Salamander Offshore Wind Farm

Offshore EIA Report

Volume ER.A.4, Annex 14.1: Navigational Risk Assessment

SALAMANDER

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Salamander Offshore Wind Farm Navigational Risk Assessment

Prepared by	Anatec Limited
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00	27th October 2023	Initial Draft
01	5th January 2024	Initial comments
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03	1st March 2024	Additional close out comments
04	10th April 2024	Final version

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Abbreviations Table

Abbreviation	Definition
AC	Alternating Current
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ALB	All-Weather Lifeboats
ARPA	Automatic Radar Plotting Aid
AW189	AgustaWestland 189
BBC	British Broadcasting Corporation
BWEA	British Wind Energy Association
CBA	Cost Benefit Analysis
CD	Chart Datum
CHIRP	Confidential Human Factors Incident Reporting Programme
COLREGs	Convention on International Regulations for Preventing Collisions at Sea
CoS	Chamber of Shipping
CTV	Crew Transfer Vessel
DF	Direction Finding
DfT	Department for Transport
DSC	Digital Selective Calling
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Field
ERCoP	Emergency Response and Cooperation Plan
ESRI	Environmental Systems Research Institute
ETRS89	European Terrestrial Reference System 1989
EU	European Union
FLiDAR	Floating Light Detection and Ranging
FRB	Fast Rescue Boat
FSA	Formal Safety Assessment

Abbreviation	Definition
GIS	Geographical Information System
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
GRP	Glass Reinforced Plastic
GT	Gross Tonnage
HMCG	Her Majesty's Coastguard
HSEQ	Health, Safety and Environment Quality
HVAC	High Voltage Alternating Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ILB	Inshore Lifeboats
IMCA	Aviation and Maritime, International Marine Contractors Association
IMO	International Maritime Organization
JIP	Joint Industry Partner
JRCC	Joint Rescue Coordination Centre
kHz	Kilohertz
Km	Kilometre
LOA	Length Overall
m	Metre
MAIB	Maritime Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MEHRA	Marine Environmental High Risk Area
MEPC	Marine Environment Protection Committee
MGN	Marine Guidance Note
MRCC	Maritime Rescue Coordination Centres
MSI	Maritime Safety Information
NAVTEX	Navigational Telex
NLB	Northern Lighthouse Board
nm	nautical miles
nm^2	Square nautical mile

Abbreviation	Definition
NRA	Navigational Risk Assessment
OAA	Offshore Array Area
OREI	Offshore Renewable Energy Installation
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PLA	Port of London Authority
PLL	Potential Loss of Life
POB	People on Board
Radar	Radio Detection and Ranging
REZ	Renewable Energy Zone
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
SFF	Scottish Fishermen's Federation
SMS	Safety Management System
SONAR	Sound Navigation Ranging
SOV	Service Operation Vessel
SPFA	Scottish Pelagic Fishermen's Association
SWFPA	Scottish White Fish Producers Association
SWPC	Salamander Wind Project Company Limited
TCE	The Crown Estate
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
US	United States
UTM	Universal Transverse Mercator
VHF	Very High Frequency
VMS	Vessel Monitoring System
VTS	Vessel Traffic Service
WGS84	World Geodetic System 1984

Abbreviation	Definition
WTG	Wind Turbine Generator

1 Introduction

1.1 Background

1. Anatec was commissioned by Salamander Wind Project Company Limited (SWPC), a joint venture between Ørsted, Simply Blue Group and Subsea7 (hereafter referred to as the 'Applicant'), to undertake a Navigational Risk Assessment (NRA) for the proposed Salamander Offshore Wind Farm (hereafter the 'Salamander Project'). This NRA assesses the offshore component of the Salamander Project only (hereafter the 'Offshore Development') and is comprised of the Offshore Array Area (OAA) and Offshore Export Cable Corridor (ECC). This NRA presents information on the Offshore Development relative to the existing and estimated future navigational activity and forms the technical annex to **Volume ER.A.3, Chapter 14: Shipping and Navigation** of the Offshore Environmental Impact Assessment Report (EIAR).

1.2 Navigational Risk Assessment

2. An Environmental Impact Assessment (EIA) is a process which identifies the environmental effects of a proposed development, both negative and positive. An important requirement of the EIA for offshore projects is the NRA. Following the requirements of the Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 (MCA, 2021) and its annexes, this NRA includes:

- Outline of methodology applied in the NRA;
- Summary of consultation undertaken with shipping and navigation stakeholders to date;
- Lessons learnt from previous offshore wind farm developments;
- Summary of the project description relevant to shipping and navigation;
- Baseline characterisation of the existing environment;
- Discussion of potential impacts on navigation, communication and position fixing equipment;
- Cumulative and transboundary overview;
- Future case vessel traffic characterisation;
- Collision and allision risk modelling;
- Assessment of navigational risk (following the Formal Safety Assessment (FSA) process);
- Outline of embedded mitigation measures; and
- Completion of MGN 654 Checklist.

3. Potential hazards are considered for each phase of development as follows:

- Construction;
- Operation and maintenance; and
- Decommissioning.

4. 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 realistic worst-case scenario which has been defined for the NRA based on the Project Design Envelope.

2 Guidance and Legislation

2.1 Legislation

5. 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 EIAR is required to support the application for the Section 36 consent for the Salamander Project. The MCA require that, as part of the EIAR, an NRA is undertaken to "inform the shipping and navigation chapter of the EIA Report" (MCA, 2021).

2.2 Primary Guidance

6. 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* (MCA, 2021) *and its annexes*; and
- *Revised Guidelines for FSA for Use in the Rule-Making Process* (International Maritime Organization (IMO), 2018).

7. MGN 654 highlights issues that shall be considered when assessing the effect on navigational safety from offshore renewable energy developments, proposed in United Kingdom (UK) internal waters, UK territorial sea or the UK Exclusive Economic Zone (EEZ).

8. The MCA require that their methodology is used as a template for preparing NRAs. It 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 3.2**). Across **Volume ER.A.3, Chapter 14: Shipping and Navigation** and the NRA both base and future case levels of risk have been identified and what measures are required to ensure the future case remains broadly acceptable or tolerable with mitigation.

2.3 Other Guidance

9. Other guidance documents used during the assessment are as follows:

- *MGN 372 Amendment 1 (M+F) Guidance to mariners operating in 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, 2021);
- *IALA Guideline G1162 Guidance on the Marking of Offshore Man-Made Structures* (IALA, 2021);
- *The Royal Yachting Association's (RYA) Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy* (Royal Yachting Association (RYA), 2019); and

- *Regulatory Expectations on Moorings for Floating Wind and Marine Devices* – (MCA and Health and Safety Executive (HSE), 2017).

2.4 Lessons Learnt

10. There is considerable benefit for the Applicant in the sharing of lessons learnt within the offshore industry. The NRA, and in particular the risk assessment undertaken in **Volume ER.A.3, Chapter 14: Shipping and Navigation**, 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. Relevant documents and studies include but are not limited to the following:

- Sharing the Wind – Recreational Boating in the Offshore Wind Strategic Areas (RYA and Cruising Association, 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 Radar Imagery from Offshore Wind Farms (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 (REZ) (Anatec and The Crown Estate (TCE), 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

11. A shipping and navigation user can only be exposed to a risk caused by a hazard if there is a pathway through which a risk can be transmitted between the source activity and the user. In cases where a user is exposed to a risk, the overall significance of risk 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;
- Level of stakeholder concern including output of the Hazard Workshop;
- Time and/or distance of any deviation;
- Number of transits of specific vessels and/or vessel types; and
- Lessons learnt from existing offshore developments.

12. It is noted that, with regards to commercial fishing vessels, the methodology and assessment has been applied to hazards considering commercial fishing vessels in transit. A separate methodology and assessment have been applied in **Volume ER.A.3, Chapter 13: Commercial Fisheries** to consider hazards on commercial fishing vessels including safety risks which are directly related to commercial fishing activity (rather than commercial fishing vessels in transit) and risks of a commercial nature.

3.2 Formal Safety Assessment Process

13. The IMO FSA process (IMO, 2018) as approved by the IMO in 2018 under Maritime Safety Committee – Marine Environment Protection Committee (MEPC).2/circ. 12/Rev.2 will be applied to the risk assessment within this NRA as required under MGN 654 (MCA, 2021), and informs **Volume ER.A.3, Chapter 14: Shipping and Navigation**.

14. The FSA process is a structured and systematic methodology based upon risk analysis and Cost Benefit Analysis (CBA) (if applicable) to reduce impacts to As Low as Reasonably Practicable (ALARP). There are five basic steps within this process as illustrated by **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 assessment (investigation of the causes and initiating events and risks of the more important hazards identified in step 1);
- Step 3 – Risk control options (identification of measures to control and reduce the identified risks);
- 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 to 4).

Figure 3-1 Flow chart of the FSA methodology

3.2.1 Hazard Workshop Methodology

15. A key tool used in the NRA process is the Hazard Workshop which ensures that all hazards are identified and the corresponding risks qualified in discussion with relevant consultees. **Table 3.1** and **Table 3.2** define the severity of consequence and the frequency of occurrence rankings that have been used to assess risks within the Hazard Log, completed based on the outputs of the Hazard Workshop.

Table 3.1 Severity of Consequence Ranking Definitions

Rank	Description	Definition			
		People	Property	Environment	Business
1	Negligible	No perceptible impact	No perceptible impact	No perceptible impact	No perceptible impact
2	Minor	Slight injury(s)	Minor damage to property i.e., superficial damage	Tier 1 local assistance required	Minor reputational risks – limited to users
3	Moderate	Multiple minor or single serious injury	Damage not critical to operations	Tier 2 limited external assistance required	Local reputational risks

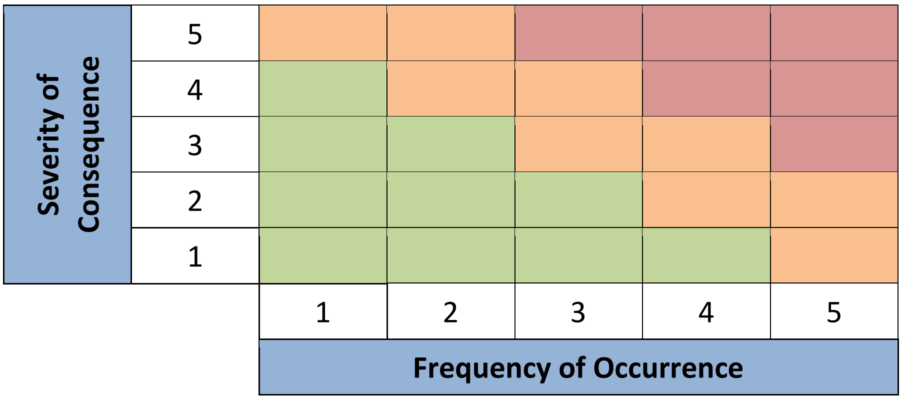
Rank	Description	Definition			
		People	Property	Environment	Business
4	Serious	Multiple serious injuries or single fatality	Damage resulting in critical impact on operations	Tier 2 regional assistance required	National reputational risks
5	Major	More than one fatality	Total loss of property	Tier 3 national assistance required	International reputational risks

Table 3.2 Frequency of Occurrence Ranking Definitions

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

16. The severity of consequence and frequency of occurrence are then used to define the significance of risk via a tolerability matrix approach as shown in **Table 3.3.** The significance of risk is defined as Broadly Acceptable (low risk), Tolerable (intermediate risk) or Unacceptable (high risk).

Table 3.3 Tolerability Matrix and Risk Rankings



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

17. Once identified, the significance of risk will be assessed to ensure it is ALARP. Further risk control measures may be required to further mitigate a hazard in accordance with the ALARP principles. Unacceptable risks are not considered to be ALARP and therefore require additional mitigation to reduce to at least tolerable limits.

3.3 Methodology for Cumulative Risk Assessment

18. The hazards identified in the FSA are also assessed for cumulative risks with the inclusion of other projects and proposed developments. Given the varying type, status and location of developments, a tiered approach to cumulative risk assessment has been undertaken, which splits developments into tiers depending upon project status, proximity to the Offshore Development and the level to which they are anticipated to cumulatively impact relevant users. It also considers data confidence, most notably in terms of the level of certainty over the location and timescales for a development.

19. The tiers are summarised in **Table 3.4** with the level of assessment undertaken for each tier included. It is noted that an aggregate of the criterion is used to determine the tier of each development. For example, if a development is located within 50 nautical miles (nm) of the Offshore Development and may impact a main commercial route within 1 nm of the OAA but the development is only scoped, it may still be allocated to Tier 1.

Table 3.4 Cumulative Tiering

Tier	Minimum Development Status	Criterion	Date Confidence	Level of Cumulative Assessment
1	Under construction, consented or under determination	▪ May impact a main commercial route passing within 1 nm of the OAA. ▪ Offshore wind farm within 50 nm. ▪ Subsea cable within 2 nm.	High or Medium	Quantitative cumulative re-routeing of main commercial routes
2	Scoped	▪ Offshore wind farm within 50 nm. ▪ Subsea cable within 2 nm.	High or Medium	Qualitative cumulative re-routeing of main commercial routes
3	Pre Scoping	▪ Offshore wind farm further than 50 nm. ▪ Subsea cable further than 2 nm.	Low	Screened Out

3.4 Study Area

20. A 10 nm buffer has been applied around the OAA as the study area for shipping and navigation (hereafter the 'EIA Study Area'). The radius of 10 nm is standard for shipping and navigation assessment and has been used in the majority of publicly available UK offshore wind farm NRAs and within the shipping and navigation assessment in the Scoping Report undertaken for the Salamander Project (Simply Blue Energy (Scotland) Ltd. (SBES), 2023). An additional buffer of 2 nm has also been applied around the Offshore ECC (the EIA Cable Corridor Study Area). These study areas are presented in **Figure 3-2**.

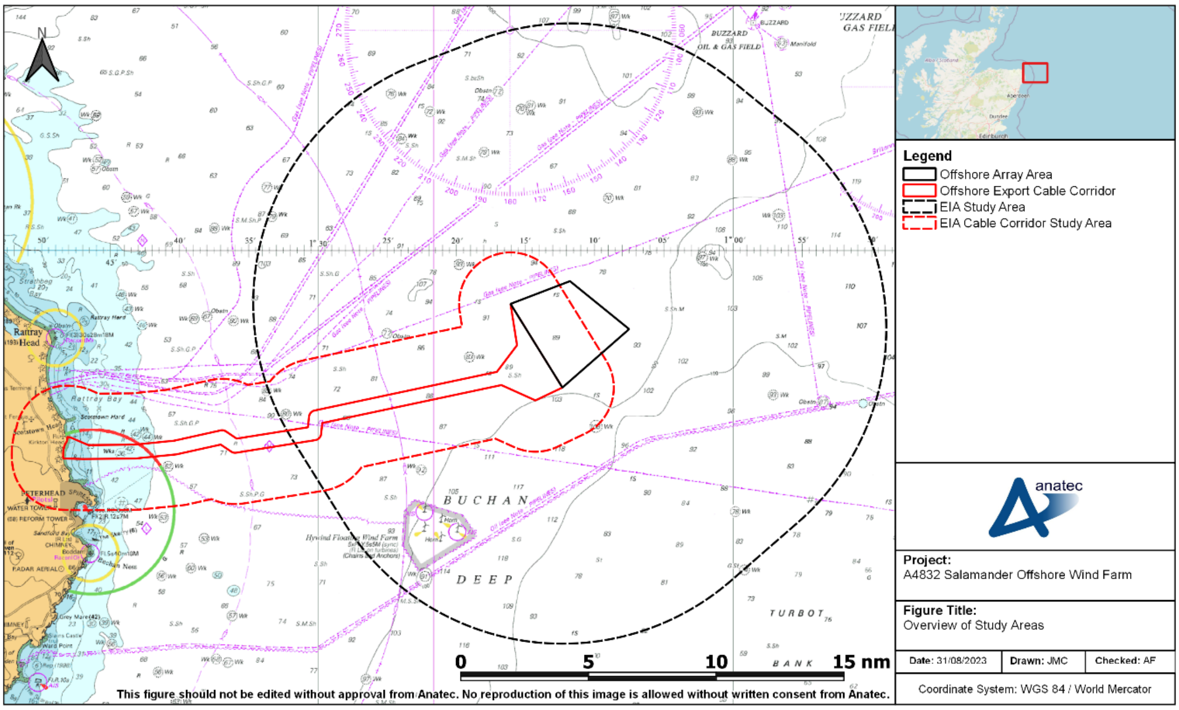


Figure 3-2 Overview of Study Areas

21. The study area has been defined in order to provide local context to the analysis of risks by capturing the relevant routes, vessel traffic movements and historical incident data within and in proximity to the Offshore Development. Navigational features wholly or partially outside the study areas are considered where appropriate, e.g., the Buzzard Oil Field.

4 Consultation

4.1 Stakeholders Consulted in the Navigational Risk Assessment Process

22. The NRA process has included consultation with key shipping and navigation stakeholders including the MCA, Northern Lighthouse Board (NLB), the Chamber of Shipping (CoS), the Royal Yachting Association (RYA) Scotland, and the Cruising Association.

23. As well as consulting with the organisations outlined above, regular operators identified from the vessel traffic surveys were provided with an overview of the Offshore Development and offered the opportunity to provide comment (the full Regular Operator letter is presented in **Appendix D**). The full list of Regular Operators identified is provided below:

- Aurora Offshore;
- Bourbon Offshore Norway;
- Fletcher Group;
- Havila Shipping;
- Hoyland Offshore;
- Island Offshore;
- North Star Shipping;
- Rem Offshore;
- Sentinel Marine;
- Simon Møkster Shipping;
- Solstad Farstad;
- The J. J. Ugland Companies;
- Tidewater; and
- Vroon Offshore.

24. North Star Shipping, Sentinel Marine and Tidewater provided feedback directly (see relevant entries in **Section 4.2**).

4.2 Consultation Responses

25. Various responses have been received from stakeholders during consultation undertaken in the NRA process, either during conference calls, via email correspondence or through the Scoping Opinion (MD-LOT, 2023). The key points and where they have been addressed in the NRA or **Volume ER.A.3, Chapter 14: Shipping and Navigation** are summarised in **Table 4.1**.

Table 4.1 Summary of Key Points Raised During Consultation

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
UK CoS	21 June 2023, Scoping response	**Do you agree that all relevant legislation, policy and guidance documents have been identified for the shipping and navigation assessment, or are there any additional legislation, policy and guidance documents that should be considered?** *"The list of documentation looks broadly as expected to assess the shipping and navigation impact, however should also include Scotland's National Marine Plan and its policies and Scotland's Sectoral Marine Plan for Offshore Wind Energy and its policies."*	This has been addressed within **Volume ER.A.3, Chapter 14: Shipping and Navigation**.
		Do you agree with the study area defined for shipping and navigation? *"Yes the 10nm study area is an accepted standard. The Chamber recommends a wider routeing study area of 50nm, which may be included as part of the wider cumulative impact assessment to consider routeing impacts of the proposed development in combination with other developments."*	Cumulative assessment methodology is presented in **Section 3.3**, with cumulative tiering considering a radius of up to 50 nm from the OAA.
		Do you agree with the data and information sources identified to inform the baseline for shipping and navigation including the planned vessel traffic surveys, or are there any additional data and information sources that should be considered?	The NRA has considered 28 days of MGN 654 compliant seasonal vessel traffic survey data from 2023 in **Section 10**.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		"AIS data from 2021 will not be representative of a typical year due to Covid-19 in particular for passenger/cruise traffic. Accordingly, the Chamber strongly recommends that additional AIS data for 2022 is procured especially for the summer period. This is widely available and allows for greater seasonal analysis."	
		Do you agree with the suggested embedded mitigation measures? *"The Chamber would expect to see inclusion of all the embedded mitigation measures as a minimum."*	The embedded mitigation measures assumed are presented in **Section 17**.
		Do you agree that all potential receptors and impacts have been identified for shipping and navigation? *"The list is as the Chamber would expect at this stage."*	The risk assessment is introduced in **Section 16**, which includes the shipping and navigation users and hazards detailed at scoping stage.
		Do you agree that the impacts proposed can be scoped out of the shipping and navigation EIA chapter? *"The Chamber agrees that no potential impacts should be scoped out."*	The risk assessment is introduced in **Section 16**, which includes the shipping and navigation users and hazards detailed at scoping stage.
		Do you agree with the approach for cumulative effects assessment and transboundary impacts?	Cumulative assessment methodology is presented in **Section 3.3**, with cumulative tiering considering a radius of up to

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		"The Chamber agrees that cumulative and transboundary impacts need to be considered and is satisfied with a 50nm study area. *The Chamber does not consider that the impacts relating to vessel displacement and reduction in port access should be assessed for the Project at the "in isolation" level only but also cumulatively with other projects in the area which impact upon the service."*	50 nm from the OAA. Cumulative assessment is presented in **Section 16.4** which includes port access and displacement.
RYA Scotland	21 June 2023, Scoping response	*"RYA Scotland agreed to a range of relevant parts in the scoping report and provided some suggestions."*	Noted.
		Do you agree that all relevant legislation, policy and guidance documents have been identified for the shipping and navigation assessment, or are there any additional legislation, policy and guidance documents that should be considered? *"Yes."*	NRA approach is as per Scoping Report (see **Section 3**).
		Do you agree with the study area defined for shipping and navigation? *"Yes."*	Study area is as per proposed in Scoping Report (see **Section 3.4**).
		Do you agree with the data and information sources identified to inform the baseline for shipping and navigation including the planned vessel	Data sources are as per Scoping Report (see **Section 5**).

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		traffic surveys, or are there any additional data and information sources that should be considered? *"The data to be used for recreational craft are adequate. The requirements for MGN 654 will have to be met but no additional data are needed even though only a proportion of recreational vessels transmit an AIS signal and recreational vessels can be difficult to spot on radar. It should be assumed that a small number of vessels will pass through the site each year. Clearly Shipping and Navigation should be scoped in to the EIA. RYA Scotland would like to contribute to the Navigational Risk Assessment."*	
		Do you agree with the suggested embedded mitigation measures? *"Yes. In addition to Kingfisher Bulletins, information should also be disseminated to harbours and marinas through Notices to Mariners.*	Promulgation of information strategy has been informed by the NRA process (including RYA Scotland consultation) and will include issue of Notices to Mariners (see **Section 17**). This will be set out in detail in the Navigational Safety Plan post consent.
		"RYA Scotland would oppose the creation of unnecessary operational safety zones"	The Salamander Project will determine safety zones to be applied for post consent in consultation with key

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
			stakeholders including RYA Scotland (see **Section 17**). The safety zone application will include procedures by which the safety zones will be monitored and policed.
		"Since the level of stakeholder concern is one of the criteria for assessing whether a marine activity should be included in the cumulative effects assessment it is a little surprising that a list of candidate projects has not been included."	Cumulative assessment methodology is presented in **Section 3.3**, with cumulative tiering considering a radius of up to 50 nm from the OAA. Cumulative assessment is presented in **Section 16.4**.
		"RYA should be RYA Scotland."	RYA Scotland has been referred to as such in this NRA.
		"An additional risk is the failure of Aids to Navigation marking the devices. There have been several cases where lights or AIS transmissions have failed on wind farms off the coast of Scotland in recent months and it has taken several days to replace them due to adverse weather. Mitigation might include the use of virtual AtNs."	The Salamander Project will comply with the relevant IALA requirements. The NLB has been consulted during the NRA process, and lighting and marking will be agreed with NLB post consent.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
MCA	21 June 2023, Scoping Response	*"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 proximity to other windfarm developments, other infrastructure, and the impact on safe navigable sea room.* *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."*	Base case vessel routeing has been defined in **Section 11** and adverse weather routeing has been assessed in **Section 11.3**. Cumulative impacts have also been considered in **Section 13**.
		"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 *Submit Navigational Risk Assessment in accordance to MGN 654"*	This NRA will be included in the application, with MGN 654 compliance demonstrated with a checklist in **Appendix A**.
		"We understand from the information presented in table 9-4 and section 9.2.5.2 that the preliminary assessment of 28 days (1st-14th July 2021 and 18th – 31st December 2021) of Automatic Identification System (AIS) data, is presented in figure 9-8. We would like to remind the applicant that a	Vessel traffic data fully compliant with MGN 654 has been gathered (comprising 14 days in February 2023 and 14 days in

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		vessel traffic survey must 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. This data shall be updated once the project-specific summer/winter vessel traffic survey has been completed. *”*	August 2023) and has been assessed in **Section 10**.
		“The Development Specification and Layout Plan referred to in Section 9.3.6 table 9-9 and table 13-1 in Annex 2 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.”	As per **Section 17**, there will be MGN 654 compliance including in relation to layout design and the Search and Rescue (SAR) checklist process.
		“We note in section 9.2.8, that Cumulative Effects Assessment will be carried out. As highlighted in this section, the proximity to other projects and activities will need to be fully considered, with an appropriate assessment of the distances between OREI boundaries and shipping routes as per MGN 654. Attention must be paid to the traffic for ensuring the	Vessel routeing has been assessed in **Section 11**, which includes consideration of traffic to/from Peterhead. Cumulative impacts have been assessed in **Section 13**.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		established shipping routes within the North Sea and particularly to / from Peterhead can continue safely without unacceptable deviations."	
		"Attention should be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection measures are required e.g., rock bags or concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase, such as at the HDD location. *Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be necessary."*	As per **Section 17**, there will be full MGN 654 (MCA, 2021) compliance including in relation to anchor studies and water depth reductions. A Cable Burial Risk Assessment will be undertaken post consent.
		"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	Any SAR mitigations required will be agreed with the MCA as part of the SAR checklist process post consent (as required under MGN 654) – see **Section 17**.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		Calling (DSC)). A SAR checklist will also need to be completed in consultation with MCA, as per MGN 654 Annex 5 SAR requirements."	
		"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."	All hydrographic survey requirements will be adhered to as required under MGN 654.
		"It is noted in section 4.3 that HVAC transmission infrastructure maybe installed. We would like to remind the applicant that in the case of any HVDC installation, consideration must be given to the effect of 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. If an HVDC cable is being used, we would expect the applicant to do a desk based compass deviation study based on the specifications of the cable lay proposed and assess the effect of EMF on ship's compasses. MCA may request for 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	High Voltage Alternating Current (HVAC) cables will be used and their electromagnetic field (EMF) effects have been considered in **Section 12.6.1**.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		precautionary notation on the appropriate Admiralty Charts (actions at a later stage depending upon the desk-based study and post installation deviation survey)."	
		"Section 9.3.11, Scoping Questions to Consultees: *• Do you agree that all relevant legislation, policy and guidance documents have been identified for the shipping and navigation assessment, or are there any additional legislation, policy and guidance documents that should be considered?* *- Compliance with Regulatory Expectations on Moorings for Floating Wind and Marine Devices (HSE and MCA, 2017). This guidance should be followed, and a Third-Party Verification of mooring arrangements will be required.* *• Do you agree with the study area defined for shipping and navigation?* *- Yes.* *• Do you agree with the data and information sources identified to inform the baseline for shipping and navigation including the planned vessel traffic surveys, or are there any additional data and information sources that should be considered?* *- Yes. Vessel traffic survey must be undertaken to the standard of MGN 654.* *• Do you agree with the suggested embedded mitigation measures?*	The relevant guidance has been followed and outlined in **Section 2**, and approach is as per the Scoping Report.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		- Yes. *• Do you agree that all potential receptors and impacts have been identified for shipping and navigation?* *- Yes.* *• Do you agree that the impacts proposed can be scoped out of the shipping and navigation EIA chapter?* *- We would expect that all the identified potential impacts identified in chapter 9.2, in particular table 9-6, should be scoped in.* *• Do you agree with the approach for cumulative effects assessment and transboundary impacts?* *- Yes.* *• Do you agree with the proposed assessment approach and list of planned consultees?* *- Yes.”*	
		“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.”	The NRA has been undertaken in alignment with MGN 654 and a completed MGN checklist is presented in **Appendix A**.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
Green Volt Offshore Wind Farm		*"Based on these potential interactions with Green Volt, we would anticipate that the offshore EIA for the proposed Salamander Offshore Wind Farm would consider the following impacts on the offshore elements of the Green Volt Offshore Windfarm project, including:* *- Windfarm site;* *- Offshore export corridor between the offshore substation to the landfall, particular the St Fergus South (north of Peterhead) primary option,* *- Increased vessel traffic and from the physical presence of Salamander infrastructure that may lead to interactions with activities related to Green Volt."*	Green Volt has been considered in **Section 13**, **Section 14.5** and **Section 16.4**.
Marine Directorate - Licensing Operations Team	21 June 2023, Scoping Opinion	*"In line with the MCA representation, the Scottish Ministers highlight the requirement that Automatic Identification System ("AIS") data meets the MGN 654 standards. The Scottish Ministers also highlight the advice from the CoS 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 CoS to reach a suitable agreement on the provision of AIS data and document the rationale for the final approach within the EIA Report."*	The vessel traffic data assessed in **Section 10** is compliant with MGN 654. This data has been supplemented with consultation and additional data sources such as long-term incident data, a year of Vessel Monitoring System (VMS) data and Anatec's ShipRoutes database.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		"In relation to the proposed study area, the Scottish Ministers are broadly content, however draw the Developers attention to the CoS recommendation of a wider routing study area of 50 nautical miles, which may be included as part of the wider cumulative impact assessment to consider routeing impacts of the Proposed Development in combination with other developments."	Cumulative assessment methodology is presented in **Section 3.3**, with cumulative tiering considering a radius of up to 50 nm from the OAA. Cumulative risk assessment is undertaken in **Section 13**.
		"The Scottish Ministers broadly agree with the impacts to shipping and navigation to be scoped in and out as detailed in Table 9-6. *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 that 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."*	HVAC cables will be used and their EMF effects have been considered in **Section 12.6.1.**
		"With regard 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.	As per **Section 17**, there will be full MGN 654 (MCA, 2021) compliance including in relation to anchor studies and water depth reductions. A Cable Burial Risk

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		The Scottish Ministers advise that this should be fully addressed in the EIA Report and highlight the MCA advice on a maximum 5% reduction in surrounding depth referenced to Chart Datum if cable protection measures are required and where depths are decreasing towards the shore."	Assessment will be undertaken post consent.
NatureScot	21 June 2023, Scoping Response	Section 4.6.2 (Floating Substructures) refers to the potential for wet storage of the substructures prior to their installation within the array area, either at the initial assembly site, the wind turbine integration site or a separate dedicated storage location. Section 4.7.1 (Floating Assembly) also indicates that once operational the substructures and WTGs will form an integrated assembly piece – the replacement of any major component parts of which is expected to be achieved by towing the assembly to port. Wet storage could represent a significant impact. Consideration of the potential impacts on all receptors needs to be addressed with the EIAR and HRA. We would welcome further discussion on this as and when further details are confirmed, noting the intention to seek a separate Marine Licence application for any requirements for wet storage out with the array area.	Wet storage of the floating substructures (and integrated WTGs) prior to tow-out to the OAA is considered to be outside the scope of this EIA and the Marine Licence applications for the Offshore Development. This is due to the fact that at this stage of the Salamander Project it is not known which port(s) will be used for wet storage and therefore it is challenging to undertake a meaningful assessment of impacts related to wet storage. The intent is that the Salamander Project will utilise the services of a port(s) that offer wet storage sites, which will have appropriate consents (obtained by the port authority)

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
			for wet storage of floating substructures, fabrication and assembly with the WTGs. To enable the availability of this option for the Salamander Project within the required timeframe, an owner of SWPC is an official member of the TS-FLOW UK-North Joint Industry Project (JIP) exploring the challenges of wet storage and identifying the opportunities and potentially suitable locations for these activities. This JIP is in collaboration with relevant ports and other floating offshore wind developers. Separate Marine Licences and associated impact assessments for wet storage areas out with the Offshore Development Area will be applied for and undertaken as appropriate.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
Tidewater	13 September 2023, Email correspondence	Vessels would keep clear of the wind farm, with passage plans taking the presence of project vessels and traffic density into consideration while complying with the requirements of safe navigation.	Vessel displacement and associated collision risk has been assessed. The risk assessment is introduced in **Section 16**.
Sentinel Marine	13 September 2023, Email correspondence	The presence of the Offshore Development might impact regular passages but this would be solved by small alternations. There are no safety concerns to their vessels, with the vessels staying clear of the Offshore Development. The floating foundations would be treated the same as fixed foundations.	Vessel displacement and associated collision risk has been assessed. The risk assessment is introduced in **Section 16**.
North Star Shipping	13 September 2023, Email correspondence	Vessels coming to Aberdeen from locations to the northeast would have to alter course by a few degrees but this would have low impact on time and cost and would be allowed for in the passage planning. There are concerns with regards to errant vessels, noting again the incorporation into passage plans being key. Vessels would pass either side of the array (not within) and preferably down wind. The operator would view floating foundations the same as fixed foundations and the same avoiding actions would be taken.	Vessel displacement and associated collision risk has been assessed, in addition to allision risk. The risk assessment is introduced in **Section 16**.
Scottish White Fish Producers Association (SWFPA)	28 September 2023, Hazard Workshop	Noted the importance of cumulative assessment (including INTOG projects).	Cumulative risk assessment is undertaken in **Section 13**.
		Noted that, although the incident data appears representative, the potential for an increase in incident rates associated with the Offshore Development needs to be considered.	Impacts on emergency response have been assessed including in relation to potential for changes in incident rates.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
			The risk assessment is introduced in **Section 16**.
		Asked if project vessel transits to/from the Offshore Development would be considered.	Hazards associated with project vessels have been assessed. The risk assessment is introduced in **Section 16**.
		Noted that the decision of whether to transit through is made by each skipper based on their individual risk assessment, based on various factors including weather conditions and which mooring configuration was being used.	Vessel displacement and hazards associated with subsea infrastructure have been assessed. The risk assessment is introduced in **Section 16**.
		Stated that there is less concern regarding the Offshore Export Cable Corridor as impacts such as the cable installation and burial process would be temporary, and noted that MGN 654 includes requirements around underkeel reduction from cable protection.	Hazards associated with the Offshore ECC have been assessed. The risk assessment is introduced in **Section 16**.
		Stated that recreational users would likely prefer to deviate due to the size of the turbines and platforms. Also stated that they may be less comfortable transiting through a site that uses floating foundations.	Vessel displacement including to recreational vessels has been assessed. The risk assessment is introduced in **Section 16**.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		Stated that traffic volume will increase due to the presence of service vessels but that the Vessel Management Plan (VMP) will mitigate the risk if implemented correctly.	Hazards associated with project vessels have been assessed. The risk assessment is introduced in **Section 16**.
		Stated that, in relation to Radio Detection and Ranging (Radar) effects, the Wind Turbine Generators (WTGs) are large but the Offshore Array Area has small spatial extent.	Radar effects assessed in **Section 12**.
Scottish Pelagic Fishermen's Association (SPFA)	28 September 2023, Hazard Workshop	Stated that larger fishing vessels would likely deviate around the Offshore Array Area.	Vessel displacement including to fishing vessels has been assessed. The risk assessment is introduced in **Section 16**.
NLB	28 September 2023, Hazard Workshop	Noted the importance of cumulative assessment.	Cumulative risk assessment undertaken in **Section 13**.
		Expressed agreement that relatively large commercial vessels would likely avoid the Offshore Array Area.	Vessel displacement and associated collision risk has been assessed. The risk assessment is introduced in **Section 16**.
		Lighting would likely be required for every WTG given their limited number, but would depend on the final layout.	As per **Section 17**, lighting and marking will be agreed with NLB post consent.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		Noted that the loss of station hazard should be considered.	Hazards associated with loss of station have been assessed. The risk assessment is introduced in **Section 16**.
		Noted that impacts on SAR should be considered.	Impacts on emergency response have been assessed. The risk assessment is introduced in **Section 16**.
		Noted that the impact of EMF effects on compasses should be considered.	HVAC cables will be used and their EMF effects have been considered in **Section 12.6.1**.
Montrose Port Authority	28 September 2023, Hazard Workshop	Oil and gas vessels to/from the port would likely deviate.	Vessel displacement and associated collision risk has been assessed. The risk assessment is introduced in **Section 16**.
MCA	13 October 2023, Meeting	MCA noted safety zones were only considered effective mitigations if they were suitably monitored and policed.	Appropriate procedures will be set out in the safety zone application (see **Section 17**).
		MCA confirmed no concern with use of subsea hubs given the water depths.	Considered in risk assessment (**Section 16**)

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		MCA confirmed no concern with EMF effects given the Offshore Export Cable(s) will be HVAC.	See **Section 12.6**.
		MCA noted that consultation from fishing stakeholders should be considered.	NRA process has included consultation with fishing vessel stakeholders including at the hazard workshop.
		MCA agreed it was appropriate that the worst case draughts of the vessel types that may pass in proximity to the infrastructure based on consultation be used for underkeel risk assessment, rather than all vessel types.	See **Section 15.5**.
CoS	20 October 2023, Meeting	Confirmed no concern with use of subsea hubs given the water depths, but noted that charting of these should be discussed with NLB.	See **Section 17**, provision of infrastructure locations including subsea hubs to the UKHO for charting purposes will be undertaken, and this will also be discussed with NLB.
		Queried a minimum buoyancy module depth to leave enough room for under keel clearance.	See **Section 15.5**.
		Queried terminus ports and sizes of tankers recorded within vessel traffic survey data.	See **Section 10.1.3.5** for further detail.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		Suggested NRA should include draught details per vessel type.	See **Section 15.5**.
		Queried maintenance strategy in particular whether WTGs would be towed from site. Noted agreement with NLB input (see above) that all WTGs should display marine lights to mitigate impact of towing a WTG from site.	As per **Section 17**, final lighting and marking will be agreed with NLB post consent, noting that initial input is that all WTGs will be lit (see above).
RYA Scotland	15 December 2023, Email correspondence	"As the data show some recreational craft are likely to pass through the site with the numbers registering on AIS in August being an underestimate".	The vessel traffic surveys include account of non AIS traffic.
		"Some may choose to go round the site but others will pass through it judging by experience elsewhere. As these will largely be vessels on passage between continental Europe and the UK and vice versa their skippers will be used to navigating round oil and gas platforms."	Displacement has been assessed in **Section 16**.
		"Most skippers rely on electronic charts and there is a significant time lag between receipt of the updates by the UKHO and the availability of revised charts from providers of recreational charts. Also, boat owners may not download the latest charts. In RYA Scotland we encourage boaters to use Kingfisher but the traffic through the site is likely to include vessels based in continental Europe who may be unaware of this source of information."	Promulgation of information including Notice to Mariners is a key mitigation as per **Section 17.1**.

Stakeholder	Form of Correspondence	Point Raised	Response and Where Addressed in the NRA
		"there is a risk of loss of lights and other Aids to Navigation at a time when access for repair can be difficult. This needs to be mitigated against."	The Salamander Project will comply with the relevant IALA requirements.

4.3 Hazard Workshop

28. A key element of the consultation phase was the Hazard Workshop, a meeting of local and national marine stakeholders to identify and discuss potential shipping and navigation hazards. Using the information gathered from the Hazard Workshop, a Hazard Log was produced for use as input into the risk assessment as introduced in **Section 16**. This ensured that expert opinion and local knowledge was incorporated into the risk assessment and that the Hazard Log was site-specific.

4.3.1 Hazard Workshop Attendance

29. The Hazard Workshop was held via teleconferencing on 28th September 2023. The Hazard Workshop was attended by:

- Montrose Port Authority;
- NLB;
- SPFA; and
- SWFPA.

30. The output documentation was shared with attendees, in addition to the MCA, CoS, RYA Scotland, and the Cruising Association.

4.3.2 Hazard Workshop Process and Hazard Log

31. During the Hazard Workshop, key maritime hazards associated with the construction, operation and maintenance and decommissioning of the Offshore Development 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.

32. 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, with appropriate embedded mitigation measures 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 and their feedback incorporated into the NRA. The Hazard Log has been used to inform the risk assessment from **Section 16** and is provided in full in **Appendix B**.

5 Data Sources

5.1 Summary of Data Sources

33. The main data sources used to characterise the shipping and navigation baseline relative to the Offshore Development are outlined in **Table 5.1**.

Table 5.1 Data Sources Used to Inform the Shipping and Navigation Baseline

Data	Source(s)	Purpose
Vessel traffic	Winter vessel traffic survey data of Automatic Identification System (AIS), Radar and visual observations for the study area (14 days, 10th to 25th February 2023) recorded from a dedicated survey vessel on-site. The data was supplemented with AIS collected from offshore and onshore receivers.	Characterising vessel traffic movements within and in proximity to the Offshore Development in line with MGN 654 (MCA, 2021) requirements.
	Summer vessel traffic survey data of AIS, Radar and visual observations for the study area (14 days, 6th to 20th August 2023) recorded from a dedicated survey vessel on-site. The data was supplemented with AIS collected from offshore and onshore receivers.	
	Anatec's ShipRoutes database (2023).	Secondary source for characterising vessel traffic movements including cumulatively within and in proximity to the Offshore Development.
	VMS data spanning 2022.	To supplement the AIS in characterising fishing vessel traffic.
Maritime incidents	Maritime Accident Investigation Branch (MAIB) marine accidents database (2002 to 2021).	Review of maritime incidents within and in proximity to the Offshore Development.
	Royal National Lifeboat Institution (RNLI) incident data (2011 to 2020).	
	Department for Transport (DfT) UK civilian SAR helicopter taskings (April 2015 to March 2020).	

Data	Source(s)	Purpose
Recreational traffic density and features	UK Coastal Atlas of Recreational Boating 2.1 (RYA, 2019)	Characterising recreational activity within and in proximity to the Offshore Development.
Other navigational features	Admiralty Charts 213, 1409 and 278 (United Kingdom Hydrographic Office (UKHO), 2022/23).	Characterising other navigational features in proximity to the Offshore Development.
	Admiralty Sailing Directions NP54 (UKHO, 2021).	
Weather	NM315-ERA5 Vortex ERA5	Characterising weather conditions in proximity to the OAA for use as input to the collision and allision risk modelling.
	Salamander Metocean data - L-100626-S07-TECH-001 Project Salamander - Phase 3 Technical Note - MetOcean Studies. (Xodus, 2021).	
	Visibility data provided in Admiralty Sailing Directions NP54 (UKHO, 2021).	
	Tidal data provided by Admiralty Charts 1409 (UKHO, 2023).	

5.2 Vessel Traffic Surveys

34. The vessel traffic surveys were undertaken by the guard vessel *Star of Hope* and in agreement with the MCA and NLB. Two 14-day AIS, Radar, and visual observation surveys undertaken in winter 2023 (during 10th to 25th February 2023) and summer 2023 (during 6th to 20th August 2023) have been considered within the baseline for a total of 28 full days. The data was supplemented with AIS collected from offshore and onshore receivers.

35. A number of vessel tracks recorded during the survey period were classified as temporary (non-routine) and were therefore excluded from the analysis to ensure the data was representative of routine activity. Besides the survey vessel itself, this included vessels that were undertaking survey/research work or guard duties (either within the dataset itself or clearly transiting to perform such activities) as well as vessels transiting to oil and gas assets performing temporary activities.

36. The dataset is assessed in full in **Section 10.1**.

5.3 Data Limitations

5.3.1 Automatic Identification System Data

37. 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 500 GT not engaged on international voyages, passenger vessels irrespective of size built on or after 1 July 2002, and fishing vessels over 15 metres (m) length overall (LOA).

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

39. Throughout the winter survey, approximately 99% of vessel tracks were recorded via AIS with the remaining 1% recorded via Radar. Throughout the summer survey, over 99% of vessel tracks were recorded via AIS with the remainder recorded via Radar.

40. The traffic data used for the Offshore ECC assessment in **Section 10.2** is an AIS-only dataset and therefore would not capture vessels not broadcasting on AIS; in particular, fishing vessels under 15 m in length and recreational vessels may be under-represented. This dataset as well as the AIS component of the vessel traffic survey dataset assume that the details broadcast via AIS are accurate (such as vessel type and dimensions) unless there is clear evidence to the contrary.

41. Both the vessel traffic survey dataset and the Offshore ECC traffic dataset encompass a period of 28 days, although this captures seasonal variation due to being equally split between winter and summer.

5.3.2 Historical Incident Data

42. Although all UK commercial vessels are required to report accidents to the Marine Accident Investigation Branch (MAIB), this is not mandatory for non-UK vessels unless they are in a UK port, within 12 nm of territorial waters (noting that the OAA is located approximately 18 nm offshore at the closest point), or carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB.

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

5.3.3 United Kingdom Hydrographic Office Admiralty Charts

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

shipping and navigation baseline are shown. Similarly for wrecks and obstructions, only those charted are shown.

45. 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 Description Relevant to Shipping and Navigation

46. The NRA reflects the Project Design Envelope which is detailed in full in **Volume ER.A.2, Chapter 4: Project Description**. The following subsections outline the maximum extent of the Offshore Development for which any shipping and navigation hazards are assessed.

6.1 Offshore Development

47. The Offshore Development is the offshore component of the Salamander Project, consisting of the OAA and Offshore ECC.

6.1.1 Offshore Array Area

48. The OAA is located approximately 18 nm east of the Aberdeenshire coast. The total area covered by the OAA is approximately 10 square nautical miles (nm^2) with charted water depths being approximately 89 m. This broadly aligns with bathymetry data collected by the Salamander Project which indicates depths range between 86.5 and 101.6m.

49. The key coordinates defining the boundary of the Offshore Development are illustrated in **Figure 6-1** and provided in **Table 6.1** using World Geodetic System 1984 (WGS84) Universal Transverse Mercator (UTM) Zone 30N.

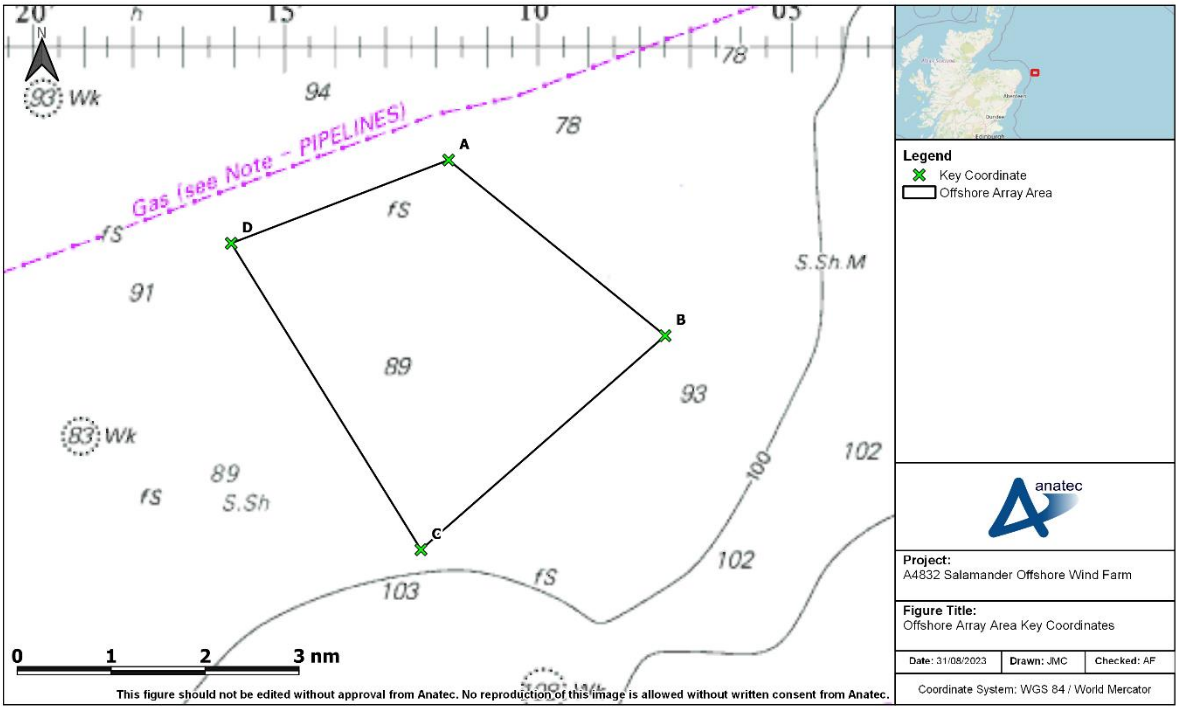


Figure 6-1 Offshore Array Area Key Coordinates

Table 6.1 List of Key Coordinates of the Offshore Array Area

Point	Longitude	Latitude
A	001° 11' 46.453" West	057° 38' 47.764" North
B	001° 07' 29.719" West	057° 36' 56.041" North
C	001° 12' 19.188" West	057° 34' 39.814" North
D	001° 16' 04.170" West	057° 37' 54.822" North

6.1.2 Offshore Export Cable Corridor

50. The Offshore ECC is presented in **Figure 6-2**. The total area covered by the Offshore ECC is approximately 14 nm^2 with charted water depths ranging between zero (nearshore) and 89 m below Chart Datum (CD). Survey data collected by the Salamander Project indicates depths are up to 104.6m.

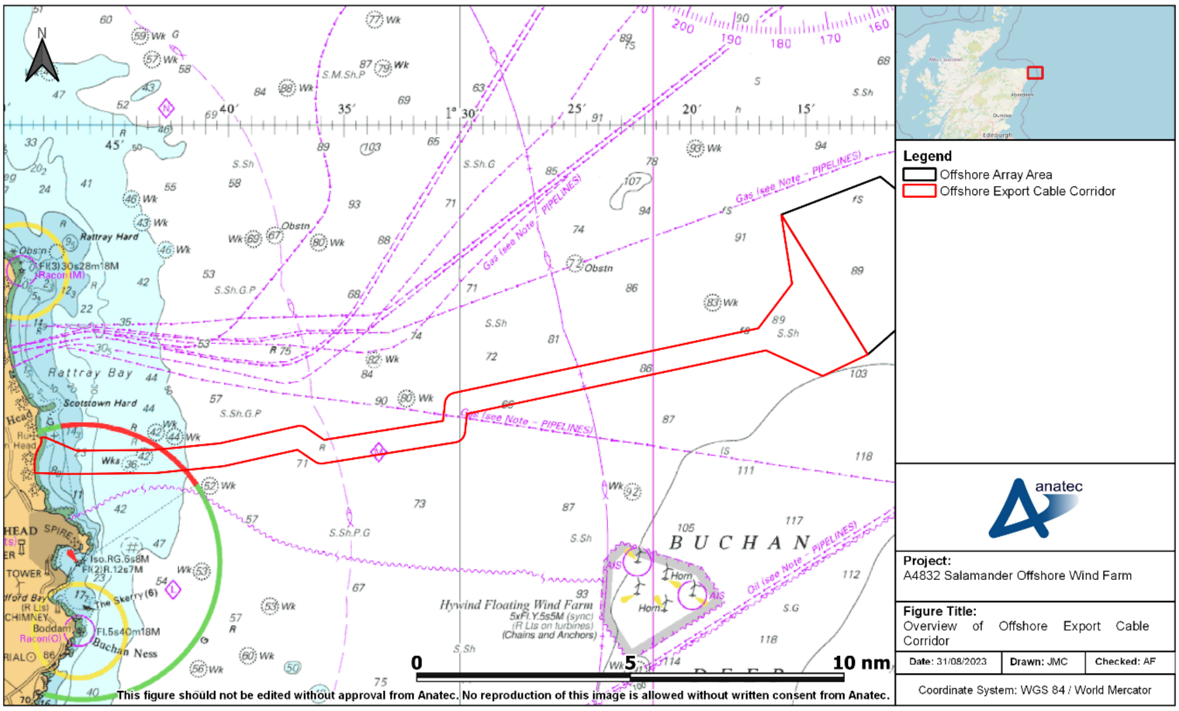


Figure 6-2 Overview of Offshore Export Cable Corridor

6.2 Surface Infrastructure

6.2.1 Indicative Worst-Case Layout

51. Up to seven WTGs will be installed. Although the final locations have not yet been defined, an indicative layout involving the maximum number of WTGs (worst-case for shipping and navigation) has been defined and is presented in **Figure 6-3**. The locations have been defined to ensure full build out of the Offshore Array, assuming

a minimum mooring line radius (to allow for the positions to be as close as possible to the boundary of the Offshore Array Area).

