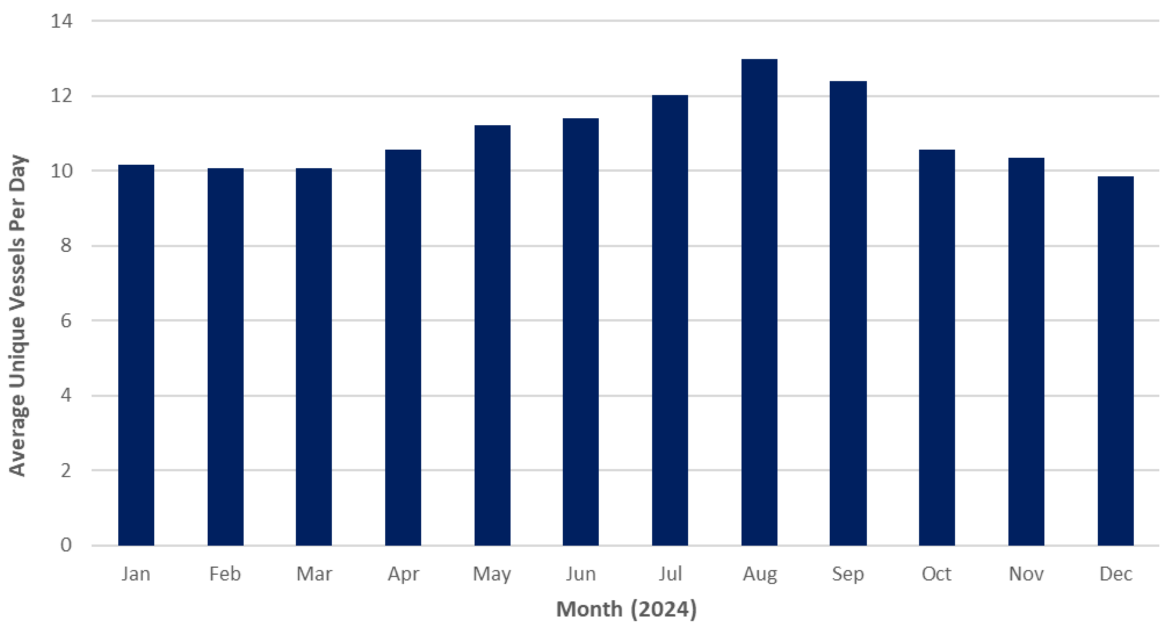

Figure E.7 Unique Oil and Gas Vessel Counts per Day per Month (2024)

955. Overall, there was an average of 11 unique oil and gas vessels per day recorded within the study area across the data period. The busiest month was August 2024, during which an average of 13 unique oil and gas vessels per day were recorded within the study area. Oil and gas vessels displayed minor seasonality with average vessels per day slightly rising

in the Summer months and a decrease recorded in December, where an average of seven unique vessels were recorded per day.

956. Oil and gas activity at fields in the study area, denoted by vessel speed and other information broadcast via AIS, was recorded at the south-western extent of the study area at the Golden Eagle and Buzzard fields as well at the north-eastern extent at the Claymore oil field. None of this activity intersected the OAA.

E.2.3.3 Fishing Vessels

957. **Figure E.8** presents the fishing vessels recorded within the study area during the data period, colour-coded by average vessel speed. Following this, **Figure E.9** illustrates the unique average counts per day per month for fishing vessels.