52. Note that no offshore substations are planned, however subsea hubs will be used (see **Section 6.3.5**).

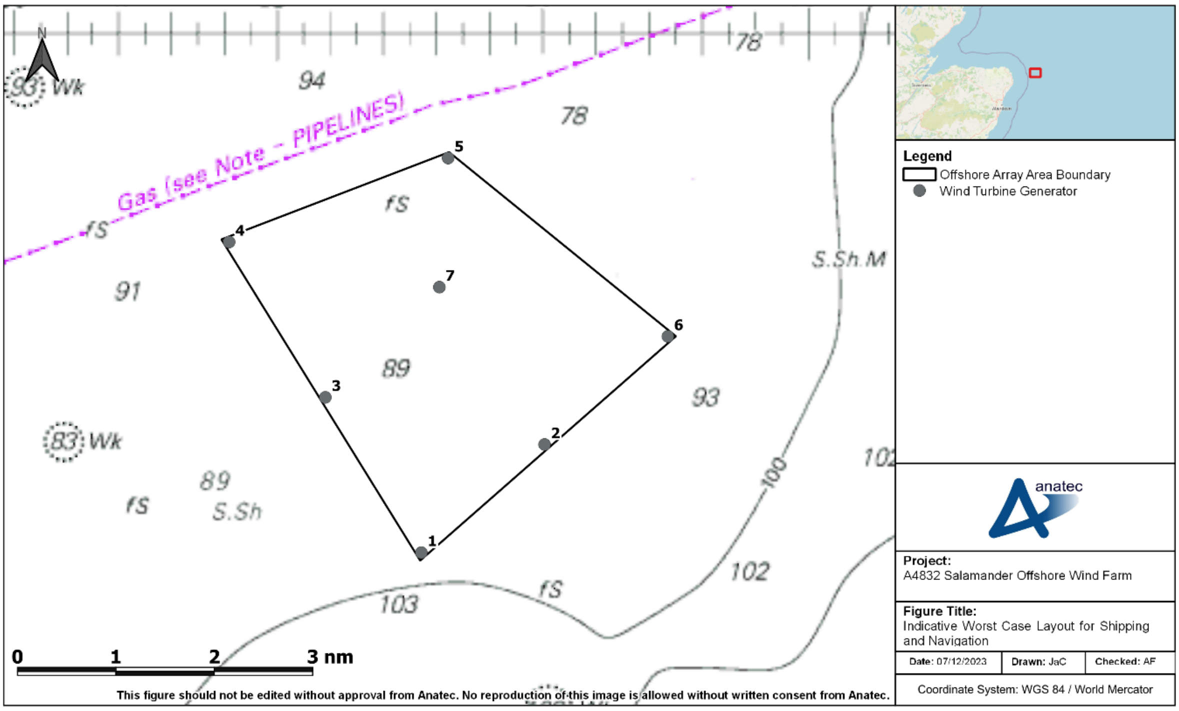


Figure 6-3 Indicative Worst-Case Layout for Shipping and Navigation

6.2.2 Wind Turbine Generators

53. The WTGs within the indicative layout each have a maximum rotor diameter of 250 m, noting that these values represent the worst-case for shipping and navigation rather than the Offshore Development as a whole.

54. Semi-submersible foundations[1] have been considered as the worst-case scenario for shipping and navigation as this foundation type provides the maximum structure dimension at the sea surface. The worst-case scenario WTG measurements assuming use of semi-submersible foundations are provided in **Table 6.2,** noting that the values provided are specific to the worst-case scenario selected for shipping and

[1] *A Semi-Submersible structure is a buoyancy-stabilised platform which floats partially submerged on the surface of the ocean whilst anchored to the seabed. The structure gains its stability through the distribution of buoyancy force associated with its large footprint and geometry which ensures the wind loading on the structure and turbine are countered by an equivalent buoyancy force on the opposite side of the structure. Included in the Project Design Envelope, there are variations of the semi-submersible concept, such as barge, buoy, or hybrid.*

navigation. Further details and information on the semi-submersible foundations are provided in **Volume ER.A.2, Chapter 4: Project Description**.

Table 6.2 Worst-Case Scenario for Shipping and Navigation – WTGs

Parameter	Worst-case scenario for shipping and navigation
Foundation type	Semi-submersible
Dimensions at sea surface	140 × 140 m
Minimum air gap (above Still Water Level (SWL))	22 m
Maximum rotor diameter	250 m
Minimum spacing	1 kilometre (km)

55. Tension leg platform foundations are also under consideration, with descriptions provided in **Volume ER.A.2, Chapter 4: Project Description**.

6.3 Subsea Infrastructure

6.3.1 Mooring System

56. Each floating substructure will have up to eight mooring lines, with maximum radius of 1,500 m (noting a Tension Leg Platform mooring system will have a significantly smaller radius of up to 125 m). Four configurations are under consideration; catenary, semi-taut, taut and tension. These options are illustrated in **Figure 6-4**.

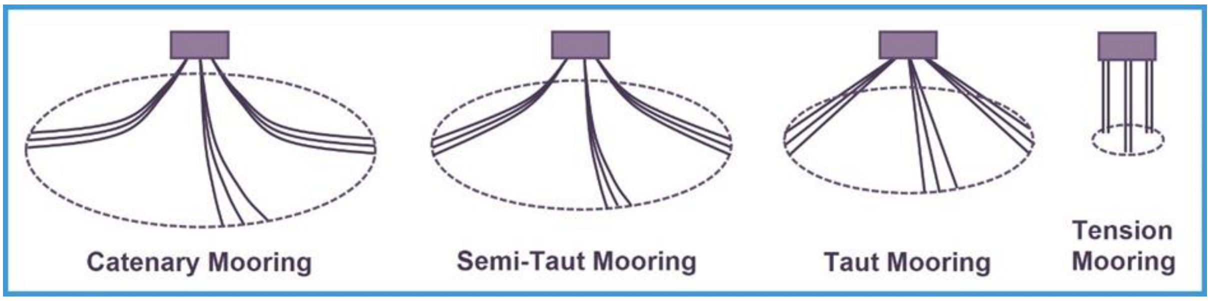


Figure 6-4 Mooring Line Options

6.3.2 Inter-array Cables

57. Up to eight Inter-array Cables will connect individual WTGs to each other or to the subsea hubs. Up to 35 km of Inter-array Cables will be required with the final length dependent on the final array layout. All Inter-array Cables will be installed within the OAA.

58. The Inter-array cables will include a dynamic section between the substructure and seabed as illustrated in **Figure 6-5**. Each Inter-array cable will have a buoyancy

module section up to 100 m in length. Inter-array cables may also 'touch down' and run along or through the seabed for a portion of their length.

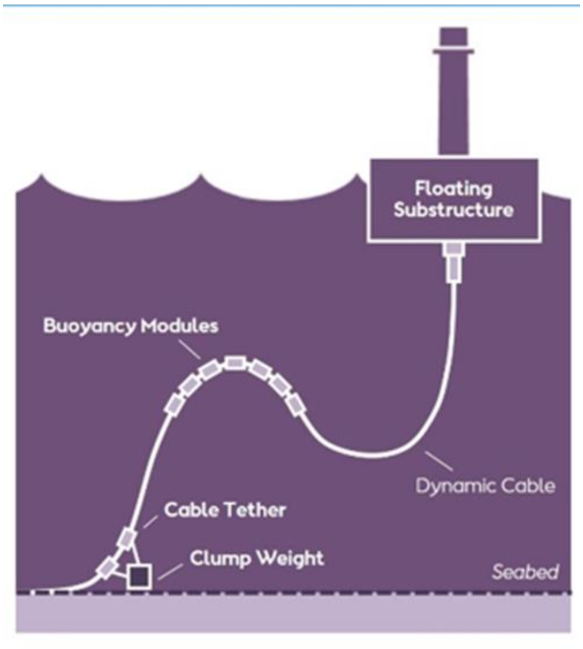


Figure 6-5 Dynamic Cable Illustration

6.3.3 Offshore Export Cable(s)

59. Up to two Offshore Export Cable(s) will carry the energy generated by the WTGs from the subsea hub(s) in the OAA to shore, with a combined length of up to 85 km. The Offshore Export Cable(s) will be installed within the Offshore ECC.

6.3.4 Cable Burial

60. 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. Cable burial depths are typically 1 – 2 m where technically feasible, with a minimum target depth of lowering of 0.6 m; this will vary depending on seabed conditions.

61. Where cable burial is not possible, alternative cable protection methods (such as rock placement, concrete mattresses etc.) may be deployed which will again be determined within the cable burial risk assessment.

62. Cable burial and protection is captured in the embedded mitigation measures (see **Section 17**).

6.3.5 Subsea Hubs

63. Up to two subsea hubs will be installed on the seabed within the OAA, with a maximum height above the seabed of 10 m and maximum dimensions of 15 × 15 m.

6.4 Construction Phase

64. It is anticipated that the offshore construction phase will last for up to 18 months. **Figure 6-6** outlines an indicative construction programme for the Offshore Development which indicates the maximum duration of construction for each element.

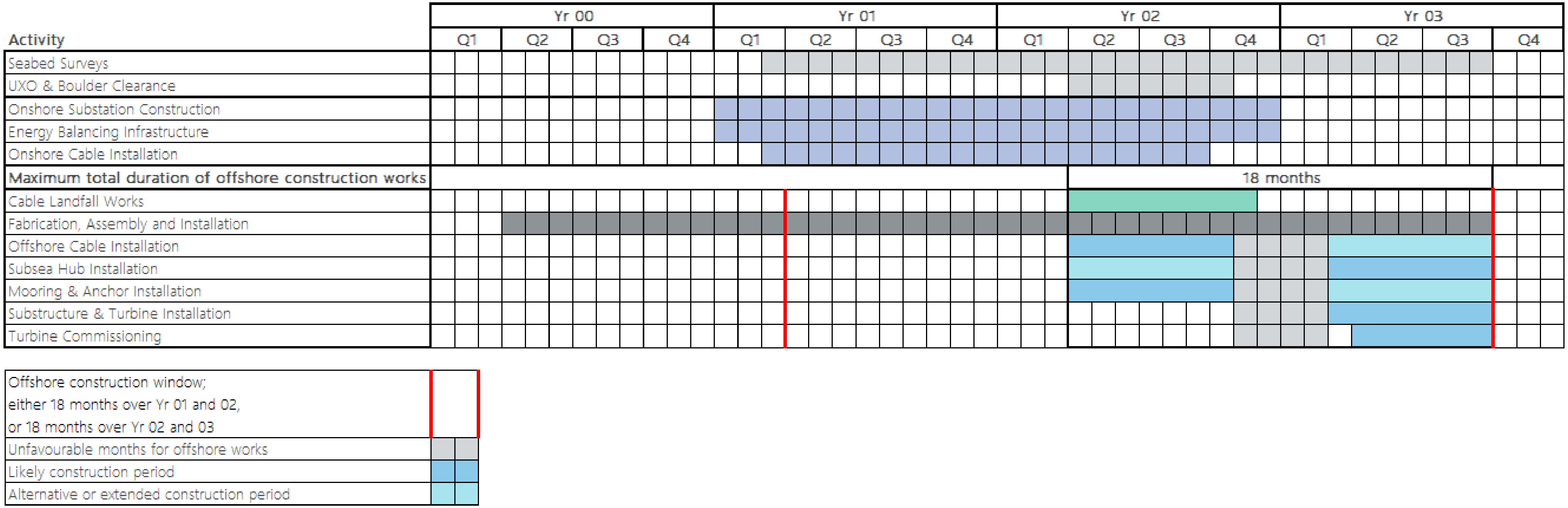


Figure 6-6 Indicative Construction Programme

6.5 Indicative Vessel and Helicopter Numbers

6.5.1 Construction Vessels

65. Up to 660 return trips per year may be made throughout the construction phase, breaking down as summarised in **Table 6.3**.

Table 6.3 Maximum Vessel Numbers and Return Trips per Vessel Type (Construction)

Vessel Type	Maximum Number of Vessels	Maximum Number of Return Trips
Jack-up vessel	1	2
Heavy lift crane vessel	2	21
Anchor handling vessel	11	161
Offshore construction vessel	2	14
Cable laying vessel	1	14
Cable burial / jointing vessel	1	14
Shallow water cable barge	1	2
Support vessel	16	238
Crew transfer vessel	4	194
Total	**39**	**660**

66. In addition, there will be a maximum of two helicopters making 21 return trips.

6.5.2 Operation and Maintenance Vessels

67. The Salamander Project will have an anticipated operational life of 35 years, with possible extension, and will be operational 24/7.

68. Up to 210 vessel movements per year may be made throughout the operation and maintenance phase, breaking down as summarised in **Table 6.4**.

Table 6.4 Maximum Vessel Movements per Vessel Type (Operation and Maintenance)

Vessel Type	Maximum Number of Movements
Service Operation Vessel (SOV) / Crew Transfer Vessel (CTV)	190
Heavy lift	3
Towing spread	5

Vessel Type	Maximum Number of Movements
Anchor handling	12
Total	**210**

69. Up to 140 helicopter transfers per year may be made during the operation and maintenance phase.

6.5.3 Decommissioning Phase

70. The decommissioning duration of the offshore infrastructure may take the same amount of time as construction of the Offshore Development, and therefore approximately one to two years, although this indicative timing may reduce.

71. Up to 516 return trips by decommissioning vessels may be made throughout the decommissioning phase, breaking down as summarised in **Table 6.5**.

Table 6.5 Maximum Vessel Numbers and Return Trips per Vessel Type (Decommissioning)

Vessel Type	Maximum Number of Vessels	Maximum Number of Return Trips
Heavy lift vessels	1	21
Anchor handling vessels	6	77
Support vessels	12	238
Crew transfer vessels	2	180
Total	**21**	**516**

72. Up to 14 return trips by helicopters may be made throughout the decommissioning phase.

6.6 Worst-Case Scenario

73. The worst-case scenario per hazard assessed is presented in **Table 6.6**.

Table 6.6 Worst Case Scenario for Shipping and Navigation

Potential Impacts and Effect	Project Design Envelope Parameters
Construction	
Vessel displacement	• Maximum extent of OAA (with an area of 10 nm^2) including any required construction buoyage; • Up to seven WTGs / floating substructures; • Up to eight mooring lines per substructure;

Potential Impacts and Effect	Project Design Envelope Parameters
	• Semi-submersible substructures with surface dimensions of up to 140 × 140 m; • Use of 500 m construction safety zones and 50 m pre-commissioning safety zones; • Up to 35 km of Inter-array Cables including use of dynamic cable sections; • Buoyancy module section per dynamic cable up to 100 m in length; • Up to two Offshore Export Cables with a total length of 85 km; • Up to two subsea hubs, l x b x h: 15 m x 15 x 10 m; • Construction phase lasting up to 18 months (offshore construction period has a window of 2.5 years, however, construction will only take place over a period of 18 months (excluding pre-construction surveys). Pre-construction surveys will occur prior to the 18 month construction period); and • Up to 40 construction vessels (with up to 12 vessels and a support barge maximum simultaneously).
Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel	• Maximum extent of OAA (with an area of 10 nm^2) including any required construction buoyage; • Use of 500 m construction safety zones and 50 m pre-commissioning safety zones; • Up to two Offshore Export Cables with a total length of 85 km; • Construction phase lasting up to 18 months; and • Up to 40 construction vessels (with up to 12 vessels and a support barge maximum simultaneously).
Increased vessel to vessel collision risk between third-party vessels	• Maximum extent of OAA (with an area of 10 nm^2) including any required construction buoyage; • Up to seven WTGs / floating substructures; • Up to eight mooring lines per substructure; • Semi-submersible substructures with surface dimensions of up to 140 × 140 m; • Use of 500 m construction safety zones and 50 m pre-commissioning safety zones; • Up to 35 km of Inter-array Cables including use of dynamic cable sections; • Buoyancy module section per dynamic cable end up to 100 m in length; • Up to two Offshore Export Cables with a total length of 85 km; • Construction phase lasting up to 18 months; and • Up to 40 construction vessels (with up to 12 vessels and a support barge maximum simultaneously).
Vessel to structure allision risk	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs / floating substructures; • Semi-submersible substructures with surface dimensions of up to 140 × 140 m; • Construction phase lasting up to 18 months; and

Potential Impacts and Effect	Project Design Envelope Parameters
	• Up to 40 construction vessels (with up to 12 vessels and a support barge maximum simultaneously).
Reduced access to local ports	• Up to two Offshore Export Cables with a total length of 85 km; • Construction phase lasting up to 18 months; and • Up to 40 construction vessels (with up to 12 vessels and a support barge maximum simultaneously).
Interaction with wet stored subsea infrastructure	• Up to seven WTGs / floating substructures; • Wet storage within water column of up to eight mooring lines per substructure; • Wet storage of dynamic cables in the water column; and • Construction phase lasting up to 18 months.
Reduction in Emergency Response Capability	• Maximum extent of OAA (with an area of 10 nm^2) including any required construction buoyage; • Up to seven WTGs / floating substructures; • Up to eight mooring lines per substructure; • Mooring line radius up to 1,500 m; • Semi-submersible substructures with surface dimensions of up to 140 × 140 m; • Up to two Offshore Export Cables with a total length of 85 km; • Up to 35 km of Inter-array Cables including use of dynamic cable sections; • Buoyancy module section per dynamic cable end up to 100 m in length; • Up to two subsea hubs, l x b x h: 15 m x 15 x 10 m; • Construction phase lasting up to 18 months; and • Up to 40 construction vessels (with up to 12 vessels and a support barge maximum simultaneously).
Operation and Maintenance	
Vessel displacement	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs; • Up to eight mooring lines per substructure; • Semi-submersible foundations with surface dimensions of up to 140 × 140 m; • Up to 35 km of Inter-array Cables including use of dynamic cable sections; • Buoyancy module section per dynamic cable end up to 100 m in length; • Use of 500 m major maintenance safety zones; and • Operational life of 35 years.
Increased vessel to vessel collision risk between third-party vessels	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs;

Potential Impacts and Effect	Project Design Envelope Parameters
	• Up to eight mooring lines per substructure; • Semi-submersible foundations with surface dimensions of up to 140 × 140 m; • Use of 500 m major maintenance safety zones; • Up to 35 km of Inter-array Cables including use of dynamic cable sections; • Buoyancy module section per dynamic cable up to 100 m in length; • Up to 210 vessel trips per year, maximum of up to 12 vessels in the OAA and Offshore ECC per day; and • Operational life of 35 years.
Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel	• Full buildout of OAA (with an area of 10 nm^2); • Up to 210 vessel trips per year, maximum of up to 12 vessels in the OAA and Offshore ECC per day; and • Operational life of 35 years.
Vessel to structure allision risk	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs; • Semi-submersible substructures with surface dimensions of up to 140 × 140 m; and • Operational life of 35 years.
Reduced access to local ports	• Full buildout of OAA (with an area of 10 nm^2); • Up to two Offshore Export Cables with a total length of 85 km; • Up to 210 vessel trips per year, maximum of up to 12 vessels in the OAA and Offshore ECC per day; and • Operational life of 35 years.
Reduction of under keel clearance from cable protection	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs; • Up to two Offshore Export Cables with a total length of 85 km; • Up to 35 km of Inter-array Cables; • Buoyancy module section per dynamic cable end up to 100 m in length; • External protection where needed, with a height of up to 1.5 m; and • Operational life of 35 years.
Anchor Interaction	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs; • Up to two Offshore Export Cables with a total length of 85 km; • Up to 35 km of Inter-array Cables; • Buoyancy module section per dynamic cable end up to 100 m in length; • Cable depths of lowering are typically 1 – 2 m where technically feasible, with a minimum target depth of lowering of 0.6 m; • External protection where needed, with a height of up to 1.5 m;

Potential Impacts and Effect	Project Design Envelope Parameters
	• Up to eight mooring lines per substructure; • Up to two subsea hubs, l x b x h: 15 x 15 x 10; • Mooring line radius up to 1,500 m; • Gravity anchors with diameter 13.5m; and • Operational life of 35 years.
Interaction with subsea infrastructure	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs; • Up to eight mooring lines per substructure; • Mooring line radius up to 1,500 m; • Up to 35 km of Inter-array Cables including use of dynamic cable sections; • Buoyancy module section per dynamic cable end up to 100 m in length; and • Operational life of 35 years.
Loss of station	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs; • Semi-submersible substructures with surface dimensions of up to 140 × 140 m; and • Operational life of 35 years.
Reduction of emergency response capability	• Full buildout of OAA (with an area of 10 nm^2); • Up to seven WTGs; • Semi-submersible substructures with surface dimensions of up to 140 × 140 m; • Up to 210 vessel trips per year, maximum of up to 12 vessels in the OAA and Offshore ECC per day; and • Operational life of 35 years.
Decommissioning	
At this stage, the worst-case scenario envelope during decommissioning is considered equal to the worst-case scenario during construction, with the exception of vessel trips, noting that there will be a total of 21 vessels involved rather than the 40 during construction phase. It is assumed that the worst-case scenario will involve full removal of all infrastructure placed during the construction phase. This assumption is subject to best practice methods and technology appropriate at the time of decommissioning.	

7 Navigational Features

74. A plot of the navigational features within and in proximity to the Offshore Development is presented in **Figure 7-1**. Each of the features shown are discussed in the following subsections and have been identified using the most detailed UKHO admiralty chart available.

75. It is noted that none of the followed navigational features were identified in proximity to the Offshore Development:

- IMO routeing measures;
- Designated anchorage areas;
- Marine aggregate dredging areas;
- Vessel Traffic Service (VTS) areas; and
- Military practice and exercise areas.

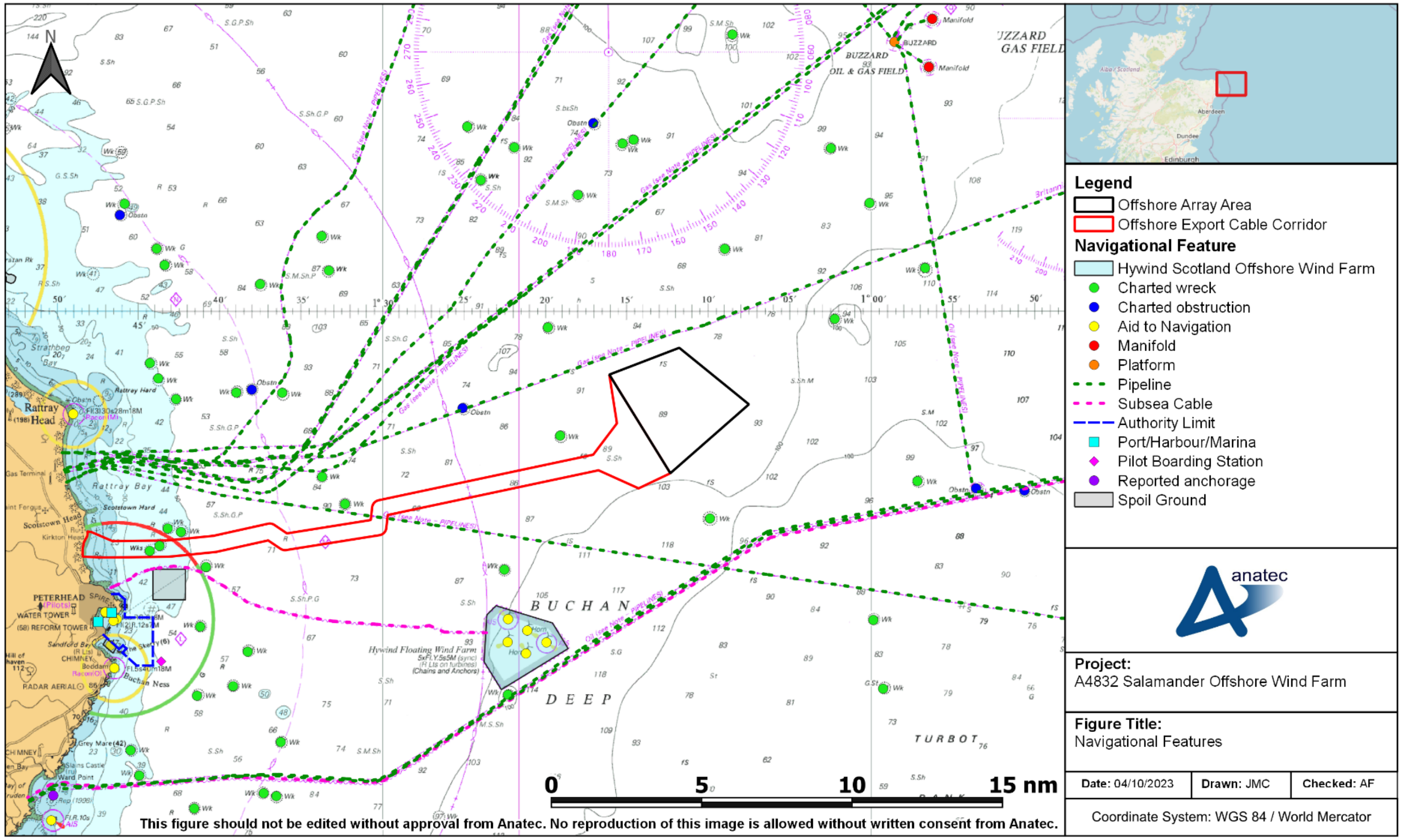


Figure 7-1 Navigational Features

7.1 Other Offshore Wind Farm Developments

76. The Hywind Scotland Offshore Wind Farm is located approximately 6.3 nm southwest of the OAA, covering an area of approximately 4.8 nm^2. It became operational in 2017 and utilises five floating WTGs.

77. Cumulative, i.e. proposed developments are considered in **Section 13**.

7.2 Pipelines

78. Charted pipelines are in proximity to the Offshore Development, many of which connect to the *St Fergus Gas Terminal* located approximately 18 nm west of the OAA and 2 nm north of the Offshore ECC. The pipeline that passes closest to the OAA also connects to this terminal, passing 0.5 nm to the northwest of the OAA.

7.3 Charted Wrecks and Obstructions

79. Charted wrecks are located in proximity to the Offshore Development, becoming sparser further offshore. There are two located within the Offshore ECC, between 2 nm and 3 nm from shore, at charted depths of 36 m and 42 m. The closest charted wreck to the OAA is approximately 2 nm from its southernmost point, at an approximate depth of 108 m.

80. There are also charted obstructions, although fewer in number, with the closest to the OAA being approximately 5 nm west of its northwestern point and at a depth of approximately 72 m.

7.4 Ports, Harbours and Related Facilities

81. Peterhead is the main port in the vicinity of the Offshore Development, located approximately 2 nm from the southern boundary of the Offshore ECC, with a pilot boarding station at its entrance. Other key ports include Aberdeen and Montrose, which vessels in proximity to the Offshore Development commonly transit to/from (see **Section 11.2**).

7.5 Aids to Navigation

82. All aids to navigation identified in proximity to the Offshore Development are located at shore, with the exception of the lights on the five turbines at the Hywind Scotland Offshore Wind Farm.

83. It is noted that, although not charted at the time of writing (December 2023), three aids to navigation have been deployed by the Applicant within the OAA. These aids to navigation comprise a metocean buoy and two Floating Light Detection and Ranging (FLiDAR) buoys. They will remain in situ for at least 12 months.

7.6 Oil and Gas Installations

84. The Buzzard oil and gas field is the closest field, located to the northeast of the OAA, with the Buzzard platform located approximately 12 nm to the northeast of its northernmost point, connected to two manifolds and a well.

7.7 Subsea Cables

85. There are two subsea cables in proximity to the Offshore Development:

- The export cable for the Hywind Scotland Offshore Wind Farm, approximately 0.3 nm south of the Offshore ECC at its closest point; and
- The *CNS Fibre Optic,* a telecommunications cable running alongside a pipeline south of the Offshore Development, with its closest point to the OAA being approximately 3.5 nm southeast of its southernmost point.

7.8 Spoil Grounds

86. A spoil ground is located approximately 0.4 nm south of the Offshore ECC, approximately 1 nm^2 in area. Smaller spoil grounds are also located to its southwest within and around the Peterhead Port authority limits, each covering an area of no more than 0.1 nm^2.

7.9 Reported Anchorage

87. A single reported anchorage location was identified in proximity to the Offshore Development, approximately 8 nm south of the Offshore ECC's landfall, within the Bay of Cruden.

8 Meteorological Ocean Data

88. This section presents meteorological and oceanographic statistics local to the Offshore Development, based on information provided by the Applicant in 2023. The data presented in this section is used as input to the collision and allision risk modelling (see **Section 15**).

8.1 Wind Direction

89. The distribution of wind direction data provided using NM315-ERA5 Vortex ERA5 Data for a height of 50 m is presented in Figure 8-1, in the form of a wind rose.

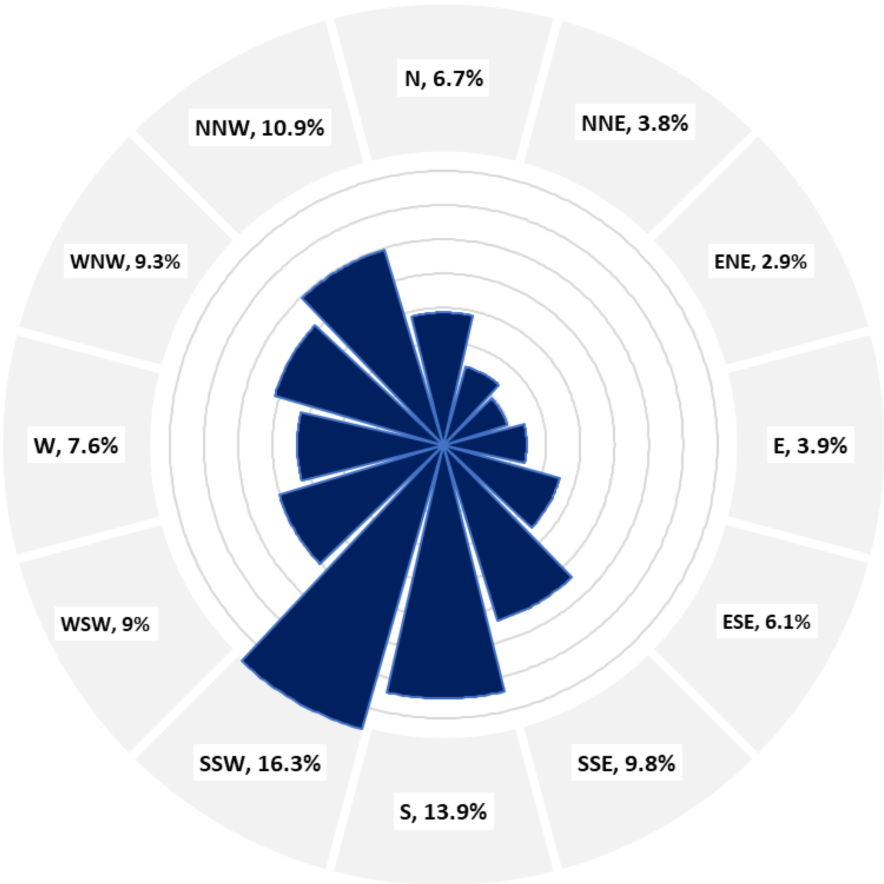


Figure 8-1 Wind Direction Distribution in Proximity to the Offshore Development

90. It can be seen that winds are predominantly from the south-southwest (16.3%) and south (13.9%).

8.2 Significant Wave Height

91. **Table 3.2** presents the proportion of the sea state within each of three defined ranges. Data from an Ørsted model and from the Salamander Project's basis of

design was provided, with the latter being chosen as being worst-case and therefore more conservative.

Table 8.1 Sea State Data

Sea State	Proportion (%)
Calm (< 1 m)	18.93
Moderate (1 – 5 m)	79.12
Severe (> 5 m)	1.95

8.3 Visibility

92. The annual average incidence of poor visibility has been assumed to be 3% based on information provided in the relevant Admiralty Sailing Directions (UKHO, 2021).

8.4 Tidal Speed and Direction

93. Tidal speed and direction data has been derived from Admiralty charts (UKHO, 2023). **Table 8.2** presents the peak flood and ebb direction and speed values obtained.

Table 8.2 Tidal Data

Tidal Diamond (Chart 1409)	Flood		Ebb	
	Direction (°)	Speed (knots)	Direction (°)	Speed (knots)
M	180	2.1	356	2.2
N	149	1.7	318	1.5
Q	189	0.8	7	0.9

9 Emergency Response and Incident Overview

94. This section summarises the existing emergency response resources (including SAR) and reviews historical maritime incident data to assess baseline incident rates in proximity to the Offshore Development.

9.1 Search and Rescue Helicopters

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

96. The SAR helicopter service is currently operated out of 10 base locations around the UK, with the closest to the Offshore Development located at Inverness Airport, approximately 78 nm west of the Offshore ECC. This base operates two AgustaWestland 189 (AW189) helicopters.

97. As part of the new MCA contract, Bristow will also launch two new seasonal bases in Fort William and Carlisle, with the former potentially relevant to the Offshore Development.

98. 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 2021. This data, within the EIA Study Area and EIA Cable Corridor Study Area, are presented in **Figure 9-1**.

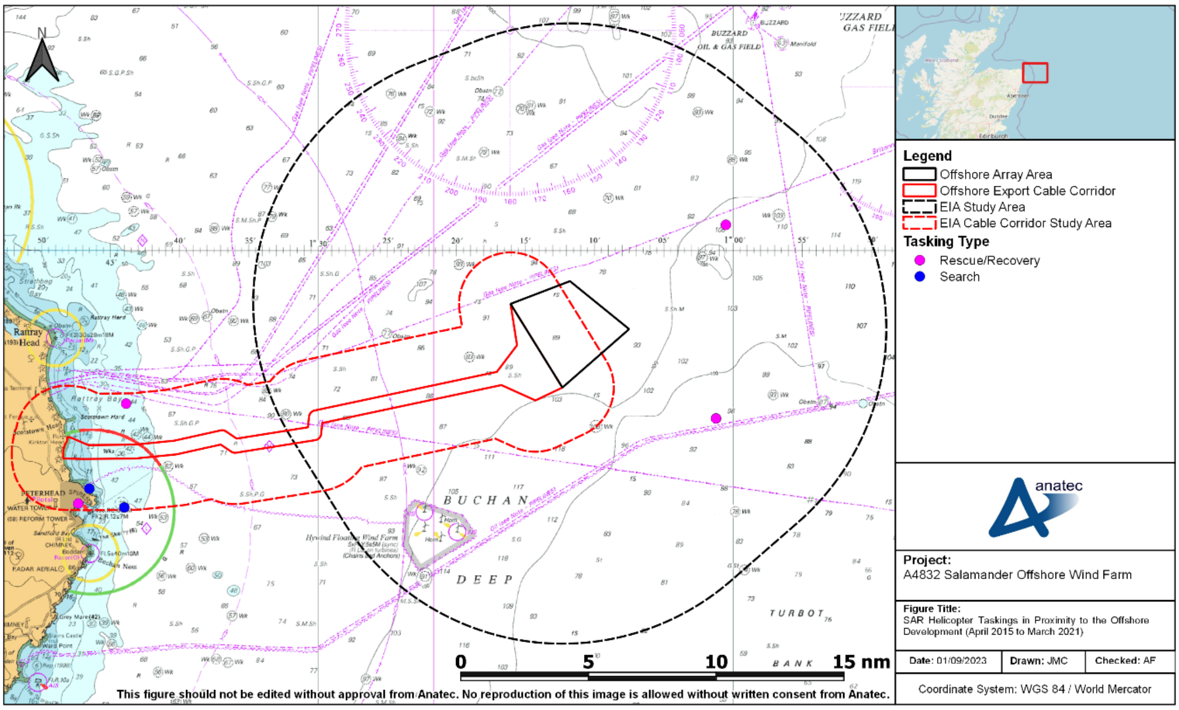


Figure 9-1 SAR Helicopter Taskings in Proximity to the Offshore Development (April 2015 to March 2021)

99. A total of seven helicopter taskings occurred in proximity to the Offshore Development, with five of these originating from the base in Inverness and the remaining two originating from the base in Stornoway. Five of the taskings were of type "*Rescue/Recovery*", with the remaining two being of type "*Search*".

9.2 Royal National Lifeboat Institution

100. The RNLI is organised into six divisions, with the relevant region for the Offshore Development 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 (ALBs) and Inshore Lifeboats (ILBs).

101. **Figure 9-2** and **Figure 9-3** present the RNLI incidents documented within the EIA Study Area and the EIA Cable Corridor Study Area during the 10 year period between 2011 and 2020, alongside the RNLI stations. **Figure 9-2** colour-codes the incidents by casualty type and **Figure 9-3** colour-codes the incidents by incident type. It is noted that hoaxes and false alarms have been excluded from the analysis.

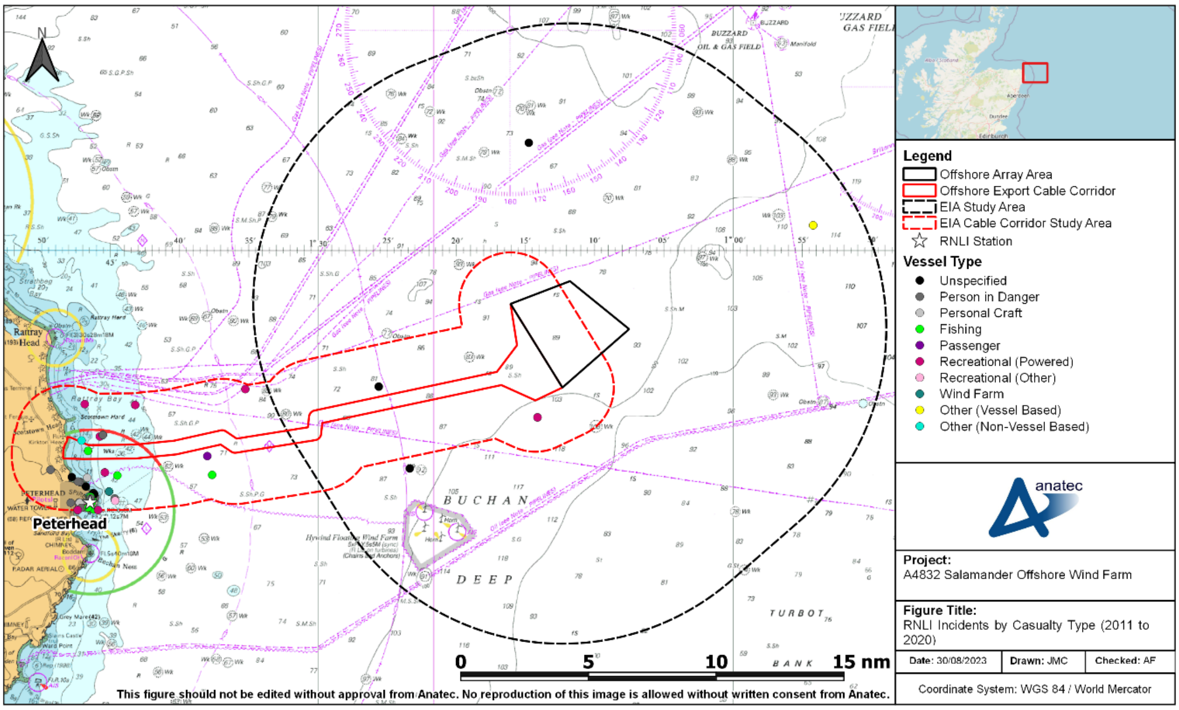


Figure 9-2 RNLI Incidents by Casualty Type (2011 to 2020)

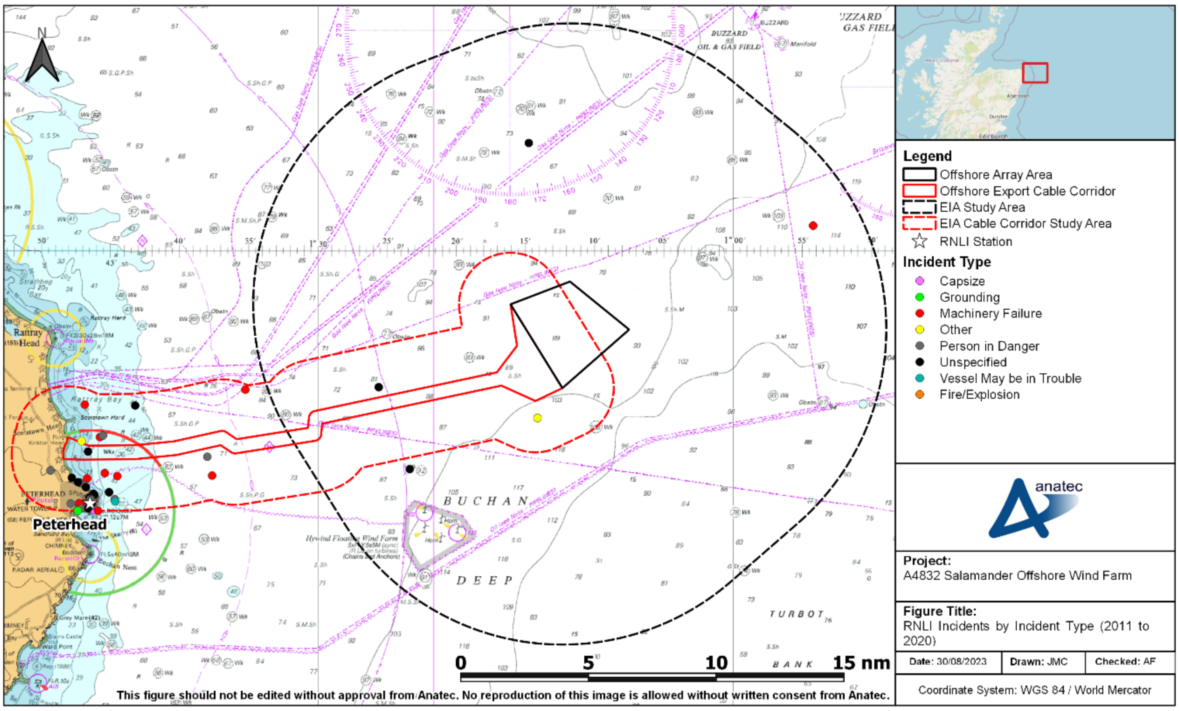


Figure 9-3 RNLI Incidents by Incident Type (2011 to 2020)

102. The closest RNLI station to the Offshore Development is at Peterhead (approximately 2 nm from the landfall of the Offshore ECC), which houses an active ALB. Given that the RNLI have an operational limit of 100 nm, it is anticipated that an incident

occurring in proximity to the Offshore Development may result in a response from an RNLI asset.

9.2.1 Offshore Array Area

103. A total of eight lifeboat responses documented by the RNLI occurred within the EIA Study Area, with six of these being unique incidents, corresponding to an average of one unique incident every one to two years. None of these incidents occurred within the OAA itself.

104. Four of these involved unspecified casualty and incident type; two of these were reported in the same location (each involving an "*unsuccessful search*") while the other two were in two different locations. All of these four were within 24 hours of one another and therefore potentially related (given the general low frequency of incidents in the area).

105. The remaining two unique incidents involved a fishing vessel experiencing machinery failure and a person in danger on a recreational vessel.

106. Two responses were from Peterhead, two from Fraserburgh, one from Leverburgh and one from Aberdeen.

9.2.2 Offshore Export Cable Corridor

107. A total of 58 lifeboat responses documented by the RNLI occurred within the EIA Cable Corridor Study Area, with 48 of these being unique incidents, corresponding to an average of five unique incidents per year. Incidents were heavily weighted towards shore, with only two of the incidents occurring beyond 7 nm of the coast. A single incident occurred within the Offshore ECC itself; a fishing vessel involved in an incident of unspecified type.

108. Excluding "*person in danger*" and non-vessel based incidents, the most common casualty types were fishing vessels (21%) and powered recreational (17%). The most common incident types recorded were "*person in danger*" (35%) and "*unspecified*" (31%).

109. Peterhead station responded to 88% of the incidents, with the remaining 12% being responded to by Fraserburgh.

9.3 Marine Accident Investigation Branch

110. All UK flagged vessels and non-UK flagged vessels in UK territorial waters (12 nm), 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, covering the 10 year period between 2012 to 2021.

111. The incidents recorded within the MAIB data between 2012 and 2021 occurring within the EIA Study Area and EIA Cable Corridor Study Area are presented in **Figure**

9-4, colour-coded by casualty type. Following this, **Figure 9-5** shows the same data colour-coded by incident type.

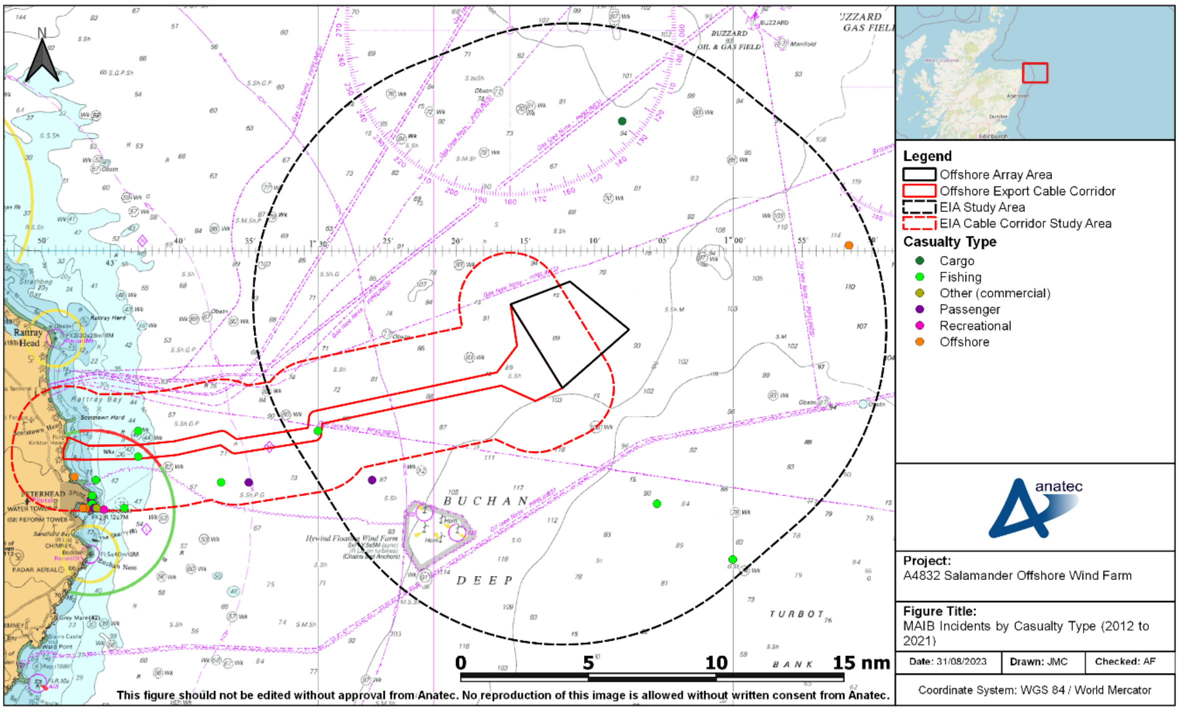


Figure 9-4 MAIB Incidents by Casualty Type (2012 to 2021)

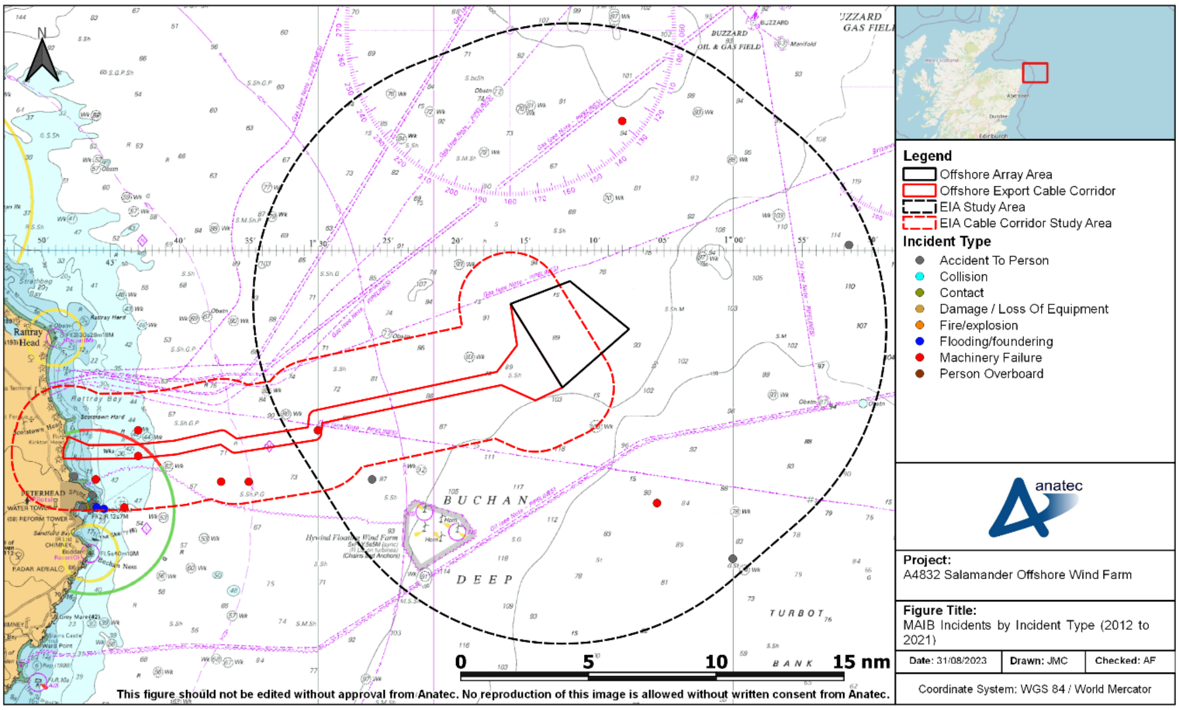


Figure 9-5 MAIB Incidents by Incident Type (2012 to 2021)

9.3.1 Offshore Array Area

112. A total of six incidents documented by the MAIB occurred within the EIA Study Area between 2012 and 2021, corresponding to an average of one incident every one to two years. Three of the casualties were fishing vessels, while the remaining three involved a cargo vessel, an offshore vessel and a passenger vessel. Three involved an accident to a person and the remaining three involved machinery failure. None of these incidents occurred within the OAA itself.

9.3.2 Offshore Export Cable Corridor

113. A total of 28 incidents documented by the MAIB occurred within the EIA Cable Corridor Study Area between 2012 and 2021, corresponding to an average of three per year. The most common casualty type was fishing, accounting for half of the casualties. This was followed by offshore, which accounted for 32%. Two of these incidents occurred within the Offshore ECC itself; both involved a fishing vessel experiencing machinery failure.

9.3.3 Review of 2002 to 2011 MAIB Data

114. A review of older MAIB incident data during the previous 10 years, i.e. 2002 to 2011, indicated that the frequency of incidents has seen a minor decline over time in this area. **Figure 9-6** presents an overview of this data within both the EIA Study Area and EIA Cable Corridor Study Area, colour-coded by incident type.

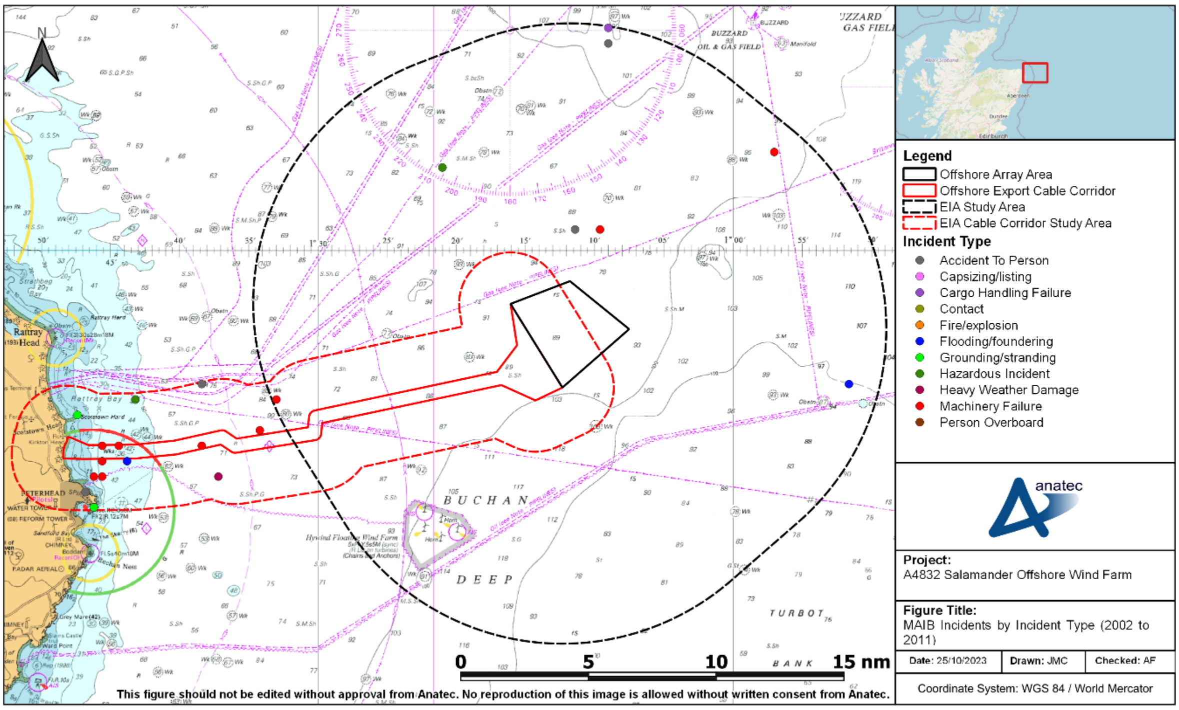


Figure 9-6 MAIB Incidents by Incident Type (2002 to 2011)

115. Within the EIA Study Area, a total of eight unique incidents (involving nine vessels) documented by the MAIB occurred between 2002 and 2011. Compared to the total of six unique incidents between 2012 and 2021, this demonstrates a slight decrease in the number of incidents (although approximately the same incident frequency i.e. an incident every one to two years). None of these incidents occurred within the OAA itself.

116. The most common casualty type documented within the EIA Study Area during 2002 and 2011 was fishing, accounting for five of the nine casualties. The remaining four casualties were two offshore vessels, a cargo vessel and an "*other (commercial)*" vessel. The most common incident type documented within the EIA Study Area during 2002 and 2011 was "*machinery failure*", accounting for three of the eight incidents. The remaining five comprised of two "*accident to person*", one "*cargo handling failure*", one *"flooding/foundering*" and one "*hazardous incident*".

117. Within the EIA Cable Corridor Study Area, a total of 37 unique incidents documented by the MAIB occurred between 2002 and 2011. Compared to the total of 28 unique incidents between 2012 and 2021, this demonstrates a decrease in incident frequency from three to four incidents per year between 2002 and 2011 to an average frequency of three incidents per year between 2012 and 2021. Three of these incidents occurred within the Offshore ECC itself; all three involved machinery failure, with two of the casualties being fishing vessels and the remaining vessel being a "*Small commercial motor vessel*".

118. The most common casualty type documented within the EIA Cable Corridor Study Area during 2002 and 2011 was fishing vessels, accounting for 69%. This was followed by offshore vessels, accounting for 15%. The most common incident types documented within the EIA Cable Corridor Study Area during 2002 and 2011 were "*accident to person*" (30%) and "*machinery failure*" (27%).

9.4 Maritime Rescue Coordinate Centres and Joint Rescue Coordinate Centres

119. Her Majesty's Coastguard (HMCG), a division of the MCA, is responsible for requesting and tasking SAR resources made available to other authorities and for coordinating the subsequent SAR operations (unless they fall within military jurisdiction).

120. The HMCG coordinates SAR operations through a network of 11 Maritime Rescue Coordination Centres (MRCC), including a Joint Rescue Coordination Centre (JRCC) based in Hampshire.

121. All of the MCA's operations, including SAR, are divided into 18 geographical regions. Area 3 – "*East Scotland*" – covers the east coast of Scotland from St Andrews to the Inverness, and therefore covers the area encompassing the Offshore Development. The Aberdeen MRCC is located within Area 3 approximately 39 nm southwest of the

southernmost point of the OAA, as illustrated in **Figure 9-7**, and coordinates the SAR response for maritime and coastal emergencies within the district boundary.

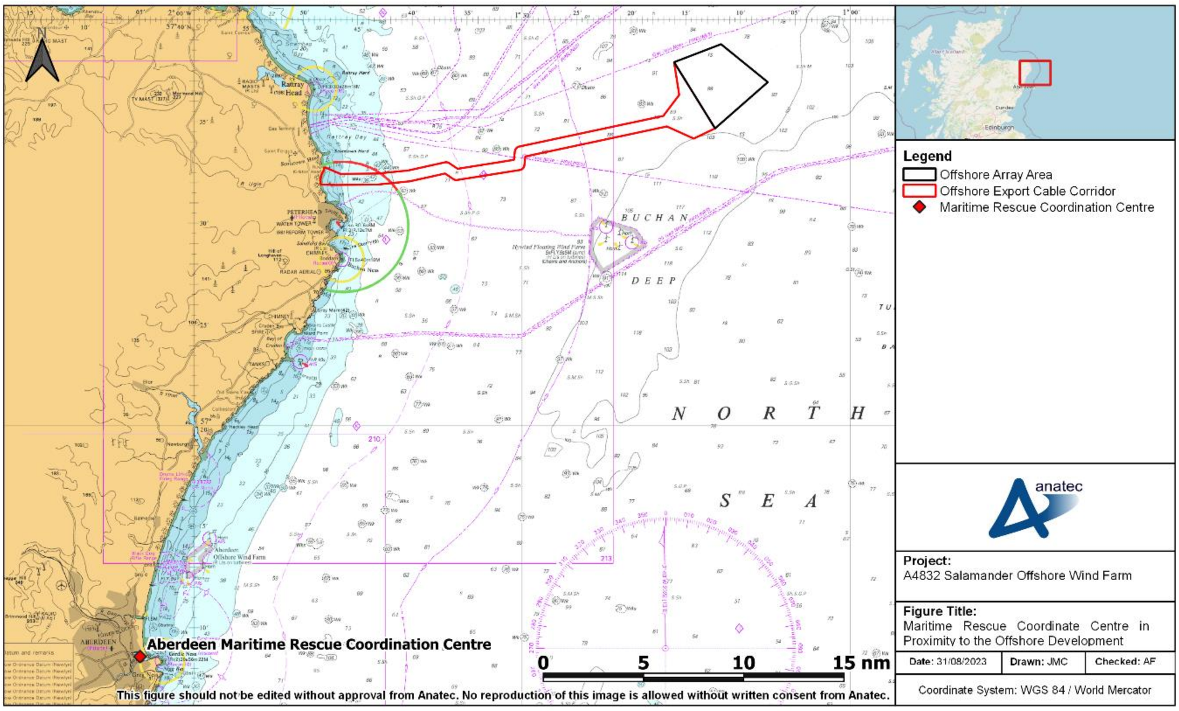


Figure 9-7 Maritime Rescue Coordination Centre in Proximity to the Offshore Development

9.5 Global Maritime Distress and Safety System

122. 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.

123. There are four GMDSS sea areas, as shown in **Figure 9-8**, and in the UK it is the responsibility of the MCA to ensure Very High Frequency (VHF) coverage from coastal stations within sea area A1 around the UK coastline.

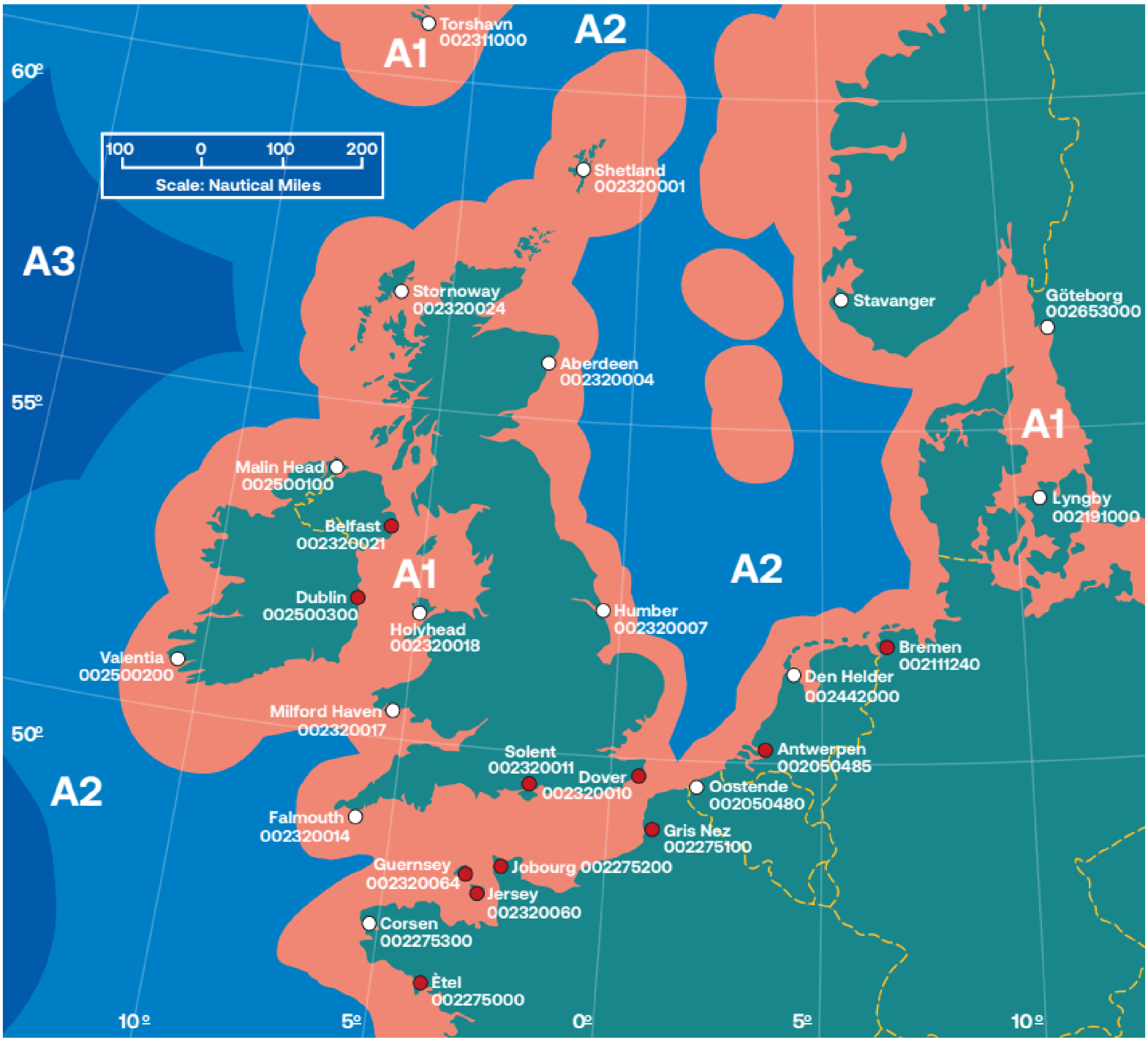


Figure 9-8 GMDSS sea areas (MCA, 2021)

9.6 Historical Offshore Wind Farm Incidents

9.6.1 Incidents Involving UK Offshore Wind Farm Developments

124. As of October 2023, there are 42 operational offshore wind farms in the UK, ranging from the North Hoyle Offshore Wind Farm (fully commissioned in 2003) to Hornsea Project Two (fully commissioned in 2022). Between them, these developments encompass approximately 21,855 fully operational WTG years.

125. 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

[2] Includes only incidents reported to an accident investigation branch or an anonymous reporting service. Unconfirmed incidents have not been considered noting that to date only one further alleged incident has been rumoured but there is no evidence to confirm.

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.

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	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	Major	None	MAIB

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage*	Harm to Persons	Source
			been holed, causing extensive flooding but no injuries sustained.			
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 vessel allided with 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 wind turbine. Minor damage to vessel and wind turbine sustained, with no personal injuries.	Minor	None	Marine Safety Forum
Third-party	Allision	9 June 2022	Fishing vessel allision with wind turbine resulting in damage to vessel and two minor injuries for crew members. RNLI lifeboat escorted vessel under its own power to port.	Minor	Injury	Web search (RNLI, 2022) and web search (Vessel Tracker, 2022)

(*) As per incident reports.

126. 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.

127. As of October 2023, 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.

128. As of October 2023, there have been 13 reported cases of an allision between a vessel and a WTG (under construction, operational or disused) in the UK, with all but one involving a support vessel for the development. Therefore, there has been an average of 1,681 years per WTG allision incident in the UK, noting that this is a conservative calculation given that only operational WTG hours have been included (whereas allision incidents counted include non-operational WTGs).

9.6.2 Incidents Involving Non-UK Offshore Wind Farms

129. It is acknowledged that collision and allision incidents involving non-UK offshore wind farm developments have also occurred. However, it is not possible to maintain a comprehensive list of such incidents.

130. One high profile non-UK incident which is noted is that involving a bulk carrier in January 2022 which dragged anchor during a storm in Dutch waters and collided with another 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 though an under-construction offshore wind farm where it allided with a WTG foundation and a platform foundation before being taken under tow.

9.6.3 Incidents Responded to by Vessels Associated with UK Offshore Wind Farms

131. From news reports, basic web searches and experience at 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**.

132. **Table 9.2** comprises known incidents that were responded to by a wind farm vessel. Additional incidents associated with the construction or operation of offshore wind farms are also known to have occurred. These incidents typically involve an accident to person which requires medical attention (including emergency response) but does not affect the operation of the vessel involved.

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 Offshore Wind Farm	HMCG 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 Offshore Wind Farm	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 Offshore Wind Farm	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 Offshore Wind Farm	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 Offshore Wind Farm	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 Offshore Wind Farm	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
Search	21 May 2020	Walney Offshore Wind Farm	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

Incident Type	Date	Related Development	Description of Incident	Source
Aircraft crash	15 June 2020	Hornsea Project One	United States (US) jet crashed into sea during routine flight. CTV and SOV for Hornsea Project One joined the search for the missing pilot.	Web search (4C Offshore, 2020)
Fire/ explosion	15 December 2020	Dudgeon Offshore Wind Farm	Fishing vessel experienced explosions on board with crew injured. SOV for Dudgeon deployed its Fast Rescue Boat (FRB) and evacuated the casualty vessel.	Web search (Offshore WIND, 2020)
Vessel in distress	3 July 2021	Robin Rigg	Wind farm CTV fire alarm sounded, with the engine then shut down. A support vessel for Robin Rigg was able to assist in escorting the vessel to port.	Web search (Vessel Tracker, 2021)
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)
Allision	9 June 2022	Westermost Rough	Fishing vessel allided with a wind turbine at Westermost Rough. A supply vessel was among the responders as an RNLI lifeboat escorted the vessel under its own power to port.	Web search (Vessel Tracker, 2022)

10 Vessel Traffic Movements

133. This section presents analysis of vessel traffic in proximity to the OAA and Offshore ECC. For the numerical analysis in this section, vessels were not counted more than once on a single day to avoid overcounting vessels in cases where a vessel may have been dropped and reacquired on AIS.

10.1 Offshore Array Area

134. This section presents analysis of vessel traffic recorded in proximity to the OAA as detailed in **Section 5**.

10.1.1 Overview

135. A plot of the vessel traffic recorded within the EIA Study Area during the 14-day winter period followed by a density plot of this traffic within a 0.25 nm × 0.25 nm grid is presented in **Figure 10-1** and **Figure 10-2** respectively. Following this, the equivalent figures for the summer period are presented in **Figure 10-3** and **Figure 10-4** respectively.

136. One vessel during the winter period had unknown type while all vessels during the summer period were assigned a known type.

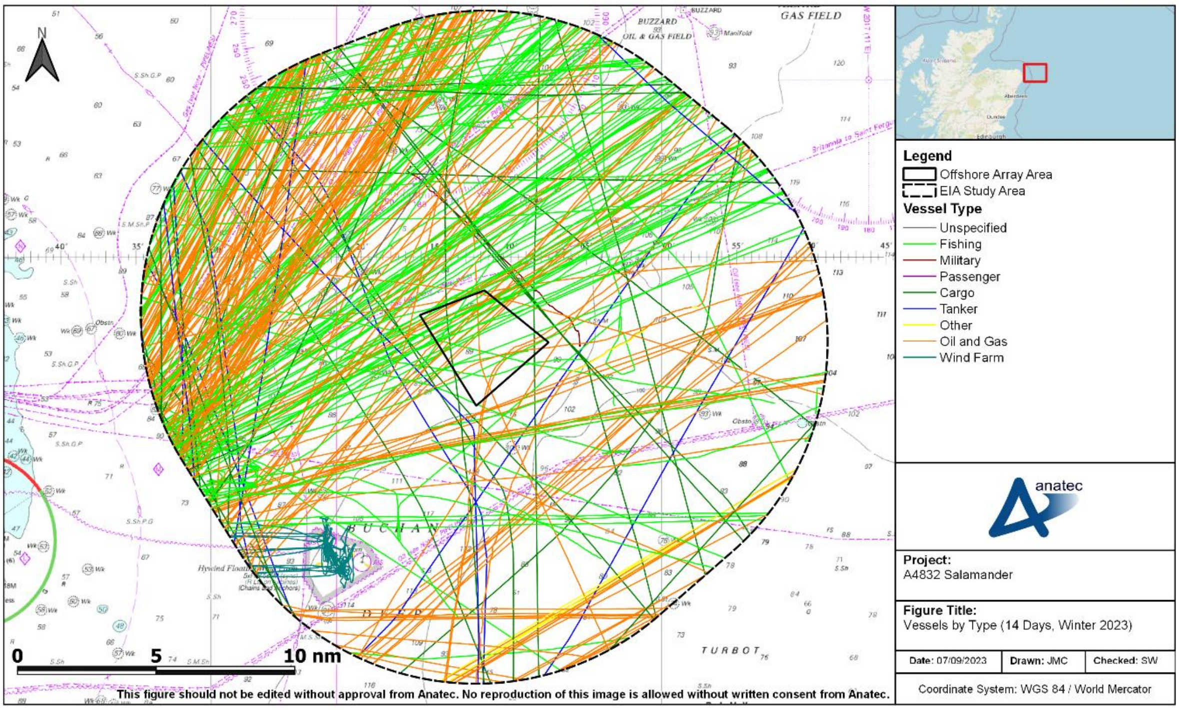


Figure 10-1 Vessels by Type (14 Days, Winter 2023)

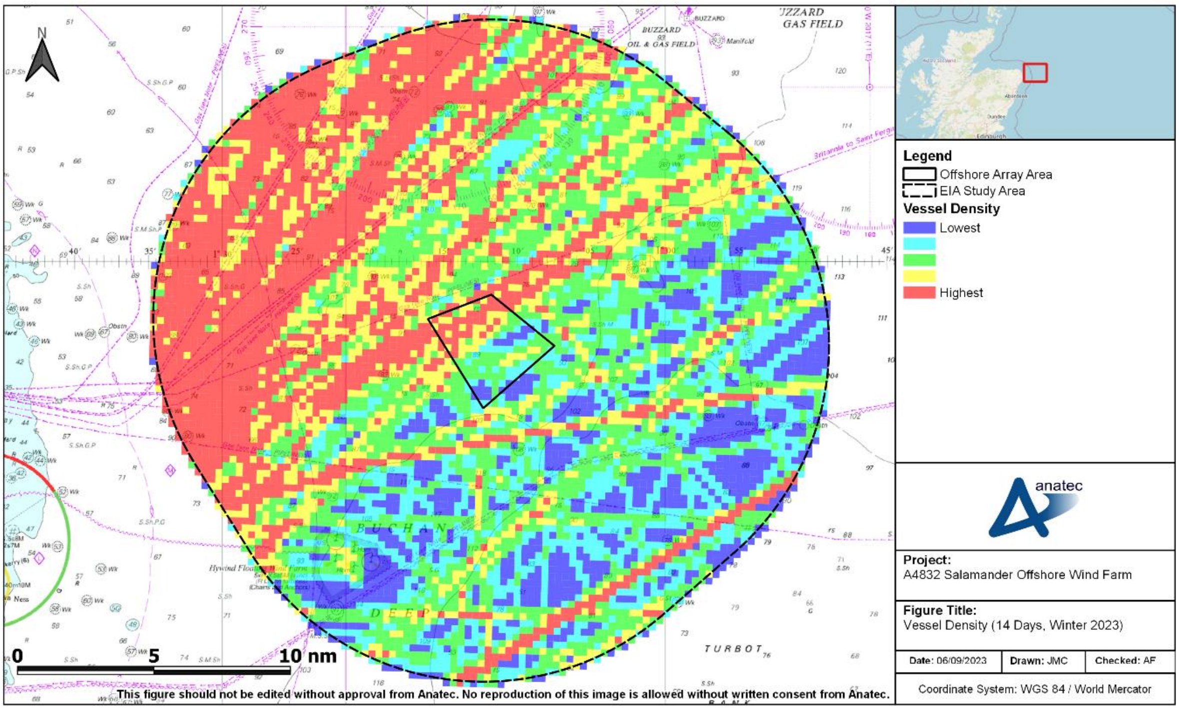


Figure 10-2 Vessel Density (14 Days, Winter 2023)

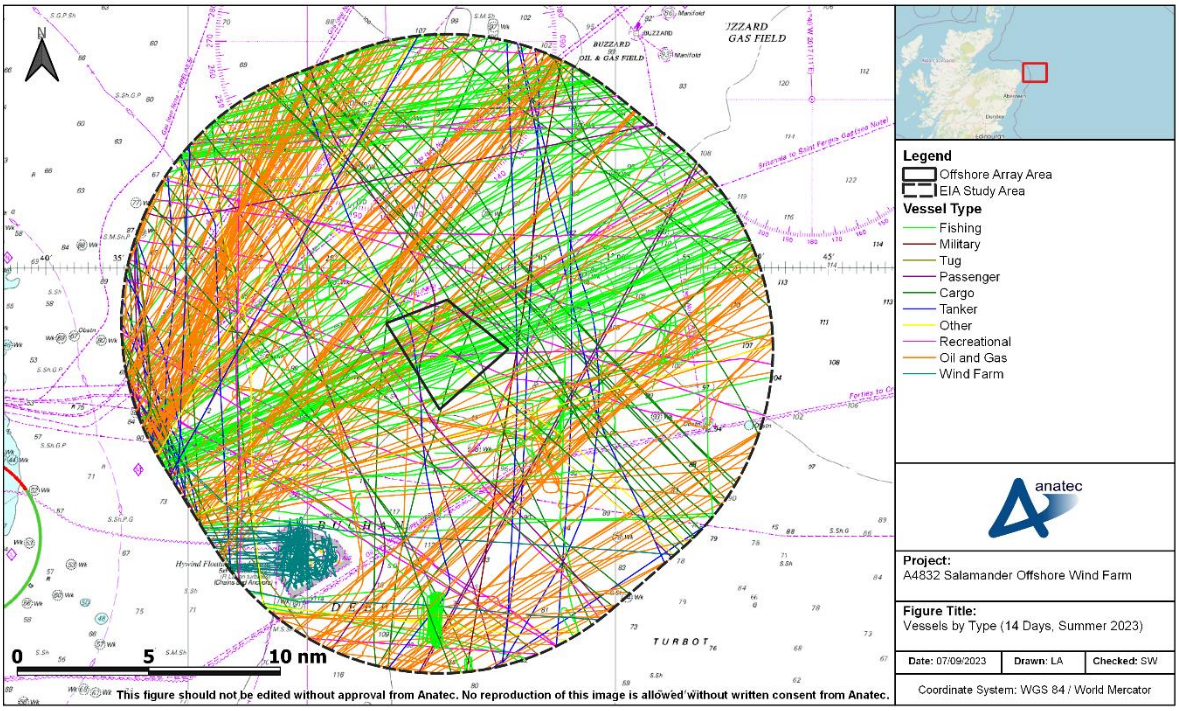


Figure 10-3 Vessels by Type (14 Days, Summer 2023)

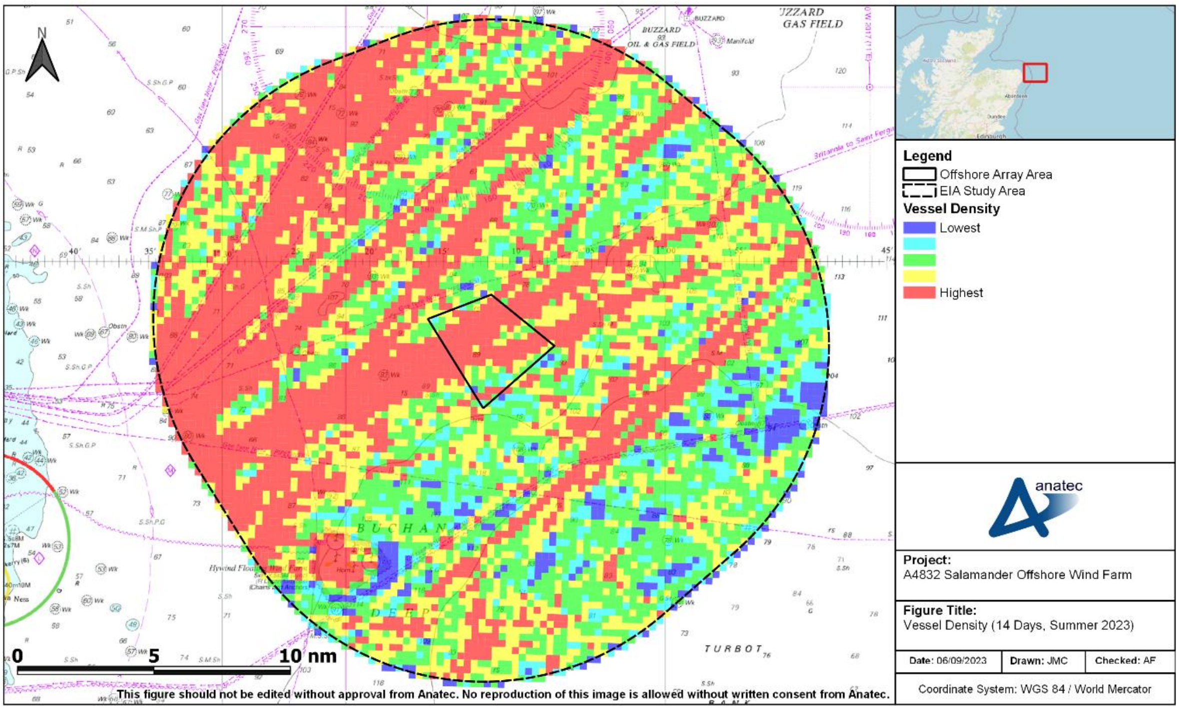


Figure 10-4 Vessel Density (14 Days, Summer 2023)

137. It can be seen that, during both survey periods, vessel traffic in the area generally consists of fishing vessels and oil and gas vessels routeing in a northeast/southwest direction. During both periods, higher vessel density can be seen in the northwestern half of the EIA Study Area compared to the southeastern half. There was higher vessel density within the OAA itself during the summer period.

138. Further details of each of the main vessel types can be found in **Section 10.1.3**.

10.1.2 Vessel Counts

139. The number of unique vessels per day recorded within the EIA Study Area during the winter period is provided in **Figure 10-5**.

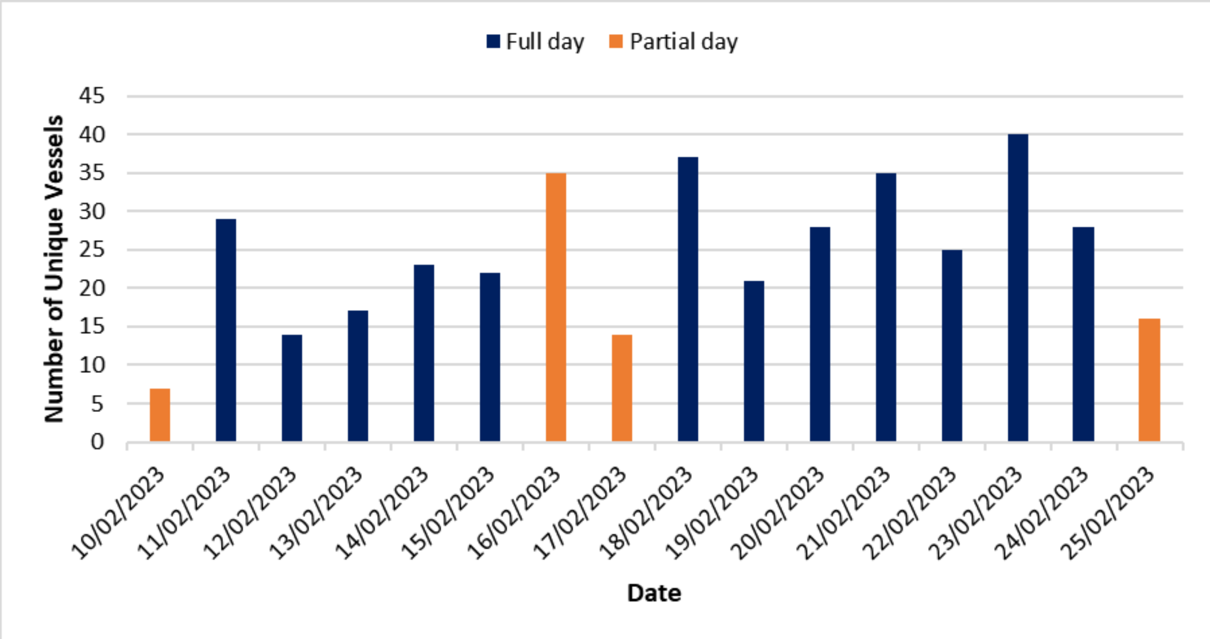


Figure 10-5 Number of Vessels per Day (14 Days, Winter 2023)

140. Within the EIA Study Area, there was an average of 28 vessels per day recorded during the winter period. The busiest full day was the 23rd February 2023, on which a total of 40 unique vessels was recorded. The quietest full day was the 12th February 2023, on which a total of 14 unique vessels was recorded.

141. Within the OAA, there was an average of three vessels per day recorded during the winter period. The busiest full day was the 20th February 2023, during which a total of eight unique vessels was recorded. The quietest full day was the 24th February 2023, on which no vessels were recorded.

142. The number of unique vessels per day recorded within the EIA Study Area during the summer period is provided in **Figure 10-6**.

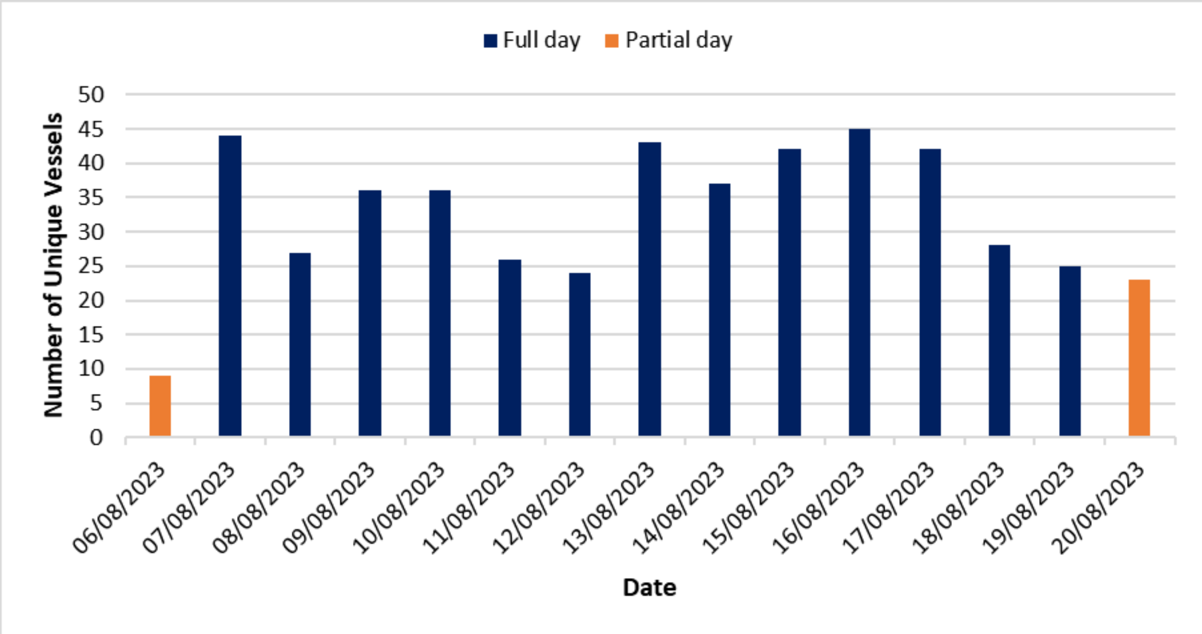


Figure 10-6 Number of Vessels per Day (14 Days, Summer 2023)

143. Within the EIA Study Area, there was an average of 35 vessels per day recorded during the summer period. The busiest full day was the 16th August 2023, on which a total of 45 unique vessels was recorded. The quietest full day was the 12th August 2023, on which a total of 24 unique vessels was recorded.

144. Within the OAA, there was an average of five vessels per day recorded during the summer period. The busiest full day was the 16th August 2023, during which a total of 11 unique vessels was recorded. The quietest full day was the 19th August 2023, on which one vessel was recorded.

10.1.3 Vessel Type

10.1.3.1 Overview

145. The percentage distribution of the main vessel types within the EIA Study Area as well as the OAA during the winter survey period is presented in **Figure 10-7**. The same distributions for the summer survey data are presented in **Figure 10-8**.

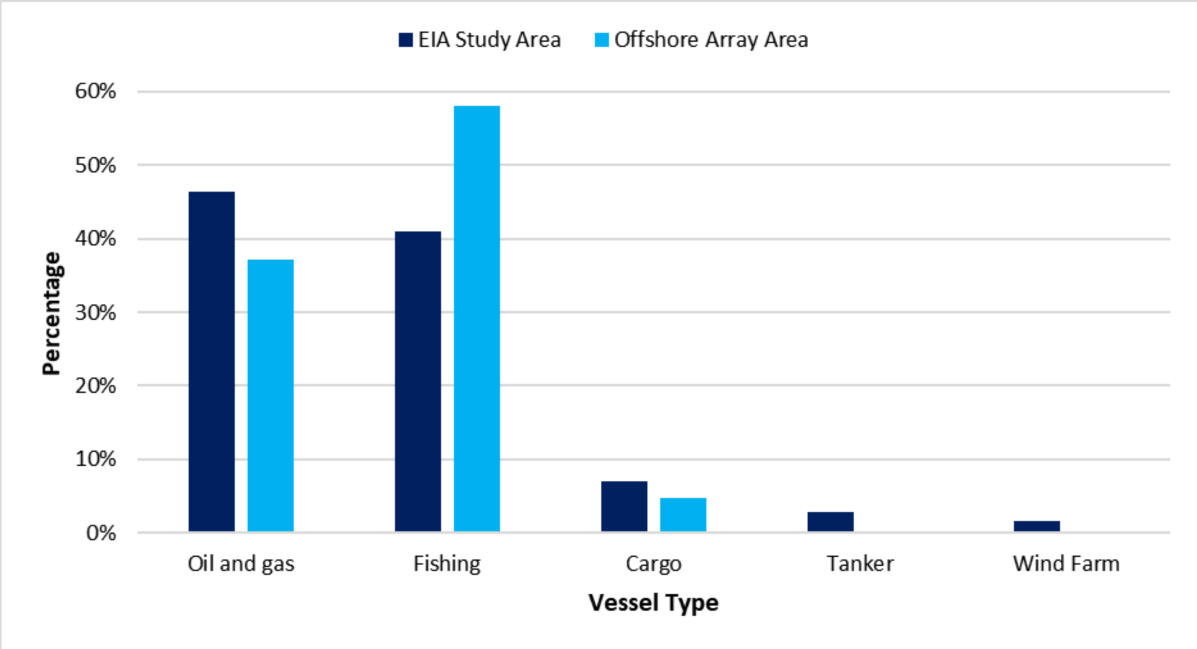


Figure 10-7 Distribution of Vessel Types (14 Days, Winter 2023)

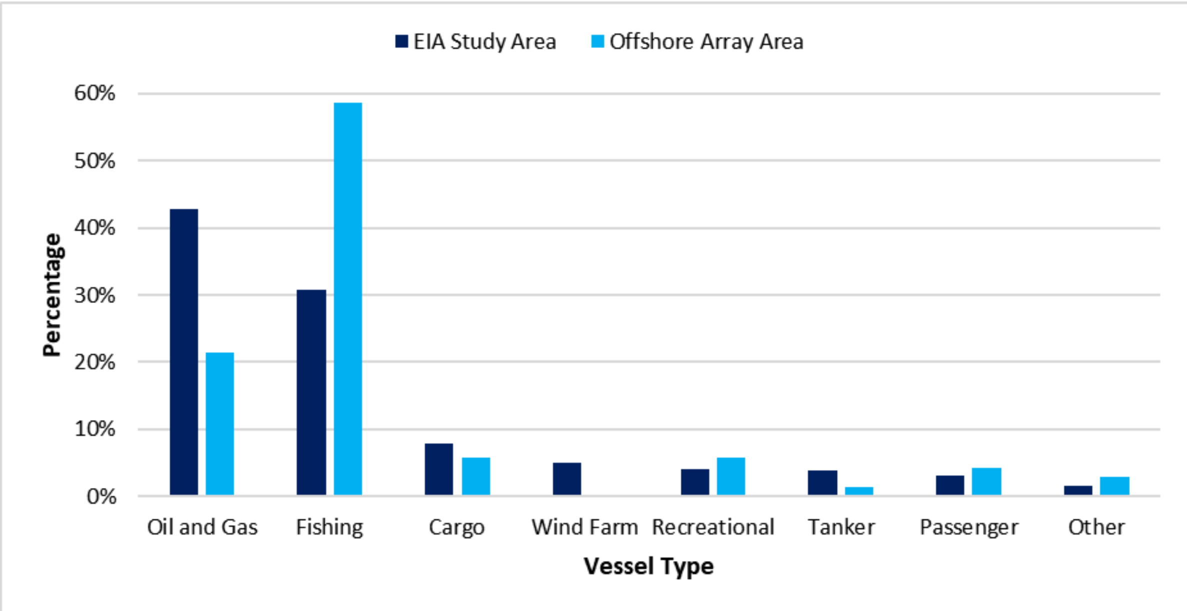


Figure 10-8 Distribution of Vessel Types (14 Days, Summer 2023)

146. During both survey periods, the dominant vessel types within the EIA Study Area were oil and gas vessels and fishing vessels, accounting for 46% and 41% respectively during the winter, and 43% and 31% respectively during the summer.

147. Besides oil and gas vessels and fishing vessels, the most common vessel types in the EIA Study Area during the winter were cargo vessels (7%), tankers (3%) and wind farm vessels (2%).

148. Besides oil and gas vessels and fishing vessels, the most common vessel types in the EIA Study Area during the summer were cargo vessels (8%), wind farm vessels (5%), recreational vessels (4%), tankers (4%), passenger vessels (3%) and vessels in the 'other' category (which included research/survey vessels).

149. During both survey periods, the dominant vessel types within the OAA were fishing vessels and oil and gas vessels, accounting for 58% and 37% respectively during the winter, and 59% and 21% respectively during the summer.

150. Besides oil and gas vessels and fishing vessels, the only vessel type recorded within the OAA during the winter was cargo, accounting for 5%.

151. Besides oil and gas vessels and fishing vessels, the most common vessel types recorded within the OAA during the summer were cargo vessels (6%), recreational vessels (6%), passenger vessels (4%), vessels in the 'other' category (3%) and a tanker (1%).

10.1.3.2 Oil and Gas Vessels

152. **Figure 10-9** presents the oil and gas vessels recorded within the EIA Study Area during the combined 28-day survey period.

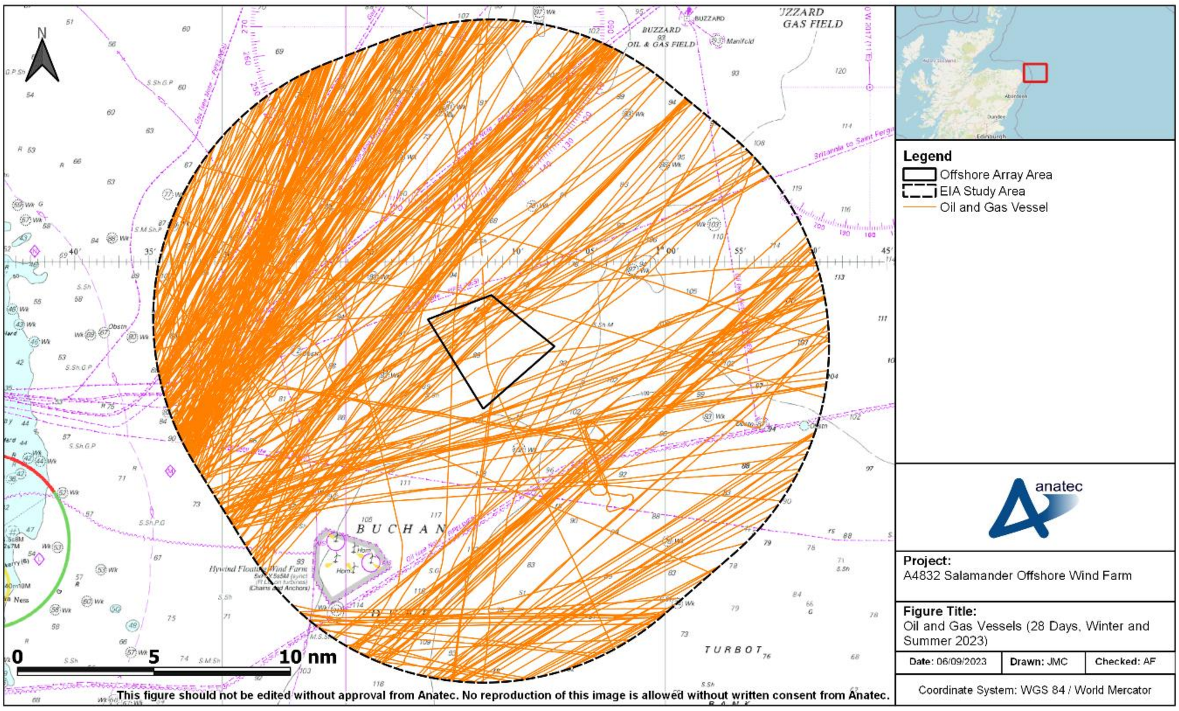


Figure 10-9 Oil and Gas Vessels (28 Days, Winter and Summer 2023)

153. Oil and gas vessels were generally observed to be engaged in northeast/southwest transit, and mainly within the northwest half of the EIA Study Area, with destinations

most commonly being Aberdeen and Peterhead as well as various North Sea oil fields.

154. An average of 14 oil and gas vessels per day was recorded during the combined 28-day period, with one per day within the OAA.

10.1.3.3 Fishing Vessels

155. **Figure 10-10** presents the fishing vessels recorded within the EIA Study Area during the combined 28-day survey period, colour-coded by average speed.

156. As a general heuristic, average speeds of below six knots are indicative of active fishing, noting that general vessel behaviour in addition to average speed should be considered when identifying fishing vessels in **Figure 10-10** that are engaged in active fishing.

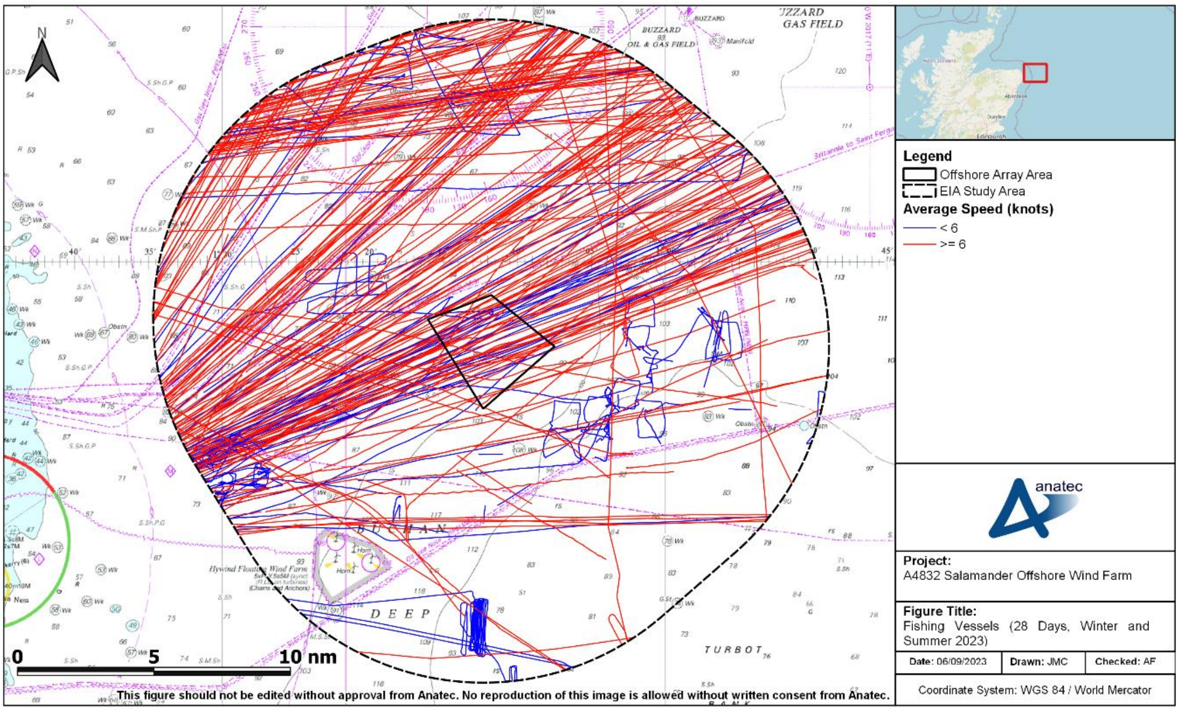


Figure 10-10 Fishing Vessels (28 Days, Winter and Summer 2023)

157. Fishing vessels were mainly observed to be engaged in northeast/southwest transit through the centre of the EIA Study area, or in east/west transit to the north of the EIA Study Area. Key destinations included Peterhead, Fraserburgh and Buckie.

158. An average of 11 fishing vessels per day was recorded during the combined 28-day period, with two to three per day within the OAA.

159. Behaviour suggestive of active fishing (based on average speeds and track behaviour) was observed at various locations within the EIA Study Area, however it is noted that there was no clear active fishing within the OAA.

160. A density heat map of VMS data recorded throughout 2022 within the EIA Study Area is presented in **Figure 10-11**.

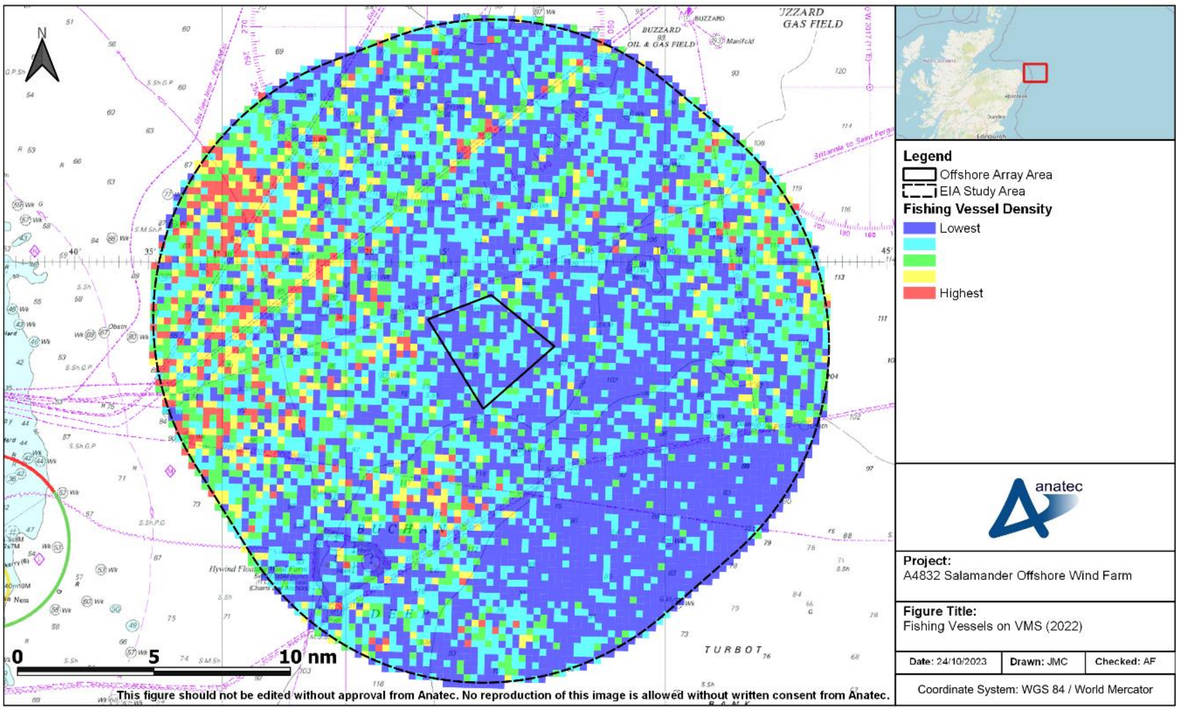


Figure 10-11 VMS Density (2022)

161. High density can mainly be seen at the western and northwestern portions of the EIA Study Area. It can also be seen that a pipeline from the Buzzard oil and gas field coincides with consistently higher density compared to the immediate vicinity, suggesting that active fishing is undertaken alongside it with relative frequency.

162. Note that further information about fishing vessels can be found in **Volume ER.A.3, Chapter 13: Commercial Fisheries**.

10.1.3.4 Cargo Vessels

163. **Figure 10-12** presents the cargo vessels recorded within the EIA Study Area during the combined 28-day survey period.

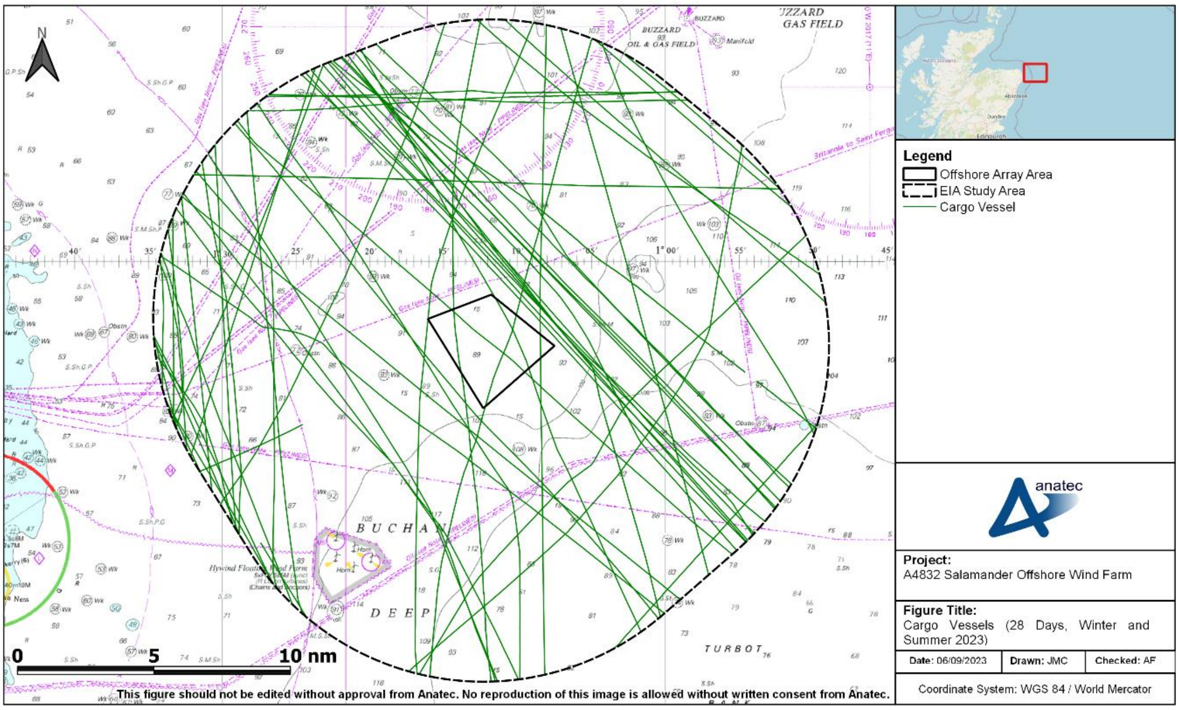


Figure 10-12 Cargo Vessels (28 Days, Winter and Summer 2023)

164. Cargo vessels were most commonly seen in northwest/southeast transit throughout the EIA Study Area, broadcasting a variety of destinations including ports in the UK, the Netherlands, Iceland, the Faroe Islands, Denmark and Sweden.

165. An average of two to three cargo vessels per day was recorded during the combined 28-day period, with one every four to five days within the OAA.

10.1.3.5 Tankers

166. **Figure 10-13** presents the tankers recorded within the EIA Study Area during the combined 28-day survey period, colour-coded by draught.