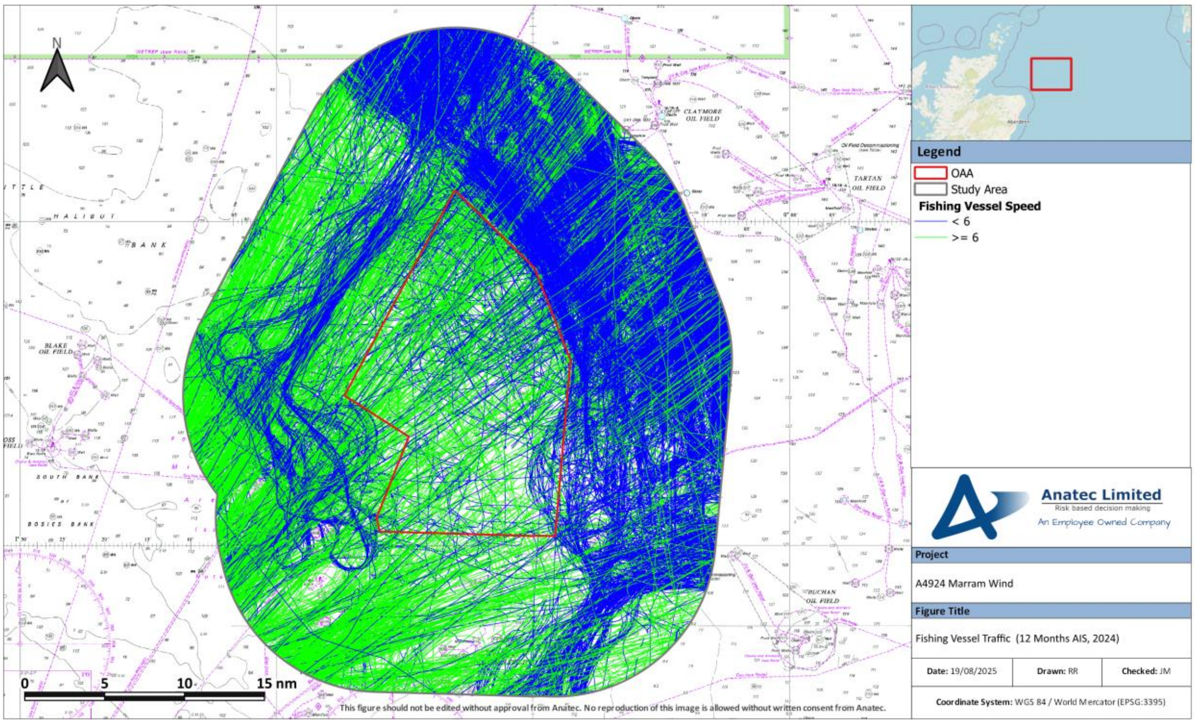

Figure E.8 Fishing Vessel Traffic Data (12 Months, 2024)