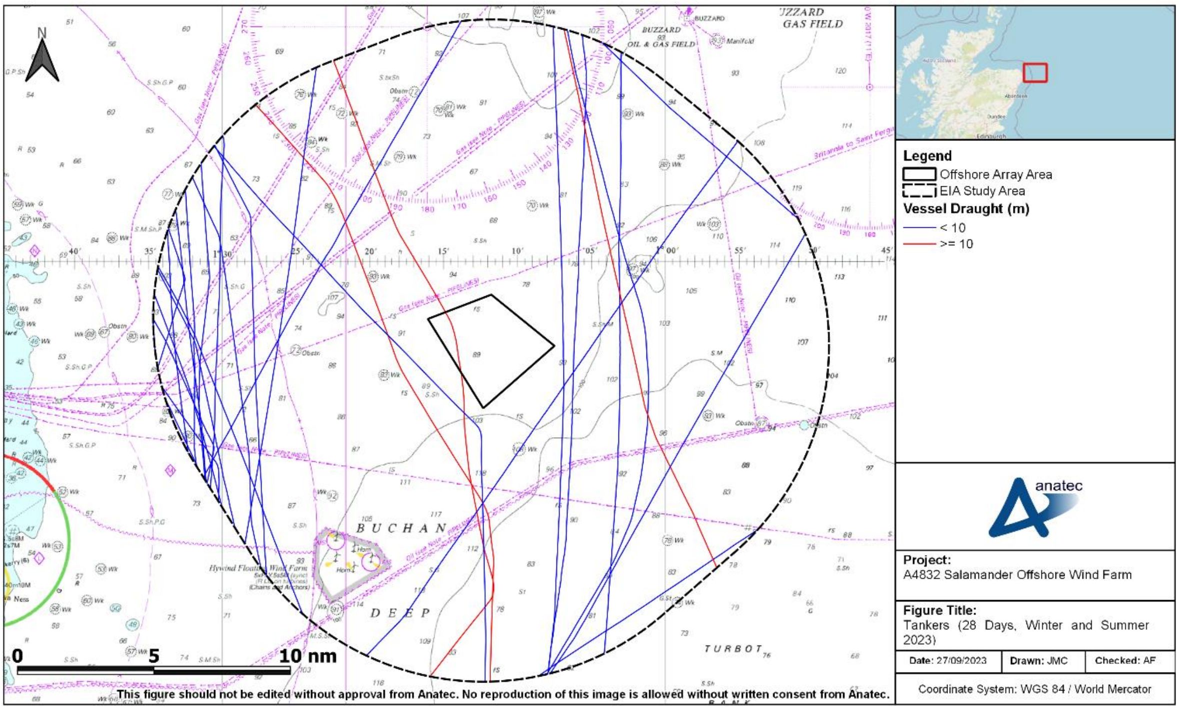


Figure 10-13 Tankers (28 Days, Winter and Summer 2023)

167. Tankers were generally seen in north/south transit through the EIA Study Area, more commonly seen inshore of the OAA. Destinations included UK ports, oil and gas installations, Ireland, the Netherlands and the US.

168. An average of one tanker per day was recorded during the combined 28-day period, with one intersection through the OAA.

10.1.3.6 Wind Farm Vessels

169. **Figure 10-14** presents the wind farm vessels recorded within the EIA Study Area during the combined 28-day survey period.

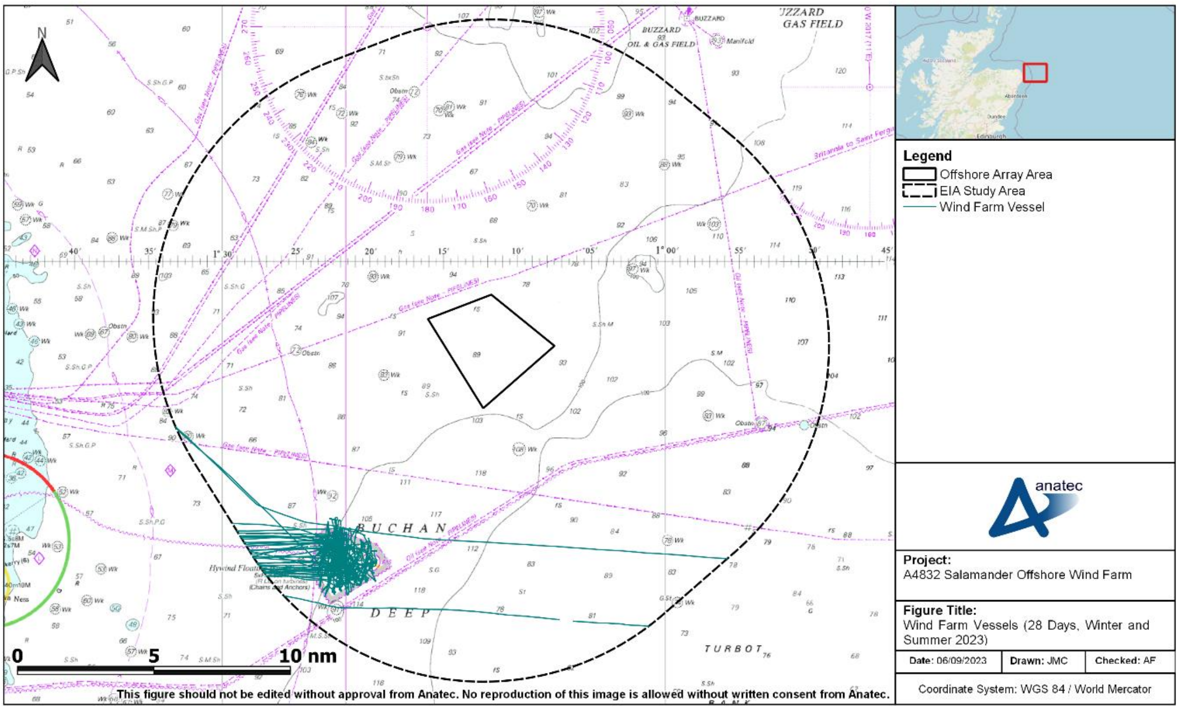


Figure 10-14 Wind Farm Vessels (28 Days, Winter and Summer 2023)

170. Wind farm vessel traffic comprised of two vessels transiting between the Hywind Scotland Offshore Wind Farm and Peterhead; on one occasion, a vessel left the wind farm on a northwest course for shelter, to return two days later. There was one wind farm vessel not associated with Hywind Scotland Offshore Wind Farm recorded; this vessel left Peterhead in eastward transit and then returned to Peterhead in westward transit later that same day.

171. There was an average of one wind farm vessel per day recorded during the combined 28-day survey period, with none intersecting the OAA.

10.1.3.7 Recreational Vessels

172. **Figure 10-15** presents the recreational vessels recorded within the EIA Study Area during the combined 28-day survey period.

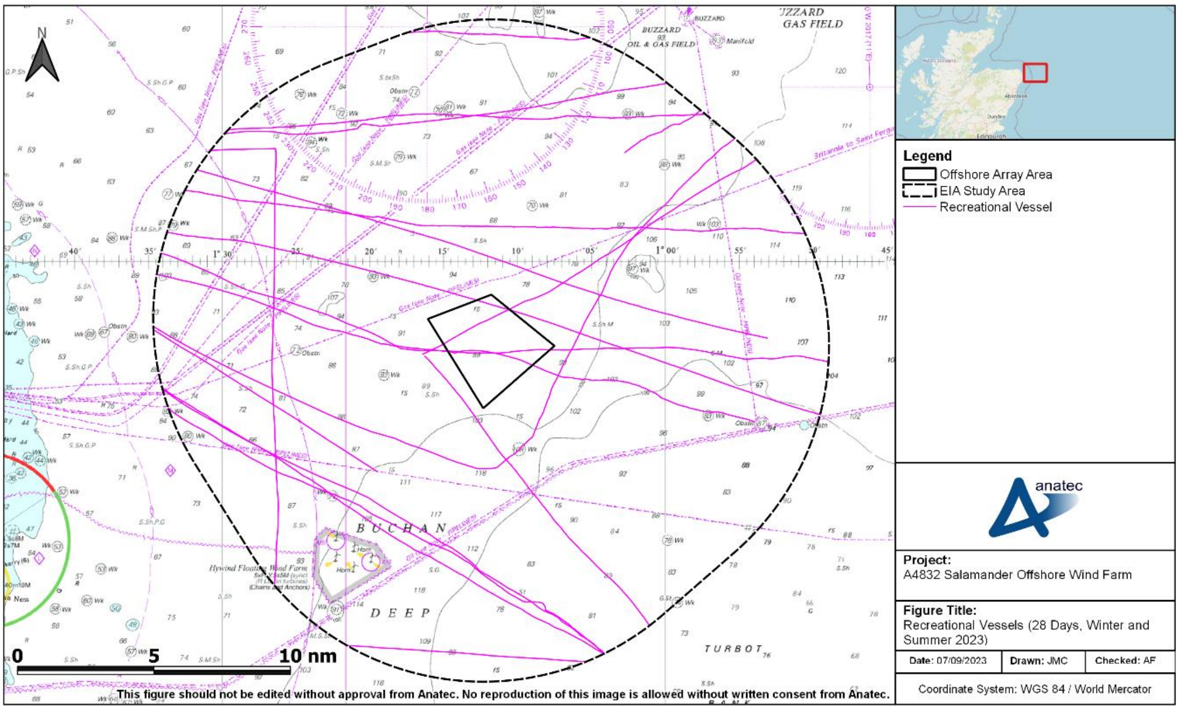


Figure 10-15 Recreational Vessels (28 Days, Winter and Summer 2023)

173. Recreational traffic was only recorded during the summer period, due to the more favourable weather of that period. Vessels were seen transiting throughout the EIA Study Area, most commonly in a southeast/northwest direction.

174. An average of one recreational vessel every one to two days was recorded during the combined 28-day survey period, with an average of one per week within the OAA.

10.1.3.7.1 Royal Yachting Association Coastal Atlas

175. The RYA Coastal Atlas may be used to "*help identify and protect areas of importance to recreational boaters, to advise on new development proposals and in discussions over navigational safety*" (RYA, 2019). The RYA Coastal Atlas includes a heat map indicating the density of recreational activity around the UK coast.

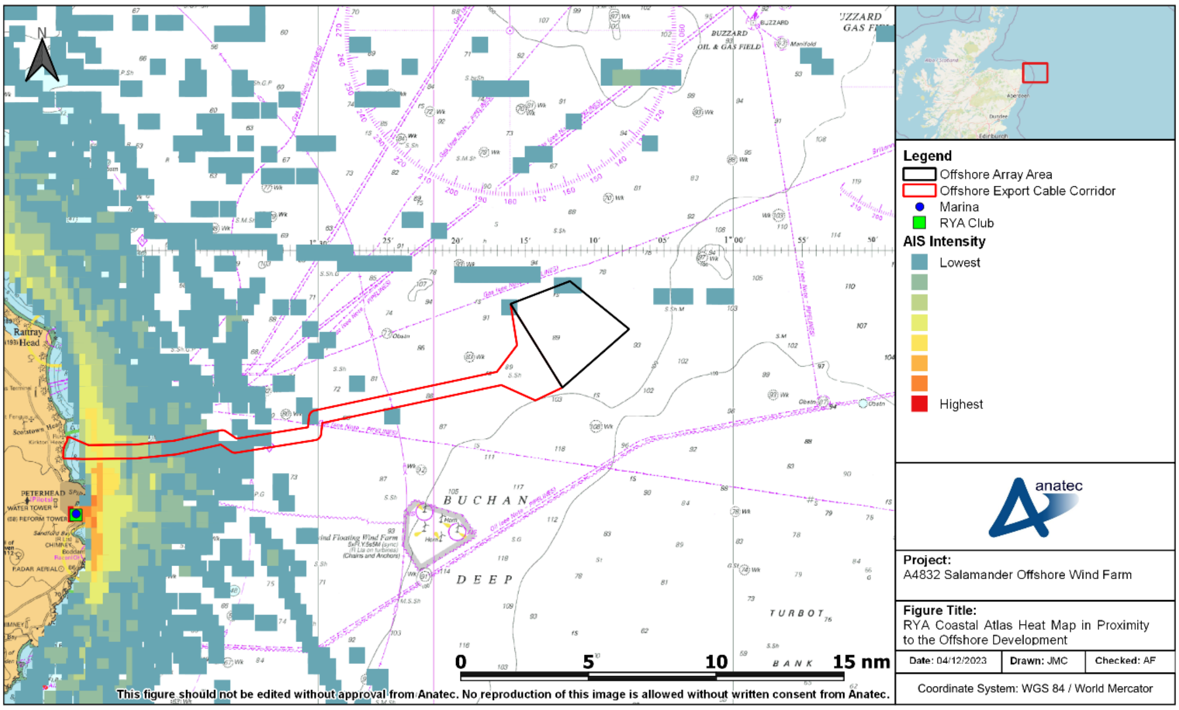


Figure 10-16 RYA Coastal Atlas Heat Map in Proximity to the Offshore Development

176. The RYA Coastal Atlas indicates that the distribution of recreational traffic is heavily weighted towards the coast, with the concentration at its greatest in the vicinity of Peterhead. The closest RYA facilities are also located at Peterhead, where a marina and RYA club are located.

177. There are no "general boating areas"[3] in proximity.

10.1.4 Vessel Size

10.1.4.1 Vessel Length

178. **Figure 10-17** presents the vessels recorded within the EIA Study Area during the combined 28-day survey period, colour-coded by vessel length. Vessel length was available for over 99% of vessels recorded.

[3] A general boating area may indicate non AIS recreational traffic presence.

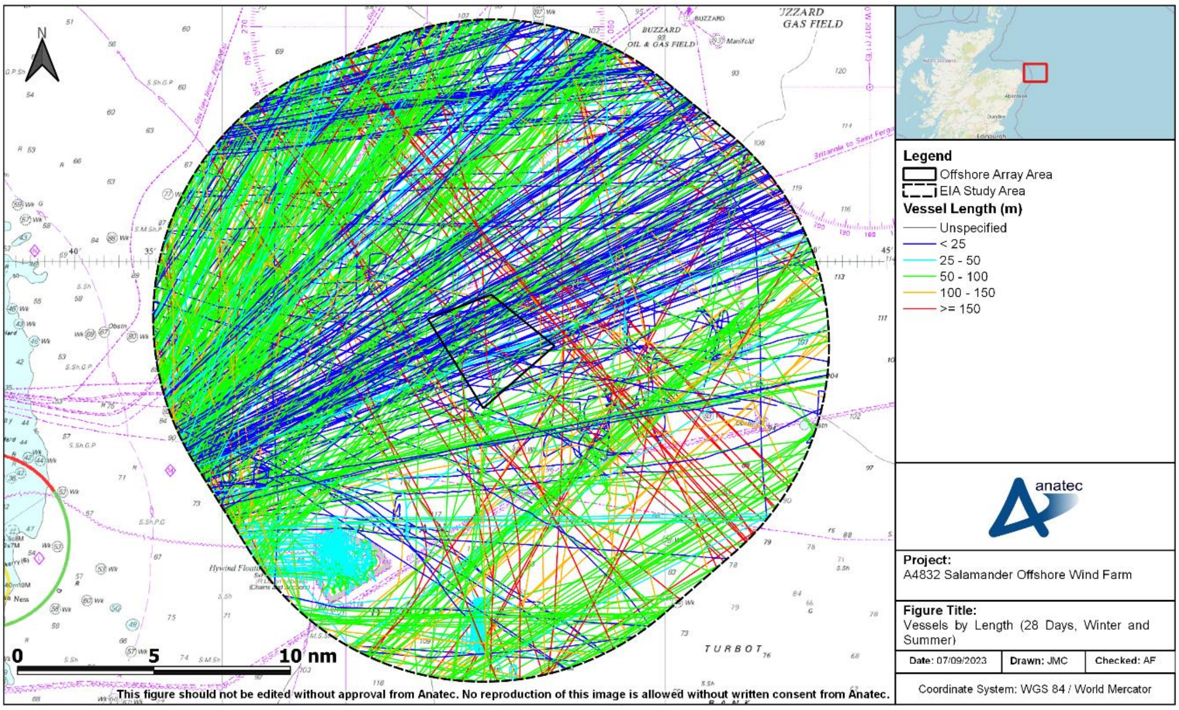


Figure 10-17 Vessels by Length (28 Days, Winter and Summer 2023)

179. A wide range of vessel lengths was recorded throughout the EIA Study Area. Vessels of length less than 100 m were generally observed to undertake northeast/southwest transits while the largest vessels (at least 150 m in length) were generally observed to undertake southeast/northwest transits.

180. **Figure 10-18** presents the distribution of vessel lengths recorded during the combined 28-day survey period, within both the EIA Study Area and OAA, excluding vessels of unspecified length.

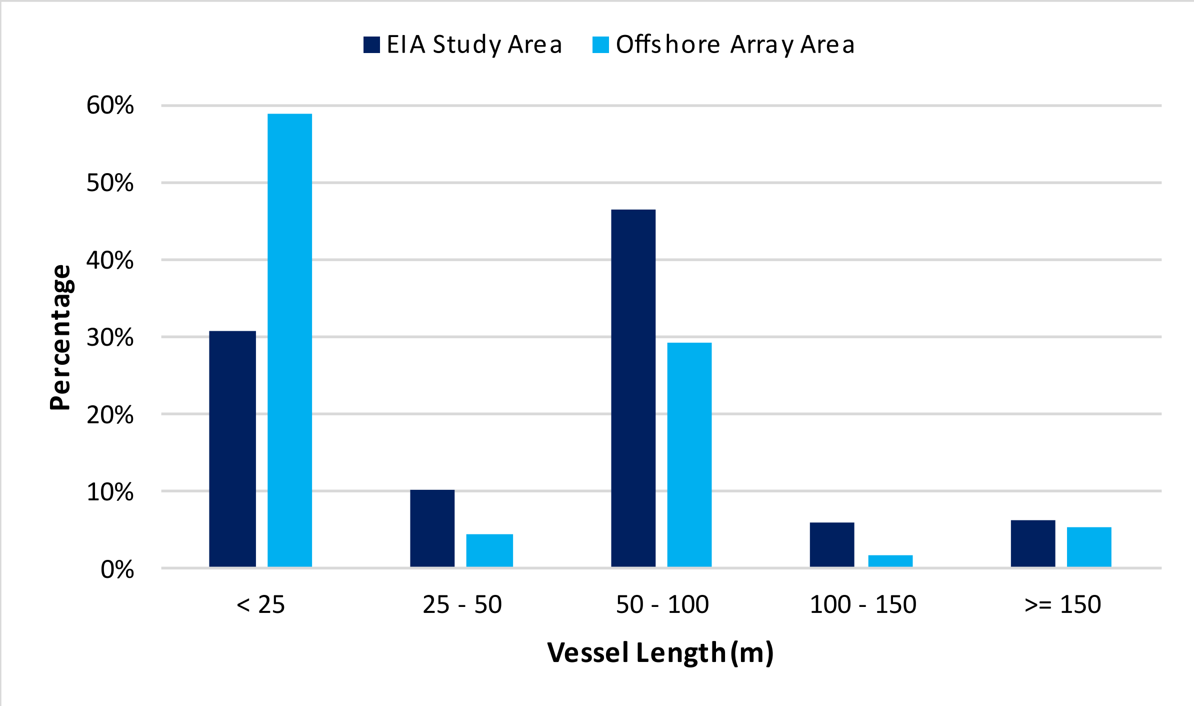


Figure 10-18 Distribution of Vessel Lengths (28 Days, Winter and Summer 2023)

181. Vessels either less than 25 m or between 50 m and 100 m were the most common length ranges in both the EIA Study Area and the OAA, with vessels between 50 m and 100 m in length being the most common within the EIA Study Area (47%) and vessels less than 25 m in length being the most common within the OAA (59%).

182. The average vessel length within the EIA Study Area and OAA was 71 m and 52 m, respectively. The longest vessels recorded within the EIA Study Area were two 300 m container ships, both recorded in northwest transit offshore of the OAA en route to the US. The longest vessel recorded within the OAA was a 292 m cruise ship recorded in southeast transit en route to Dover.

10.1.4.2 Vessel Draught

183. **Figure 10-19** presents the vessels recorded within the EIA Study Area during the combined 28-day survey period, colour-coded by vessel draught. Vessel draught was available for approximately 86% of vessels recorded.

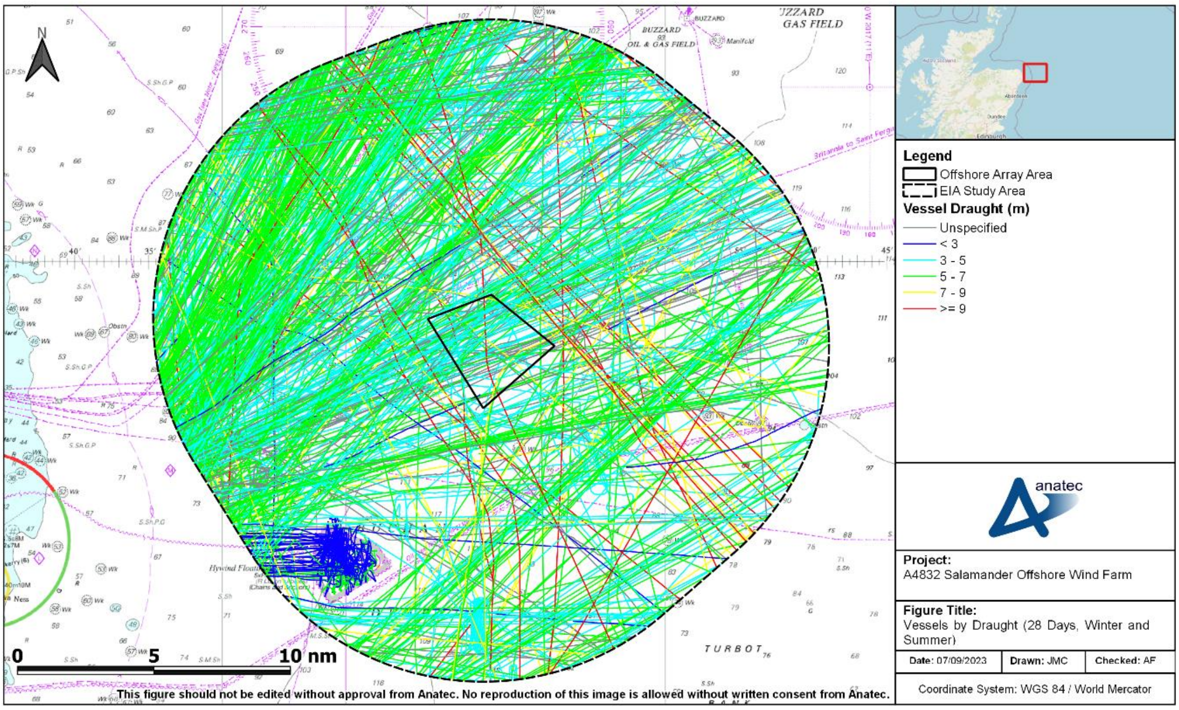


Figure 10-19 Vessels by Draught (28 Days, Winter and Summer 2023)

184. As with vessel lengths (see **Section 10.1.4.1**), a wide range of draught values was recorded through the EIA Study Area. The smallest draughts (less than 3 m) were primarily associated with wind farm vessels, to the southwest of the OAA. The largest draughts (at least 9 m) were primarily recorded from cargo vessels and tankers in southeast/northwest transit.

185. **Figure 10-20** presents the distribution of vessel draughts recorded during the combined 28-day survey period, within both the EIA Study Area and OAA, excluding vessels of unspecified draught.

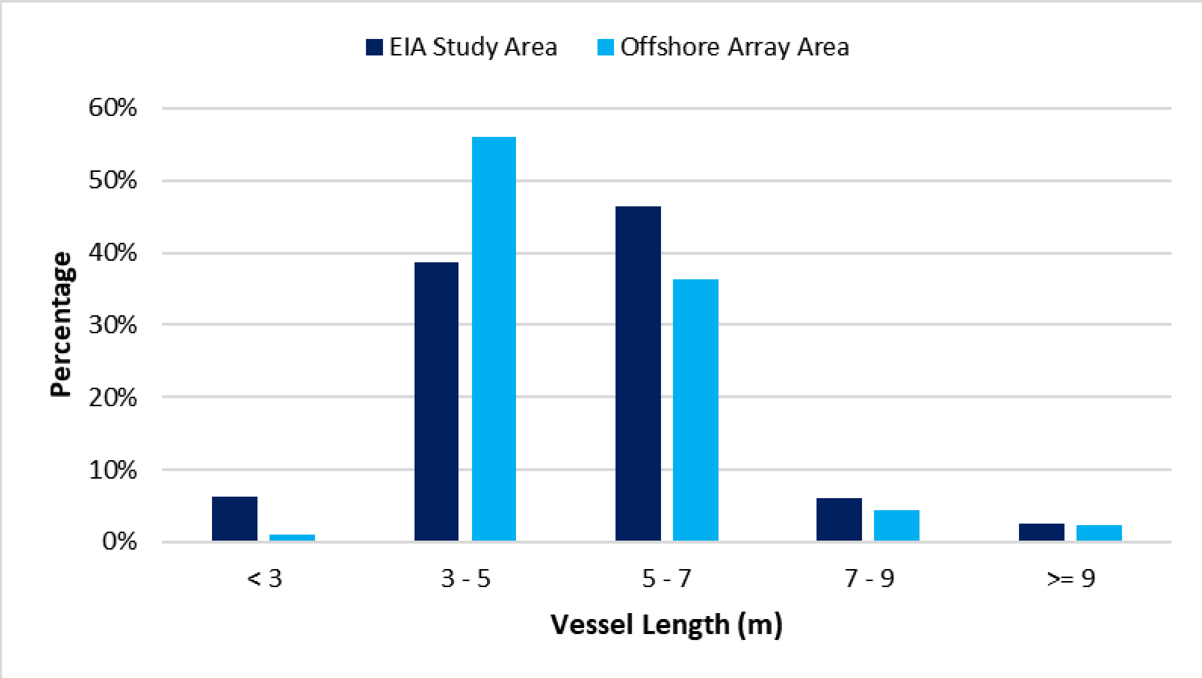


Figure 10-20 Distribution of Vessel Lengths (28 Days, Winter and Summer 2023)

186. Vessel draughts between 3 m and 7 m were the most common within both the EIA Study Area and OAA, accounting for 85% and 92% of values respectively. Within the EIA Study Area, the 5 m to 7 m range was more common, accounting for 46%. Within the OAA, the 3 m to 5 m range was more common, accounting for 56%.

187. The average vessel draught recorded within the EIA Study Area and OAA was 5.0 m and 4.9 m respectively. The deepest draught recorded within the EIA Study Area was 14.0 m, from a bulk carrier in southeast transit offshore of the OAA. The deepest draught recorded within the OAA was 11.6 m, from a shuttle tanker in southward transit to France.

188. Further consideration of vessel draughts in relation to underkeel clearance is provided in **Section 15.5**.

10.1.5 Anchored Vessels

189. Vessels broadcast their navigation status including whether at anchor via AIS; no vessels were broadcasting 'At Anchor' as their navigation status within the EIA Study Area during the combined 28-day survey period. As an additional step, AIS tracks from vessels which transmitted a navigation status other than 'At Anchor' were used as input to Anatec's Speed Analysis model. The program detects any tracks of vessels that were travelling with speeds of less than one knot for a minimum of 30 minutes. These tracks were then manually reviewed and none displayed anchoring behaviour.

10.2 Offshore Export Cable Corridor

190. This section presents assessment of vessel traffic recorded on AIS within the EIA Cable Corridor Study Area during the same periods assessed in **Section 10.1**, i.e. a 14-day period between 10th and 25th February 2023 and a 14-day period between the 6th and 20th August 2023.

10.2.1 Overview

191. A plot of the vessel traffic recorded within the EIA Cable Corridor Study Area during the 14-day winter period followed by a density plot of this traffic within a 0.25 nm × 0.25 nm grid is presented in **Figure 10-21** and **Figure 10-22** respectively. Following this, the equivalent figures for the summer period are presented in **Figure 10-23** and **Figure 10-24** respectively. All vessels were assigned a known type.

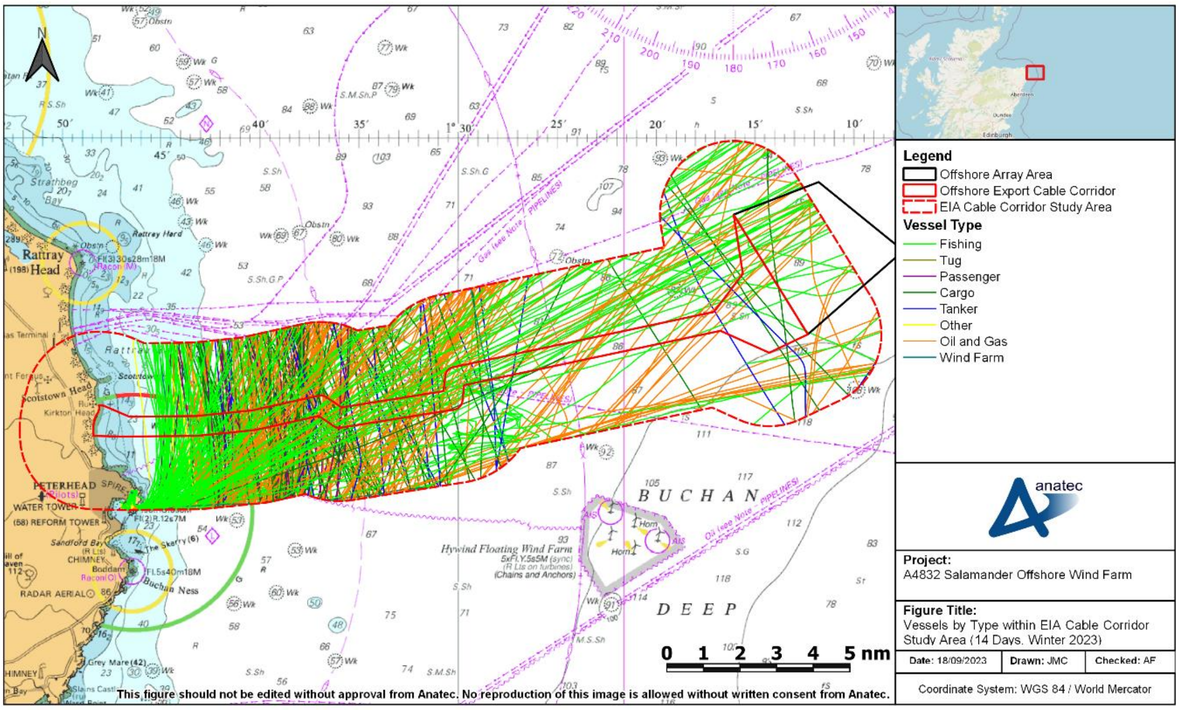


Figure 10-21 Vessels by Type within EIA Cable Corridor Study Area (14 Days, Winter 2023)

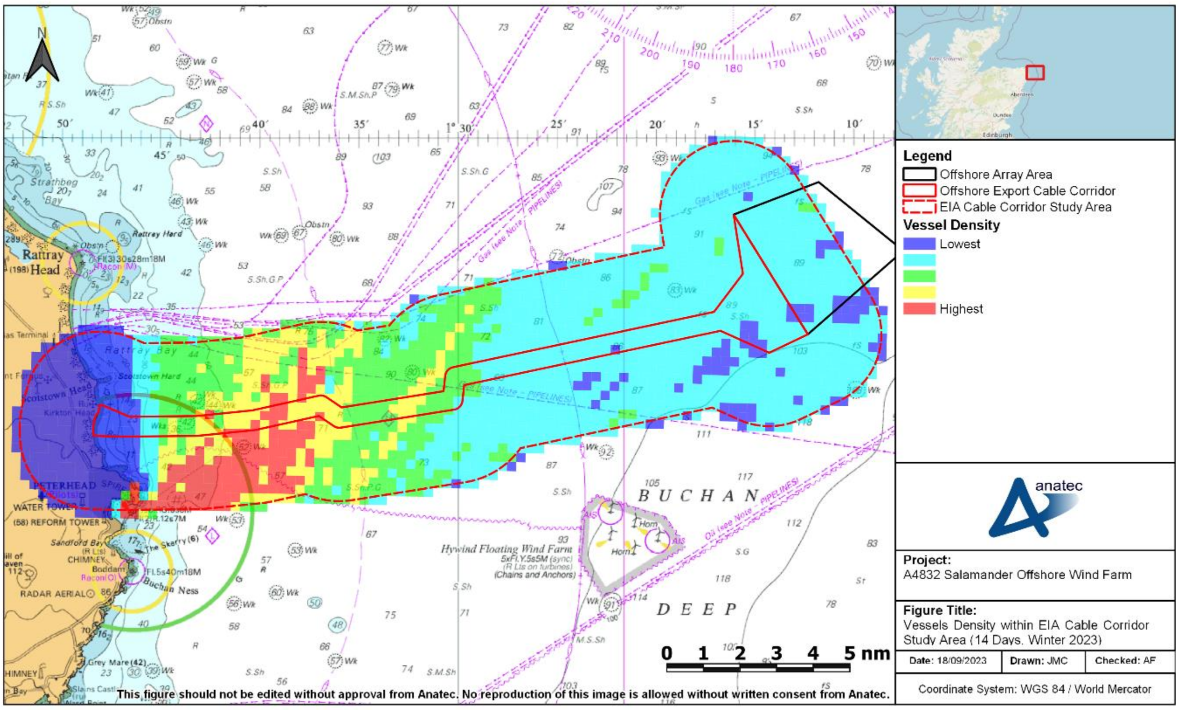


Figure 10-22 Vessel Density within EIA Cable Corridor Study Area (14 Days, Winter 2023)

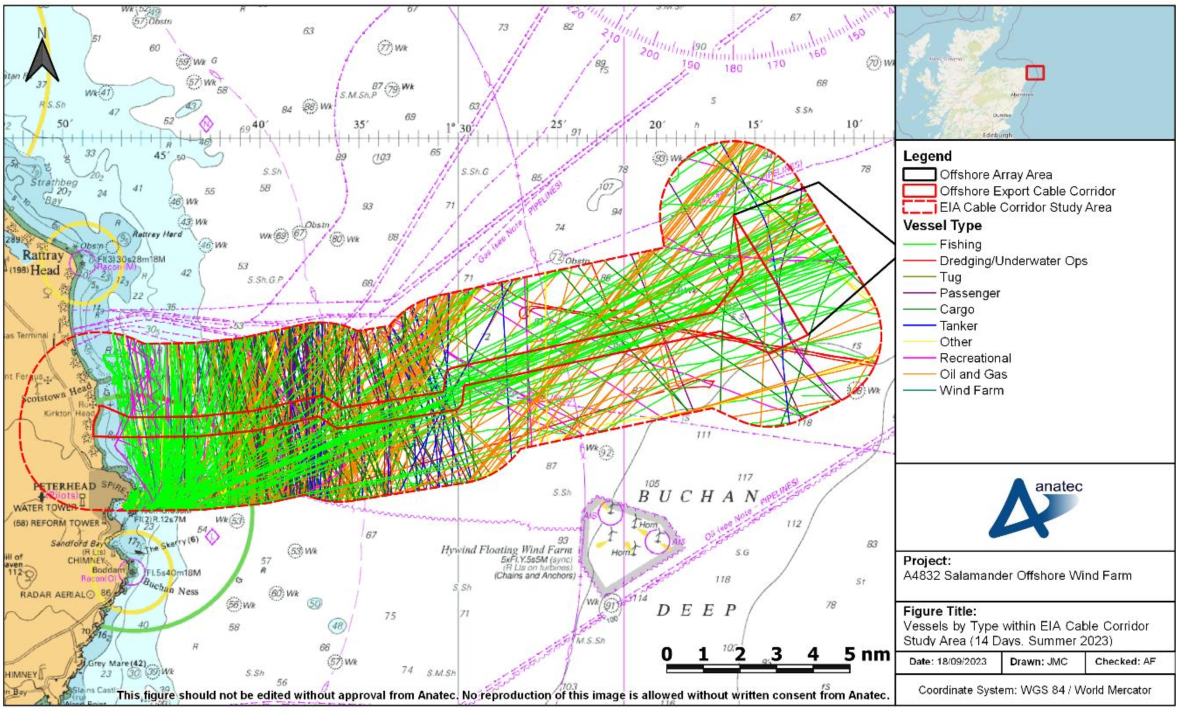


Figure 10-23 Vessels by Type within EIA Cable Corridor Study Area (14 Days, Summer 2023)

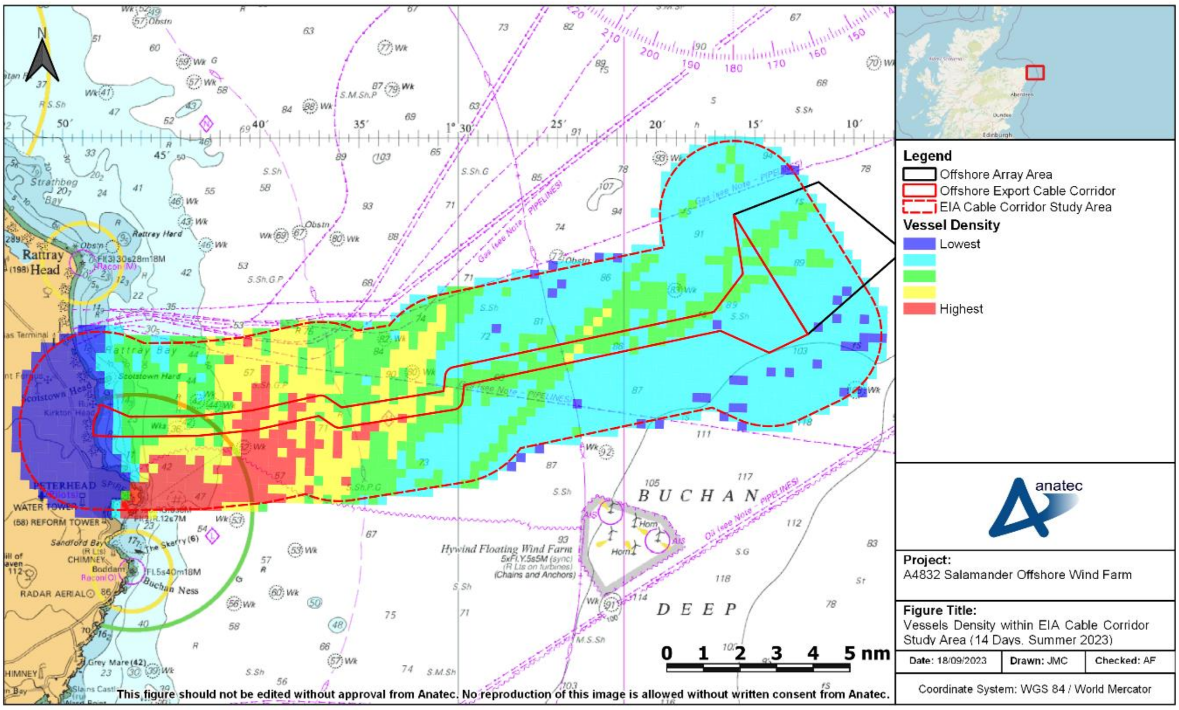


Figure 10-24 Vessel Density within EIA Cable Corridor Study Area (14 Days, Summer 2023)

192. During both periods, traffic was at its densest close to shore, largely due to fishing vessels and oil and gas vessels transiting to/from Peterhead south of the landfall. Commercial vessels were also seen in north/south transit, generally within 10 nm of the shore.

193. Further details of each of the main vessel types can be found in **Section 10.2.3**.

10.2.2 Vessel Counts

194. The number of unique vessels per day recorded within the EIA Cable Corridor Study Area during the winter period is provided in **Figure 10-25**.

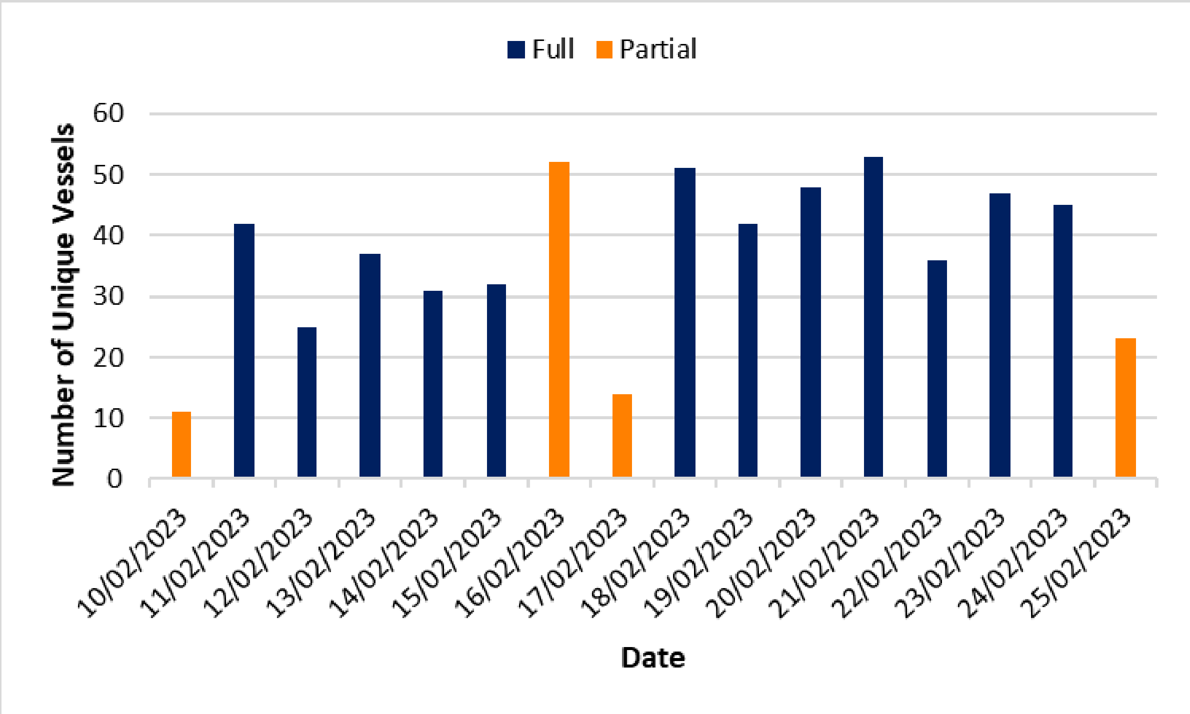


Figure 10-25 Number of Vessels per Day within EIA Cable Corridor Study Area (14 Days, Winter 2023)

195. Within the EIA Cable Corridor Study Area, there was an average of 42 vessels per day recorded during the winter period. The busiest full day was the 21st February 2023, on which a total of 53 unique vessels was recorded. The quietest full day was the 12th February 2023, on which a total of 25 unique vessels was recorded.

196. Within the Offshore ECC, there was an average of 32 vessels per day recorded during the winter period. The busiest full day was the 21st February 2023, during which a total of 39 unique vessels was recorded. The quietest full day was the 12th February 2023, on which 18 unique vessels were recorded.

197. The number of unique vessels per day recorded within the EIA Cable Corridor Study Area during the summer period is provided in **Figure 10-26**.

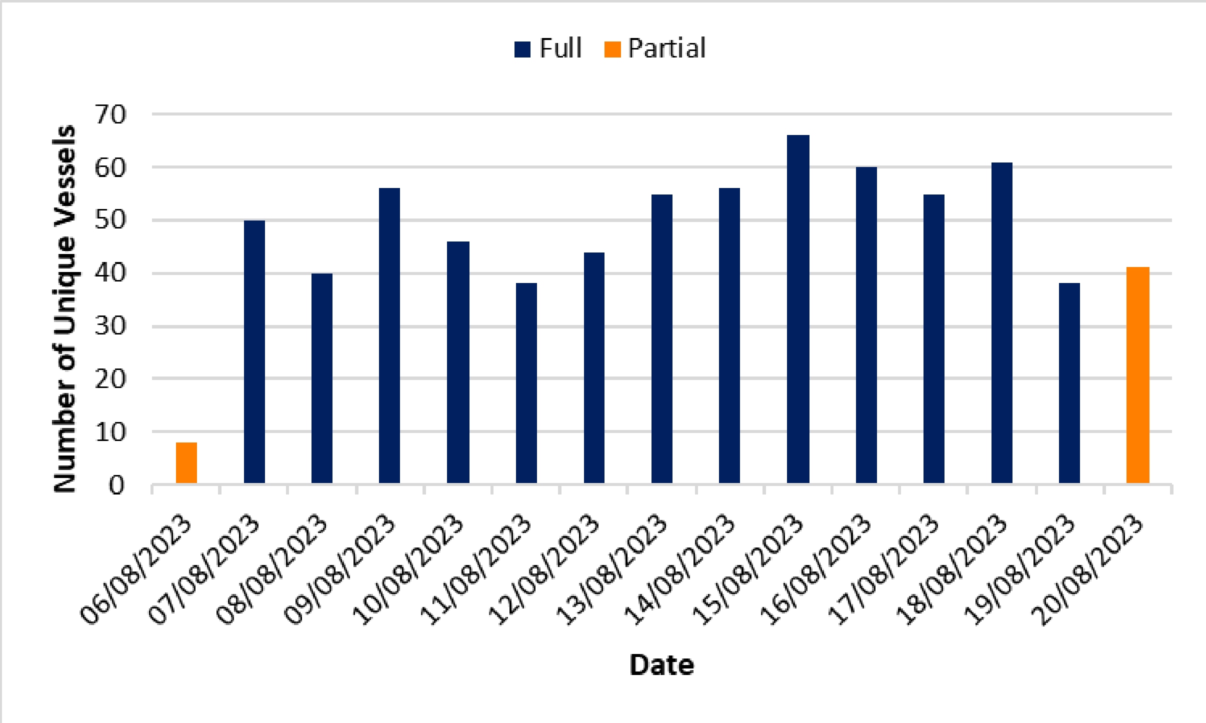


Figure 10-26 Number of Vessels per Day within EIA Cable Corridor Study Area (14 Days, Summer 2023)

198. Within the EIA Cable Corridor Study Area, there was an average of 51 vessels per day recorded during the summer period. The busiest full day was the 15th August 2023, on which a total of 66 unique vessels was recorded. The quietest full days were the 11th and 19th August 2023, with 38 unique vessels recorded on each of these days.

199. Within the Offshore ECC, there was an average of 39 vessels per day recorded during the summer period. The busiest full day was the 18th August 2023, during which a total of 51 unique vessels was recorded. The quietest full day was the 11th August 2023, on which a total of 30 unique vessels was recorded.

10.2.3 Vessel Type

10.2.3.1 Overview

200. The percentage distribution of the main vessel types within the EIA Cable Corridor Study Area as well as the Offshore ECC during the winter survey period is presented in **Figure 10-27**. The same distributions for the summer survey data are presented in **Figure 10-28**.

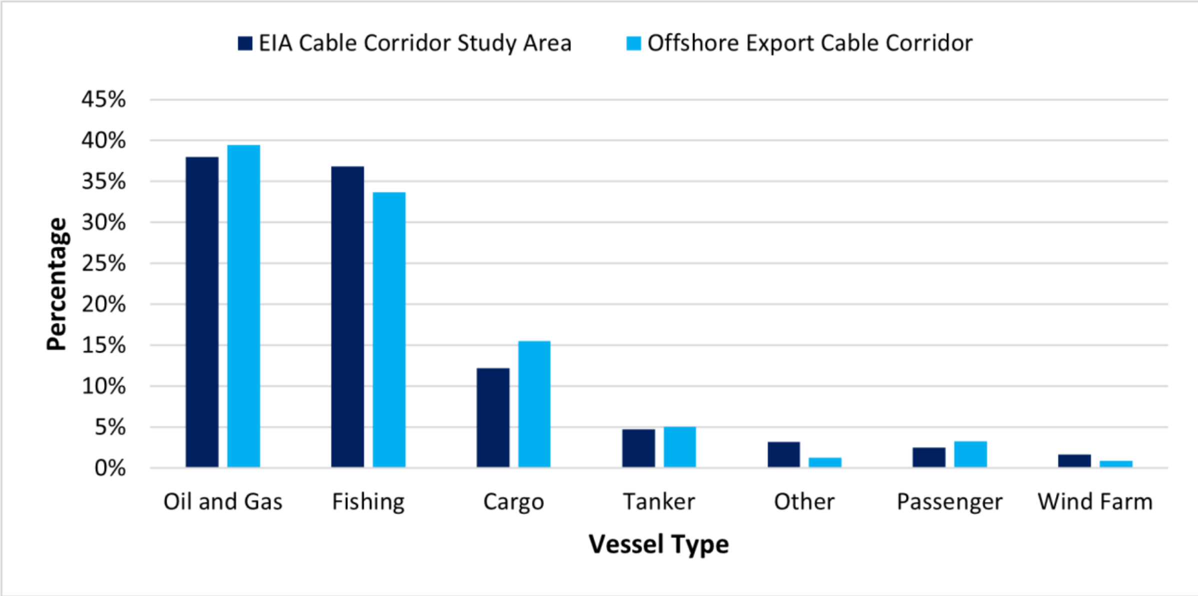


Figure 10-27 Distribution of Vessel Types within EIA Cable Corridor Study Area (14 Days, Winter 2023)

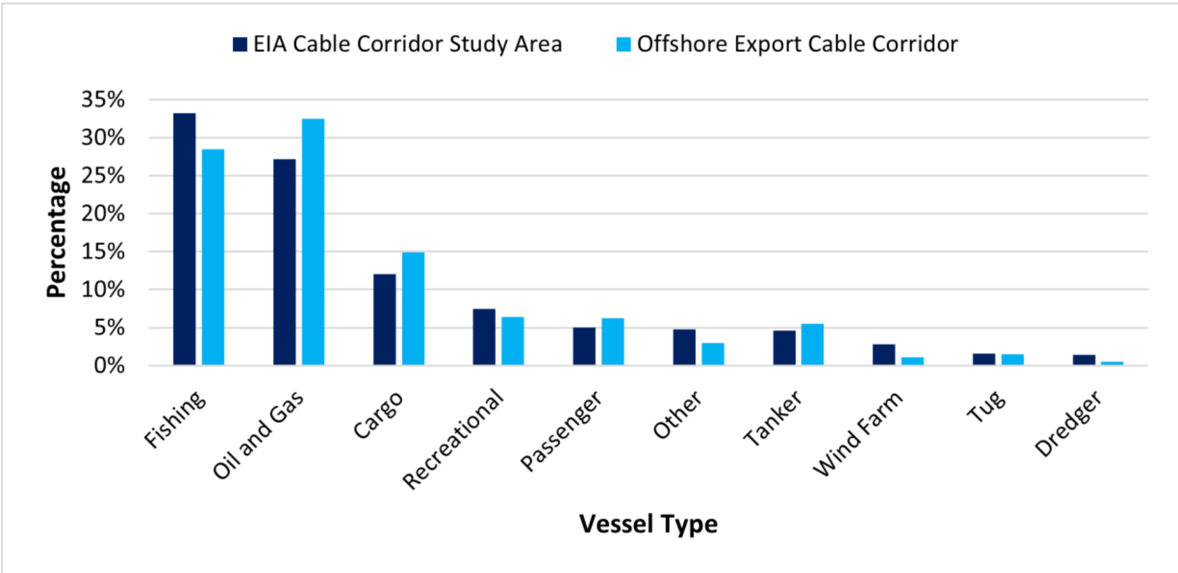


Figure 10-28 Distribution of Vessel Types within EIA Cable Corridor Study Area (14 Days, Summer 2023)

201. It can be seen that the distribution of vessel types within both the EIA Cable Corridor Study Area and Offshore ECC were in broad agreement, during both the winter and summer periods.

202. During both periods, the dominant vessel types within the EIA Cable Corridor Study Area were oil and gas vessels and fishing vessels, accounting for 38% and 37% respectively during the winter, and 27% and 33% respectively during the summer.

203. Besides oil and gas vessels and fishing vessels, the most common vessel types in the EIA Cable Corridor Study Area during the winter were cargo vessels (12%), tankers (5%), vessels in the 'other' category (3%), passenger vessels (3%) and wind farm vessels (2%). Also recorded in small numbers (less than 1%) were tugs.

204. Besides oil and gas vessels and fishing vessels, the most common vessel types in the EIA Cable Corridor Study Area during the summer were cargo vessels (12%), recreational vessels (7%), passenger vessels (5%), vessels in the 'other' category (5%), tankers (5%), wind farm vessels (3%), tugs (2%) and dredgers (1%).