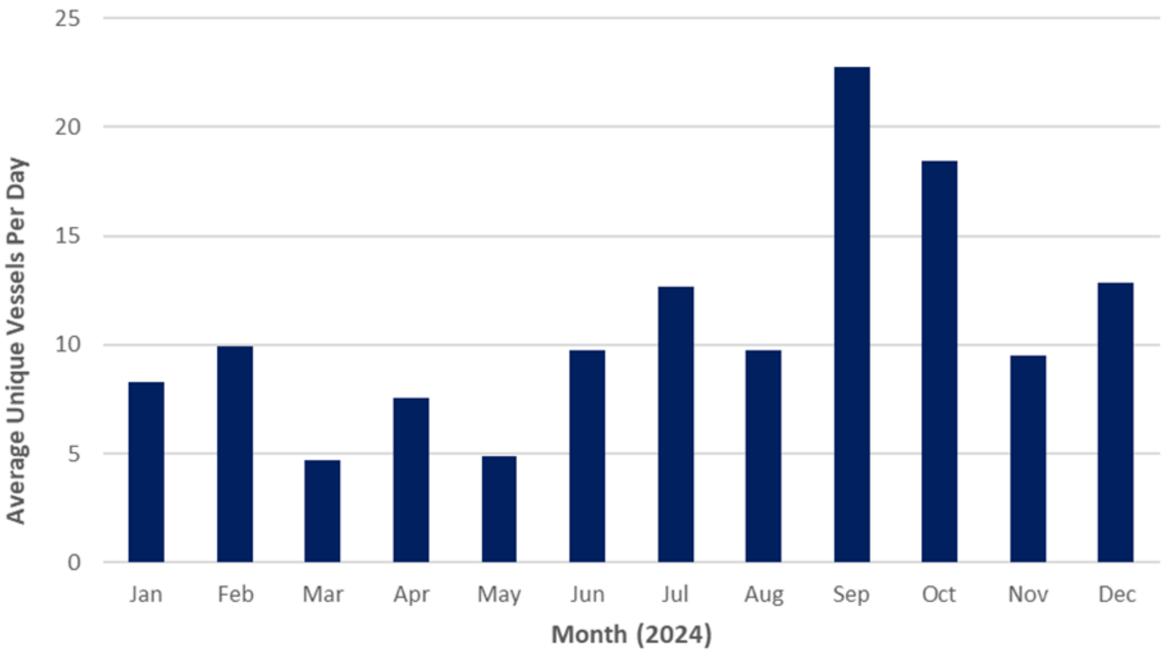

Figure E.9 Unique Fishing Vessel Counts per Day per Month (2024)

958. Overall, there was an average of 11 unique fishing vessels per day recorded within the study area across the data period. The busiest month was September 2024, during which an average of 22 unique fishing vessels per day were recorded within the study area. Fishing vessels displayed seasonality with average vessels per day dropping in spring and summer months to an average of four–five unique vessels per day in March, while increasing in autumn and winter

959. Fishing vessels operating below 6kt were observed throughout the study area, with particular prevalence to the east of the Project array area, with these vessels noted to operate out of Fraserburgh and Peterhead. Based on analysis of vessel track speed and behaviour, as well as information broadcast on AIS such as navigational status, it is estimated that fishing vessels engaged in active fishing behaviour commonly operated below 6kt. The highest density areas for fishing vessels are within the east and north-east of the study area, as well as activity to the south-west of the OAA. These high-density areas were seen to align with areas of vessels operating at lower speeds, and thus likely engaged in active fishing behaviour. However, instances of likely fishing activity were also recorded at average speeds of above 6kt throughout the study area and within the OAA.

960. The high prominence of fishing vessels during September 2024 may be partly due to the seasonal activity of pelagic fisheries, particularly herring, which correlates with fish stock landings in the North Sea for this month (Marine Management Organisation (MMO), 2024). This aligns with the fishing vessel activity recorded by the vessel traffic surveys (**Section 10.1.2.2**).

E.2.3.4 Commercial Vessels

961. **Figure E.10** presents the commercial vessels recorded within the study area during the data period, colour-coded by vessel type. Following this, **Figure E.11** illustrates the unique average counts per day per month for commercial vessels.