205. During both survey periods, the dominant vessel types within the Offshore ECC were oil and gas vessels and fishing vessels, accounting for 39% and 34% respectively during the winter, and 32% and 28% respectively during the summer.

206. Besides oil and gas vessels and fishing vessels, the most common vessel type recorded within the Offshore ECC during the winter was cargo vessels, accounting for 16%; this was followed by tankers (5%), passenger vessels (3%) and vessels in the 'other' category (1%). Also recorded in small numbers (less than 1%) were wind farm vessels and tugs.

207. Besides oil and gas vessels and fishing vessels, the most common vessel type recorded within the Offshore ECC during the summer was cargo vessels, accounting for 15%; this was followed by recreational vessels (6%), passenger vessels (6%), tankers (6%), vessels in the 'other' category (3%), tugs (1%) and wind farm vessels (1%). Also recorded in small numbers (less than 1%) were dredgers.

10.2.3.2 Fishing Vessels

208. **Figure 10-29** presents the fishing vessels recorded within the EIA Cable Corridor Study Area during the combined 28-day period. The six knot threshold described in **Section 10.1.3.3** has been applied to the colour coding.

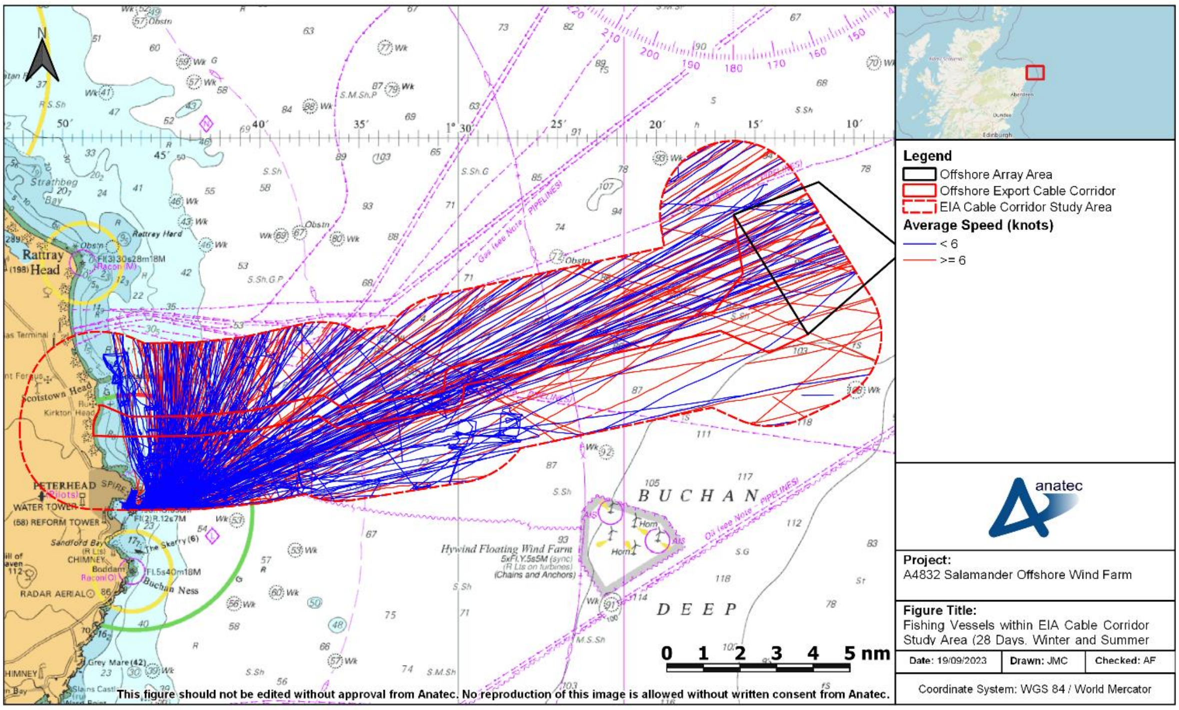


Figure 10-29 Fishing Vessels within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

209. Fishing vessels were mainly seen in transit to/from Peterhead in a wide range of directions. Potential active fishing behaviour was observed within the EIA Cable Corridor Study Area, including within the Offshore ECC itself (suggested by track behaviour and speeds).

210. An average of 16 fishing vessels per day was recorded within the EIA Cable Corridor Study Area during the combined 28-day period, with 11 per day within the Offshore ECC. It should be noted that as this is an AIS-only dataset, fishing vessels may be under-represented (see **Section 5.3.1**).

10.2.3.3 Oil and Gas Vessels

211. **Figure 10-30** presents the oil and gas vessels recorded within the EIA Cable Corridor Study Area during the combined 28-day period.

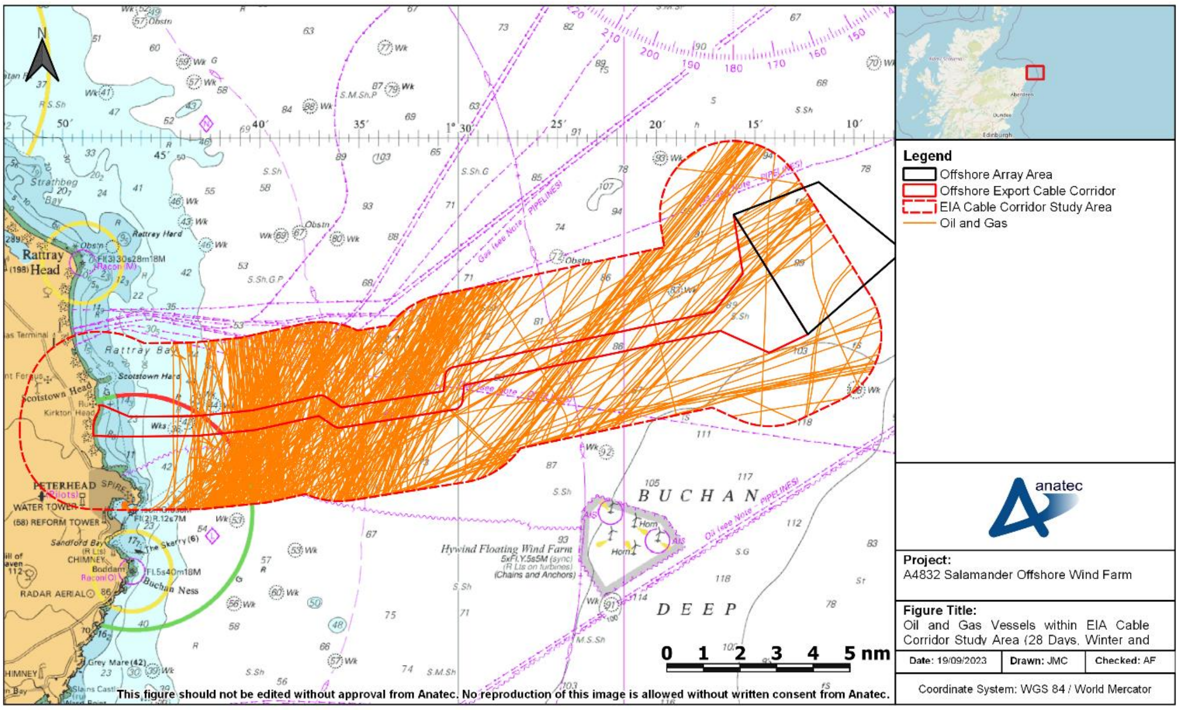


Figure 10-30 Oil and Gas Vessels within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

212. Oil and gas vessels were mainly seen transiting between either Peterhead or Aberdeen and various oil and gas infrastructure in the North Sea. The majority of these vessels were recorded within 10 nm of the coast.

213. An average of 15 oil and gas vessels per day was recorded within the EIA Cable Corridor Study Area during the combined 28-day period, with 12 to 13 per day within the Offshore ECC.

10.2.3.4 Cargo Vessels

214. **Figure 10-31** presents the cargo vessels recorded within the EIA Cable Corridor Study Area during the combined 28-day period.

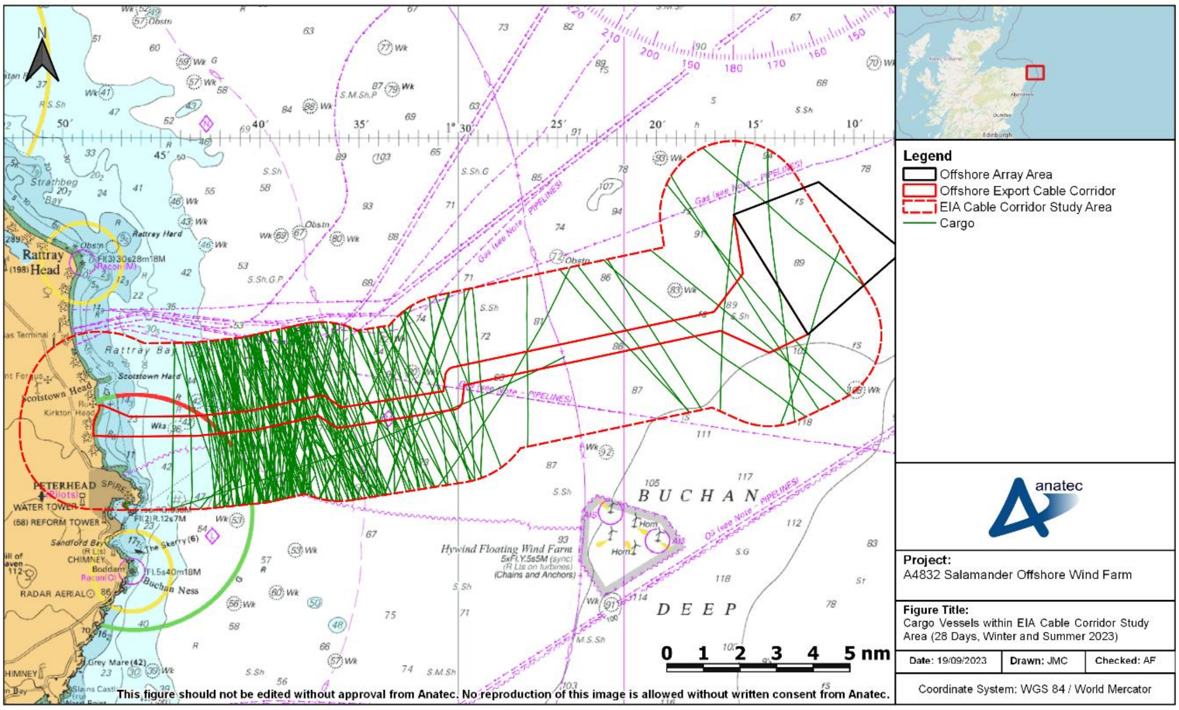


Figure 10-31 Cargo Vessels within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

215. Cargo vessels were mainly seen in southeast/northwest transit within 10 nm of the coast, with the most common destinations including Aberdeen, Kirkwall and Rotterdam.

216. An average of five to six cargo vessels per day was recorded within the EIA Cable Corridor Study Area during the combined 28-day period, with five to six per day also within the Offshore ECC.

10.2.3.5 Tankers

217. **Figure 10-32** presents the tankers recorded within the EIA Cable Corridor Study Area during the combined 28-day period.

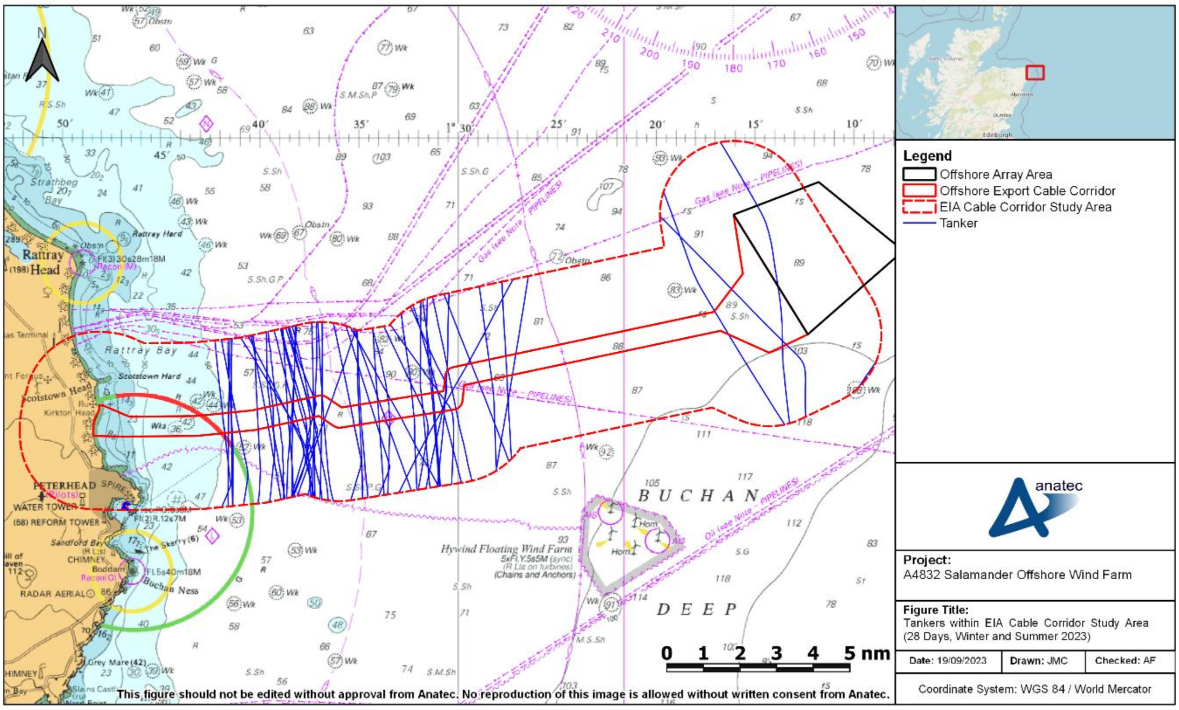


Figure 10-32 Tankers within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

218. Tankers were generally in north/south transit within 10 nm of the coast, with various British ports as their destinations.

219. An average of two tankers per day was recorded within the EIA Cable Corridor Study Area during the combined 28-day period, with two per day also within the Offshore ECC.

10.2.3.6 Recreational Vessels

220. **Figure 10-33** presents the recreational vessels recorded within the EIA Cable Corridor Study Area during the combined 28-day period.

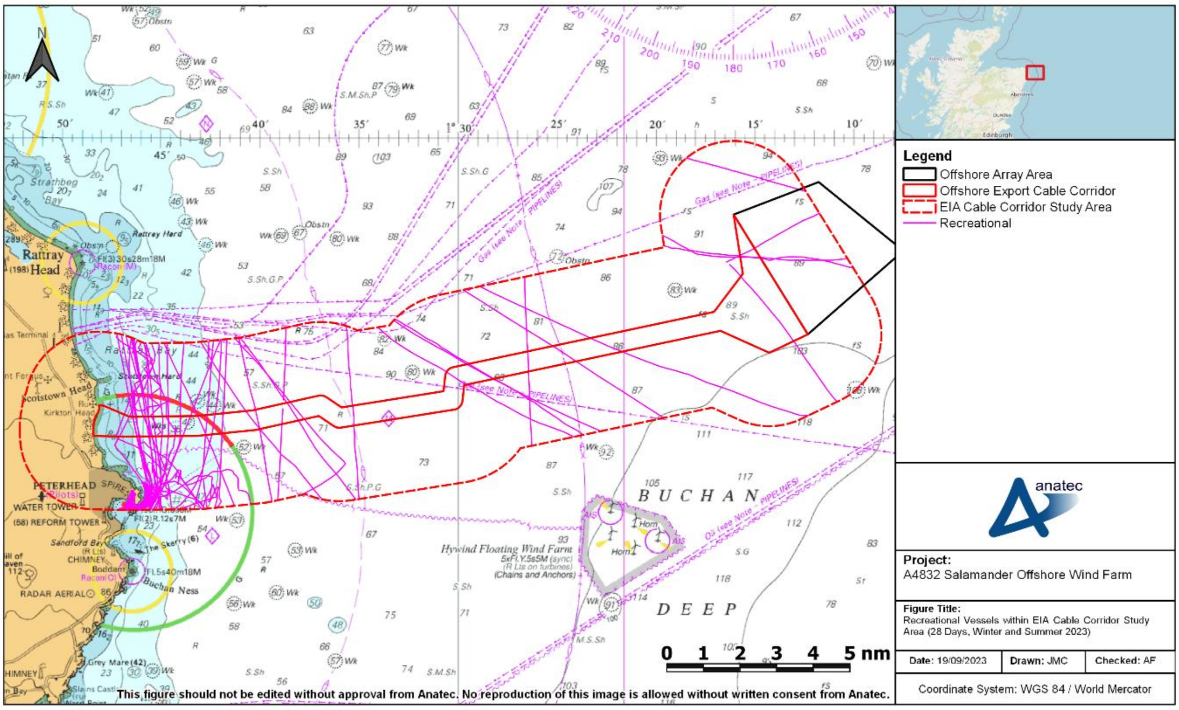


Figure 10-33 Recreational Vessels within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

221. Recreational vessels were observed to most commonly remain close to the coast within shallow waters, travelling to/from Peterhead, with a smaller proportion transiting further offshore. Recreational traffic was only recorded during the summer period, likely due to the more favourable conditions.

222. An average of two recreational vessels per day was recorded within the EIA Cable Corridor Study Area during the combined 28-day period, with one to two per day within the Offshore ECC. It should be noted that as this is an AIS-only dataset, recreational vessels may be under-represented (see **Section 5.3.1**).

10.2.4 Vessel Size

10.2.4.1 Vessel Length

223. **Figure 10-34** presents the vessels recorded within the EIA Cable Corridor Study Area during the 28-day period, colour-coded by vessel length. Approximately 99% of vessels were assigned a valid length.

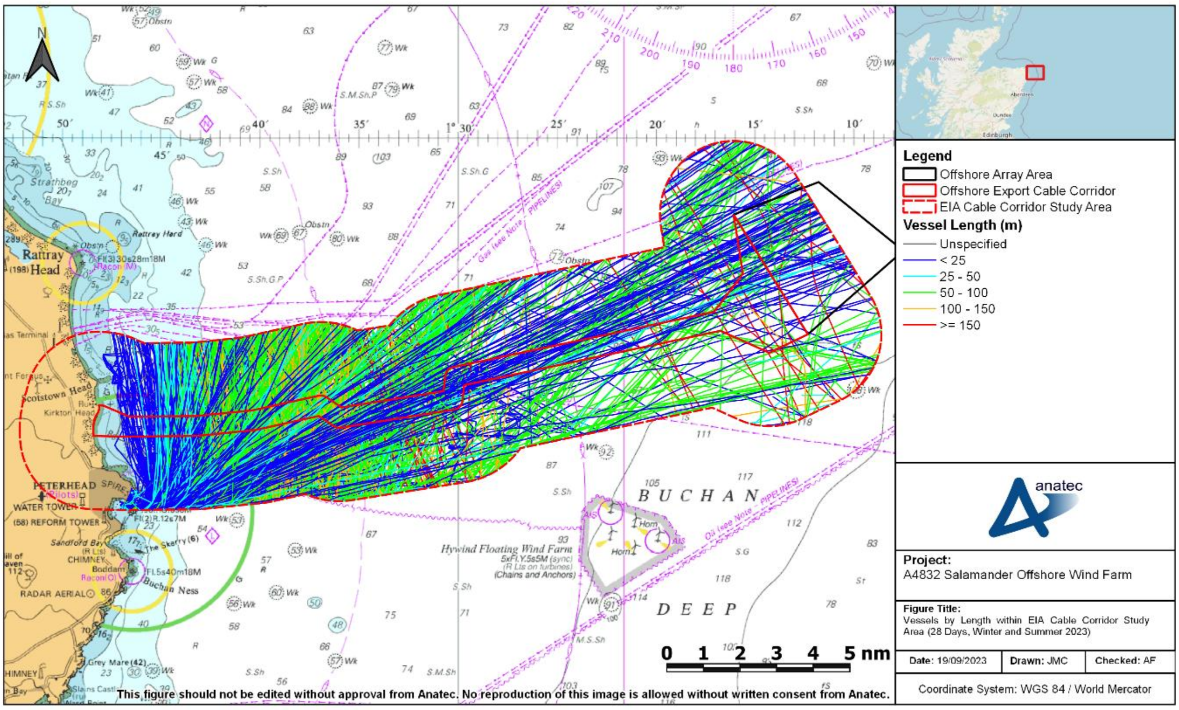


Figure 10-34 Vessels by Length within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

224. The majority of the smallest vessels (less than 25 m) were fishing vessels travelling to/from Peterhead, transiting either north/south within shallow waters close to the coast or northeast/southwest to/from fishing grounds further offshore. These were the vessels most commonly seen to enter/exit Peterhead. The longest vessels (at least 150 m) were generally commercial vessels in southeast/northwest transit.

225. **Figure 10-35** presents the distribution of vessel lengths within both the EIA Cable Corridor Study Area and Offshore ECC during the 28-day period.

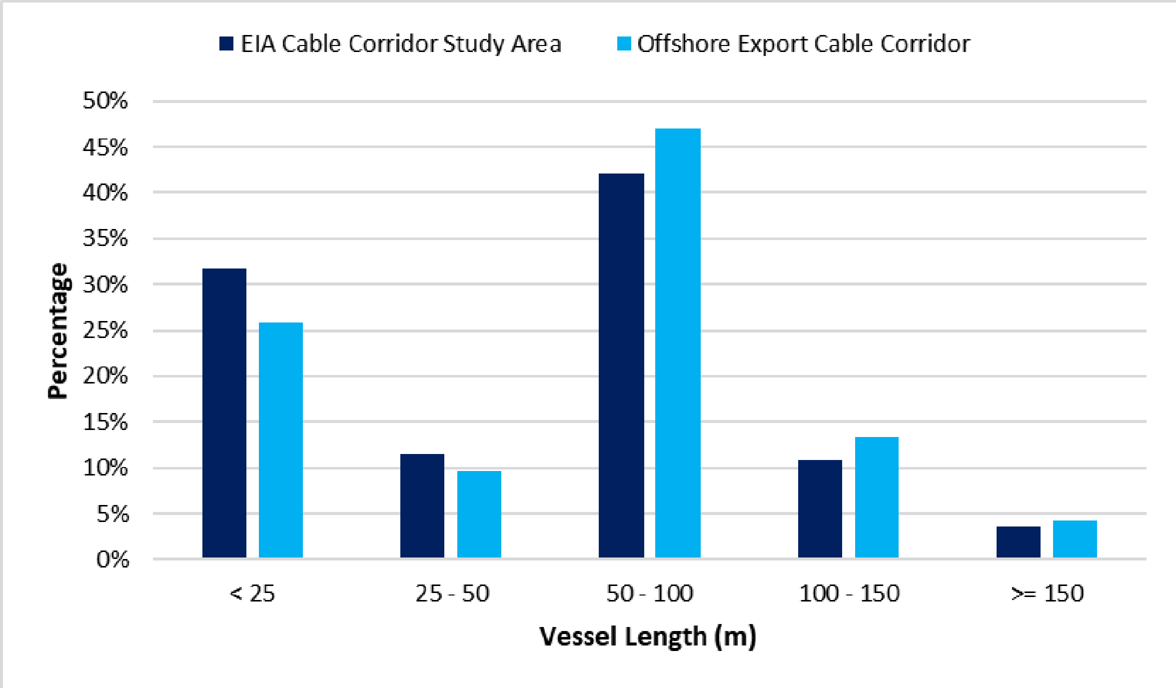


Figure 10-35 Distribution of Vessel Lengths within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

226. It can be seen that the distribution of vessel lengths was similar between the EIA Cable Corridor Study Area and the Offshore ECC. The average vessel length within the EIA Cable Corridor Study Area was 66 m while within the Offshore ECC it was 74 m. The longest vessel within both the EIA Cable Corridor Study Area and Offshore ECC was a 330 m cruise ship in southeast transit to the Firth of Forth.

10.2.4.2 Vessel Draught

227. **Figure 10-36** presents the vessels recorded within the EIA Cable Corridor Study Area during the 28-day period, colour-coded by vessel draught. Approximately 73% of tracks were assigned a valid draught; most vessels with unassigned draught were recreational and fishing vessels, and therefore likely had shallow draught.

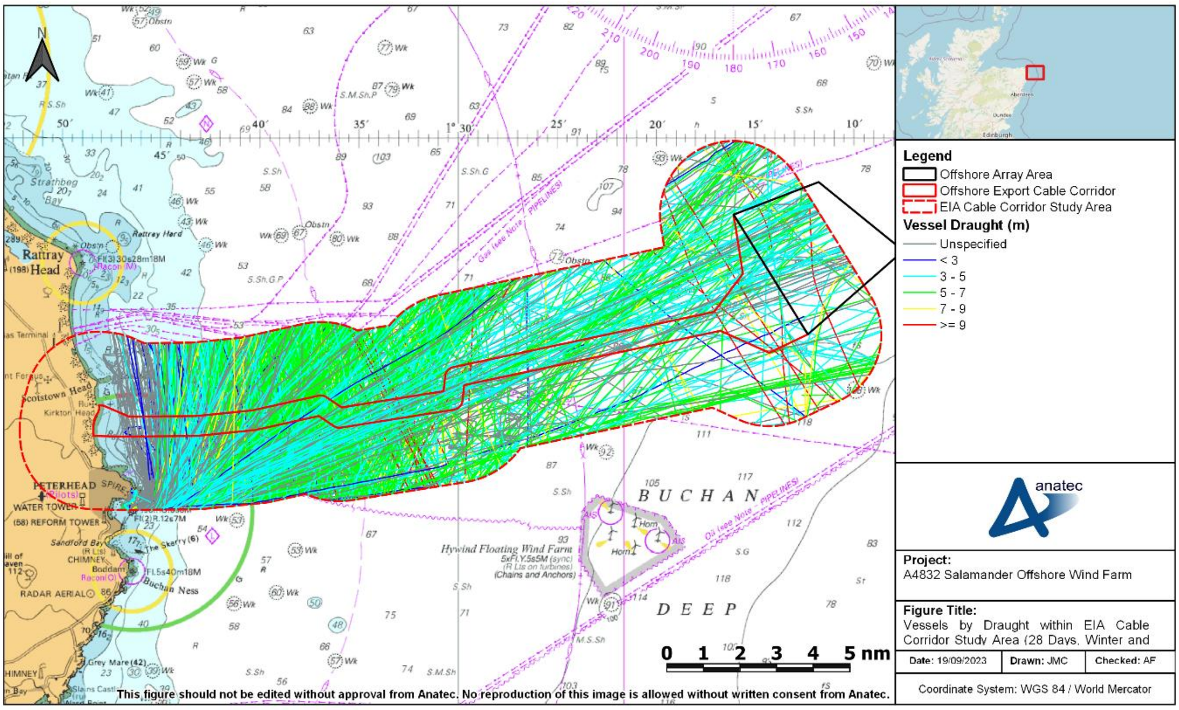


Figure 10-36 Vessels by Draught within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

228. The shallowest draughts (less than 3 m) were mainly recorded from fishing vessels and wind farm vessels remaining close to the coast in north/south transit. The deepest draughts (at least 9 m) were mainly recorded from cargo vessels and tankers in southeast/northwest transit either in the centre of the EIA Cable Corridor Study Area or to its eastern extent.

229. **Figure 10-37** presents the distribution of vessel draughts within both the EIA Cable Corridor Study Area and Offshore ECC during the 28-day period.

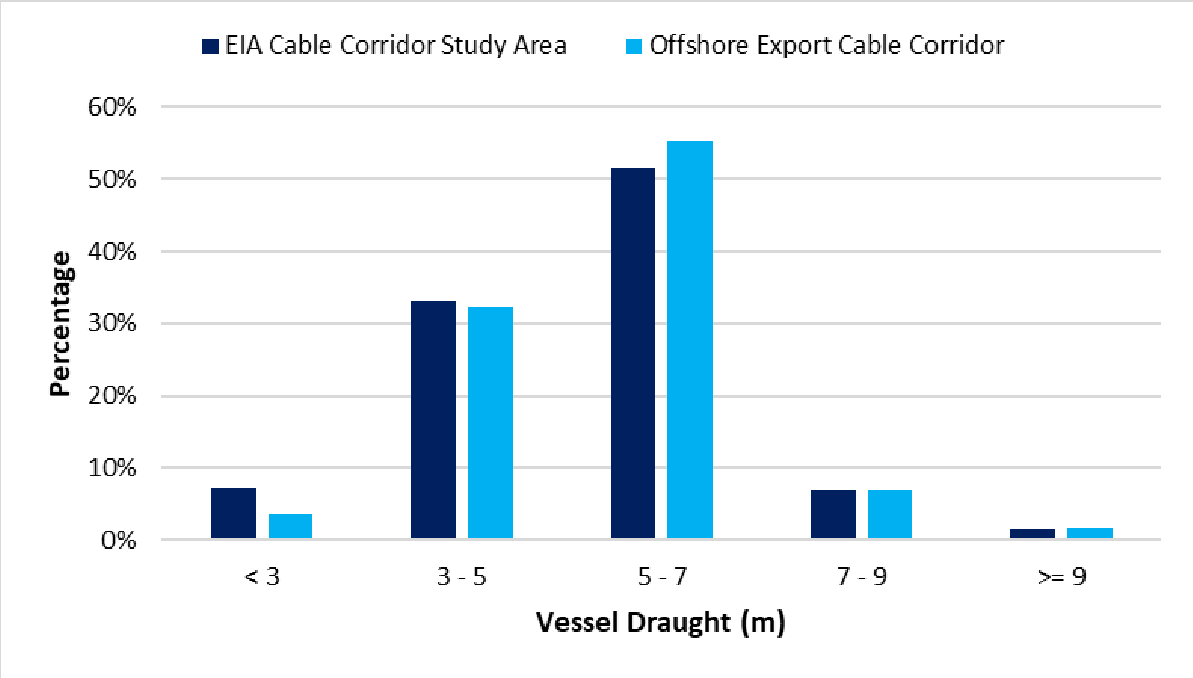


Figure 10-37 Distribution of Vessel Draughts within EIA Cable Corridor Study Area (28 Days, Winter and Summer 2023)

230. It can be seen that the distribution of vessel draughts was similar between the EIA Cable Corridor Study Area and the Offshore ECC. The average vessel draught within the EIA Cable Corridor Study Area and Offshore ECC was 5.1 m and 5.2 m respectively. The deepest draught within both the EIA Cable Corridor Study Area and Offshore ECC was 15.0 m, recorded from a bulk carrier in southeast transit to southeast England.

10.2.5 Anchored Vessels

231. Applying the same criteria as described in **Section 10.1.5**, no vessels were identified as being at anchor within the EIA Cable Corridor Study Area.

11 Base Case Vessel Routeing

11.1 Definition of a Main Commercial Route

232. 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**.

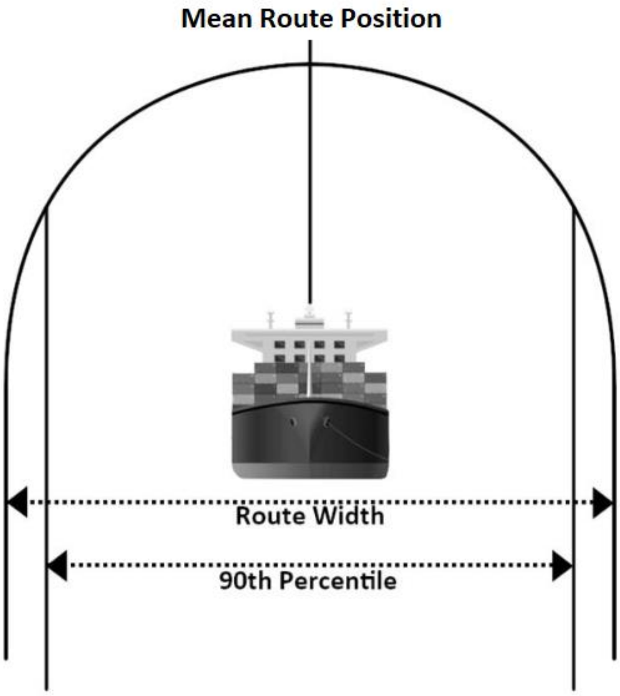


Figure 11-1 Illustration of Main Route

233. It is noted that the majority of fishing vessels recorded were observed to be in transit (see **Section 10**), however have been excluded from the routeing analysis in this section on the basis that fishing vessel behaviour is non-routine in nature. Allision risk to fishing vessels has been modelled separately in **Section 15.4.5**.

11.2 Pre Wind Farm Main Commercial Routes

234. A total of 16 main[4] commercial routes were identified from the vessel traffic survey data. These main commercial routes and corresponding 90th percentiles within the EIA Study Area are shown relative to the OAA in **Figure 11-2**. Following this, a

[4] Main routes were identified on the basis of there being a minimum of three vessels per week undertaking the route.

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. It is noted that the start and end locations are based on the most common destinations transmitted via AIS by vessels on those routes; however, destination information is not always transmitted and therefore it may not always be possible to derive precise destination information, especially if the route was undertaken by a relatively low number of vessels during the 28-day period.

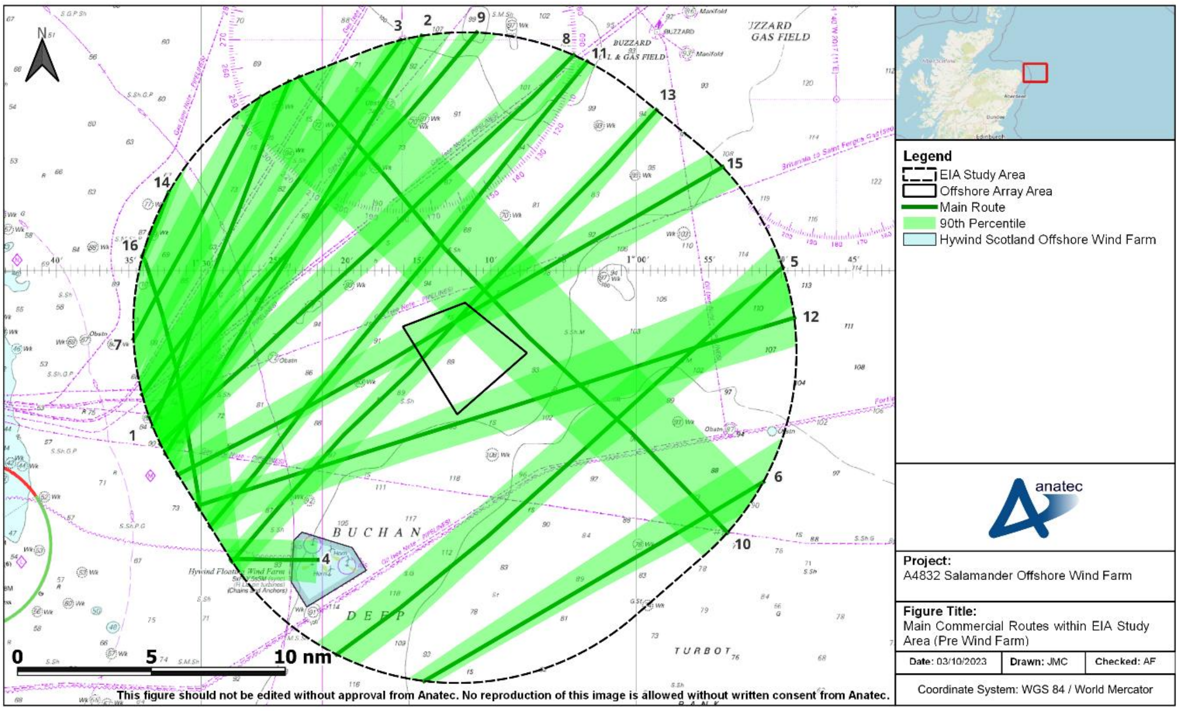


Figure 11-2 Main Commercial Routes within EIA Study Area (Pre Wind Farm)

Table 11.1 Description of Main Commercial Routes

Route number	Average Vessels per Week	Description
1	17	**Aberdeen - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
2	11 - 12	**Aberdeen - various oil and gas infrastructure.** Used almost entirely by oil and gas vessels (96%).
3	9	**Peterhead - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
4	7 - 8	**Peterhead - Hywind Offshore Wind Farm.** Used entirely by wind farm support vessels.
5	7	**Aberdeen - various oil and gas infrastructure.** Used almost entirely by oil and gas vessels (96%).

Route number	Average Vessels per Week	Description
6	7	**Aberdeen – Piper B.** Used almost entirely by oil and gas vessels (89%).
7	5 - 6	**Peterhead - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
8	5	**Peterhead - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
9	5	**Peterhead - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
10	5	**Europe – America.** Used almost entirely by cargo vessels (95%).
11	4 - 5	**Aberdeen - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
12	4 - 5	**Peterhead – various oil and gas infrastructure.** Used almost entirely by oil and gas vessels (88%).
13	4 - 5	**Aberdeen - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
14	4	**Peterhead - various oil and gas infrastructure.** Used entirely by oil and gas vessels.
15	3 - 4	**Peterhead – Global Producer 3.** Used entirely by oil and gas vessels.
16	3 - 4	**Various.** Used by tankers (64%), cargo vessels (21%) and passenger vessels (14%).

11.3 Adverse Weather Routeing

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

236. Adverse weather was not raised as a concern by commercial vessel operators, likely due to the available searoom meaning that such vessels can safely avoid the OAA during adverse conditions. Input for smaller vessels was that adverse weather would be a key determining factor in whether or not to transit through the OAA, with general stakeholder consensus being most small vessels would still likely avoid transit through.

237. Hazards associated with adverse weather routeing have been considered within the risk assessment (see **Section 16**).

12 Navigation, Communication and Position Fixing Equipment

238. 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 Offshore Development.

12.1 Very High Frequency Communications (including Digital Selective Calling)

239. 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 Digital Selective Calling (DSC)) when operated close to WTGs.

240. 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.

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

242. 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 area 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).

243. 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).

244. 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 Offshore Development is anticipated to have no significant impact upon VHF communications.

12.2 Very High Frequency Direction Finding

245. 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 50 m). This is deemed to be a relatively small-scale

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

246. 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 1 nm, the homer system operated as expected with no apparent degradation.

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

12.3 Automatic Identification System

248. 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).

249. 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 Offshore Development.

12.4 Navigational Telex System

250. 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.

251. 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.

252. 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.

253. 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 Offshore Development.

12.5 Global Positioning System

254. 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".

255. 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).

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

12.6 Electromagnetic Interference

257. 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.

258. 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 the EMF are minimised to ensure continued safe navigation.

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

12.6.1 Subsea Cables

260. The subsea cables for the Offshore Development will be Alternating Current (AC), 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 cables associated with the Offshore Development are not considered any further. The MCA confirmed they had no concern during consultation on the basis that AC was being used (see Section 4).

12.6.2 Wind Turbine Generators

261. 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.

12.6.3 Experience at Operational Offshore Wind Farms

262. 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.

12.7 Marine Radar

263. 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.

12.7.1 Trials

264. 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.

265. 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).

266. 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 1.5 nm) 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 12-1**.

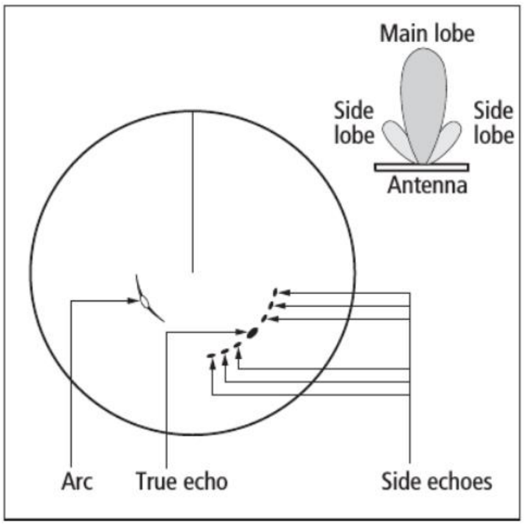


Figure 12-1 Illustration of side lobes on Radar screen

267. 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 12-2**.

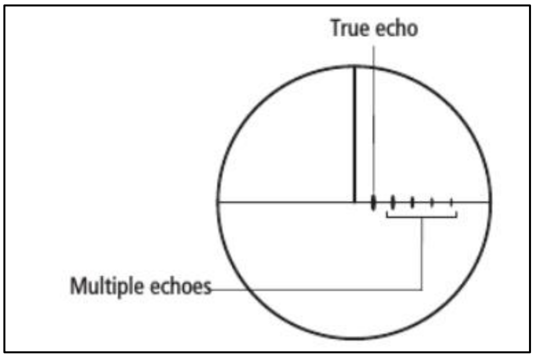


Figure 12-2 Illustration of multiple reflected echoes on Radar screen

268. 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).

269. 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.

270. 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[5]. 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.

[5] It is acknowledged that other theoretical analysis has been undertaken.

271. 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".

272. 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, 2008). The interference buffers presented in **Table 12.1** are based primarily on MGN 654 (MCA, 2021), with consideration also made of past guidance MGN 371 (MCA, 2008), MGN 543 (MCA, 2016) and MGN 372 (MCA, 2008).

Table 12.1 Distances at Which Impacts on 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 0.25 nm. ▪ Vessels may generate multiple echoes on shore-based Radars under 0.45 nm.
1.5	▪ Under MGN 654, impacts on Radar are considered to be tolerable with mitigation between 0.5 and 3.5 nm. ▪ S-band Radar interference starts at 1.5 nm. ▪ Echoes develop at approximately 1.5 nm, 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.

273. As noted in **Table 12.1**, the onset range from the WTGs of false returns is approximately 1.5 nm, 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)

12.7.2 Experience from Operational Developments

274. The evidence from mariners operating in proximity to existing offshore wind farms is that they quickly learn to adapt to any effects. **Figure 12-3** 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 12-3** are as per **Table 12.1**.

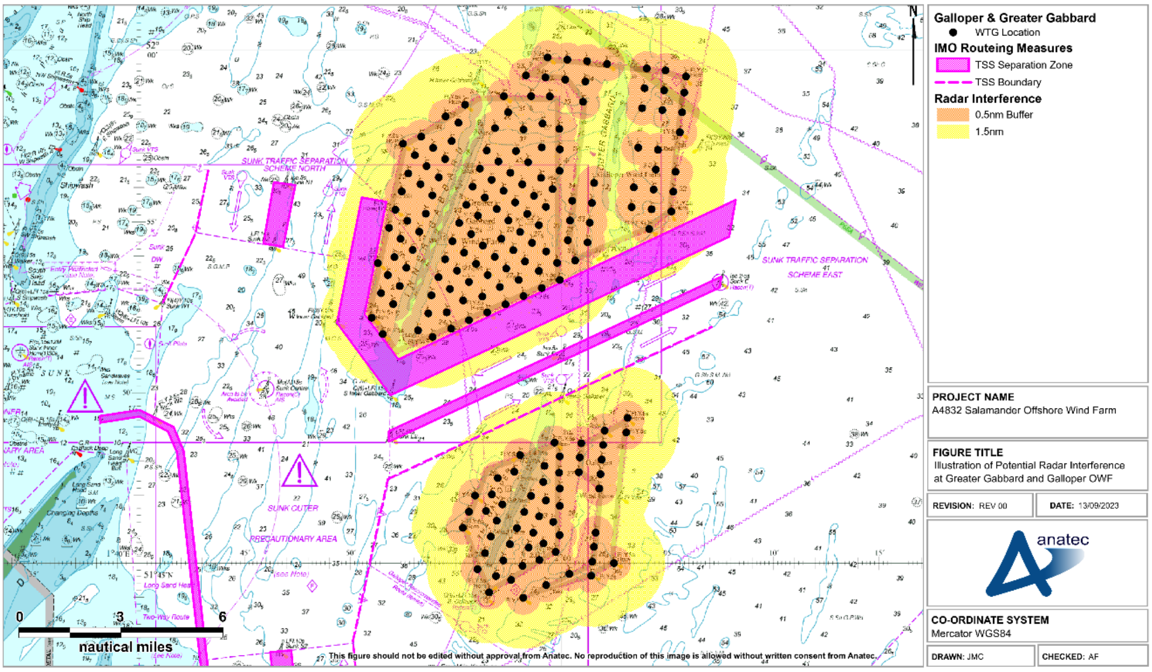


Figure 12-3 Illustration of Potential Radar Interference at Greater Gabbard and Galloper Offshore Wind Farm

275. As indicated by **Figure 12-3**, vessels utilising these TSS lanes will 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.

276. AIS information can also be used to verify the targets of larger vessels (generally vessels over 15 m LOA – the minimum threshold for fishing vessel AIS carriage requirements). Approximately 3% of the vessel traffic recorded within the EIA Study Area was under 15 m LOA, with less than 1% of vessel tracks recorded on Radar.

277. 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.

12.7.3 Increased Radar Returns

278. Beam width is the angular width, horizontal or vertical, of the path taken by the Radar pulse. Horizontal beam width ranges from 0.75° to 5°, and vertical beam width from 20° to 25°. How well an object reflects energy back towards the Radar depends upon its size, shape and aspect angle.

279. 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° to 25°) dependent upon the distance from the target. Therefore, increased WTG height in the array will not create any effects in addition to those already identified from existing operational wind farms (interfering side lobes, multiple and reflected echoes).

280. 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.

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

281. 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.

12.7.5 Application to the Offshore Development

282. Upon commissioning of the Offshore Development, some commercial vessels may pass within 1.5 nm of the 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.

283. **Figure 12-4** presents an illustration of potential Radar interference due to the OAA relative to the post wind farm routeing illustrated in **Section 14.4.2**. The Radar effects have been applied to the indicative array layout introduced in **Section 6.2.1**.

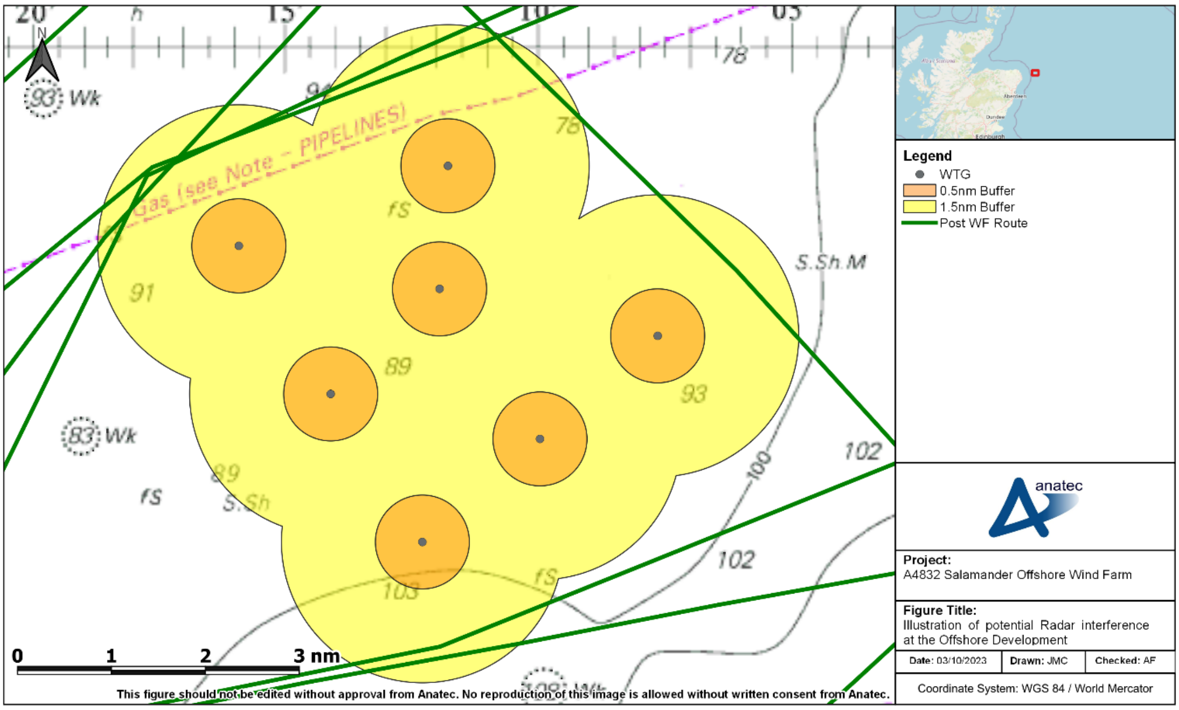


Figure 12-4 Illustration of potential Radar interference at the Offshore Development

284. Vessels passing within the OAA will be subject to a greater level of interference with impacts becoming more substantial in close proximity to WTGs. This will 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. However, it is noted that there is sufficient searoom in all directions for vessels to pass further from the structures should they choose to do so.

285. 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.

12.8 Sound Navigation Ranging Systems

286. 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 Offshore Development.

12.9 Noise

287. 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.

12.10 Summary of Potential Effects on Use

288. Based on the detailed technical assessment of the effects due to the presence of the Offshore Development on navigation, communication and position fixing equipment in the previous subsections, **Table 12.2** summarises the assessment of frequency and consequence and the resulting risk for each component of this impact.

Table 12.2 Summary of risk to navigation, communication and position fixing equipment

Topic	Frequency	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

289. On the basis of these findings, associated risks are screened out of the risk assessment undertaken (see **Section 16**).

13 Cumulative Overview

290. The cumulative assessment methodology as set out within **Section 3.3** has been used to screen in cumulative offshore wind farm developments and subsea cables, and assign each a cumulative tier. A summary of this process is provided in **Table 13.1**.

291. Following this, the location of the tiered offshore wind farm developments is shown in **Figure 13-1** relative to the OAA. It is noted that existing offshore wind farm developments are considered to be captured within the baseline, however are shown in **Figure 13-1** for reference.

292. Any proposed project that is not yet scoped has not been screened in (see **Section 3.3**) due to low data confidence, even if within 50nm. This includes the BP Alternative Energy, Aspen, Campion, Bowdun, Broadshore, Scaraben, and Sinclair projects. The early stage of these developments at the time of writing (December 2023) means that meaningful assessment cannot be undertaken. It should be noted that a review of projects was undertaken in early March 2024 (i.e. less than two months prior to submission) and the projects that have submitted a scoping report between December and March are Stromar Offshore Wind Farm and the Broadshore Hub (Broadshore, Sinclair and Scaraben Projects) in January 2024.

293. It is noted that port developments (and specifically the subsequent changes in vessel traffic movements) are considered as part of the future case vessel traffic scenarios (see **Section 14**).

Table 13.1 Cumulative Tiering Summary

Development	Type	Status	Distance to Offshore Array Area (nm)	Closest Distance to Offshore Export Cable Corridor (nm)	Data Confidence	Tier	Rationale
Muir Mhor	Offshore Wind Farm	Scoping Submitted	15.3	0	Medium	1	Route interaction within 50nm, export cable corridor within 2nm
Green Volt	Offshore Wind Farm	Consent Application Submitted	18.1	0	High	1	Route interaction within 50nm, export cable corridor within 2nm
Marram Wind	Offshore Wind Farm	Scoping Submitted	25.4	0	Medium	1	Route interaction within 50nm,

Development	Type	Status	Distance to Offshore Array Area (nm)	Closest Distance to Offshore Export Cable Corridor (nm)	Data Confidence	Tier	Rationale
							export cable corridor within 2nm
Buchan	Offshore Wind Farm	Scoping Submitted	35.7	0	Medium	2	No route interaction within 50nm, export cable corridor within 2nm
Morven	Offshore Wind Farm	Scoping Submitted	40.5	40.1	Medium	2	No route interaction within 50nm
Ossian	Offshore Wind Farm	Scoping Submitted	42.9	42.9	Medium	2	No route interaction within 50nm
Caledonia	Offshore Wind Farm	Scoping Submitted	43.3	34.0	Medium	2	No route interaction within 50nm
Cenos	Offshore Wind Farm	Scoping Submitted	82.9	0	Medium	1	Export cable corridor within 2nm (Cenos array farther than 50nm and therefore only export cable corridor screened in).
NorthConnect	Subsea Cable	Consented	0	0	High	1	Subsea cable within 2nm
Eastern Green Link 2	Subsea Cable	Consented	14.4	1.5	High	1	Subsea cable within 2nm

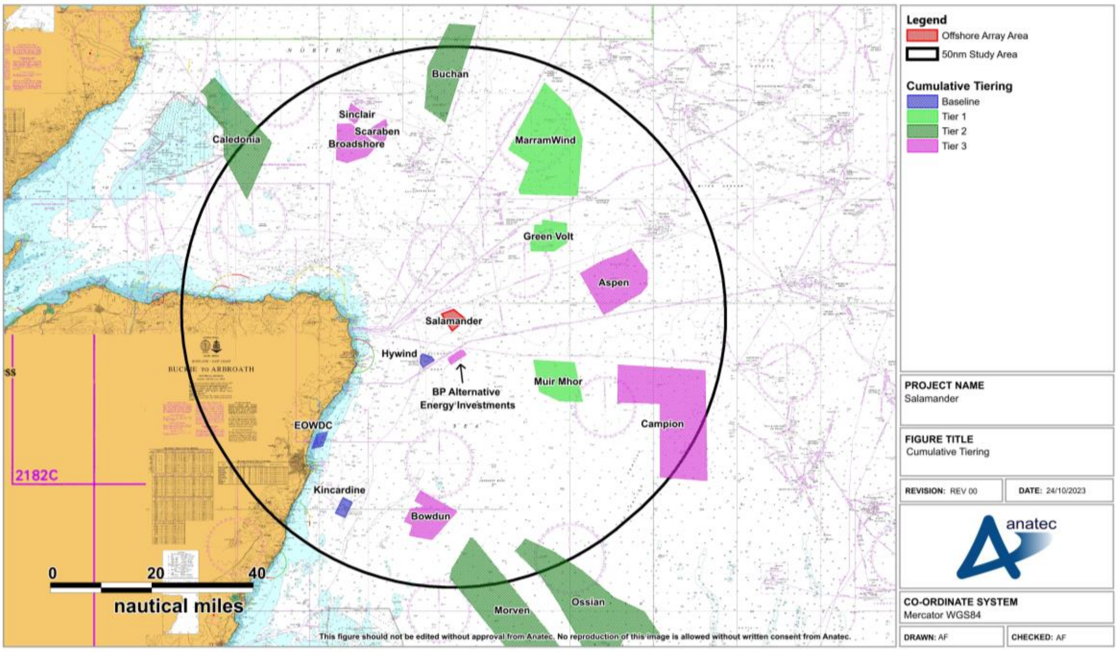


Figure 13-1 Cumulative Tiering – Offshore Wind Farms

14 Future Case Vessel Traffic

294. The characterisation of vessel traffic established in the baseline is used as input to the risk assessment (see **Section 16**). 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 Offshore Development (the "post wind farm" scenario).