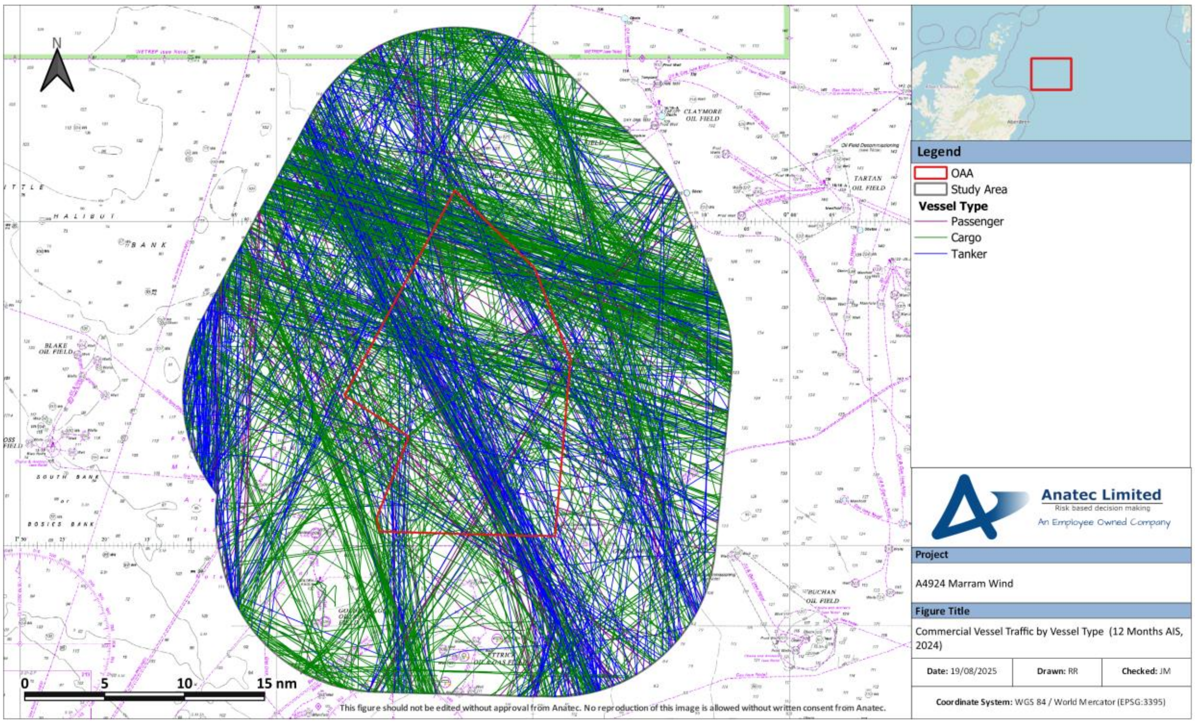

Figure E.10 Commercial Vessel Traffic by Vessel Type (12 Months AIS, 2024)

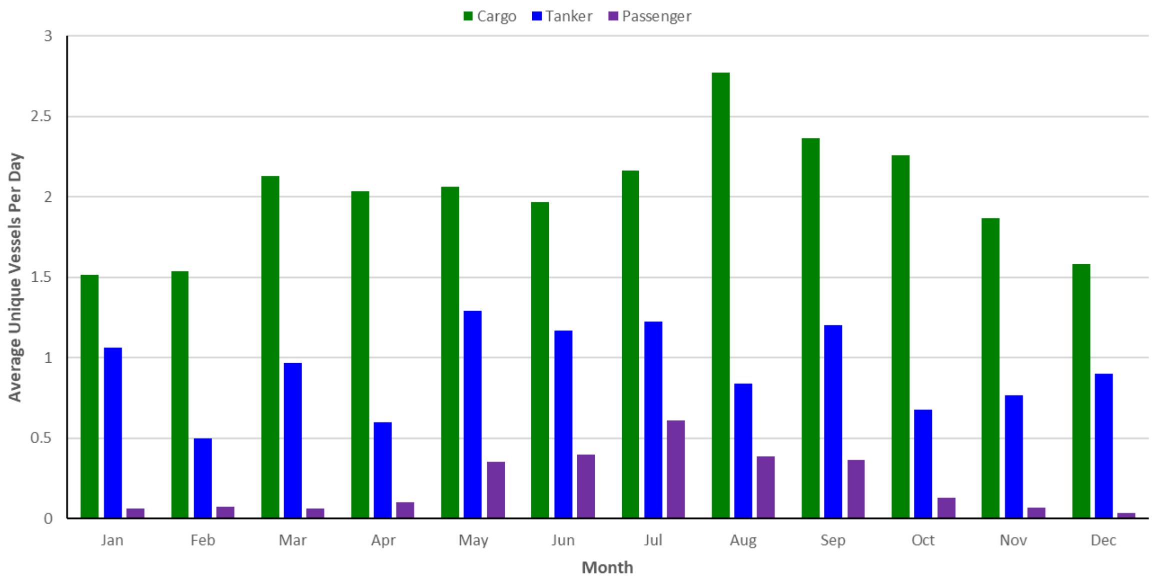

Figure E.11 Unique Commercial Counts per Day per Month by Vessel Type (2024)

Cargo Vessels

962. There was an average of two unique cargo vessels recorded per day within the study area across the data period. The busiest month was August 2024 when an average of two–three unique vessels per day were recorded. Cargo vessels displayed minor seasonality with average vessels per day dropping in January and February, with one–two cargo vessels being recorded per day, but overall variations were not significant.