295. The following subsections provide details of high-level future case scenarios which have been used to inform the risk assessment.

14.1 Increases in Commercial Vessel Activity

296. There is uncertainty associated with long-term predictions of vessel traffic growth including the potential for any other new developments in UK or transboundary ports and the long-term effects of Brexit.

297. Therefore, two independent scenarios of potential growth in commercial vessel movements of 10% and 20% have been estimated throughout the lifetime of the Offshore Development.

14.2 Increases in Commercial Fishing Vessel and Recreational Vessel Activity

298. There is similar uncertainty associated with long-term predictions for commercial fishing vessel and recreational vessel transits given the limited reliable information on future trends upon which any firm assumption could be made. There are no known major developments which would increase commercial fishing or recreational vessel activity in the region.

299. Therefore, a conservative potential growth in commercial fishing vessel and recreational vessel movements of 10% and 20% has been estimated throughout the lifetime of the Offshore Development.

14.3 Increases in Traffic Associated with the Offshore Development Operations

300. During the construction phase, up to 660 return trips will be made by vessels involved in the installation of the Offshore Development (see **Section 6.5.1**), with similar numbers during decommissioning (516 as per **Section 6.5.3**). During the operation and maintenance phase, up to 210 vessel movements per year may be made throughout the operation and maintenance phase of the Offshore Development (see **Section 6.5.2**).

14.4 Commercial Traffic Routeing (the Offshore Development in Isolation)

14.4.1 Methodology

301. It is not possible to consider all potential alternative routeing options for commercial traffic and therefore worst-case alternatives have been considered where possible in consultation with operators. Assumptions for re-routeing include:

- All alternative routes maintain a minimum mean distance of 1 nm 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 sandbanks, aids to navigation and known routeing preferences.

302. Annex 2 of MGN 654 defines a methodology for assessing passing distance from offshore wind farm boundaries (the Shipping Route Template) but states that it is "*not a prescriptive tool but needs intelligent application*".

303. 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 1 nm 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 1 nm off established developments.

304. Evidence also demonstrates that commercial vessels do not transit through arrays. Regular vessel operators in the vicinity of the Offshore Development confirmed in consultation that they would not pass through the OAA (see **Section 4**), and similar input was provided in the Hazard Workshop.

305. The NRA also aims to establish the worst-case scenario based on navigational safety parameters, and when considering this the most conservative realistic scenario for vessel routeing is considered to be when main commercial routes pass 1 nm 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.

14.4.2 Main Commercial Route Deviations

306. An illustration of the anticipated worst-case shift in the mean positions of the main commercial routes within the EIA Study Area following the construction of the Offshore Development is presented in **Figure 14-1**. These deviations are based on

Anatec's assessment of the worst-case scenario including the indicative array layout presented in **Section 6.2.1**.

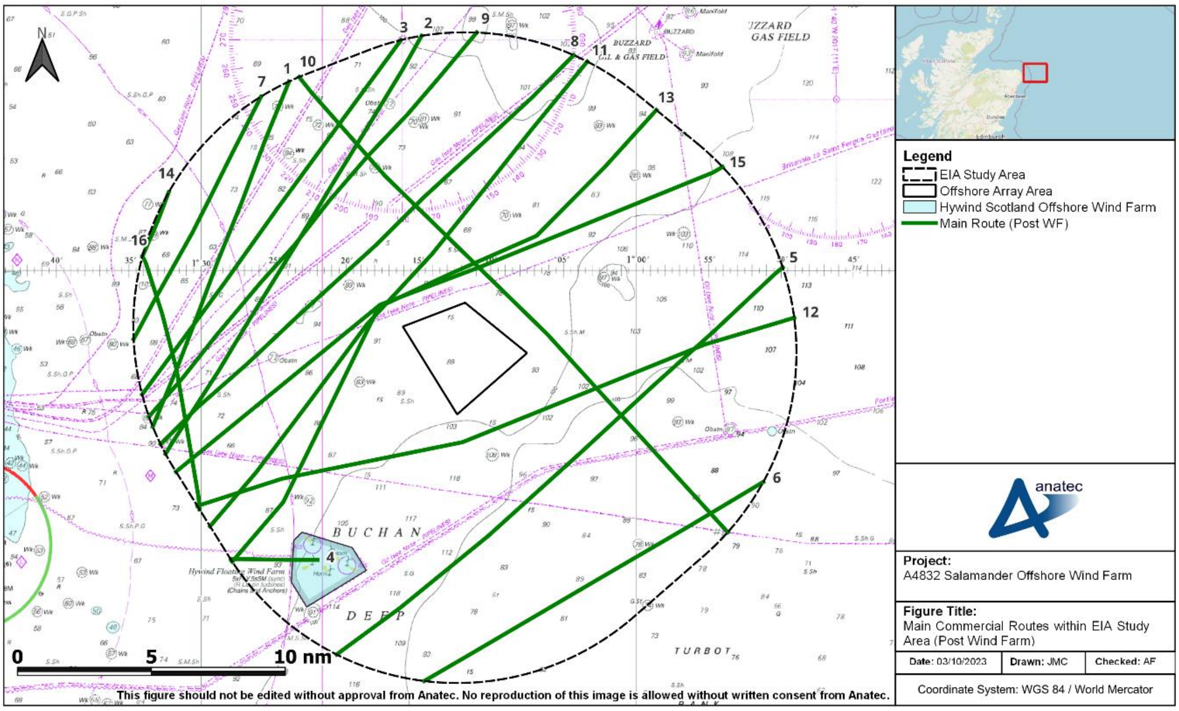


Figure 14-1 Main Commercial Routes within EIA Study Area (Post Wind Farm)

307. Deviations from the pre wind farm scenario would be required for five out of the 16 main commercial routes identified, with the level of deviation ranging from a change of less than 0.1 nm for routes 10 and 11 to an increase of 0.8 nm for Route 13. For the displaced routes, the increase in route length within the EIA Study Area compared to the pre wind farm scenario is presented in **Table 14.1**.

Table 14.1 Summary of Post Wind Farm Main Commercial Route Deviations Within EIA Study Area

Route Number	Average Vessels per Week	Change in Route Length (nm)
10	5	< 0.1 nm
11	4 – 5	< 0.1 nm
12	4 – 5	0.1 nm
13	4 – 5	0.8 nm
15	3 - 4	0.3 nm

14.5 Commercial Traffic Routeing (Cumulative)

308. Consideration has been given to vessel routeing on a cumulative basis. Anatec's ShipRoutes database and the baseline data have been used to estimate which main

routes may also intersect screened in cumulative developments. The results are shown in **Table 14.2** (developments not shown did not have any route intersections). Following this, a summary of the developments' route interactions is provided per tier in **Sections 14.5.1** to **Section 14.5.3**.

Table 14.2 Cumulative Routeing Interactions

Row Labels	Green Volt	Marram Wind	Muir Mhor	Salamander
1				
2		✓		
3		✓		
4				
5				
6				
7				
8		✓		
9		✓		
10			✓	✓
11	✓	✓		✓
12				✓
13	✓	✓		✓
14				
15	✓			✓
16				

14.5.1 Tier 1

309. Three developments were observed to interact with main routes identified in proximity to the OAA, as shown in **Table 14.2**:

- **Green Volt** located 18.1 nm to the northeast of the OAA. Relevant routes are northwest/southwest bound from Aberdeen or Peterhead. Considered likely that these vessels will pass either north of Marram Wind or south of Green Volt. Vessels passing north of Marram Wind will not be impacted by the OAA. Vessels passing south of Green Volt may require a minor deviation north or south of the OAA, noting that there is sufficient sea room to accommodate such a deviation.
- **Marram Wind** located 25.5 nm northeast of the OAA. Relevant routes are northwest/southwest bound from Aberdeen or Peterhead. Considered likely that these vessels will pass either north of Marram Wind or south of Green Volt. Vessels passing north of Marram Wind will not be impacted by the OAA. Vessels

passing south of Green Volt may require a minor deviation north or south of the OAA, noting that there is sufficient sea room to accommodate such a deviation.

- **Muir Mhor** located 15.3 nm east of the OAA. Relevant routeing is northwest/southeast to/from the Moray Firth. Associated vessels will likely deviate east of the OAA and west of Muir Mhor, representing a minor deviation.

14.5.2 Tier 2

310. There are no Tier 2 developments within 35 nm of the OAA. The routeing of relevance to the OAA will be commercial vessels on generally north/south bound routes.

311. Within the northern extent of the 50 nm study area, it is considered likely that vessels will pass between Caledonia and Buchan (there is approximately 30 nm separating these projects). In the southern extent, it is likely that vessels will pass inshore of Morven, noting certain vessels (in particular oil and gas vessels) may pass offshore of Ossian. Vessels on these transits may pass either inshore or offshore of the OAA, and there is searoom available to safely accommodate either option.

14.5.3 Tier 3

312. Tier 3 developments have been screened out based on low data confidence.

15 Collision and Allision Risk Modelling

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

15.1 Hazards Under Consideration

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

- Increased vessel to vessel collision risk;
- Powered vessel to structure allision risk;
- Drifting vessel to structure allision risk; and
- Fishing vessel to structure allision risk.

315. The pre wind farm assessment has been informed by the vessel traffic survey data (see **Section 10.1**) in combination with the outputs of consultation (see **Section 4**) 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 Offshore Development as set out in **Section 14**.

15.2 Scenarios Under Consideration

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

- Pre wind farm with the base case vessel traffic level;
- Pre wind farm with future case vessel traffic level defined by:
  - A 10% increase in traffic; and
  - A 20% increase in traffic.
- Post wind farm with the base case vessel traffic level; and
- Post wind farm with future case vessel traffic levels defined by:
  - A 10% increase in traffic; and
  - A 20% increase in traffic.

317. The results of the base case scenarios are detailed in full in the following subsections with the equivalent results for the future case scenarios provided in **Section 355**.

15.3 Pre Wind Farm Modelling

15.3.1 Vessel to Vessel Encounters

318. An assessment of current vessel to vessel encounters has been undertaken using the vessel traffic data collected as part of the vessel traffic surveys (see **Section 10**). The

model defines an encounter as two vessels passing within 1 nm 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 collisions. No account of whether encounters are head on or stern to head are given; only close proximity is accounted for.

319. Coordinated operations between vessels that are not independent, such as wind farm support vessels associated with Hywind Offshore Wind Farm and vessels involved in a towing operation, were excluded. Encounters between two fishing vessels or two recreational vessels were retained, which is considered conservative given the possibility they are not independent (a recreational race, or pair trawling).

320. **Figure 15-1** presents a heat map based upon the geographical distribution of vessel encounter tracks within a 0.25 nm × 0.25 nm density grid.

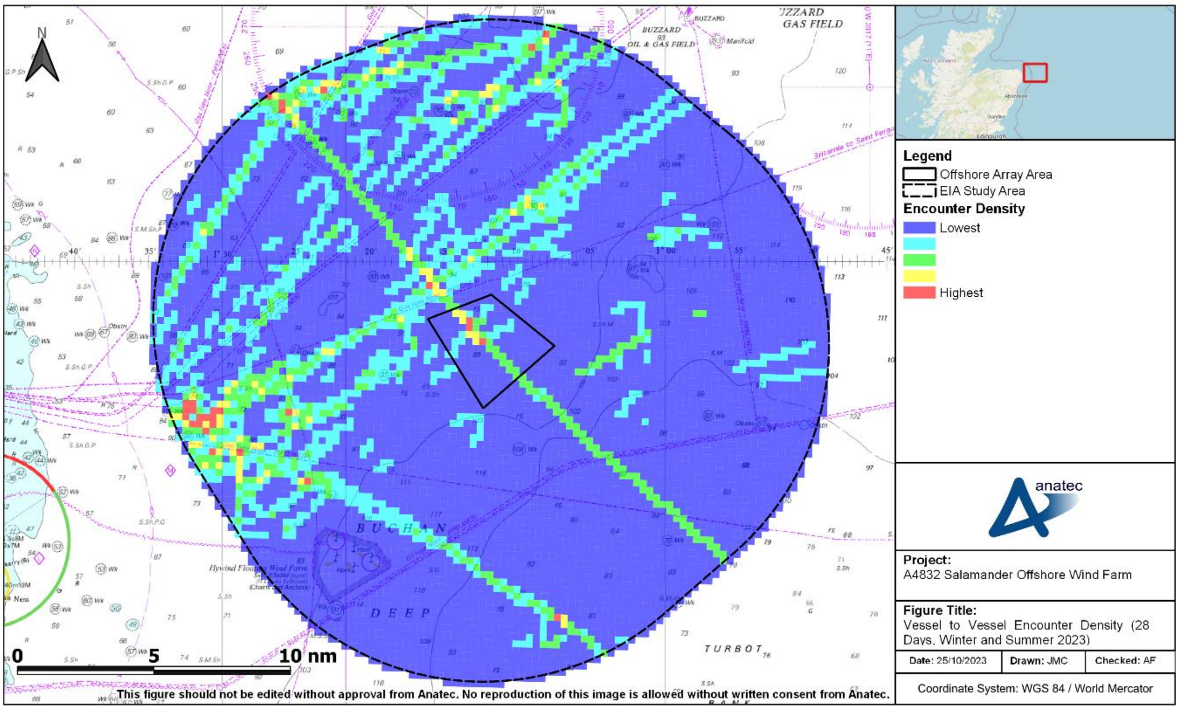


Figure 15-1 Vessel to Vessel Encounter Density (28 Days, Winter and Summer 2023)

321. There was on average four encounters per day within the EIA Study Area throughout the combined 28-day survey period. Encounters were most common within the northwestern half of the EIA Study Area. The greatest number of encounters recorded on a single day was nine, on 7 August 2023.

322. The most frequent vessel types involved in encounters during the combined 28-day survey period were fishing vessels (44%) and oil and gas vessels (36%).

15.3.2 Vessel to Vessel Collisions

323. The pre wind farm vessel routeing (which was based on the vessel traffic survey data) was used as input to Anatec's COLLRISK model, which has been run to estimate the existing vessel to vessel collision risk in proximity to the Offshore Development.

324. A heat map based upon the geographical distribution of collision risk within a 0.5×0.5 nm grid for the base case is presented in **Figure 15-2**.

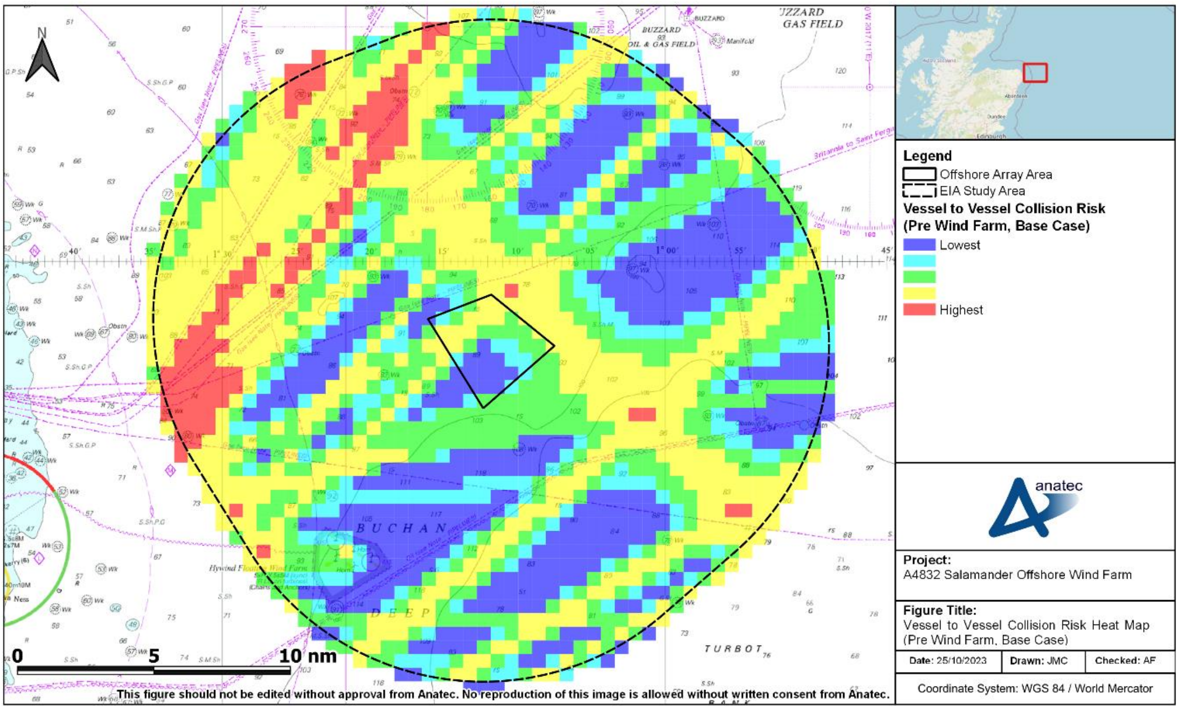


Figure 15-2 Vessel to Vessel Collision Risk Heat Map (Pre Wind Farm, Base Case)

325. Assuming base case vessel traffic levels, the annual collision frequency pre wind farm was estimated to be 8.43×10^{-4}, corresponding to a return period of one every 1,186 years. This is comparable to return periods for other similar offshore wind farm developments. The highest collision frequency was at the western extent of the EIA Study Area, which largely corresponds to oil and gas traffic travelling to/from Peterhead and Aberdeen.

326. 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, such as minor impacts. Other incident data, which includes minor incidents, is presented in **Section 9**.

15.4 Post Wind Farm

15.4.1 Simulated Automatic Identification System Data

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

328. A plot of 28 days of simulated AIS (to match the total duration of the vessel traffic surveys) within the EIA Study Area based on the post wind farm commercial routes is presented in **Figure 15-3**.

329. It is noted that the simulated AIS represents a worst-case scenario based on a mean 1 nm passing distance from the OAA for deviated routes.

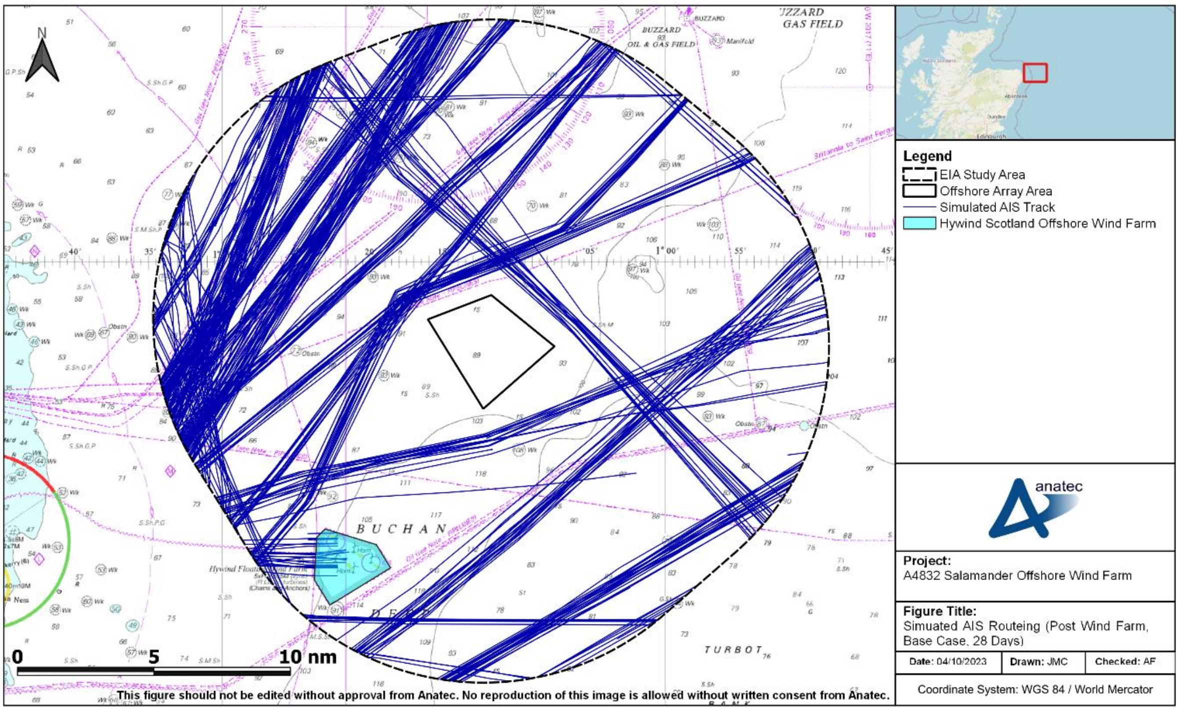


Figure 15-3 Simulated AIS Routeing (Post Wind Farm, Base Case, 28 Days)

15.4.2 Vessel to Vessel Collisions

330. 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 Offshore Development.

331. A heat map based upon the geographical distribution of collision risk within a 0.5 × 0.5 nm grid for the base case is presented in **Figure 15-4**.

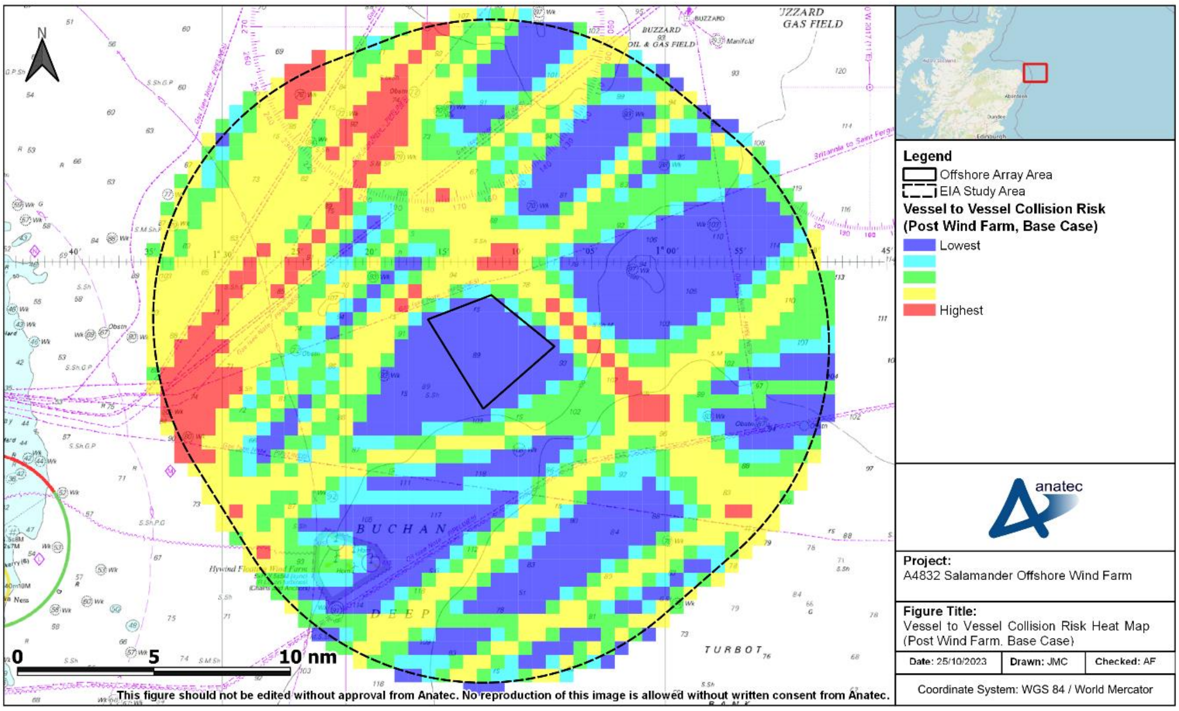


Figure 15-4 Vessel to Vessel Collision Risk Heat Map (Post Wind Farm, Base Case)

332. Assuming base case vessel traffic levels, the annual collision frequency post wind farm was estimated to be 8.72×10^{-4}, corresponding to a return period of one every 1,147 years. This represents a 3% increase in collision frequency compared to the pre wind farm base case result. This low change is reflective of the limited deviations anticipated to be required.

15.4.3 Powered Vessel to Structure Allision

333. Based upon the vessel routeing identified in the EIA Study Area, the anticipated re-routeing as a result of the presence of the Offshore Development, and assumptions that relevant embedded mitigation measures are in place (see **Section 17**), the frequency of an errant vessel under power deviating from its route to the extent that it came into proximity with a WTG within the OAA is considered to be low.

334. From consultation with the shipping industry (see **Section 4**), it is also assumed that commercial vessels would be unlikely to navigate between the WTGs due to the restricted sea room. During the operation and maintenance phase, this risk will likely also be mitigated by the lighting and marking of the WTGs.

335. Using the post wind farm routeing as input, together with the worst-case indicative array 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 WTGs

within the OAA whilst under power. In order to maintain a worst-case scenario, the model did not consider one structure shielding another.

336. A plot of the annual powered vessel allision frequency per structure for the base case is presented in **Figure 15-5**.

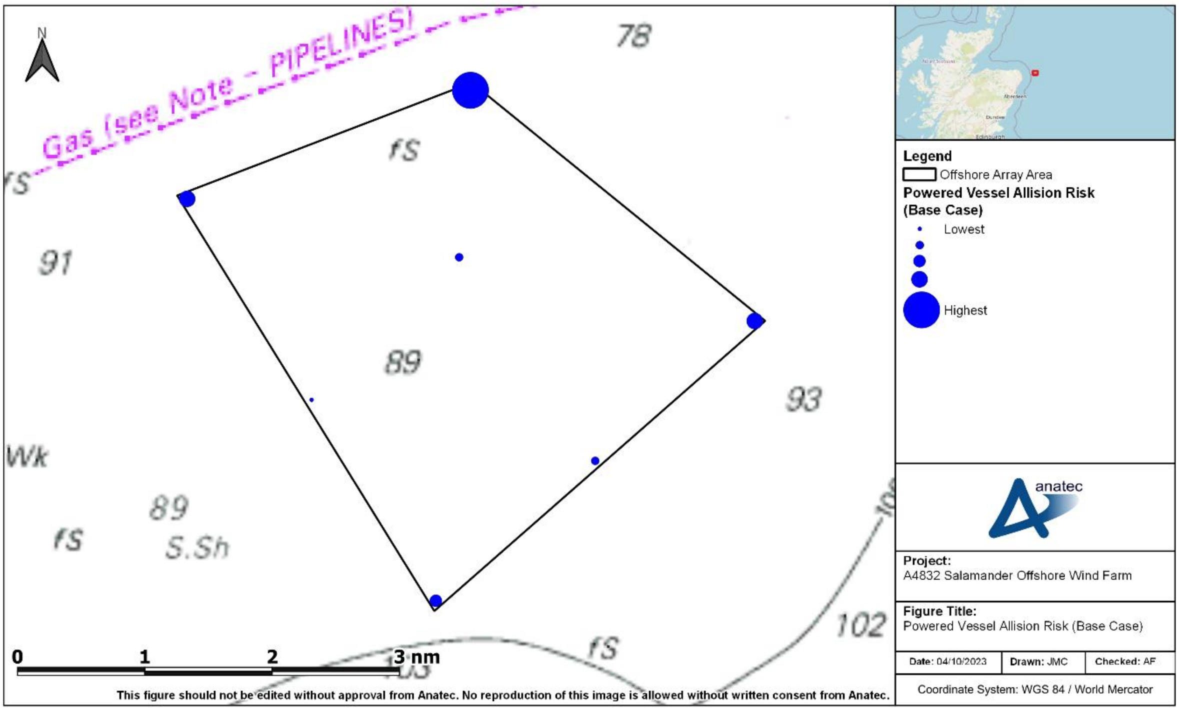


Figure 15-5 Powered Vessel Allision Risk (Base Case)

337. Assuming base case vessel traffic levels, the annual powered vessel allision frequency was estimated to be 6.29×10^{-4}, corresponding to a return period of an allision every 1,589 years.

338. The greatest powered vessel to structure allision risk was associated with the northernmost structure where multiple main commercial routes pass at the minimum mean distance from the OAA (1 nm); the allision risk of this individual WTG was 5.38×10^{-4}, corresponding to a return period of an allision every 1,858 years and accounting for 85% of the total allision frequency for the OAA.

15.4.4 Drifting Vessel to Structure Allision

339. Using the post wind farm routeing as input, together with the worst-case indicative array 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 WTGs within the OAA. The model is based on the premise that propulsion on a vessel must fail before drifting will 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.

340. The exposure times for a drifting scenario are based upon the vessel hours spent in the EIA Study Area. These have been estimated based on the vessel traffic levels, speeds, and revised routeing patterns (see **Section 14**). The exposure is divided by vessel type and size to ensure that these specific factors, which have been shown to influence incident rates based upon analysis of historical incident data, are taken into account for the modelling.

341. Using this information, the overall rate of mechanical failure in proximity to the OAA was estimated. The probability of a vessel drifting towards a WTG 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.

342. 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 WTG. 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.

343. After modelling the three drifting scenarios, it was established that the flood tide dominated scenario produced the worst-case results. A plot of the annual drifting vessel allision frequency per WTG for the base case is presented in **Figure 15-6**.

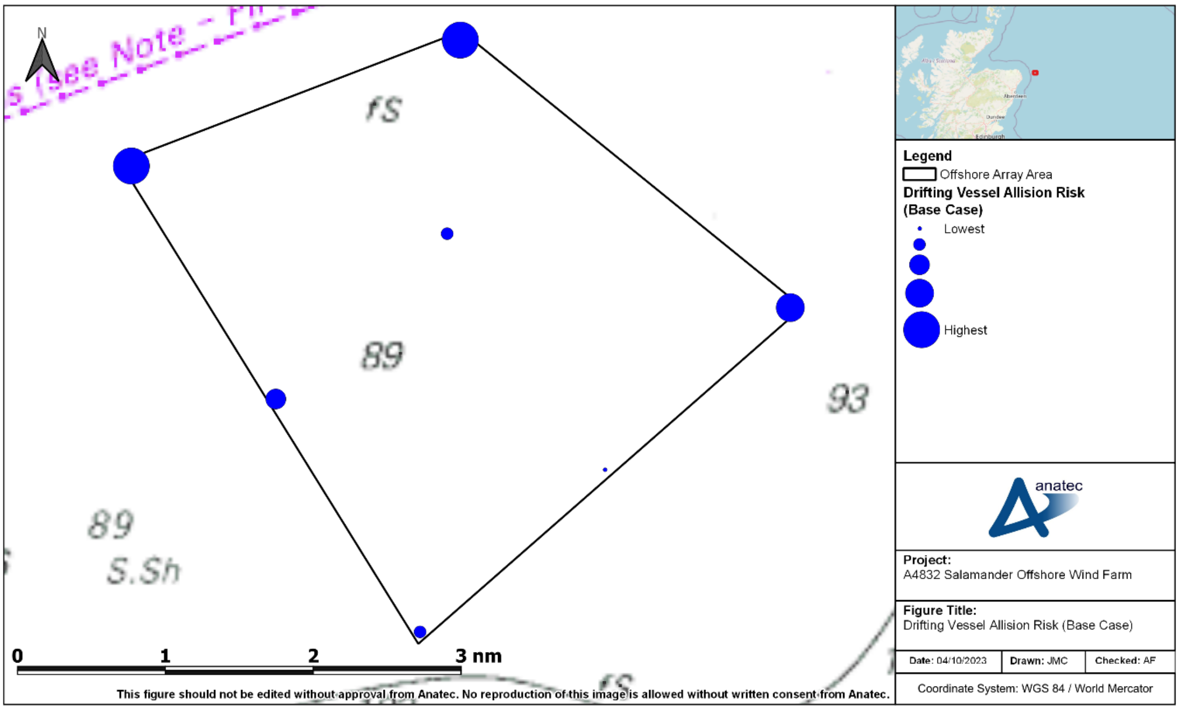


Figure 15-6 Drifting Vessel Allision Risk (Base Case)

344. Assuming base case vessel traffic levels, the annual drifting vessel allision frequency was estimated to be 2.15×10^{-5}, corresponding to a return period of an allision every 46,451 years.

345. The greatest drifting vessel to structure allision risk was associated with the northwestern, northern and eastern WTGs, where multiple main commercial routes pass at the minimum mean distance from the OAA (1 nm); these routes pass to the north of these WTGs and would drift towards them during flood tide. The greatest individual allision risk was associated with the northwestern WTG and had an allision frequency of 7.84×10^{-6}, corresponding to a return period of an allision every 127,524 years.

346. 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).

15.4.5 Fishing Vessel to Structure Allision

347. 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 EIA Study Area. Moreover, fishing vessels could be observed internally within the OAA in addition to externally.

348. Anatec's fishing allision 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. Given that not all fishing vessels broadcast on AIS, the vessel density observed is scaled up to account for non-AIS fishing vessels (based on the proportion of non-AIS fishing vessels that were observed during the vessel traffic surveys).

349. A plot of the annual fishing vessel allision frequency per WTG for the base case is presented in **Figure 15-7**.

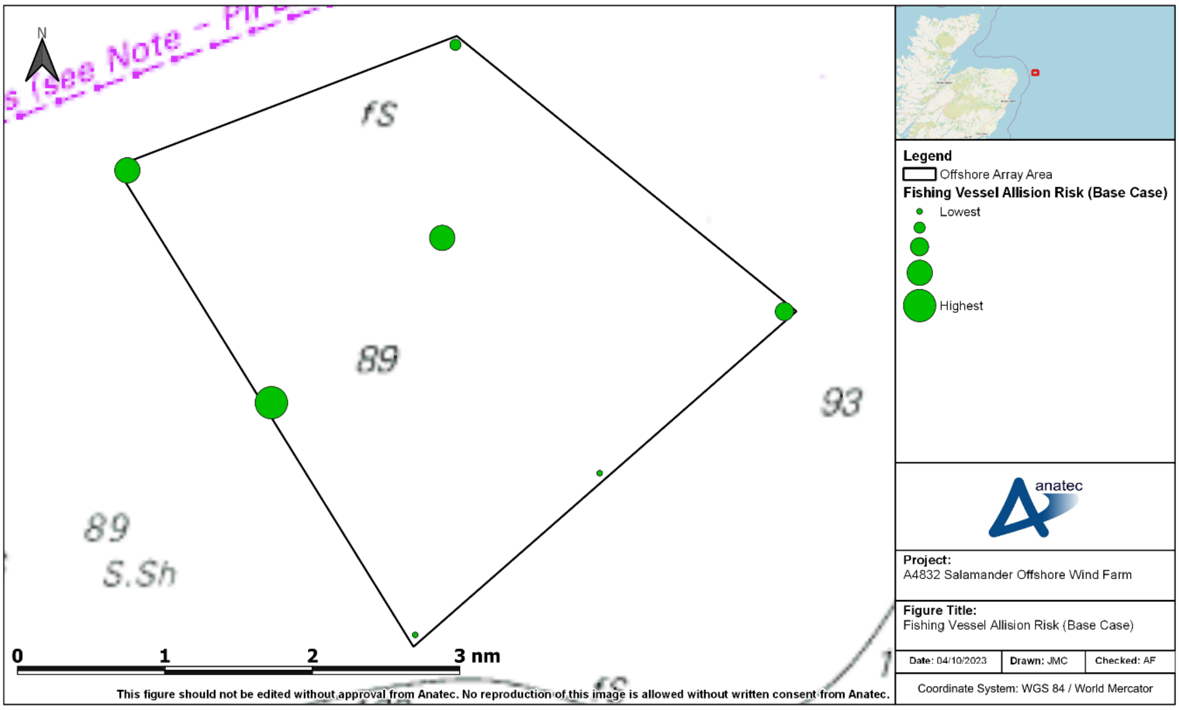


Figure 15-7 Fishing Vessel Allision Risk (Base Case)

350. Assuming base case vessel traffic levels, the annual fishing vessel to structure allision frequency was estimated to be 8.25×10^{-2}, corresponding to a return period of 12 years. This is a relatively high risk of allision; however, it is noted that the model is especially conservative in its estimations given that it assumes that the nature of fishing vessel activity (i.e., the number and geographic distribution of the vessels) will not change after the installation of the WTGs. No account has been made on a modelling basis on fishing vessels choosing to pass further from the WTGs or avoid the OAA altogether. This is considered extremely conservative, noting that consultation (see **Section 4**) indicated that the majority of fishing vessels are likely to avoid the structures. In this regard, it is noted that the Offshore Array Area was selected using information provided by the Scottish Fishermen's Federation (SFF), with site selection avoiding key areas where high intensity fishing occurs. Further

details are provided in **Volume ER.A.2, Chapter 3: Site Selection and Consideration of Alternatives**.

351. It should also be noted that the majority of fishing vessels recorded passing through the OAA during the surveys were in transit as opposed to using the area to undertake active fishing (see **Section 10.1.3.3**). Based on historical incident data (see **Section 9.6**), most likely consequences of an allision are minor.

352. The greatest fishing vessel to structure allision risk was associated with the southwestern WTG where the allision frequency was 2.00×10^{-2}, corresponding to a return period of 50 years.

15.5 Subsea Infrastructure Interaction

353. There is the potential that vessels could interact with the subsea infrastructure associated with the OAA. To assess this, vessel draughts recorded per vessel type during the vessel traffic surveys has been assessed.

354. **Table 15.1** presents the average and maximum vessel draughts per vessel type, within the EIA Study Area, during the combined 28-day survey period. **Table 15.2** presents the same values recorded within the OAA.

Table 15.1 Average and Maximum Draught per Vessel Type, EIA Study Area, 28 Days

Vessel Type	Average Draught (m)	Maximum Draught (m)
Oil and Gas	5.3	11.6
Fishing	4.2	8.2
Cargo	6.8	14
Tankers	7.5	13.7
Wind Farm	3.8	6
Passenger	7.0	8.2

Table 15.2 Average and Maximum Draught per Vessel Type, Offshore Array Area, 28 Days

Vessel Type	Average Draught (m)	Maximum Draught (m)
Fishing	4.1	5.2
Oil and Gas	5.5	11.6
Cargo	5.7	7.9
Passenger	6.9	8.2

355. Consultation feedback (see **Section 4**) has consistently indicated that the majority of vessels are expected to avoid the OAA due to the presence of subsea infrastructure, and the fact that the associated deviations are limited (see **Section 14.4**). This includes input from the hazard workshop and direct from local vessel operators.

356. It is also noted that this aligns with vessel behaviour associated with the local Hywind project (see **Section 7.1**). The vessel traffic data (**Section 10.1**) shows that vessels avoid this development, which is a floating project similar in scale to the Salamander Project.

357. Any vessels that do transit through are likely to be small vessels, and therefore vessels with shallow draughts. Maximum fishing vessel draught recorded within the EIA Study Area was 8.2 m, however 90% of fishing vessels had draught of 5 m or less.

358. Input from the hazard workshop (see **Section 4**) indicated that a clearance depth of 10 m for the dynamic cables and mooring lines would likely be sufficient to mitigate risks to fishing vessels. This aligns with the assessment of vessel draughts (see **Table 15.2**) which shows that average draught of fishing vessels within the OAA was 4.1 m, and maximum draught was 5.2 m.

359. The MCA also agreed during consultation (see **Section 4**) that it would be appropriate to base underkeel calculations on the vessel types that may choose to transit through the OAA, rather than on maximum draughts recorded for all vessel types.

360. Given uncertainty over associated designs at this stage, appropriate underkeel clearances will be discussed and agreed with MCA and NLB once such designs are better understood. Underkeel interaction is considered further in **Section 16**.

15.6 Risk Result Summary

361. 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, these scenarios have also each been modelled with two future case traffic levels. **Table 15.3** summarises the results of all six scenarios.

Table 15.3 Risk Results Summary

Risk	Scenario	Annual Frequency		
		Pre Wind Farm	Post Wind Farm	Increase
Vessel to vessel collision	Base case	8.43×10^{-4} (1 every 1,186 years)	8.72×10^{-4} (1 every 1,147 years)	2.85×10^{-5}
	Future case (10%)	1.04×10^{-3} (1 every 965 years)	1.07×10^{-3} (1 every 933 years)	3.52×10^{-5}
	Future case (20%)	1.23×10^{-3} (1 every 814 years)	1.27×10^{-3} (1 every 788 years)	4.16×10^{-5}
Powered vessel to structure allision	Base case	-	6.29×10^{-4} (1 every 1,589 years)	-
	Future case (10%)	-	6.92×10^{-4} (1 every 1,444 years)	-
	Future case (20%)	-	7.55×10^{-4} (1 every 1,324 years)	-
Drifting vessel to structure allision	Base case	-	2.15×10^{-5} (1 every 46,451 years)	-
	Future case (10%)	-	2.37×10^{-5} (1 every 42,229 years)	-
	Future case (20%)	-	2.58×10^{-5} (1 every 38,710 years)	-
Fishing vessel to structure allision	Base case	-	8.25×10^{-2} (1 every 12 years)	-
	Future case (10%)	-	9.07×10^{-2} (1 every 11 years)	-
	Future case (20%)	-	9.90×10^{-2} (1 every 10 years)	-
Total	**Base case**	8.43×10^{-4} (1 every 1,186 years)	8.40×10^{-2} (1 every 12 years)	8.32×10^{-2}
	Future case (10%)	1.04×10^{-3} (1 every 965 years)	9.25×10^{-2} (1 every 11 years)	9.15×10^{-2}
	Future case (20%)	1.23×10^{-3} (1 every 814 years)	1.01×10^{-1} (1 every 10 years)	9.98×10^{-2}

16 Risk Assessment

362. This section provides a qualitative and quantitative risk assessment (using FSA) for the hazards identified due to the Salamander Project, based on baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments.

363. At the end of the assessment of each hazard, these frequency of occurrence and severity of consequence rankings are summarised with the resulting significance of risk given in **highlighted bold text**.

364. The risk control log (see **Section 17**) summarises the risk assessment and a concluding risk statement is provided (see **Section 19.5**).

16.1 Construction Phase

16.1.1 Vessel Displacement

365. Based on operational experience of wind farms under construction, it is considered likely that commercial vessels will deviate to avoid the OAA during construction, which is anticipated to be marked as a buoyed construction area, noting that this will be directed by NLB. There will be no restrictions on entry other than through any active safety zones, however experience indicates that commercial vessels will still avoid the construction works. This aligns with input received from commercial vessel operators who use the local area.

366. A total of 16 vessel routes were identified within the main routeing analysis (**Section 11.2**), five of which were anticipated to deviate to avoid the OAA. The maximum deviation was 0.8 nm, to Route 13, used by less than a vessel a day on average. All other deviations were less than 0.3 nm (and again were to routes used by less than a vessel a day on average). This aligns with input received from commercial vessel operators who use the local area, which indicated any deviations would be minor.

367. Other smaller vessel types (e.g. fishing, recreation) may still choose to transit through the OAA during construction, noting this would be at the discretion of individual vessels. However, consultation input including at the hazard workshop indicated smaller vessels would likely still avoid the OAA given the deviations required would be small.

368. There may also be some minor displacement associated with the installation works within the Offshore ECC, however any such displacement would be temporary in nature and spatially limited to the area immediately around the operation.

369. The primary consequence of vessel displacement is considered to be increased journey times and distances for affected third-party vessels. However, as above any deviations are anticipated to be minor based both on the routeing analysis in **Section 14.4** and consultation feedback, and can be safely accommodated by the searoom

available around the OAA and the Offshore ECC Vessels are expected to comply with international and flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan in advance given the promulgation of information relating to the Salamander Project and display on the relevant nautical charts.

370. No specific concerns were raised in consultation regarding adverse weather routeing in the consultation process. It is likely that vessels will be more likely to avoid the OAA during adverse conditions, however there is room to accommodate the minor deviations that would be required.

371. The frequency of occurrence in relation to displacement of vessel traffic is considered reasonably probable given that minor deviations are anticipated to occur to a small number of vessels. Severity of consequence is considered negligible given any deviations will be minor and can be safely accommodated. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.1.2 Increased Vessel to Vessel Collision Risk Between Third-party Vessels

372. As discussed in the Vessel Displacement impact (**Section 16.1.1**), any deviations and displacement of third party traffic is anticipated to be minor, both in terms of the number of vessels affected and also the magnitude of the deviations. It is therefore considered unlikely that there will be a large increase in encounters and collision risk, noting that there is considered to be searoom to safely accommodate any displaced vessels. This aligns with the collision modelling undertaken within **Section 15.4** which estimated a vessel would be involved in a collision once per 1,147 years, representing an increase of only 3% from the pre wind farm scenario.

373. In addition to larger vessels, smaller vessels may also choose to avoid the OAA during construction, which is anticipated to be marked as a buoyed construction area, noting that this will be directed by NLB. This could lead to increased encounters with other larger commercial vessels. However, given the searoom available, and noting any such encounters would be managed via COLREGS and SOLAS, it is considered unlikely that this would lead to any notable increase in collision risk between small vessels and larger commercial vessels.

374. In the event that an encounter between vessels does occur, it is likely to be localised and occur for only a short duration, with collision avoidance action implemented by the vessels involved, in line with the COLREGs, thus ensuring that the situation does not develop into a collision incident. This is supported by experience at previous under construction wind farms, where no collision incidents involving two third-party vessels as a result of a wind farm have been reported (**Section 9.6**). Historical collision incident data also indicates that the most likely consequences will be low should a collision occur, with minor contact between the vessels resulting in minor damage and no injuries to persons, with both vessels able to resume their respective passages and undertake a full inspection at the next port. As an unlikely worst-case,

one of the vessels could be foundered resulting in a Potential Loss of Life (PLL) and / or pollution. If pollution were to occur in proximity to the OAA or involving a Salamander Project vessel, then the MPCP will be implemented to minimise the environmental risks.

375. Details of the Salamander Project will be promulgated in advance via all usual means, and the infrastructure will also be displayed on nautical charts. This will ensure vessels can passage plan in advance to minimise disruption and deviations, in turn minimising collision risk.

376. The frequency of occurrence in relation to third party to third party collision risk is considered negligible given that deviations are anticipated to occur to a low number of vessels. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.1.3 Increased Vessel to Vessel Collision Risk Between a Third-party Vessel and a Salamander Project Vessel

377. The risk of encounters and collision risk associated with Salamander Project vessels involved in construction will be managed via marine coordination. This will include the application of traffic management procedures such as indicative transit routes between the OAA and the construction ports used, which will be set out in the Vessel Management Plan which will be a condition of consent. The implementation of the Vessel Management Plan was noted as an important mitigation during the hazard workshop. Salamander Project vessels will carry AIS and be compliant with Flag State regulations including IMO conventions such as the COLREGs. Further, an Offshore Fishing Liaison Officer will liaise with the local fishing industries to increase awareness of the Salamander Project vessels and activities.

378. An application for safety zones will also be made, which will include 500 m safety zones around any structures where construction work is ongoing (as indicated by the presence of a construction vessel). These safety zones will make it clear to any passing third party traffic the areas which should be avoided to minimise collision risk with the construction vessels, noting such vessels may be Restricted in Ability to Manoeuvre (RAM). The Salamander Project may also utilise and promulgate advisory safe passing distances around other ongoing works or vessels where identified as necessary via risk assessment (e.g. cable installation). Details and locations of any safety zones and advisory safe passing distances will be promulgated including via the usual means.

379. Lighting and marking as required by NLB and MCA will be exhibited during the construction phase, which will further increase mariner awareness of the potential for ongoing sensitive operations when in proximity of the OAA, both in day and night conditions including in poor visibility.

380. Third-party vessels may experience restrictions on ability to visually identify Salamander Project vessels entering and exiting or within the OAA during reduced periods of visibility. However, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions, noting that Salamander Project vessels will also carry AIS regardless of size.

381. Based on historical incident data (**Section 9.6**), there has been one instance of a third-party vessel colliding with a wind farm vessel. In both incidents moderate vessel damage was reported with no harm to persons. It is noted that this incident occurred in 2011, and awareness of offshore wind developments and application of the measures outlined above has since improved and been refined considerably, with no further collision incidents reported since. In this regard it is noted that the nearby Hywind Scotland project means users of the area will be familiar with the presence of wind farm vessels.

382. Should an encounter occur between a third-party vessel and a Salamander Project vessel, it is likely to be localised and occur for only a short duration of time. 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.

383. Should a collision occur, the most likely consequences will be similar to that outlined for the case of a collision between two third-party vessels above, namely minor contact between the vessels leading to minor damage and no injuries to persons, with both vessels able to safely make their next port to undertake a full inspection. As an unlikely worst case, one of the vessels could be foundered resulting in a PLL and pollution. If pollution were to occur in proximity to the OAA or involving a Salamander Project vessel, then the MPCP will be implemented to minimise the environmental risks.

384. The frequency of occurrence in relation to third party to Salamander Project vessel collision risk is considered negligible noting the marine coordination and associated procedures that will be in place including the Vessel Management Plan. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.1.4 Vessel to Structure Allision Risk

385. The spatial extent of impacts associated with vessel allision are considered small given that a vessel must be in close proximity to a structure in the OAA for an allision incident to occur. The forms of allision considered are:

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

16.1.4.1 Powered Allision

386. Quantitative powered allision assessment has been undertaken in **Section 15.4**, with the outputs estimating that a powered allision would occur once every 1,589 years. This value is reflective of the low levels of traffic anticipated to be routeing in proximity to the OAA as per the baseline vessel traffic data assessment and the anticipated routeing. It is noted that there have been no reported allision incidents to date associated with the nearby Hywind Scotland project, which is similar in scale and type to the Salamander Project.

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

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

389. Additionally, vessels are expected to comply with international and flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan in advance given the promulgation of information relating to the Salamander Project including display of the structures on relevant nautical charts.

390. The structures (including when partially completed) and construction area as a whole will be lit and marked as directed by the MCA and NLB to ensure passing mariner awareness. There will also be 50 m pre-commissioning safety zones in place around foundations for the duration of the construction period, highlighting to mariners the allision risk.

16.1.4.2 Drifting Allision

391. Quantitative drifting allision assessment has been undertaken in **Section 15.4**, with the outputs estimating that a drifting allision would occur once every 46,451 years. This is comparatively low when compared against the estimated allision frequencies of other UK offshore wind farm (OWF) developments and is reflective of the low levels of traffic anticipated to be routing in proximity to the OAA as per the baseline vessel traffic survey data assessment and the anticipated post wind farm routing.

392. Based on historical incident data, there have been no instances of a third-party vessel alliding with a UK operational wind farm structure whilst Not Under Command (NUC). It is also noted that this includes the nearby Hywind Scotland project, which is similar in scale and type to the Salamander Project.