963. Cargo vessel sub types recorded were part containerised (34%), general cargo (32%), and bulk carriers (17%). RoRo represented 2% of cargo vessels.

Tankers

964. There was an average of one unique tanker recorded per day within the study area across the data period. The busiest month was May 2024 when an average of one–two vessels per day were recorded. Tankers displayed minimal seasonality with average vessels per day dropping in February, with one tanker recorded every two days, but the overall variation in vessels numbers was not significant, partly due to the relatively low volume of tankers recorded overall.

965. Tanker sub-types recorded were crude oil tankers (43%), combined chemical/ oil tankers (15%), product tankers (11%), chemical tankers (11%), Liquid Petroleum Gas (LPG) tankers (9%).

Passenger Vessels

966. There was an average of one unique passenger vessel recorded every four–five days within the study area across the data period. The busiest month was July 2024 when an average of one vessel every two days was recorded. Passenger vessels displayed high seasonality (May to October); this broadly aligns with cruise timetables as well as favourable sailing conditions.

967. Passenger vessel sub-types recorded were cruise liners (78%), RoPax vessels (10%), and sail training vessels (9%).

Serco NorthLink Ferries

968. Serco NorthLink Ferries accounted for 56% of all Ro-Ro and 28% of Ro-Pax vessels recorded as discussed in **Section 12.2.1** are on adverse weather transits. These transits are illustrated in **Figure E.12** by vessel name.

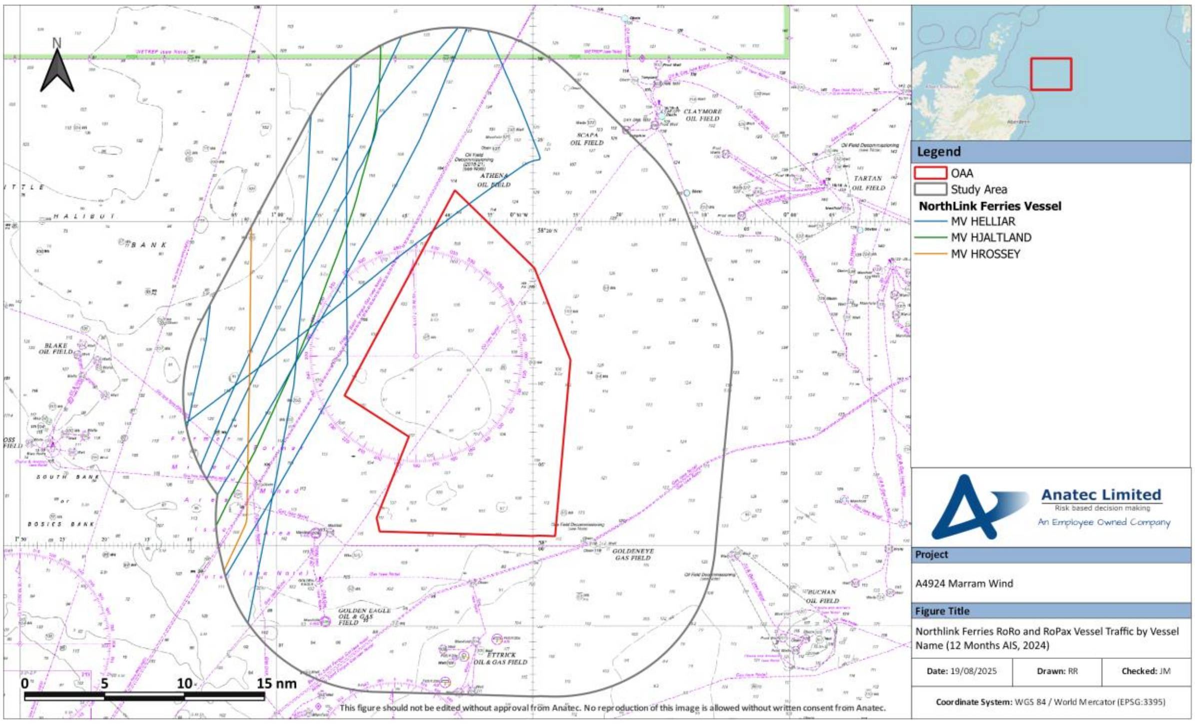

Figure E.12 Serco NorthLink Ferries RoRo and RoPax Vessel Traffic by Vessel Name (12 Months, 2024)