393. A vessel adrift scenario may only develop into an allision situation if in proximity to a structure within the OAA. This would only be the case where the vessel was either located internally within or in close proximity to the OAA, and the direction of the wind and/or tide is towards a structure. In the event that a vessel starts to drift towards the OAA, the vessel will first initiate its own procedures for such an event, which may involve dropping anchor depending on water depths or the use of thrusters (depending on availability and power supply). This may include an emergency anchoring event which would involve checking relevant nautical charts to ensure that deployment of the anchor will not lead to other risks (such as anchor snagging on a subsea cable) in line with emergency procedures.

394. Further, any project vessels on site associated with the construction of the Salamander Project may be able to provide assistance in liaison with MCA and as required under SOLAS obligations (IMO, 1974). This would depend on the size of both the adrift vessel and the Salamander Project vessel(s).

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

16.1.4.3 Internal Allision

396. It is likely that only smaller vessels (e.g. fishing, recreation) will transit through the OAA, noting this may be less likely during the construction phase. On this basis it is considered unlikely that a commercial vessel would be involved in an internal allision (noting that regular operators of the area indicated they would deviate to avoid the OAA).

397. Based on modelling of allision risk to fishing vessels in **Section 15.4**, the base case annual fishing vessel to structure internal allision frequency is estimated to be 8.25×10^{-2}, corresponding to a return period of approximately one in 12 years. This is a relatively high return period, however it is important to note that this is based on a worst case conservative assumption that baseline activity will remain unchanged once the structures are in place i.e., no account is made for fishing vessels choosing to pass further from the structures or choosing to avoid the OAA altogether. In this regard it is noted that input received during the hazard workshop was that fishing vessels are likely to avoid the OAA, with the ongoing construction works likely to mean access is less likely than during the O&M phase.

398. Any vessel navigating within the OAA is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974) and promulgation of information via the usual means will ensure that such vessels have good awareness of the Salamander Project.

399. The structures (including when partially completed) and construction area as a whole will be lit and marked as directed by the MCA and NLB to ensure passing mariner awareness. There will also be 50 m pre-commissioning safety zones in place around foundations for the duration of the construction period, highlighting to mariners the allision risk.

400. For recreational vessels with a mast there is an additional allision risk when navigating internally associated with the turbine blades. However, the minimum blade tip clearance is 22 m which is aligned with the minimum clearance the RYA recommend for minimising allision risk (RYA, 2019).

16.1.4.4 Significance

401. The frequency of occurrence is considered remote. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **tolerable and ALARP,** and therefore Not Significant in EIA terms.

16.1.5 Reduced Access to Local Ports

402. The key port in the area is considered to be Peterhead, with the Offshore ECC making landfall approximately 2 nm to the north of the port entrance, meaning it passes clear of the port limits and charted pilotage area. On this basis the installation works are unlikely to notably impact port access, with any impact being temporary and limited spatially.

403. There is considered to be no impact from the OAA on port access given it is located 18 nm from shore.

404. Marine coordination and vessel procedures will be in place to manage Salamander Project vessel movements and minimise disruption to third-party vessels whilst entering or exiting port. As such, no notable impact on port access is expected from Salamander Project vessels, noting any interactions with third party vessels would be managed via COLREGS in addition to the marine coordination procedures including the Vessel Management Plan. All relevant port rules and procedures will also be followed by Salamander Project vessels using any selected ports, as set out by those ports.

405. The frequency of occurrence is considered extremely unlikely given Salamander Project vessel movements will be managed via marine coordination and Vessel Management Plan. Severity of consequence is considered minor. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.1.6 Interaction with Wet Stored Subsea Infrastructure

406. During construction, it is intended that mooring lines and subsea cables will be wet stored within the OAA, and may not be entirely on the seabed and include sections in the water column. It is considered unlikely that the mooring lines and cables would be near enough to the surface to risk any vessel interaction during this period noting water depths in excess of 80 m, however precise design requirements for wet storge are not yet known. Therefore, once designs are finalised, the need for any mitigation will be discussed and agreed with MCA and NLB.

407. It is anticipated that the OAA will be marked as a buoyed construction area (noting that this would be directed by NLB), and that the mooring lines and dynamic cables will be within the OAA including while wet stored.

408. Wet storage of the floating substructures (and integrated WTGs) prior to tow-out to the Offshore Array Area is considered to be outside the scope of the Marine Licence applications for the Offshore Development and is therefore not assessed herein. The intent is that the Salamander Project will utilise the services of a port(s) that offer wet storage sites, which will have appropriate consents (obtained by the port authority) for wet storage of floating substructures, fabrication and assembly with the WTGs. To enable the availability of this option for the Salamander Project within the required timeframe, an owner of SWPC is an official member of the TS-FLOW UK-North Joint Industry Project (JIP) exploring the challenges of wet storage and identifying the opportunities and potentially suitable locations for these activities. This JIP is in collaboration with relevant ports and other floating offshore wind developers. Separate Marine Licences and associated impact assessments for wet storage areas outwith the Offshore Development Area will be applied for and undertaken as appropriate.

409. The frequency of occurrence for Interaction with Wet Stored Subsea Infrastructure during construction is considered extremely unlikely. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be tolerable.

410. Assuming the confirmation of any required mitigation in agreement with MCA and NLB once design requirements are known, the hazard is considered **tolerable with mitigation and ALARP**, and therefore Not Significant in EIA terms.

16.1.7 Reduction of Emergency Response Capability

411. The construction of the Salamander Project will lead to an increased level of vessels and personnel in the area over baseline levels. On this basis there may be an increase in the number of incidents requiring emergency response over baseline rates.

412. Baseline incident rates are considered low in the area based on the data studied, with an average of less than one per year indicated within the MAIB, RNLI and helicopter taskings datasets. It is also noted that to date, there have only been 13 reported allision incidents associated with OWFs in the UK. While it should be

considered that this only covers allisions, it is still not anticipated that the Salamander Project would notably increase the observed baseline incident rates which are already low.

413. Further, the on-site vessels and resources associated with the construction of the Salamander Project will form additional resource to respond to any incidents in the area in liaison with the MCA, both in terms of incidents associated with the Salamander Project (i.e. self help resources), but also incidents occurring in the general area to third party vessels. As required under MGN 654 (MCA, 2021), the Applicant will produce and submit an Emergency Response Cooperation Plan (ERCoP) specific to the construction phase to the MCA detailing how they would cooperate and assist in the event of an incident including consideration of the resources associated with the Salamander Project.

414. The frequency of occurrence is considered extremely unlikely noting the limited anticipated effect on incidents rates and presence of Salamander Project vessels. Severity of consequence is considered moderate. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2 Operation and Maintenance

16.2.1 Vessel Displacement

415. As per **Section 16.1.1**, it is anticipated that commercial vessels will deviate during the construction phase and it is considered likely that these pre-established deviations would remain during the operational phase. This aligns with both operational experience of other UK wind farms, and the consultation input received from regular operators of the area. It is noted that there would be no formal restrictions on entry into the OAA other than through any active safety zones, however operational experience indicates commercial vessels will still avoid the structures.

416. A total of 16 vessel routes were identified within the main routeing analysis (**Section 11.2**), five of which were anticipated to deviate to avoid the OAA. The maximum deviation was 0.8 nm, to Route 13, used by less than a vessel a day on average. All other deviations were less than 0.3 nm (and again were to routes used by less than a vessel a day on average). This aligns with input received from commercial vessel operators who use the local area, which indicated any deviations would be minor.

417. Smaller vessel types (e.g. fishing vessels and recreational vessels) may still choose to transit through the OAA during the operational phase, noting that this would be at the discretion of the individual vessels. In this regard, it should be considered that there is limited experience in the deployment of floating projects and on this basis it is considered that smaller vessels may be less likely to transit between floating structures than those on fixed foundations. This aligns with the vessel traffic data collected which shows that vessels tended to avoid the operational Hywind Scotland site to the south (other than vessels associated with Hywind Scotland itself i.e. O&M

vessels), noting that Hywind Scotland is similar to the Salamander Project in that both are small scale floating projects. Regardless, the final layout will be agreed with the MCA and NLB post-consent, and these discussions will include consideration of surface navigation both for passing traffic and internal navigation.

418. There may be some displacement resulting from maintenance activities within the Offshore ECC however any such displacement would be temporary and spatially limited to the area around the operation, and there is searoom to accommodate any such minor deviations.

419. The main consequence of vessel displacement will be increased journey times and distances for the deviated vessels. However, as above, deviations are expected to be minor and third-party commercial vessels are considered likely to utilise routes that were established during the construction phase. Vessels are expected to comply with international and flag state regulations (including the COLREGs and SOLAS) and will be able to passage-plan in advance given the promulgation of information relating to the Salamander Project and display of infrastructure on relevant nautical charts, meaning any disruption can be minimised. Furthermore, vessels will likely be more familiar with the Salamander Project during the operational phase compared to the construction phase.

420. No specific concerns were raised in consultation regarding adverse weather routeing in the consultation process. It is likely that vessels will be more likely to avoid the OAA during adverse conditions, however there is room to accommodate the minor deviations that would be required.

421. The frequency of occurrence in relation to vessel traffic displacement is considered remote, given that deviations will have already been established during the construction phase with a low number of vessels impacted by the transition to operational phase. The severity of consequence is considered negligible, given that any deviations will be minor and can be safely accommodated. On this basis, the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2.2 Increased Vessel to Vessel Collision Risk Between Third-party Vessels

422. As discussed in **Section 16.2.1**, any deviations and displacement of third party traffic is anticipated to be minor, both in terms of the number of vessels affected and also the magnitude of the deviations, with these deviations likely to be well established in the O&M phase. It is therefore considered unlikely that there will be a large increase in encounters and collision risk, noting that there is considered to be searoom to safely accommodate any displaced vessels. This aligns with the collision modelling undertaken within **Section 15.4**, which estimated that post wind farm a vessel would be involved in a collision once per 1,147 years, representing an increase of only 3% from the pre wind farm scenario. It also aligns with input received from

vessel operators which indicated limited concerns with the minor deviations required to avoid the OAA.

423. In addition to larger vessels, smaller vessels may also choose to avoid the OAA which could lead to increased encounters with other larger commercial vessels. However, given the searoom available, and noting any such encounters would be managed via COLREGS and SOLAS, it is considered unlikely that this would lead to any notable increase in collision risk between small vessels and larger commercial vessels.

424. In the event that an encounter between vessels does occur, it is likely to be localised and occur for only a short duration, with collision avoidance action implemented by the vessels involved, in line with the COLREGs, thus ensuring that the situation does not develop into a collision incident. This is supported by experience at previous under construction wind farms, where no collision incidents involving two third-party vessels have been reported. Historical collision incident data also indicates that the most likely consequences will be low should a collision occur, with minor contact between the vessels resulting in minor damage and no injuries to persons, with both vessels able to resume their respective passages and undertake a full inspection at the next port. As an unlikely worst case, one of the vessels could be foundered resulting in a PLL and / or pollution. If pollution were to occur in proximity to the OAA or involving a Salamander Project vessel, then the MPCP will be implemented to minimise the environmental risks.

425. Details of the Salamander Project will be promulgated in advance via all usual means, and the infrastructure will also be displayed on nautical charts. This will ensure vessels can passage plan in advance to minimise disruption and deviations, in turn minimising collision risk.

426. The frequency of occurrence in relation to third party to third party collision risk is considered negligible given that deviations are anticipated to occur to a low number of vessels. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2.3 Increased Vessel to Vessel Collision Risk Between a Third-party Vessel and a Salamander Project Vessel

427. The risk of encounters and collision risk associated with Salamander Project vessels during the O&M phase will be managed via marine coordination, similarly to the construction phase. This will include the application of traffic management procedures such as indicative transit routes between the OAA and the base ports used, which will be set out in the Vessel Management Plan which will be a condition of consent. The implementation of the Vessel Management Plan was noted as an important mitigation during the hazard workshop. Salamander Project vessels will carry AIS and be compliant with Flag State regulations including IMO conventions such as the COLREGs.

428. An application for safety zones will also be made, which will include 500 m safety zones around any structures where major maintenance is ongoing. These safety zones will make it clear to any passing third party traffic the areas which should be avoided to minimise collision risk with the Salamander Project vessels, noting such vessels may be RAM. The Salamander Project may also utilise and promulgate advisory safe passing distances around other ongoing works or vessels where identified as necessary via risk assessment (e.g. cable maintenance). Details and locations of any safety zones and advisory safe passing distances will be promulgated via the usual means.

429. Lighting and marking as required by NLB and MCA will be exhibited during the O&M phase, which will further increase mariner awareness of the potential for any ongoing sensitive maintenance operations when in proximity of the OAA, both in day and night conditions including in poor visibility.

430. Third-party vessels may experience restrictions on ability to visually identify Salamander Project vessels entering and exiting or within the OAA during reduced periods of visibility. However, this hazard will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions, noting that Salamander Project vessels will also carry AIS regardless of size.

431. Based on historical incident data, there has been one instance of a collision involving a wind farm vessel within a harbour. Moderate vessel damage was reported with no harm to persons. It is noted that this incident occurred in 2011, and awareness of offshore wind developments and application of the measures outlined above has since improved and been refined considerably, with no further collision incidents reported since involving a third party vessel.

432. Should an encounter occur between a third-party vessel and a Salamander Project vessel, it is likely to be localised and occur for only a short duration of time. 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. It is noted that Salamander Project vessel numbers are anticipated to be lower during the O&M phase than during construction (up to 12 vessels total compared to up to 40 vessels total), and as such frequency of encounters is also likely to be lower.

433. Should a collision occur, the most likely consequences will be similar to that outlined for the case of a collision between two third-party vessels above, namely minor contact between the vessels leading to minor damage and no injuries to persons, with both vessels able safely make their next port to undertake a full inspection. As an unlikely worst case, one of the vessels could be foundered resulting in a PLL and pollution. If pollution were to occur in proximity to the OAA or involving a Salamander Project vessel, then the MPCP will be implemented to minimise the environmental risks.

434. The frequency of occurrence in relation to third party to Salamander Project vessel collision risk is considered negligible noting the marine coordination and associated procedures that will be in place including the Vessel Management Plan. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2.4 Vessel to Structure Allision Risk

435. The spatial extent of impacts associated with vessel allision are considered small given that a vessel must be in close proximity to a structure in the OAA for an allision incident to occur. The forms of allision considered are:

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

16.2.4.1 Powered Allision

436. Quantitative powered allision assessment has been undertaken in **Section 15.4** with the outputs estimating that a powered allision would occur once every 1,589 years. This value is reflective of the low levels of traffic anticipated to be routeing in proximity to the OAA as per the baseline vessel traffic data assessment and the anticipated post wind farm routeing. It is noted that there have been no reported allision incidents to date associated with the nearby Hywind Scotland project, which is similar in scale and type to the Salamander Project.

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

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

439. Additionally, vessels are expected to comply with international and flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan in advance given the promulgation of information relating to the Salamander Project including display of the structures on relevant nautical charts.

440. The structures will also be lit and marked as directed by the MCA and NLB to ensure passing mariner awareness (e.g. lights, sound signals). NLB indicated during the hazard workshop that NLB may require all WTGs to have marine lights installed, meaning if a WTG was towed away for maintenance, the lighting and marking would remain complete. Precise requirements will be agreed via the LMP process post-consent.

16.2.4.2 Drifting Allision

441. Quantitative drifting allision assessment has been undertaken in **Section 15.4** with the outputs estimating that a drifting allision would occur once every 46,451 years. This is comparatively low when compared against the estimated allision frequencies of other UK OWF developments and is reflective of the low levels of traffic anticipated to be routeing in proximity to the OAA as per the baseline vessel traffic survey data assessment and the anticipated post wind farm routeing.

442. Based on historical incident data, there have been no instances of a third-party vessel alliding with a UK operational wind farm structure whilst NUC. It is also noted that this includes the nearby Hywind Scotland project, which is similar in scale and type to the Salamander Project.

443. A vessel adrift scenario may only develop into an allision situation if in proximity to a structure within the OAA. This would only be the case where the vessel was either located internally within or in close proximity to the OAA, and the direction of the wind and/or tide is towards a structure. In the event that a vessel starts to drift towards the OAA, the vessel will first initiate its own procedures for such an event, which may involve dropping anchor depending on water depths or the use of thrusters (depending on availability and power supply). This may include an emergency anchoring event which would involve checking relevant nautical charts to ensure that deployment of the anchor will not lead to other risks (such as anchor snagging on a subsea cable) in line with emergency procedures.

444. Further, any Salamander Project vessels on site may be able to provide assistance in liaison with MCA and as required under SOLAS obligations (IMO, 1974). This would depend on the size of both the adrift vessel and the Salamander Project vessel(s).

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

16.2.4.3 Internal Allision

446. It is likely that only smaller vessels (e.g. fishing, recreation) will transit through the OAA, as discussed in **Section 16.2.1**. On this basis it is considered unlikely that a

commercial vessel would be involved in an internal allision (noting that regular operators of the area indicated they would deviate to avoid the OAA).

447. Based on the modelling of allision risk to fishing vessels in **Section 15.4**, the base case annual fishing vessel to structure internal allision frequency is estimated to be 8.25×10^{-2}, corresponding to a return period of approximately one in 12 years. This is a relatively high return period, however it is important to note that this is based on a worst case conservative assumption that baseline activity will remain unchanged once the structures are in place i.e., no account is made for fishing vessels choosing to pass further from the structures or choosing to avoid the OAA altogether. In this regard it is noted that input received during the hazard workshop was that fishing vessels are likely to avoid the OAA.

448. Minimum spacing between structures of 1,000 m is considered sufficient for safe internal navigation i.e. keeping clear of the structures in the OAA. It is noted that this spacing is greater than that associated with many other OWFs in the UK located near the coast where smaller vessel traffic would be expected to be of higher levels. Further, the final layout will be agreed with both NLB and MCA, noting these discussions will include consideration of ensuring safe internal navigation.

449. Any vessel navigating within the OAA is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974) and promulgation of information via the usual means will ensure that such vessels have good awareness of the Salamander Project.

450. The Applicant will exhibit lights, marks, sounds, signals and other aids to navigation as required by NLB and MCA. This will include unique identification marking of each structure in an easily understandable pattern to minimise the risk of a mariner navigating internally becoming disoriented, noting the ID system will be agreed with the MCA.

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

16.2.4.4 Significance

452. The frequency of occurrence is considered remote. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **tolerable and ALARP,** and therefore Not Significant in EIA terms.

16.2.5 Reduced Access to Local Ports

453. The key port in the area is considered to be Peterhead, with the Offshore ECC making landfall approximately 2 nm to the north of the port entrance, meaning it passes clear of the port limits and charted pilotage area. On this basis any maintenance works are unlikely to notably impact port access, with any impact being temporary and limited spatially. There will be no impact from the cables once they are installed.

454. There is considered to be no impact from the OAA on port access given it is located 18 nm from shore.

455. Marine coordination and vessel procedures will be in place to manage Salamander Project vessel movements and minimise disruption to third-party vessels whilst entering or exiting any port used. As such, no notable impact on port access is expected from Salamander Project vessels, noting any interactions with third party vessels would be managed via COLREGS in addition to the marine coordination procedures including the Vessel Management Plan. All relevant port rules and procedures will also be followed by Salamander Project vessels using any selected ports, as set out by those ports.

456. It is also noted that Salamander Project vessel numbers during the O&M phase are anticipated to be lower than during the construction phase (up to 12 vessels total compared to up to 40 vessels total).

457. The frequency of occurrence is considered extremely unlikely given Salamander Project vessel movements will be managed via marine coordination and Vessel Management Plan. Severity of consequence is considered minor. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2.6 Reduction of Under Keel Clearance from Cable Protection

458. Where suitable burial as defined by the cable burial risk assessment is not possible, external remedial protection may be utilised, with this protection potentially being up to 1.5 m in height. This could lead to a reduction of navigable depths, leading to a potential for underkeel interaction.

459. In line with MGN 654, where any depth reduction exceeded 5%, the Applicant will undertake further assessment and consult with the MCA to determine whether any additional mitigation is required to ensure safety of navigation. The key areas of risk are likely to be in areas where water depths are shallow i.e. the coastal / nearshore

areas where only smaller vessels would be expected to transit. Input received at the Hazard Workshop was that concern over underkeel risk to recreational vessels was limited given the provisions of MGN 654.

460. Should an underwater allision occur, minor damage incurred is the most likely consequence, and foundering of the vessel resulting in a PLL and pollution the unlikely worst case consequences.

461. The frequency of occurrence is considered extremely unlikely. Severity of consequence is considered moderate. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2.7 Interaction with Subsea Infrastructure

462. Vessels navigating in proximity to the floating foundations within the OAA may be at risk of interaction with either the mooring lines, or any underwater elements of the floating substructures not visible from the surface including the dynamic subsea cables. The level of risk will depend on the clearance available above subsea elements (in particular the mooring lines and dynamic cables).

463. There will be up to eight mooring lines per floating substructure used to secure them to the seabed, with a mooring line radius of up to 1,500 m. The highest risk areas in terms of potential underkeel clearance interaction will be the areas in the immediate vicinity of the floating substructures where the mooring lines are closest to the surface. The same applies for the dynamic cables, noting the use of buoyancy modules mean the dynamic cables will descend away from the foundations but then re-ascend towards the surface.

464. It is considered likely that larger commercial vessels will not enter into the OAA based on operational experience of other UK OWFs including the nearby Hywind Scotland, and the input received from vessel operators during the consultation process. On this basis, taking into consideration the baseline and anticipated post wind farm vessel routeing, it is considered unlikely that a commercial vessel would pass in close proximity to the floating foundations and hence be at risk of subsea interaction.

465. Therefore, it is likely that any vessels in proximity to the substructures will be small (e.g. fishing, recreation), noting that such vessels will typically have much smaller draughts than larger commercial vessels. Based on the vessel traffic data collected, average fishing vessel draught within the OAA was 4.1 m, with the maximum being 5.2 m. Input received at the hazard workshop was that an underwater clearance of 10 m would likely alleviate the risk to fishing vessels, noting that the vessel traffic data shows fishing vessels avoided the nearby Hywind Scotland site. The confirmed available clearance should be discussed with the MCA and NLB post consent to determine if any additional mitigation is required.

466. It is considered likely that any vessels choosing to pass in close proximity to the floating foundations will be transiting with caution noting that the relevant infrastructure will be charted, and promulgation of information will be undertaken.

467. There is limited experience of deployment of large scale floating offshore wind projects in UK waters, however it is noted that the nearby Hywind Scotland and Kincardine Offshore Wind Farm floating projects are both located off the eastern Scottish Coast, in relative proximity to the OAA. To date there have been no reported underkeel interactions between passing vessels and the components associated with these projects.

468. There is not considered to be a risk of underkeel interaction with the subsea hubs given the water depths being in excess of 80 m within the OAA relative to the height of the subsea hubs (up to 10 m). Stakeholders confirmed limited concern during consultation.

469. Details of the infrastructure including the WTGs / floating substructures, mooring lines, and subsea cables will be promulgated to maximise awareness of the Salamander Project and any potential underkeel interaction risk. The locations of the WTGs / floating substructures would 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.

470. The frequency of occurrence is considered extremely unlikely. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be tolerable.

471. Assuming the confirmation of available underkeel clearance in agreement with MCA and NLB post installation, the hazard is considered **tolerable with mitigation and ALARP**, and therefore Not Significant in EIA terms.

16.2.8 Loss of Station

472. The MCA require under their Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA & 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 if any modifications to a system occur or if new information becomes available with regard to its reliability, additional TPV would be required.

473. A loss of station is therefore considered likely to represent a low frequency event, noting that for a total loss of station, all moorings would be required to fail.

474. The Regulatory Expectations also require the provision of continuous monitoring either by Global Positioning System (GPS) or other suitable means, The Applicant will put such a system in place, with each WTG continuously monitored, and with capability of being tracked in the event of a loss of station as detailed in MGN 654.

475. The frequency of occurrence in relation to the risk of loss of station is considered negligible noting the TPV and associated requirements under the MCA regulatory expectations. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2.9 Anchor Interaction with Subsea Cables

476. No vessels at anchor were identified within the vessel traffic data studied (**Section 10**) and the nearest anchoring area identified was a reported anchorage location 8 nm south of the Offshore ECCs landfall, within the Cruden Bay. Further, no concerns around proximity to known or preferred anchoring areas have been raised during consultation.

477. In line with SOLAS (IMO, 1974), the charted location of any hazards should be taken into consideration by vessels as part of the decision making process over where to anchor. The locations of subsea cables, structure locations and mooring lines will be provided to the UKHO for charting purposes, and as such mariners will be able to include the locations of this infrastructure within their decision making processes.

478. In the event that an interaction incident occurs between a vessel anchor and the cables, the most likely consequences will be low based on historical anchor interaction incidents, with no damage incurred to the cable or the vessel. As an unlikely worst case, a snagging incident could occur and/or the vessel's anchor and the cable could be damaged. For fishing vessels or recreational vessels the consequences may also include compromised stability of the vessel.

479. The cables would be protected via either burial or remedial external protection, noting this will be assessed and defined as part of the cable burial risk assessment process which will consider baseline traffic patterns over the cables, and ensure protection is suitable for the expected vessel types, sizes and numbers in the area.

480. It is noted that there will be dynamic sections of cables and mooring lines between the seabed and the floating foundations. However, anchor interaction with these sections is considered an unlikely event given water depths and the presence of infrastructure means anchoring is unlikely to be attempted in the vicinity of the OAA.

481. The frequency of occurrence in relation to the risk of anchor interaction is considered extremely unlikely given baseline anchoring is low and the cable burial risk assessment process will be in place to ensure the cables are protected. Severity of consequence is considered moderate. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.2.10 Reduction of Emergency Response Capability

482. The operation of the Salamander Project will lead to an increased level of vessels and personnel in the area over baseline levels. On this basis there may be an increase in the number of incidents requiring emergency response over baseline rates.

483. Baseline incident rates are considered low in the area based on the data studied, with an average of less than one per year indicated within the MAIB, RNLI and helicopter taskings datasets. It is also noted that to date, there have only been 13 reported allision incidents associated with OWFs in the UK. While it should be considered that this only covers allisions, it is still not anticipated that the Salamander Project would notably increase the observed baseline incident rates which are already low.

484. Further, the on-site vessels and resources associated with the Salamander Project will form additional resource to respond to any incidents in the area in liaison with the MCA, both in terms of incidents associated with the Salamander Project (i.e. self help resources), but also incidents occurring in the general area to third party vessels. As required under MGN 654, the Applicant will produce and submit an ERCoP to the MCA detailing how they would cooperate and assist in the event of an incident including consideration of the resources associated with the Salamander Project.

485. In terms of SAR access, the final layout will be agreed with the MCA post-consent and will comply with the requirements of MGN 654 ensuring suitable SAR access is maintained. It is noted that the scale of the Salamander Project (up to seven WTGs only) means the spatial area covered is low.

486. The frequency of occurrence is considered extremely unlikely noting the limited anticipated effect on incidents rates and MGN 654 compliance including in relation to layout design and SAR access. Severity of consequence is considered moderate. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.3 Decommissioning

16.3.1 Vessel Displacement

487. Given construction and decommissioning are likely to represent similar scenarios, it is likely that this hazard will be similar in nature to the equivalent construction phase hazard i.e. similar deviations to those established during the construction phase.

488. On this basis the frequency of occurrence in relation to displacement of vessel traffic is considered reasonably probable given that minor deviations are anticipated to occur to a small number of vessels. Severity of consequence is considered negligible given any deviations will be minor and can be safely accommodated. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.3.2 Increased Vessel to Vessel Collision Risk Between Third-party Vessels

489. Given construction and decommissioning are likely to represent similar scenarios, it is likely that this hazard will be similar in nature to the equivalent construction phase hazard i.e. similar deviations to those established during the construction phase leading to similar collision risk.

490. On this basis, the frequency of occurrence in relation to third party to third party collision risk is considered negligible given that deviations are anticipated to occur to a low number of vessels. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.3.3 Increased Vessel to Vessel Collision Risk Between a Third-party Vessel and a Salamander Project Vessel

491. Given construction and decommissioning are likely to represent similar scenarios (in particular increased Salamander Project vessel presence), it is likely that this hazard will be similar in nature to the equivalent construction phase hazard.

492. On this basis the frequency of occurrence in relation to third party to Salamander Project vessel collision risk is considered negligible. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.3.4 Vessel to Structure Allision Risk

493. Given construction and decommissioning are likely to represent similar scenarios (in particular increased Salamander Project vessel presence, and potential for partial infrastructure), it is likely that this hazard will be similar in nature to the equivalent construction phase hazard.

494. The frequency of occurrence is considered remote. Severity of consequence is considered serious. On this basis the significance of risk is assessed to be **tolerable and ALARP**, and therefore Not Significant in EIA terms.

16.3.5 Reduced Access to Local Ports

495. Given construction and decommissioning are likely to represent similar scenarios (in particular increased Salamander Project vessel presence including to and from base ports), it is likely that this hazard will be similar in nature to the equivalent construction phase hazard. It is noted that local vessels will likely be more familiar with the presence of wind farm traffic during decommissioning than was the case during construction.

496. On this basis, the frequency of occurrence is considered extremely unlikely given Salamander Project vessel movements will be managed via marine coordination.

Severity of consequence is considered minor. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.3.6 Reduction of Emergency Response Capability

497. Given construction and decommissioning are likely to represent similar scenarios (in particular increased Salamander Project vessel and personnel presence), it is likely that this hazard will be similar in nature to the equivalent construction phase hazard.

498. The frequency of occurrence is considered extremely unlikely noting the limited anticipated effect on incidents rates and presence of Salamander Project vessels. Severity of consequence is considered moderate. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.4 Cumulative Risk Assessment

16.4.1 Cumulative Vessel Displacement

499. Cumulative routeing has been considered within **Volume ER.A.3, Chapter 14: Shipping and Navigation**, with the assessment showing that Green Volt, Marram Wind, and Muir Mhor may impact routes also impacted by the Salamander Project. These projects are all in excess of 18 nm from the OAA, and based on the cumulative analysis in **Section 14.5**, while deviations will be required, there is searoom to safely accommodate them. It is also noted that given the small scale of the Salamander Project, any localised deviations around the OAA will be small, and therefore not contribute significantly to wider cumulative deviations.

500. There may be limited deviations associated with other screened in subsea cable installations, however any such deviations will be spatially limited to the area around the operation and temporary in nature.

501. On this basis, when considering the size of the overarching cumulative area assessed and the small scale of the OAA, cumulative displacement is assessed as being of negligible consequence in terms of navigational safety but of reasonably probable occurrence, meaning significance is **broadly acceptable** and therefore Not Significant in EIA terms.

16.4.2 Cumulative Increased Vessel to Vessel Collision Risk Between Third-party Vessels

502. Cumulative routeing impacts are expected, however as per **Section 16.4.2** are anticipated to be minor at a localised level and therefore not contribute largely to wider cumulative deviations. There is also searoom available in all directions to safely accommodate any deviations, with the closest existing development being Hywind Scotland in excess of 5 nm to the south, and the closest proposed cumulative developments being in excess of 15 nm away.

503. On this basis, when considering the size of the cumulative area assessed relative to the scale of the Salamander Project, cumulative increase in collision risk is assessed

as being of serious consequence in terms of navigational safety but of negligible occurrence, meaning significance is **broadly acceptable** and Not Significant in EIA terms.

16.4.3 Cumulative Increased Vessel to Vessel Collision Risk Between a Third-party Vessel and a Salamander Project Vessel

504. Ports used by the Salamander Project and other cumulative developments cannot be confirmed at this stage, however there is the potential that similar ports could be used by developments to mobilise vessels from. On this basis, there may be a cumulative increase in Salamander Project vessels within the general area, which may lead to increased encounters and collision risk. However, all developers should be establishing appropriate vessel management systems (e.g. marine coordination) and as such any encounters will be managed, including by COLREGS and SOLAS. The Vessel Management Plan is also a standard condition of consent for Scottish projects and it can therefore be assumed that all projects will be implementing one.

505. It is noted that there is already regular wind farm traffic vessel activity in the area associated with Hywind Scotland, and as such passing vessels will be familiar with ongoing wind farm operations being undertaken.

506. There may be additional collision risk associated with the vessels associated with the installation of other screened in subsea cable installations, however any such risk would be managed including by COLREGS and SOLAS.

507. On this basis, when taking into considering the size of the cumulative area assessed, cumulative increase in collision risk (third party to Salamander Project vessel) is assessed as being of serious consequence in terms of navigational safety but of negligible occurrence, meaning significance is **broadly acceptable** and therefore Not Significant in EIA terms.

16.4.4 Vessel to Structure Allision Risk

508. All cumulative developments will be required to implement lighting and marking in agreement with NLB and in compliance with IALA G1162 (IALA, 2021). For each development these discussions will include consideration of the current cumulative understanding, thus minimising allision risk on a cumulative basis, noting that all layouts will also need to be agreed with the MCA and NLB, with surface navigation and allision risk forming part of these discussions.

509. Allision hazards associated with internal navigation will be localised to each individual development, noting there are no projects directly adjacent to the OAA. There is searoom available in all directions to safely accommodate vessel transits without a need for vessels to pass in close proximity to structures, with the closest existing development being Hywind Scotland in excess of 5 nm to the south, and the closest proposed cumulative developments being in excess of 15 nm away.

510. On this basis, when taking into considering the size of the cumulative area assessed relative to the scale of the Salamander Project, cumulative increase in allision risk is assessed as being of serious consequence in terms of navigational safety but of negligible occurrence, meaning significance is **broadly acceptable**, and therefore Not Significant in EIA terms.

16.4.5 Cumulative Reduced Access to Local Ports

511. Ports used by the Salamander Project and other cumulative developments cannot be confirmed at this stage, however there is the potential that similar ports could be used by developments to mobilise vessels from. On this basis, there may be a cumulative increase in Salamander Project vessels within the general area, which may lead to increased impact on port access. However, all developers should be establishing appropriate vessel management systems (e.g. marine coordination) and the Vessel Management Plan is also a standard condition of consent for Scottish projects and it can therefore be assumed that all projects will be implementing one.

512. As discussed in the in isolation assessment, the infrastructure associated with the Salamander Project is not anticipated to impact port access to local ports based on proximity, and in this regard it is noted that screened in cumulative development arrays are further offshore. Other screened in subsea cables may pass in closer proximity to Peterhead than the Offshore ECC, however any impact would be temporary and spatially limited to the area immediately around the cable installation.

513. The frequency of occurrence is considered extremely unlikely given Salamander Project vessel movements will be managed via marine coordination and Vessel Management Plan. Severity of consequence is considered minor. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

16.4.6 Cumulative Reduction of Emergency Response Capability

514. As per the incident assessment in **Section 9**, baseline incident rates are low. Further, additional cumulative developments mean additional resources would be available. For these reasons there is not considered likely to be a notable effect on emergency response resources on a cumulative level. This takes account of historical data showing that allisions and collisions caused by wind farms do not occur at a high frequency.

515. All wind farm developments will be required to comply with MGN 654 (MCA, 2021), and to agree layout with the MCA, which will ensure suitable SAR access is available. Regardless there are no existing or planned projects in direct proximity to the OAA. As such no cumulative impact on SAR access is anticipated.

516. The frequency of occurrence is considered extremely unlikely noting the limited anticipated effect on incidents rates and MGN 654 compliance including in relation

to layout design and SAR access. Severity of consequence is considered moderate. On this basis the significance of risk is assessed to be **broadly acceptable** and therefore Not Significant in EIA terms.

17 Risk Control Log

17.1 Mitigation

Embedded mitigations adopted for the purposes of reducing the risks of the identified hazards associated with the construction, operation and decommissioning of the Salamander Project are summarised in **Table 17.1**.

Table 17.1 Embedded Mitigation

Potential Impact and Effect	Mitigation ID	Mitigation	Project Aspect	Project Phase
Primary				
Vessel to structure allision risk	Co35	Blade clearance of ≥ 22 m above Mean High Water Springs (MHWS) (in line with RYA policy (RYA, 2019))	OAA	Construction, Operation & Maintenance (O&M), and Decommissioning
Reduction of under keel clearance from cable protection Anchor interaction with subsea cables	Co14	Avoidance of sensitive features during cable routing wherever practicable. Cables will be buried as the primary cable protection method, however other cable protection methods will be used where adequate burial cannot be achieved. A Cable Burial Risk Assessment (CBRA) will be completed to determine suitable cable protection measures, and will be implemented within relevant Project plans.	Offshore ECC and OAA	Operation & Maintenance (O&M)
Tertiary				
Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk	Co24	Standard 500 m safety zones will be applied around substructure elements during construction, decommissioning and major maintenance works and safety zones of up to 50 m during pre-commissioning works. Additionally, 500 m advisory safe passing distance will also	Offshore ECC and OAA	Construction, O&M, and Decommissioning

Potential Impact and Effect	Mitigation ID	Mitigation	Project Aspect	Project Phase
		be requested around all project vessels undertaking major works and restriction of navigation rights within the OAA will be considered under Section 36A.		
Vessel Displacement Increased vessel to vessel collision risk between third-party vessels Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk Reduced access to local ports Reduction of emergency response capability	Co11	A Vessel Management Plan (VMP) will be developed and include details of: - Vessel routing to and from construction sites and ports, - Vessel notifications including Notice to Mariners and Kingfisher Bulletin; and - Code of conduct for vessel operators including for the purpose of reducing disturbance and collision with marine fauna.	Offshore ECC and OAA	Construction, O&M, and Decommissioning
Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk Interaction with wet stored subsea infrastructure	Co36	The Salamander Project will utilise Guard vessel(s) as required by risk assessment.	Offshore ECC and OAA	Construction, O&M, and Decommissioning

Potential Impact and Effect	Mitigation ID	Mitigation	Project Aspect	Project Phase
Reduction of emergency response capability				
Increased vessel to vessel collision risk between third-party vessels Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk Reduction of emergency response capability Loss of Station	Co33	Compliance with MGN 654 and its annexes, and completion of a SAR checklist where applicable.	Offshore ECC and OAA	Construction, O&M, and Decommissioning
Increased vessel to vessel collision risk between third-party vessels Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk Reduction of emergency response capability Loss of Station	Co31	An Emergency Response Cooperation Plan (ERCoP) will be developed through consultation with the Maritime Coastguard Agency (MCA) which will encompass appropriate risk assessments and designated evacuation plans for site personnel in the unlikely event of a fire breaking out on board vessels supporting the Offshore Development.	Offshore ECC and OAA	Construction, O&M, and Decommissioning

Potential Impact and Effect	Mitigation ID	Mitigation	Project Aspect	Project Phase
Vessel Displacement Increased vessel to vessel collision risk between third-party vessels Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk Interaction with wet stored subsea infrastructure Reduction of under keel clearance from cable protection Interaction with subsea infrastructure Anchor interaction with subsea cables	Co34	The Salamander Project will provide details of offshore development to facilitate appropriate marking of all infrastructure on UKHO Admiralty Charts to the UKHO.	Offshore ECC and OAA	Construction, O&M, and Decommissioning
Vessel Displacement Increased vessel to vessel collision risk between third-party vessels Increased vessel to vessel collision risk between a third-party vessel and a	Co53	Approval and implementation of a Lighting and Marking Plan (LMP) in agreement with Northern Lighthouse Board (NLB) and International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA). LMP will be in line with IALA Recommendation G1162 (IALA, 2021) including a	Offshore ECC and OAA	Construction, O&M, and Decommissioning

Potential Impact and Effect	Mitigation ID	Mitigation	Project Aspect	Project Phase
Salamander Project vessel Vessel to structure allision risk Reduction of emergency response capability Interaction with subsea infrastructure		buoyed construction area if required by NLB.		
Increased vessel to vessel collision risk between third-party vessels Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk Reduction of emergency response capability	Co9	Construction Environmental Management Plan (CEMP) will be developed and will include details of: - A marine pollution contingency plan to address the risks, methods and procedures to protect the Offshore Development Area from potential polluting events associated with the Salamander Project; - A chemical risk review to include information regarding how and when chemicals are to be used, stored and transported in accordance with recognised best practice guidance; - A biosecurity plan (offshore) detailing how the risk of introduction and spread of invasive non-native species will be minimised; - Waste management and disposal arrangements; and	Offshore ECC and OAA	Construction

Potential Impact and Effect	Mitigation ID	Mitigation	Project Aspect	Project Phase
		- Protocol for management of Dropped Objects.		
Increased vessel to vessel collision risk between third-party vessels Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel Vessel to structure allision risk	Co10	Operational Environmental Management Plan (OEMP) will be developed and will include details of: - A marine pollution contingency plan to address the risks, methods and procedures to protect the Offshore Development Area from potential polluting events associated with the Salamander Project; and - Waste management and protection of the marine environment.	Offshore ECC and OAA	O&M
Reduction of under keel clearance from cable protection Interaction with subsea infrastructure Anchor interaction with subsea cables	Co45	Where scour protection is required, MGN 654 will be adhered to with respect to changes greater than 5% to the under keel clearance in consultation with the MCA.	Offshore ECC and OAA	Construction
Reduction of under keel clearance from cable protection Interaction with subsea infrastructure Anchor interaction with subsea cables Vessel to structure allision risk	Co30	A Cable Plan will be produced prior to construction of the Offshore Export Cable(s) which will include; details of cable depth of lowering; a detailed cable laying plan which ensures safe navigation is not compromised; details of cable protection for each cable crossing; and proposals for monitoring of offshore cable.	Offshore ECC and OAA	Construction, O&M, and Decommissioning

Potential Impact and Effect	Mitigation ID	Mitigation	Project Aspect	Project Phase
Vessel to structure allision risk Reduced access to local ports Interaction with wet stored subsea infrastructure Reduction of emergency response capability Reduction of under keel clearance from cable protection Interaction with subsea infrastructure Loss of station Anchor interaction with subsea cables	Co18	All vessels will comply with relevant best practice navigational safety guidance from the International Regulations for the Prevention of Collisions at Sea (COLREGS) and the international regulations for the Safety of Life at Sea (SOLAS).	Offshore ECC and OAA	Construction, O&M, and Decommissioning

517. Based on the findings of the FSA, it was determined that additional mitigation was necessary to ensure that hazards associated with underkeel interaction with the floating foundations, mooring lines and dynamic cables were ALARP. The necessary additional mitigation is as follows:

- Consultation with MCA and NLB on any necessary mitigations to address subsea interaction risk with once wet stored components once design requirements are known; and
- Consultation with MCA and NLB on any necessary mitigations to address subsea interaction risk with operational mooring lines and dynamic cables once design requirements are known.

17.2 Risk Control Log

518. **Table 17.2** presents a summary of the assessment of shipping and navigation hazards scoped into the risk assessment. This includes the proposed embedded mitigation measures, frequency of occurrence, severity of consequence and significance of risk for each hazard.

Table 17.2 Summary of assessment

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Construction									
Vessel Displacement	OAA and Offshore ECC	Co11, Co34 and Co53	All Vessels	Reasonably Probable	Negligible	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Increased vessel to vessel collision risk between third-party vessels	OAA and Offshore ECC	Co11, Co31, Co33, Co34, Co53 and Co9	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Increased vessel to vessel collision risk between a third-party vessel and a	OAA and Offshore ECC	Co24, Co11, Co36, Co31, Co33, Co34, Co53 and Co9	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Salamander Project vessel									
Vessel to structure allision risk	OAA	Co24, Co11, Co30, Co36, Co31, Co33, Co34, Co53, Co9 and Co18	All Vessels	Remote	Serious	Tolerable and ALARP	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Tolerable and ALARP	Not Significant
Reduced access to local ports	OAA and Offshore ECC	Co11 and Co18	Vessels and Port Services	Extremely unlikely	Minor	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Interaction with wet stored subsea infrastructure	OAA	Co30, Co36, Co34, Co18	All Vessels	Extremely Unlikely	Serious	Tolerable	Consultation with MCA and NLB on any necessary mitigations once wet storage design requirements are known. (Co38)	Tolerable and ALARP	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Reduction of emergency response capability	OAA and Offshore ECC	Co11, Co36, Co31, Co33, Co53, Co9 and Co18	Emergency Response Resources	Extremely unlikely	Moderate	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Operation and Maintenance									
Vessel Displacement	OAA and Offshore ECC	Co11, Co34 and Co53	All Vessels	Remote	Negligible	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Increased vessel to vessel collision risk between third-party vessels	OAA and Offshore ECC	Co11, Co31, Co33, Co34, Co53 and Co10	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel	OAA and Offshore ECC	Co24, Co11, Co36, Co31, Co33, Co34, Co53 and Co10	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Vessel to structure allision risk	OAA	Co35, Co24, Co11, Co30, Co36, Co31, Co33, Co34, Co53, Co10 and Co18	All Vessels	Remote	Serious	Tolerable and ALARP	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Tolerable and ALARP	Not Significant
Reduced access to local ports	OAA and Offshore ECC	Co11 and Co18	Vessels and Port Services	Extremely Unlikely	Minor	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Reduction of under keel clearance from cable protection	OAA and Offshore ECC	Co14, Co30, Co34, Co18 and Co45	All Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Interaction with subsea infrastructure	OAA	Co34, Co30, Co53, Co18 and Co45	All Vessels	Extremely Unlikely	Serious	Tolerable	Consultation with MCA and NLB on clearance depths once underkeel clearance is confirmed to reduce interaction with subsea infrastructure to ALARP. (Co37)	Tolerable and ALARP	Not Significant
Loss of station	OAA	Co31, Co33 and Co18	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Anchor interaction with subsea cables	OAA and Offshore ECC	Co14, Co30, Co34, Co18 and Co45	Anchored Vessels	Extremely Unlikely	Moderate	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Reduction of emergency response capability	OAA and Offshore ECC	Co11 and Co36	Emergency Response Resources	Extremely unlikely	Moderate	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Decommissioning									
Vessel Displacement	OAA and Offshore ECC	Co11, Co34, and Co53	All Vessels	Reasonably Probable	Negligible	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Increased vessel to vessel collision risk between third-party vessels	OAA and Offshore ECC	Co11, Co31, Co33, Co34, Co53, Co9, and Co10	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel	OAA and Offshore ECC	Co24, Co11, Co36, Co31, Co33, Co34, Co53, Co9, and Co10	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Vessel to structure allision risk	OAA	Co35, Co30, Co24, Co11, Co36, Co31, Co33, Co34, Co53, Co9, Co10 and Co18	All Vessels	Remote	Serious	Tolerable and ALARP	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Tolerable and ALARP	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Reduced access to local ports	OAA and Offshore ECC	Co11 and Co18	Vessels and Port Services	Extremely unlikely	Minor	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Reduction of emergency response capability	OAA and Offshore ECC	Co11 and Co36	Emergency Response Resources	Extremely unlikely	Moderate	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Cumulative									
Vessel Displacement	OAA and Offshore ECC	Co11, Co34, and Co53	All Vessels	Reasonably Probable	Negligible	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Increased vessel to vessel collision risk between third-party vessels	OAA and Offshore ECC	Co11, Co31, Co33, Co34, Co53 and Co10	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Increased vessel to vessel collision risk between a third-party vessel and a Salamander Project vessel	OAA and Offshore ECC	Co24, Co11, Co36, Co31, Co33, Co34, Co53 and Co10	All Vessels	Negligible	Serious	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Vessel to structure allision risk	OAA	Co35, Co30, Co24, Co11, Co36, Co31, Co33, Co34, Co53, Co10 and Co18	All Vessels	Negligible	Serious	Tolerable and ALARP	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Tolerable and ALARP	Not Significant

Project Activity and Impact	Project Aspect	Embedded Mitigation	Receptor	Frequency of Occurrence	Severity of Consequences	Significance of Risk	Additional Mitigation	Residual Significance of Risk	Significance of Effect in EIA Terms
Reduced access to local ports	OAA and Offshore ECC	Co11 and Co18	Vessels and Port Services	Extremely unlikely	Minor	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant
Reduction of emergency response capability	OAA and Offshore ECC	Co11 and Co36	Emergency Response Resources	Extremely unlikely	Moderate	Broadly Acceptable	No additional mitigation measures have been identified for this effect above and beyond the embedded mitigation as it was concluded that the effect was Not Significant	Broadly Acceptable	Not Significant

18 Through Life Safety Management

519. Health, Safety and Environment Quality, (HSEQ) documentation including a Safety Management System (SMS) will be in place for the Salamander Project and will be continually updated throughout the development process. The following subsections provide an overview of this documentation and how it will be maintained and reviewed with reference, where required, to specific marine documentation.

520. Monitoring, reviewing, and auditing will be carried out on all procedures and activities and feedback actively sought. Any designated person (identified in HSEQ 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.

18.1 Incident Reporting

521. After any incidents, including near misses, an incident report form will be completed in line with the HSEQ documentation. This will then be assessed for relevant outcomes and reviewed for possible changes required to operations.

522. 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.

523. All investigations shall be performed in a timely manner.

524. A database (lessons learnt) of all marine incidents will be developed. It will include the outcomes of investigations and any resulting actions. The Applicant will promote awareness of their potential occurrence and provide information to assist monitoring, inspection and auditing of documentation.

525. When appropriate, the designated person (noted within the Emergency Response and Cooperation Plan (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.

18.2 Review of Documentation

526. The Applicant will be responsible for reviewing and updating all documentation including the risk assessments, ERCoP, SMS and, if required, will convene a review panel of stakeholders to quantify risk.

527. Reviews of the risk register should be made after any of the following occurrences:

- Changes to the Offshore Development, conditions of operation and prior to decommissioning;
- Planned reviews; and
- Following an incident or exercise.

528. 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.

18.3 Inspection of Resources

529. All vessels, facilities, and equipment necessary for marine operations associated with the Offshore Development are to be subject to appropriate inspection and testing to determine fitness for purpose and availability in relation to their performance standards. This will be in compliance with the performance standards specified by NLB.

18.4 Audit Performance

530. Auditing and performance review are the final steps in HSEQ 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.

531. 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.

18.5 Safety Management System

532. The Applicant will manage the risk associated with the activities undertaken at the Offshore Development. An integrated SMS, which ensures that the safety and environmental risks of those activities are ALARP, will be established. This includes the use of remote monitoring and switching for aids to navigation to ensure that if a light is faulty then a quick fix can be instigated, which will allow IALA availability requirements to be met.

18.6 Cable Monitoring

533. The subsea cable routes will be subject to periodic inspection post-construction to monitor the cable protection, including burial depths. Maintenance of the protection will be undertaken as necessary.

534. If exposed cables or ineffective protection measures are identified during post-construction monitoring, these would be promulgated to relevant sea users including via Notice 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 permanently mitigated.

535. Details will be included in full within the Cable Burial Risk Assessment (CBRA), to be produced post-consent.

18.7 Hydrographic Surveys

536. As required by Annex 4 of MGN 654, detailed and accurate hydrographic surveys will be undertaken periodically at intervals agreed with the MCA.

18.8 Decommissioning Programme

537. 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 Offshore Development) which is considered to be a danger to navigation and which it has not proved possible to remove. Such an obstruction may require marking until such time as it is either removed or no longer considered a danger to navigation, the continuing cost of which would need to be met by the Applicant.

19 Summary

538. Using baseline data, collision and allision risk modelling and the outputs of consultation, hazards relating to shipping and navigation have been identified for the Offshore Development for all phases of the development (construction, operation and maintenance and decommissioning). This has been fed into the FSA undertaken (see **Section 16**).

19.1 Consultation

539. Throughout the NRA process, consultation has been undertaken with key shipping and navigation stakeholders including the MCA, NLB, CoS, RYA Scotland and the Cruising Association. A hazard workshop and regular operator outreach has also been undertaken. Further details on consultation can be found in **Section 4**.

19.2 Baseline Characterisation

19.2.1 Navigational Features

540. The Hywind Scotland Offshore Wind Farm is located approximately 6.3 nm southwest of the OAA; it became operational in 2017 and utilises five floating turbines.

541. Charted pipelines are in proximity to the Offshore Development; the pipeline that passes closest to the OAA passes 0.5 nm to the northwest of the OAA.

542. Peterhead is the main port in the vicinity of the Offshore Development, located approximately 2 nm from the southern boundary of the Offshore ECC, with a pilot boarding station at its entrance.

543. These navigational features, and additional navigational features, are presented and detailed in **Section 7**.

19.2.2 Maritime Incidents

544. The maritime incident baseline is presented and detailed in **Section 9**.

545. From MAIB incident data recorded between 2012 and 2021, a total of six incidents occurred within the EIA Study Area, corresponding to an average of one incident every one to two years. None of these incidents occurred within the OAA itself.

546. A total of 28 MAIB incidents occurred within the EIA Cable Corridor Study Area between 2012 and 2021, corresponding to an average of three incidents per year. Two of these incidents occurred within the Offshore ECC itself; both involved a fishing vessel experiencing machinery failure.