E.2.3.5 Recreational Vessels

969. **Figure E.13** presents the recreational vessels recorded within the study area during the data period. Following this, **Figure E.14** illustrates the unique average counts per day per month for recreational vessels.

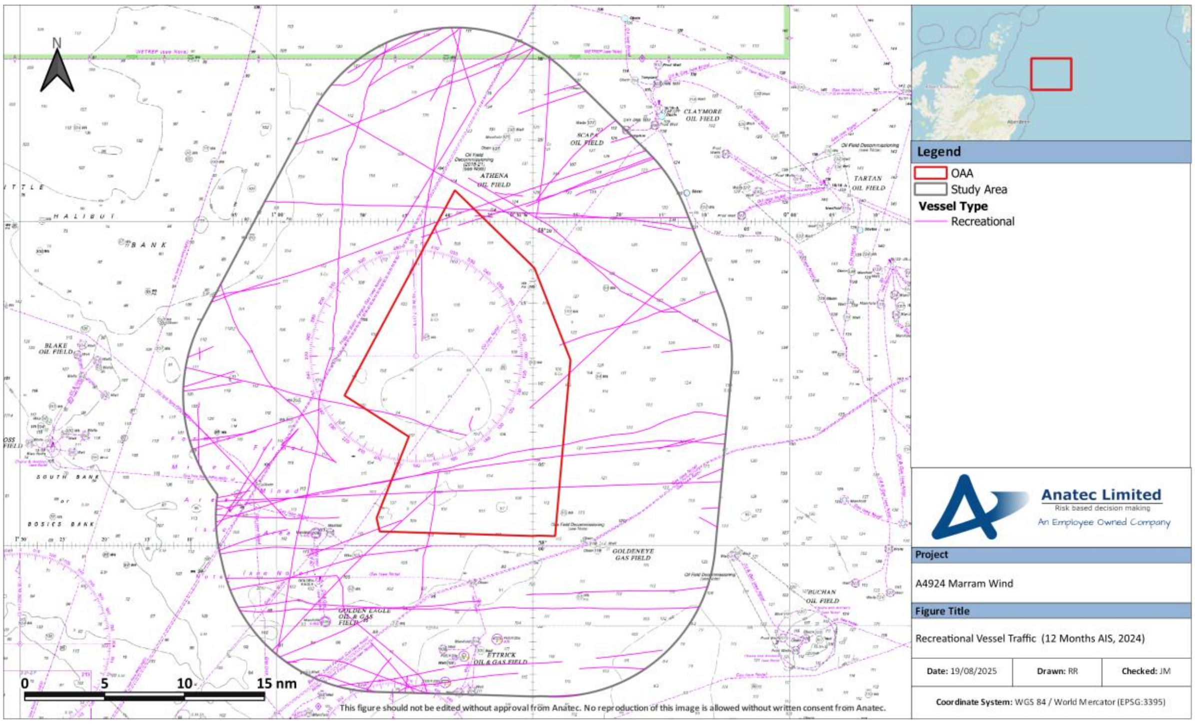

Figure E.13 Recreational Vessel Traffic (12 Months AIS, 2024)

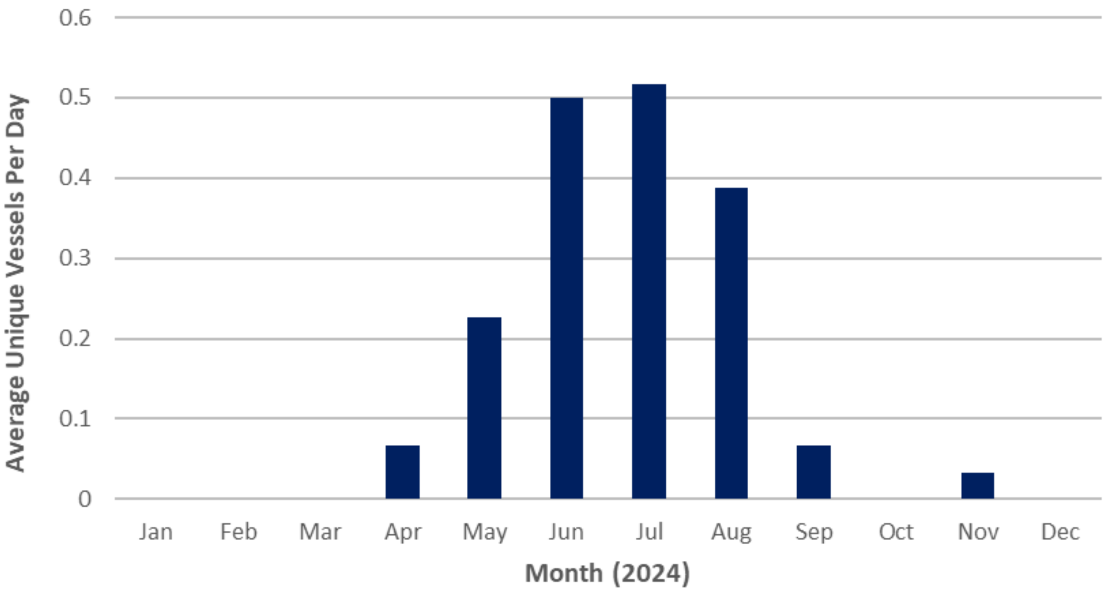

Figure E.14 Unique Recreational Vessel Counts per Day per Month (2024)

970. There was an overall average of one unique recreational vessel recorded every week across the data period. However, recreational vessels were only recorded between April and September with an additional one vessel recorded in November. When only the Summer season is considered (April to September), this increases to approximately one unique recreational vessels every three days.

971. Recreational vessels are highly seasonal, with Summer months offering more favourable sailing conditions. The busiest month for recreational vessels was July 2024, during which one unique recreational vessel was recorded every second day.

972. The majority of recreational vessels were observed on various east west courses, generally although no clear preferred routeing of recreational vessels was observed. This volume of recreational vessels is low and is expected given the distance offshore. Those vessels recorded are likely on transcontinental transits given their direction of travel.

973. Recreational vessels were sporadically recorded within the OAA during the Summer months only.

E.3 Vessel Traffic Survey Data Comparison

974. Table E.1 compares traffic volumes by vessel type between the long-term vessel traffic data and vessel traffic survey data recorded within the study area.

Table E.1 Comparison of Vessel Type Counts Between Long-Term Vessel Traffic Data and Vessel Traffic Survey Data

Vessel Type	Long-Term Vessel Traffic Data (2024)			Summer Survey (2024)	Winter Survey (2024)
	Busiest Month	Quietest Month	Average Vessels per Day	Average Vessels per Day	Average Vessels per Day
Oil and Gas	August	December	11	12	11 to 12
Fishing	September	March	11	10	9 to 10
Cargo	August	January	2	2	1 to 2
Tanker	May	February	1	1	0 to 1
Passenger	July	December	0 to 1	0 to 1	0
Recreational	July	January, February, March, October, December	0 to 1	0 to 1	0

975. In the case of all vessel types, average vessel numbers were correlated across the survey periods as well as the long-term vessel traffic data. The vessel which displayed seasonality with transits mainly recorded over the summer months; recreational and passenger vessels, were recorded in low numbers overall, which is expected given the distance offshore. This was reflected by average numbers across the long-term data period.

976. Overall, there is good agreement and understanding between the counts for the long-term vessel traffic data and the vessel traffic surveys.

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