547. A review of older MAIB incident data spanning the previous 10 years (2002 to 2011) indicated that the frequency of incidents has seen a minor decline over time in this area.

548. From RNLI incident data recorded between 2011 and 2020, a total of eight lifeboat responses occurred within the EIA Study Area, with six of these being unique incidents, corresponding to an average of one unique incident every one to two years. None of these incidents occurred within the OAA itself.

549. A total of 58 lifeboat responses documented by the RNLI occurred within the EIA Cable Corridor Study Area, with 48 of these being unique incidents, corresponding to an average of five unique incidents per year. Incidents were heavily weighted towards shore, with only two of the incidents occurring beyond 7 nm of the coast.

550. A total of seven helicopter taskings occurred in proximity to the Offshore Development between April 2015 and March 2021, corresponding to an average of one per year.

19.2.3 Vessel Traffic Movements

551. The vessel traffic baseline is presented and detailed in **Section 10**.

552. Within the EIA Study Area, there was an average of 28 vessels per day during the winter survey period and 35 vessels per day during the summer survey period. Within the OAA itself, there was an average of three vessels per day during the winter and five vessels per day during the summer. Oil and gas vessels and fishing vessels were the most common vessel types during both survey periods.

553. Within the EIA Cable Corridor Study Area, there was an average of 42 vessels per day during the winter survey period and 51 vessels per day during the summer survey period. Within the Offshore ECC itself, there was an average of 32 vessels per day during the winter and 39 vessels per day during the summer. Oil and gas vessels and fishing vessels were the most common vessel types during both survey periods.

19.3 Vessel Routeing

554. A total of 16 main commercial routes were identified from the vessel traffic survey data. The highest-use main commercial route was a route used by oil and gas vessels between Aberdeen and various oil and gas infrastructure, with an average of 17 unique vessels per week. Five of these routes are anticipated to require deviation as a result of the presence of the OAA, with the amount of deviation within the EIA Study Area ranging from less than 0.1 nm to 0.8 nm.

19.4 Collision and Allision Risk Modelling

555. The collision and allision risk modelling has been presented and discussed in **Section 15**.

556. Six scenarios were assessed:

- Pre wind farm with the base case vessel traffic level;
- Pre wind farm with a future case vessel traffic level defined by:
  - A 10% increase in traffic; and
  - A 20% increase in traffic.
- Post wind farm with the base case traffic level; and
- Post wind farm with a future case vessel traffic level defined by:
  - A 10% increase in traffic; and
  - A 20% increase in traffic.

557. **Table 19.1** presents a summary of the collision and allision modelling results.

Table 19.1 Risk Results Summary

Risk	Scenario	Annual Frequency		
		Pre Wind Farm	Post Wind Farm	Increase
Vessel to vessel collision	Base case	8.43×10^{-4} (1 every 1,186 years)	8.72×10^{-4} (1 every 1,147 years)	2.85×10^{-5}
	Future case (10%)	1.04×10^{-3} (1 every 965 years)	1.07×10^{-3} (1 every 933 years)	3.52×10^{-5}
	Future case (20%)	1.23×10^{-3} (1 every 814 years)	1.27×10^{-3} (1 every 788 years)	4.16×10^{-5}
Powered vessel to structure allision	Base case	-	6.29×10^{-4} (1 every 1,589 years)	-
	Future case (10%)	-	6.92×10^{-4} (1 every 1,444 years)	-
	Future case (20%)	-	7.55×10^{-4} (1 every 1,324 years)	-
Drifting vessel to structure allision	Base case	-	2.15×10^{-5} (1 every 46,451 years)	-
	Future case (10%)	-	2.37×10^{-5} (1 every 42,229 years)	-
	Future case (20%)	-	2.58×10^{-5} (1 every 38,710 years)	-
Fishing vessel to structure allision	Base case	-	8.25×10^{-2} (1 every 12 years)	-

Risk	Scenario	Annual Frequency		
		Pre Wind Farm	Post Wind Farm	Increase
	Future case (10%)	-	9.07×10^{-2} (1 every 11 years)	-
	Future case (20%)	-	9.90×10^{-2} (1 every 10 years)	-
Total	**Base case**	8.43×10^{-4} (1 every 1,186 years)	8.40×10^{-2} (1 every 12 years)	8.32×10^{-2}
	Future case (10%)	1.04×10^{-3} (1 every 965 years)	9.25×10^{-2} (1 every 11 years)	9.15×10^{-2}
	Future case (20%)	1.23×10^{-3} (1 every 814 years)	1.01×10^{-1} (1 every 10 years)	9.98×10^{-2}

19.5 Risk Statement

558. Using the baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments, various shipping and navigation hazards have been risk assessed in line with the FSA approach. The full risk control log including details of hazards, proposed embedded and additional mitigation measures and significance of risk is presented in **Section 17**.

559. The significance of risk has been determined as either Broadly Acceptable or Tolerable and ALARP for all shipping and navigation hazards assessed.

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Appendix A Marine Guidance Note 654 Checklist

560. 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.

561. 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. Developers 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, array variation, operation and decommissioning. This should be supplied as authoritative Geographical Information System (GIS) data, preferably in Environmental Systems Research Institute (ESRI) format.		
Traffic Survey. Includes:		
All vessel types.	P	**Section 10: Vessel Traffic Movements** All vessel types are considered with specific breakdowns by vessel type given within the EIA Study Area.
At least 28 days duration, within either 12 or 24 months prior to submission of the EIAR	P	**Section 5: Data Sources** A total of 28 full days of vessel traffic survey data from February and August 2023 has been assessed within the EIA Study Area.
Multiple data sources.	P	**Section 5: Data Sources** The vessel traffic survey data includes AIS, Radar and visual observations to maximise coverage of vessels not broadcasting on AIS in addition to other data sources.
Seasonal variations.	P	**Section 5: Data Sources** A total of 28 full days of vessel traffic survey data from February and August 2023 has been assessed within the EIA Study Area.
MCA consultation.	P	**Section 4: Consultation** The MCA has been consulted as part of the NRA process.
General Lighthouse Authority (GLA) consultation.	P	**Section 4: Consultation** The NLB has been consulted as part of the NRA process.
UK CoS consultation.	P	**Section 4: Consultation** The UK CoS has been consulted as part of the NRA process.
Recreational and fishing vessel organisations consultation.	P	**Section 4: Consultation** The SWFPA, SPFA, RYA Scotland and the Cruising Association have been consulted as part of the NRA process, including through the Hazard Workshop.

Issue	Compliance	Comments
Port and navigation authorities consultation, as appropriate.	P	**Section 4: Consultation** Port Authority representation has 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.	P	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Offshore Development has been analysed. **Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase. **Section 16.4: Cumulative Risk Assessment** Cumulative risk assessment has been undertaken.
ii. Numbers, types and sizes of vessels presently using such areas.	P	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Offshore Development 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.	P	**Section 7: Navigational Features** Non-transit uses of the areas in proximity to the Offshore Development have been identified, including fishing vessels engaged in fishing activities and wind farm vessels supporting Hywind Offshore Wind Farm. **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 wind farm vessels supporting Hywind Offshore Wind Farm.
iv. Whether these areas contain transit routes used by coastal or deep-draught vessels on passage.	P	**Section 11: Base Case Vessel Routeing** Main commercial routes have been identified using the principles set out in MGN 654 in proximity to the Offshore Development.
v. Alignment and proximity of the site relative to adjacent shipping lanes.	P	**Section 7: Navigational Features** There are no IMO routeing measures in proximity to the Offshore Development.
vi. Whether the nearby area contains prescribed routeing schemes or precautionary areas.	P	**Section 7: Navigational Features** There are no IMO routeing measures or precautionary areas in proximity to the Offshore Development.
vii. Proximity of the site to areas used for anchorage (charted or uncharted), safe haven, port approaches and pilot boarding or landing areas.	P	**Section 7: Navigational Features** Relevant features have been identified in proximity to the Offshore Development.

Issue	Compliance	Comments
viii. Whether the site lies within the jurisdiction of a port and/or navigation authority.	P	**Section 7: Navigational Features** Relevant features have been identified in proximity to the Offshore Development.
ix. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	P	**Section 10: Vessel Traffic Movements** Commercial fishing vessel movements in proximity to the Offshore Development are assessed.
x. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.	P	**Section 7: Navigational Features** No areas used for military purposes in proximity to the Offshore Development were identified.
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.	P	**Section 7: Navigational Features** Submarine cables, pipelines, oil and gas platforms and wrecks were identified in proximity to the Offshore Development.
xii. Proximity of the site to existing or proposed OREI developments, in cooperation with other relevant developers, within each round of lease awards.	P	**Section 7: Navigational Features** Hywind Offshore Wind Farm was identified in proximity to the Offshore Development. **Section 13: Cumulative Overview** Cumulative developments have been identified.
xiii. Proximity of the site relative to any designated areas for the disposal of dredging spoil or other dumping ground.	P	**Section 7: Navigational Features** Relevant features have been identified in proximity to the Offshore Development.
xiv. Proximity of the site to aids to navigation and/or VTS in or adjacent to the area and any impact thereon.	P	**Section 7: Navigational Features** Aids to navigation in proximity to the Offshore Development were identified.
xv. Researched opinion using computer simulation techniques with respect to the displacement of traffic and, in particular, the creation of 'choke points' in areas of high traffic density and nearby or consented OREI sites not yet constructed.	P	**Section 15: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Offshore Development.

Issue	Compliance	Comments
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.	P	**Section 9: Emergency Response and Incident Overview** Historical vessel incident data published by DfT (**Section 9.1**), RNLI (**Section 9.2**) and MAIB (**Section 9.3**) in proximity to the Offshore Development has been considered alongside historical offshore wind farm incident data throughout the UK (**Section 9.6**).
xvii. Proximity of the site to areas used for recreation which depend on specific features of the area.	P	**Section 10: Vessel Traffic Movements** Recreational vessel movements in proximity to the Offshore Development are assessed.
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.	P	**Section 14: Future Case Vessel Traffic** A methodology for post wind farm routeing is outlined and includes a minimum distance of 1 nm 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.	P	No navigation corridor with regular routeing by commercial vessels have been identified between offshore wind farm developments (Hywind is in excess of 6nm and both developments are small in scale, screened in cumulative projects in excess of 15nm away).
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.	P	**Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and include consideration of anchoring and emergency response.
b. Clearances of fixed or floating WTG blades above the sea surface are not less than 22 m (above Mean High Water Springs (MHWS) for fixed). Floating turbines allow for degrees of motion.	P	**Section 6: Project Description Relevant to Shipping and Navigation** **Section 6.2.2** outlines the shipping and navigation worst-case scenario for WTGs including the minimum air gap above SWL.

Issue	Compliance	Comments
c. Underwater devices: i. Changes to charted depth; ii. Maximum height above seabed; and iii. Under keel clearance.	P	**Section 6: Project Description Relevant to Shipping and Navigation** **Section 6.3** outlines the shipping and navigation worst-case scenario for subsea infrastructure including the cable burial and protection specifications.
d. Whether structures block or hinder the view of other vessels or other navigational features.	P	**Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and include consideration of the potential for vessels navigating in proximity to structures to be visually obscured or inhibit the use of existing aids to navigation.
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.	P	**Section 6: Project Description Relevant to Shipping and Navigation** Water depths within the Offshore Development are provided. **Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Offshore Development relating to various states of the tide. **Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Offshore Development has been analysed including vessel draught. **Section 15: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Offshore Development 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.	P	**Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Offshore Development relating to various states of the tide. **Section 15: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Offshore Development including accounting for tidal conditions.
c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.	P	
d. The set is across the major axis of the layout at any time, and, if so, at what rate.	P	

Issue	Compliance	Comments
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.	P	**Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Offshore Development relating to various states of the tide. **Section 15: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Offshore Development including accounting for tidal conditions and assessment of whether machinery failure could cause vessels to be set into danger.
f. The structures themselves could cause changes in the set and rate of the tidal stream.	P	**Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Offshore Development 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 produce siltation, deposition of sediment or scouring, affecting navigable water depths in the wind farm area or adjacent to the area.	P	**Section 8: Meteorological Ocean Data** **Section 8.4** provides meteorological data in proximity to the Offshore Development relating to various states of the tide. **Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and include consideration of the potential for reduction in under keel clearance.
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.	P	**Section 8: Meteorological Ocean Data** Provides meteorological data in proximity to the Offshore Development relating to weather and visibility. **Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Offshore Development has been analysed including recreational vessels. **Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and include consideration of adverse weather routeing.
i. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	P	**Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and include consideration of internal allision risk for vessels under sail.

Issue	Compliance	Comments
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.	P	**Section 8: Meteorological Ocean Data** Provides meteorological data in proximity to the Offshore Development relating to wind direction and various states of the tide. **Section 15: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Offshore Development including accounting for weather conditions and assessment of whether machinery failure could cause vessels to be set into danger. **Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and include consideration of drifting allision risk.
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. 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.	P	**Section 4: Consultation** Regular Operator consultation and consultation with fishing and recreational representatives was undertaken following the vessel traffic surveys. **Section 15: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk resulting from the Offshore Development including accounting for weather and tidal conditions. **Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and include consideration of internal allision risk.
b. Navigation in and/or near the site should be prohibited or restricted:		
i. For specified vessel types, operations and/or sizes.	P	**Section 12: 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**
ii. In respect of specific activities.	P	
iii. In all areas or directions.	P	
iv. In specified areas or directions.	P	

Issue	Compliance	Comments
v. In specified tidal or weather conditions.	P	A methodology for post wind farm routeing is outlined and includes a minimum distance of 1 nm from offshore installations and existing offshore wind farm boundaries, i.e., it is assumed that commercial vessels will avoid the OAA. **Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and includes consideration of vessel displacement.
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.	P	**Section 16: Risk Assessment** The hazards due to the Offshore Development have been assessed for each phase and includes consideration of vessel displacement and emergency response capability.
d. Guidance on the calculation of safe distance of OREI boundaries from shipping routes has been considered.	P	**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.		
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 developers and operators.		
a. An ERCoP will be developed for the construction, operation and decommissioning phases of the OREI.	P	**Section 17: Risk Control log** 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.	P	**Section 2: Guidance and Legislation** Outlines the guidance and legislation used within the NRA including Annex 5 of MGN 654. **Section 17: Risk Control log** 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.

Issue	Compliance	Comments
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).	P	**Section 17: Risk Control log** 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.	P	**Section 18: 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.	P	
iii. Post construction: Cable route(s).	P	
iv. Post decommissioning of all or part of the development: the installed generating assets area and cable route.	P	
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:		
i. Vessels operating at a safe navigational distance.	P	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Offshore Development 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.	P	
iii. Vessels by the nature of their work necessarily operating within the OREI.	P	
b. The structures could produce Radar reflections, blind spots, shadow areas or other adverse effects:		
i. Vessel to vessel.	P	**Section 13: Navigation, Communication and Position Fixing Equipment**
ii. Vessel to shore.	P	
iii. VTS Radar to vessel.	P	

Issue	Compliance	Comments
iv. Racon to/from vessel.	**P**	Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Offshore Development including in relation to marine Radar.
c. The structures and generators might produce SONAR interference affecting fishing, industrial or military systems used in the area.	**P**	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Offshore Development including in relation to SONAR.
d. The site might produce acoustic noise which could mask prescribed sound signals.	**P**	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Offshore Development 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.	**P**	**Section 13: Navigation, Communication and Position Fixing Equipment** Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Offshore Development including in relation to EMF interference.
Risk mitigation measures recommended for OREI during construction, operation 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 developer'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.	**P**	**Section 17: Risk Control log** 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.	**P**	**Section 17: Risk Control log** 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[6].	**P**	**Section 17: Risk Control log** 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 Area to be Avoided (ATBA).	**P**	There are no plans to designate the Offshore Development as an ATBA.

[6] As per SI 2007 No 1948 "The Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007.

Issue	Compliance	Comments
v. Provision of aids to navigation as determined by the GLA.	P	**Section 17: Risk Control log** 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.	P	There are no plans to implement any new routeing measures in proximity to the Offshore Development.
vii. Monitoring by Radar, AIS, Closed Circuit Television (CCTV) or other agreed means.	P	**Section 17: Risk Control log** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the SAR checklist.
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of Safety Zones.	P	**Section 17: Risk Control log** 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 phase onwards.	P	**Section 17: Risk Control log** 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.	P	**Section 17: Risk Control log** 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 where appropriate.
xi. Update NRAs every two years, e.g. at testing sites.	P	Not applicable to the Offshore Development.
xii. Device-specific or array-specific NRAs.	P	**Section 6: Project Description Relevant to Shipping and Navigation** All offshore elements of the Salamander Project have been considered in this NRA including all infrastructure (surface and subsea) within the OAA and Offshore ECC.
xiii. Design of OREI structures to minimise risk to contacting vessels or craft.	P	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.	P	**Section 17: Risk Control log** Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards. **Section 18: 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.	✓	**Section 16: 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.
Description of the marine environment.	✓	**Section 7: Navigational Features** Relevant navigational features in proximity to the Offshore Development have been described. **Section 13: Cumulative Overview** Potential future developments have been screened in to the cumulative risk assessment where a cumulative or in combination activity has been identified based upon the location and distance from the Offshore Development, including consideration of other offshore wind farms, oil and gas infrastructure and marine aggregate dredging areas.
SAR overview and assessment.	✓	**Section 9: Emergency Response and Incident Overview** Existing SAR resources in proximity to the Offshore Development are summarised including the UK SAR operations contract, RNLI stations and assets and HMCG stations. **Section 16: Risk Assessment** The risk assessment includes an assessment of how activities associated with the Offshore Development may restrict emergency response capability of existing resources.
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 Offshore Development for which any shipping and navigation hazards are assessed is provided including a description of the OAA and Offshore ECC, construction phase programme and indicative vessel and helicopter numbers during the construction, operation and maintenance and decommissioning phases. **Section 14: Future Case Vessel Traffic** Worst-case alternative routeing for commercial traffic has been considered.
Analysis of the vessel traffic, including base case and future traffic densities and types.	✓	**Section 10: Vessel Traffic Movements** Vessel traffic data in proximity to the Offshore Development has been analysed and includes vessel density and breakdowns of vessel type. **Section 14: Future Case Vessel Traffic** Future vessel traffic levels have been considered, broken down as increases in commercial vessel activity, commercial fishing vessel and recreational vessel activity and increases in

Item	Compliance	Comments
		traffic associated with project operations. Additionally, worst-case alternative routeing for commercial traffic has been considered.
Status of the Hazard Log: ▪ Hazard identification; ▪ Risk assessment; ▪ Influences on level of risk; ▪ Tolerability of risk; and ▪ Risk matrix.	✓	**Section 3: Navigational Risk Assessment Methodology** A tolerability matrix has been defined to determine the tolerability (significance) of risks. **Appendix B: Hazard Log** The complete Hazard Log is presented and includes a description of the hazards considered, possible causes, consequences (most likely and worst-case) and relevant embedded mitigation measures. Using this information, each hazard is then ranked in terms of frequency of occurrence and severity of consequence to give a tolerability (significance) level.
NRA: ▪ Appropriate risk assessment; ▪ MCA acceptance for assessment techniques and tools; ▪ Demonstration of results; and ▪ Limitations.	✓	**Section 2: Guidance and Legislation** MGN 654 and the IMO's FSA guidelines are the primary guidance documents used for the assessment. **Section 15: Collision and Allision Risk Modelling** Provides quantification of collision and allision risk with the results outlined numerically and graphically, where appropriate.
Risk control log	✓	**Section 17: Risk Control Log** Provides the risk control log which summarises the assessment of shipping and navigation hazards scoped into the risk assessment. This includes the proposed embedded mitigation measures, frequency of occurrence, severity of consequence and significance of risk, per hazard.

Appendix B Hazard Log

The hazard log is provided below. Further background details are provided in **Section 4.3**.

Hazard Type	Hazard Title	Phase (C/O/D)	Embedded Mitigations	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst Case Consequences	Realistic Worst Case Consequences							Further Mitigation	Additional Comments
							Consequences					Risk			Consequences					Risk		
						Frequency	People	Environment	Property	Business	Average			Frequency	People	Environment	Property	Business	Average			
Commercial Vessels																						
Displacement resulting in increased collision risk	Increased collision risk involving commercial vessels due to displacement from historical routes and reduction in available sea room	C/D	- Display on charts - Promulgation of information - Lighting and marking - COLREGs / SOLAS	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	5	1	1	1	1	1.0	Tolerable	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		Noted importance of considering the cumulative impact on vessel routeing. General consensus was that commercial vessels would avoid the wind farm.
Collision with project vessels	Increased collision risk between a commercial vessel and a project vessel (construction/decommissioning)	C/D	- Vessel Management Plan - Display on charts - Promulgation of information - Safety zones - Marine coordination - Lighting and marking - COLREGs / SOLAS - Guard vessel (via risk assessment)	Presence of project vessels associated with construction/decommissioning Third party users not aware project vessels are engaged in operations Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		

Allision	New allision risk for commercial vessels due to presence of pre commissioned floating structures	C/D	- MGN 654 compliance - Display on charts - Promulgation of information - Safety zones - Lighting and marking - Guard vessel (via risk assessment)	Presence of pre commissioned floating structures Human error or navigational error Mechanical or technical failure (vessel) Adverse weather Unfamiliarity with project Failure of Aid to Navigation	Vessel passes floating structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable	Vessel allides with floating structure resulting in damage to vessel, injury and potentially pollution	2	5	4	5	4	4.5	Tolerable		General consensus was that commercial vessels would avoid the wind farm.
Anchor interaction	Increased anchor snagging risk for commercial vessels due to subsea cables, cable protection and mooring lines / anchors	C/D	- MGN 654 compliance - Display on charts - Promulgation of information - Cable burial risk assessment - Guard vessel (via risk assessment)	Presence of subsea cables or cable protection Presence of mooring lines/ anchors Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection/ mooring line/anchor but no snagging occurs.	3	1	1	1	1	1.0	Broadly Acceptable	Vessel anchors on or drags anchor over an installed cable/protection/ mooring line/anchor resulting in damage to the cable/protection and/or vessel anchor	2	3	1	3	2	2.3	Broadly Acceptable		

Displacement resulting in increased collision risk	Increased collision risk involving commercial vessels due to displacement from historical routes and reduction in available sea room	O	- Display on charts - Promulgation of information - Lighting and marking - COLREGs / SOLAS	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		Noted importance of considering the cumulative impact on vessel routeing. General consensus was that commercial vessels would avoid the wind farm.
Collision with project vessels	Increased collision risk between a commercial vessel and a project vessel due to the presence of project vessels associated with operation and maintenance	O	- Vessel Management Plan - Display on charts - Promulgation of information - Safety zones - Marine coordination - Lighting and marking - COLREGs / SOLAS - Guard vessel (via risk assessment)	Presence of project vessels (O&M) Third party users not aware project vessels are engaged in operations Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	3	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		
Allision	New allision risk for commercial vessels due to presence of floating structures	O	- MGN 654 compliance - Display on charts - Promulgation of information - Lighting and marking - Guard vessel (via risk assessment)	Presence of floating structures Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather Failure of Aid to Navigation	Vessel passes floating structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable	Vessel allides with floating structure resulting in damage to vessel, injury and potentially pollution	2	5	4	5	4	4.5	Tolerable		General consensus was that commercial vessels would avoid the wind farm.

Anchor interaction	Increased anchor snagging risk for commercial vessels due to subsea cables, cable protection and mooring lines	O	- MGN 654 compliance - Display on charts - Promulgation of information - Cable burial risk assessment	Presence of subsea cables or cable protection Presence of mooring lines/anchors Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection/ mooring line/anchor but no snagging occurs	3	1	1	1	1	1.0	Broadly Acceptable	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor	2	3	1	2	2	2.0	Broadly Acceptable		
Commercial Fishing Vessels (in Transit)																						
Displacement resulting in increased collision risk	Increased collision risk involving fishing vessels due to temporary displacement from historical routes and reduction in available sea room	C/D	- Display on charts - Promulgation of information - Lighting and marking - COLREGs / SOLAS	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	5	1	1	1	1	1.0	Tolerable	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		General consensus was that fishing vessels would avoid the wind farm. Noted that this impact considers fishing vessels in transit. Active fishing is considered in Commercial Fisheries chapter.
Collision with project vessels	Increased collision risk between a commercial fishing vessel and a project vessel (construction/d ecommissioning)	C/D	- Vessel Management Plan - Display on charts - Promulgation of information - Safety zones - Marine coordination - Lighting and marking - COLREGs / SOLAS - Guard vessel (via risk assessment)	Presence of project vessels associated with construction/ decommissionin g Third party users not aware project vessels are engaged in operations Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		Assumes project vessel levels are within typical industry standards.

Allision	New allision risk for commercial fishing vessels due to presence of pre commissioned floating structures	C/D	- MGN 654 compliance - Display on charts - Promulgation of information - Safety zones - Lighting and marking - Guard vessel (via risk assessment)	Presence of pre commissioned floating structures Human error or navigational error Mechanical or technical failure (vessel) Adverse weather Unfamiliarity with project Failure of Aid to Navigation	Vessel passes floating structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable	Vessel allides with floating structure resulting in damage to vessel, injury and potentially pollution	2	5	4	5	4	4.5	Tolerable		General consensus was that fishing vessels would avoid the wind farm. Assumes layout will be MGN 654 compliant.
Anchor interaction	Increased anchor snagging risk for commercial fishing vessels due to subsea cables, cable protection and mooring lines. * Gear snagging is considered in Commercial Fisheries chapter.	C/D	- MGN 654 compliance - Display on charts - Promulgation of information - Cable burial risk assessment - Guard vessel (via risk assessment)	Presence of subsea cables or cable protection Presence of mooring lines/ anchors Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection/ mooring line/anchor but no interaction occurs	3	1	1	1	1	1.0	Broadly Acceptable	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor Risks to vessel stability	2	3	1	3	2	2.3	Broadly Acceptable		
Displacement resulting in increased collision risk	Increased collision risk involving commercial fishing vessels due to displacement from historical transits to fishing grounds and reduction in available sea room	O	- Display on charts - Promulgation of information - Lighting and marking - COLREGs / SOLAS	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		General consensus was that fishing vessels would avoid the wind farm. Noted that this impact considers fishing vessels in transit. Active fishing is considered in Commercial Fisheries chapter.

Collision With project vessels	Increased collision risk between a commercial fishing vessel and a project vessel (O&M)	O	- Vessel Management Plan - Display on charts - Promulgation of information - Safety zones - Marine coordination - Lighting and marking - COLREGs / SOLAS - Guard vessel (via risk assessment)	Presence of project vessels (O&M) Third party users not aware project vessels are engaged in operations Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	3	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		Assumes project vessel levels are within typical industry standards.
Allision	New allision risk for commercial fishing vessels due to presence of floating structures	O	- MGN 654 compliance - Display on charts - Promulgation of information - Lighting and marking - Guard vessel (via risk assessment)	Presence of floating structures Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather Failure of Aid to Navigation	Vessel passes floating structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable	Vessel allides with floating structure resulting in damage to vessel, injury and potentially pollution	2	5	4	5	4	4.5	Tolerable		General consensus was that fishing vessels would avoid the wind farm. Assumes layout will be MGN 654 compliant.
Anchor interaction	Increased anchor snagging risk for commercial fishing vessels due to subsea cables, cable protection and mooring lines. * Gear snagging is considered in Commercial Fisheries chapter.	O	- MGN 654 compliance - Display on charts - Promulgation of information - Cable burial risk assessment - Guard vessel (via risk assessment)	Presence of subsea cables or cable protection Presence of mooring lines/ anchors Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/protection/ mooring line/anchor but no snagging occurs	3	1	1	1	1	1.0	Broadly Acceptable	Vessel anchors on or drags anchor over an installed cable/protection resulting in damage to the cable/protection and/or anchor Risks to vessel stability	1	3	1	3	2	2.3	Broadly Acceptable		
Recreational Vessels (2.5 to 24 metres)																						

Displacement resulting in increased collision risk	Increased collision risk involving recreational vessels due to temporary displacement from historical cruising routes and reduction in available sea room	C/D	- Display on charts - Promulgation of information - Lighting and marking - COLREGs / SOLAS	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels that do not impact on compliance with COLREGS	5	1	1	1	1	1.0	Tolerable	Increased encounters between third party vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		General consensus was that even though recreational vessels were small, they may still avoid transit through.
Collision with project vessels	Increased collision risk between a recreational vessel and a project vessel (construction/decommissioning)	C/D	- Vessel Management Plan - Display on charts - Promulgation of information - Safety zones - Marine coordination - Lighting and marking - COLREGs / SOLAS - Guard vessel (via risk assessment)	Presence of project vessels associated with construction/decommissioning Third party users not aware project vessels are engaged in operations Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		Assumes project vessel levels are within typical industry standards.
Allision	New allision risk for recreational vessels due to presence of floating structures	C/D	- MGN 654 compliance - Display on charts - Promulgation of information - Safety zones - Lighting and marking - Minimum 22m blade clearance - Guard vessel (via risk assessment)	Presence of pre commissioned floating structures Human error or navigational error Mechanical or technical failure (vessel) Adverse weather Unfamiliarity with project Failure of Aid to Navigation	Vessel passes floating structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable	Vessel allides with floating structure resulting in damage to vessel, injury and potentially pollution	2	5	4	5	4	4.5	Tolerable		Assumes layout will be MGN 654 compliant, and that requirements around degrees of motion (pitch, roll, yaw, heave, surge and sway) will be adhered to in relation to floating structures. General consensus was that even though recreational vessels were small, they may still avoid transit through.

Anchor interaction	Increased anchor snagging risk for recreational vessels due to subsea cables, cable protection and mooring lines	C/D	- MGN 654 compliance - Display on charts - Promulgation of information - Cable burial risk assessment - Guard vessel (via risk assessment)	Presence of subsea cables or cable protection Presence of mooring lines/ anchors Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable /protection /mooring line/anchor but no interaction occurs	2	1	1	1	1	1.0	Broadly Acceptable	Vessel anchors on or drags anchor over an installed cable/ protection resulting in damage to the cable/protection and/or anchor Risks to vessel stability	1	3	1	3	2	2.3	Broadly Acceptable		
Displacement resulting in increased collision risk	Increased collision risk involving recreational vessels due to displacement from historical cruising routes and reduction in available sea room	O	- Display on charts - Promulgation of information - Lighting and marking - COLREGs / SOLAS	Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters that do not impact on compliance with COLREGS	4	1	1	1	1	1.0	Broadly Acceptable	Increased encounters that do impact on compliance with COLREGS and result in increased collisions	1	4	4	4	4	4.0	Broadly Acceptable		General consensus was that even though recreational vessels were small, they may still avoid transit through.
Collision with project vessels	Increased collision risk between a recreational vessel and a project vessel (O&M)	O	- Vessel Management Plan - Display on charts - Promulgation of information - Safety zones - Marine coordination - Lighting and marking - COLREGs / SOLAS - Guard vessel (via risk assessment)	Presence of project vessels (O&M) Third party users not aware project vessels are engaged in operations Human error or navigational error Mechanical or technical failure (vessel) Adverse weather	Increased encounters between third party vessels and project vessels that do not impact on compliance with COLREGS	3	1	1	1	1	1.0	Broadly Acceptable	Increased encounters between third party vessels and project vessels that do impact on compliance with COLREGS and result in increased collisions	2	5	4	5	4	4.5	Tolerable		Assumes project vessel levels are within typical industry standards.

Allision	New allision risk for recreational vessels due to presence of floating structures	O	- MGN 654 compliance - Display on charts - Promulgation of information - Lighting and marking - Guard vessel (via risk assessment) - Minimum 22m blade clearance	Presence of floating structures Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather Failure of Aid to Navigation	Vessel passes floating structure at an unsafe distance and has to make last minute adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable	Vessel allides with floating structure resulting in damage to vessel, injury and potentially pollution	2	5	4	5	4	4.5	Tolerable		Assumes layout will be MGN 654 compliant, and that requirements around degrees of motion (pitch, roll, yaw, heave, surge and sway) will be adhered to in relation to floating structures. General consensus was that even though recreational vessels were small, they may still avoid transit through.
Anchor interaction	Increased anchor snagging risk for recreational vessels due to subsea cables, cable protection and mooring lines	O	- MGN 654 compliance - Display on charts - Promulgation of information - Cable burial risk assessment - Guard vessel (via risk assessment)	Presence of subsea cables or cable protection Presence of mooring lines/ anchors Human error or navigational error Mechanical or technical failure Adverse weather	Vessel anchors on or drags anchor over an installed cable/ protection / mooring line/anchor but no snagging occurs	2	1	1	1	1	1.0	Broadly Acceptable	Vessel anchors on or drags anchor over an installed cable/ protection resulting in damage to anchor and risk to vessel stability	1	2	1	2	2	1.8	Broadly Acceptable		
All Vessels																						
Interference with marine navigation, communications and position fixing equipment	Presence of floating WTGs, export and inter array cables may interfere with equipment used on board all vessels.	O	- MGN 654 compliance - Display on charts - Promulgation of information - Lighting and marking - COLREGs / SOLAS	Human error relating to adjustment of Radar controls Presence of floating structures	Infrastructure has minor but manageable effect upon the Radar, communications and navigation equipment on a vessel	5	1	1	1	1	1.0	Tolerable	Interference with marine equipment affecting efficiency of navigation and/or collision avoidance	3	1	1	1	1	1.0	Broadly Acceptable		Project is using HVAC and therefore limited concerns with EMF impacts.

Loss of station	Floating structure breaks free of mooring creating collision risk to passing traffic	O	- MGN 654 and MCA/HSE Regulatory Expectations 2017 compliance - Promulgation of information - Lighting and marking - COLREGs / SOLAS - Guard vessel (via risk assessment) - Mooring line design - Monitoring of floating substructures	Damage to or failure of mooring line(s) Adverse weather	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	2	2	2.0	Broadly Acceptable	Total failure of mooring system leads to drifting of floating structure with risk of collision with vessels	1	4	4	4	4	4.0	Broadly Acceptable		
Underkeel interaction with cable protection	Reduction of navigable depth from cable protection leading to underkeel interaction	O	- MGN 654 compliance - Display on charts - Promulgation of information - Cable burial risk assessment	Presence of cable protection causes reduction in water depth Human error or navigational error	Vessel transits over an area of reduced clearance causing vibration etc. but does not make contact	3	2	2	2	2	2.0	Broadly Acceptable	Vessel makes contact with cable protection / infrastructure resulting in damage to the vessel and potentially pollution.	1	4	4	4	4	4.0	Broadly Acceptable		Limited concern with this hazard given MGN 654 requirements on depth reductions. No concern with use of subsea hubs given water depths of the OAA.
Interaction with mooring lines or dynamic cables	Vessels passing in proximity to floating structures interacting with mooring lines or dynamic cables.	O	- MGN 654 compliance - Display on charts - Promulgation of information - Lighting and marking - Design of mooring lines and dynamic cables	Presence of mooring lines and dynamic cables Mooring line and dynamic cable design Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather	Vessel passes in proximity to floating structure but no interaction with mooring lines or dynamic cables occurs	5	1	1	1	1	1.0	Tolerable	Vessel passes in proximity to floating structure and makes contact with mooring line or dynamic cable.	3	4	4	4	4	4.0	Tolerable	Further consideration of underkeel clearances required	The risk associated with this hazard will depend on mooring line and dynamic cable design. There may also be underkeel interaction impacts associated with the subsea sections of the floating substructures, again

																						dependent on design. Indicated during workshop that an underkeel clearance value of 10m would likely manage risk to fishing vessels.
Emergency response																						
Emergency response	Presence of floating WTGs may restrict access/response for existing emergency responders	C/O/D	- MGN 654 compliance - Marine coordination - Lighting and marking - COLREGs / SOLAS - Marine Pollution Contingency Plan - Guard vessel (via risk assessment)	Wind farm array not designed to facilitate air or surface responder access Adverse weather	Delay to response request	3	1	1	1	2	1.3	Broadly Acceptable	Delay to response request leading to loss of life	1	4	4	4	4	4.0	Broadly Acceptable		Noted the importance of considering increased incident rates from the baseline caused by the wind farm. Assumes layout will be MGN 654 compliant.

Appendix C Consequences Assessment

C.1 Introduction

562. 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 Offshore Array.

563. The significance of the impact due to the presence of the Offshore Array is also assessed based on risk evaluation criteria and comparison with historical incident data in UK waters[7].

C.2 Risk Evaluation Criteria

C.2.1 Risk to People

564. Regarding the assessment of risk to people two measures are considered, namely:

- Individual risk; and
- Societal risk.

C.2.1.1 Individual Risk

565. Individual risk considers whether the risk from an incident to a particular individual changes significantly due to the presence of the Offshore Array. 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.

566. The purpose of estimating the individual risk is to ensure that individuals who may be affected by the presence of the Offshore Array 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 Offshore Array relative to the UK background individual risk levels.

567. 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 (i.e., the region in which risk is tolerable assuming the IMO risk acceptance criteria bounds) for each of the vessel types presented.

[7] For the purposes of this assessment, UK waters is defined as the UK EEZ and UK territorial waters refers to the 12 nm limit from the British Isles, excluding the Republic of Ireland.

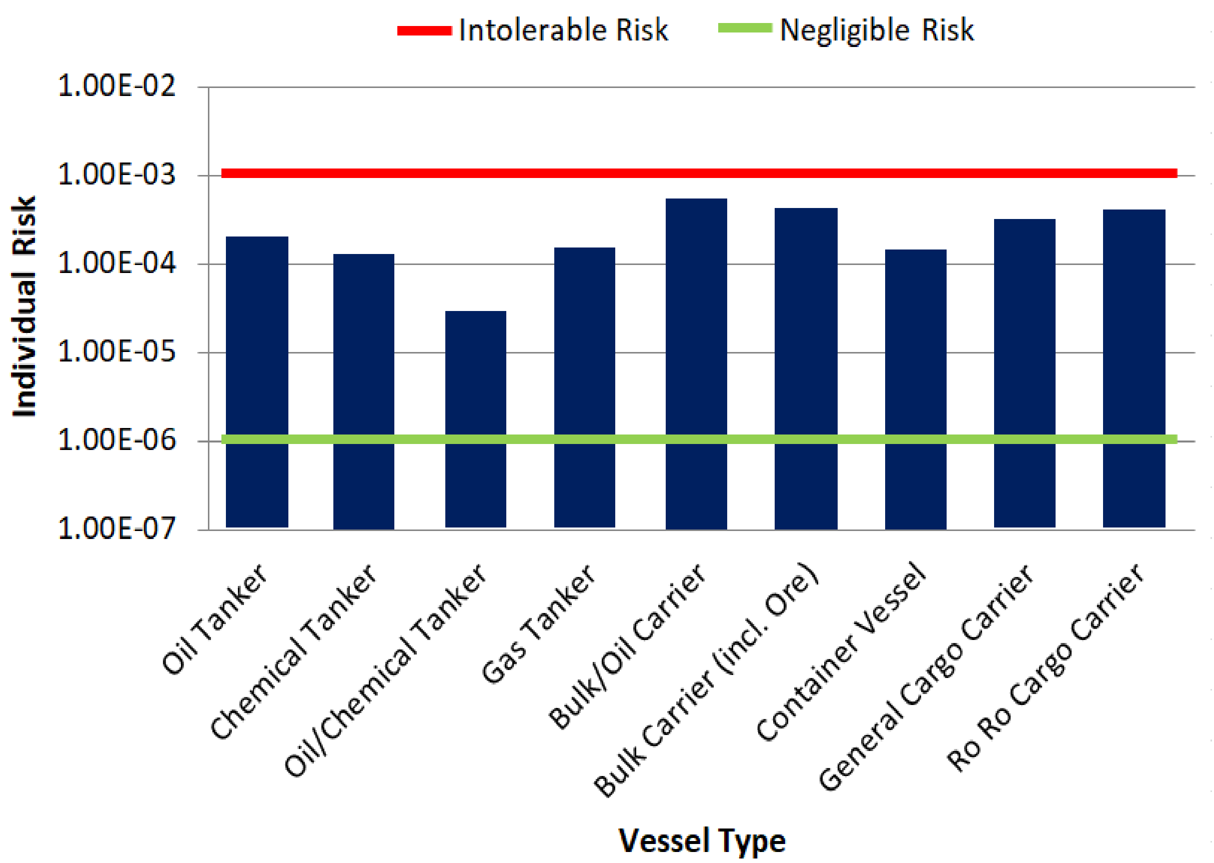

Figure C.1 Individual Risk Levels and Acceptance Criteria per Vessel Type

568. The typical bounds defining the ALARP regions for decision making within shipping are presented in **Table C.1**. 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

569. On a UK basis, the MCA have presented individual risks for various UK industries based on HSE data from 1987 to 1991. The risks for different industries are presented in **Figure C.2**.

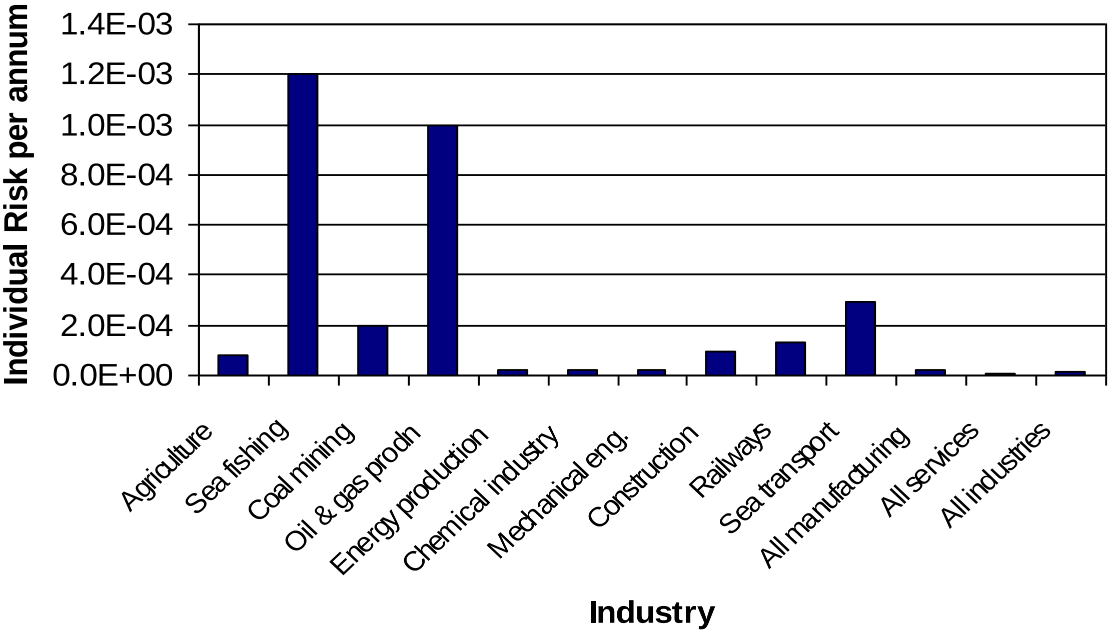

Figure C.2 Individual Risk per Year for Various UK Industries

570. The individual risk for sea transport of 2.9×10^{-4} per year is consistent with the worldwide data presented in **Figure C.1**, whilst the individual risk for sea fishing of 1.2×10^{-3} per year is the highest across all of the industries included.

C.2.1.2 Societal Risk

571. 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.

572. Within this assessment, societal (navigation based) risk can be assessed for the Offshore Array, giving account to the change in risk associated with each incident scenario caused by the introduction of the WTGs. 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 Potential Loss of Life (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.

573. 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.2.2 Risk to Environment

574. For risk to the environment, the key criteria considered in terms of the risk due to the Offshore Array is the potential quantity of oil spilled from a vessel involved in an incident.

575. 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 Offshore Array compared to UK background pollution risk levels.

C.3 Marine Accident Investigation Branch Incident Data

C.3.1 All Incidents in UK Waters

576. All British flagged commercial vessels are required to report incidents to the MAIB. Non-British flagged vessels do not have to report an incident to the MAIB unless located at a UK port or within 12 nm 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.

577. 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.

578. 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 Offshore Array.

579. 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).

580. The location of all incidents in proximity to the UK are presented in **Figure C.3**, colour-coded by incident type. The majority of incidents occur in coastal waters.

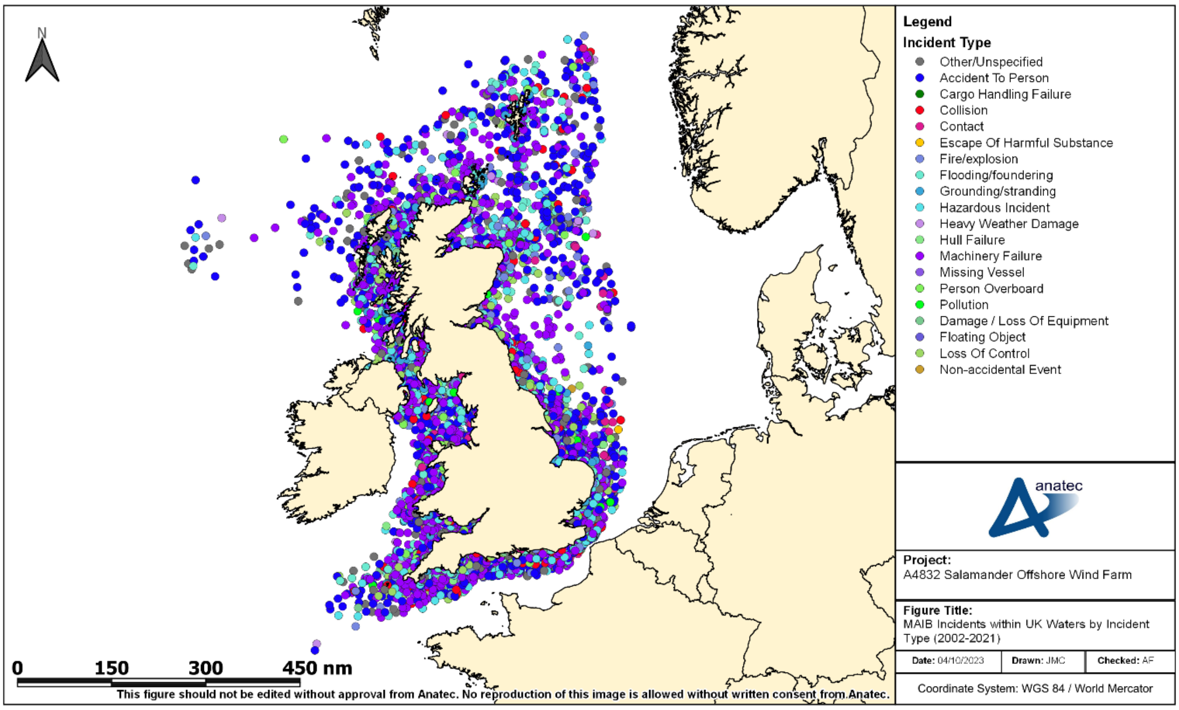

Figure C.3 MAIB Incidents within UK Waters by Incident Type (2002-2021)

581. The distribution of incidents by year in UK waters is presented in **Figure C.4**.

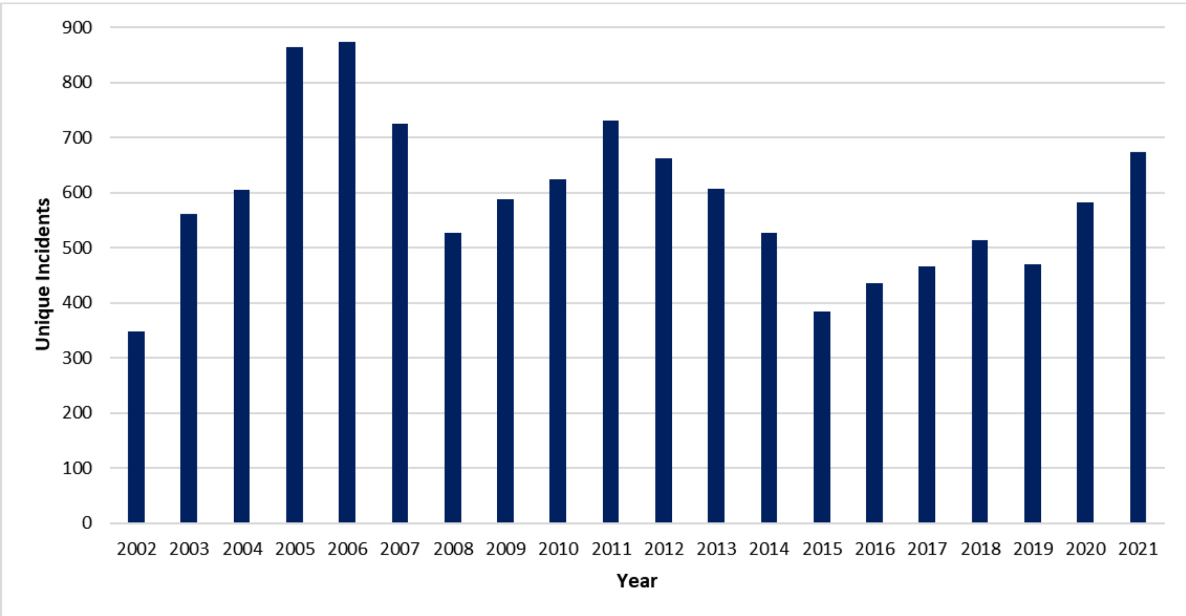

Figure C.4 MAIB Unique Incidents per Year within UK Waters (2002 to 2021)

582. The average number of unique incidents per year was 589. There has generally been a fluctuating trend in incidents over the 20-year period.

583. The distribution of incidents in UK waters by incident type is presented in **Figure C.5**.

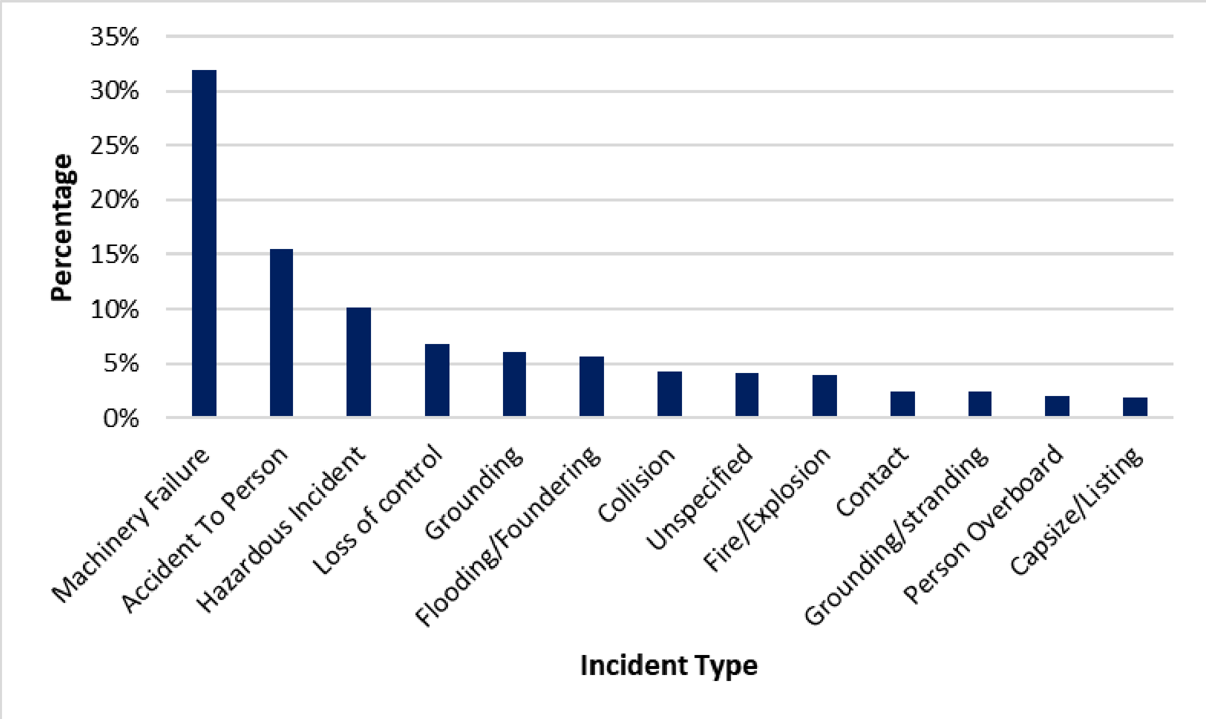

Figure C.5 MAIB Incident Types Breakdown within UK Waters (2002 to 2021)

584. 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.

585. The distribution of incidents in UK waters by vessel type is presented in **Figure C.6**.

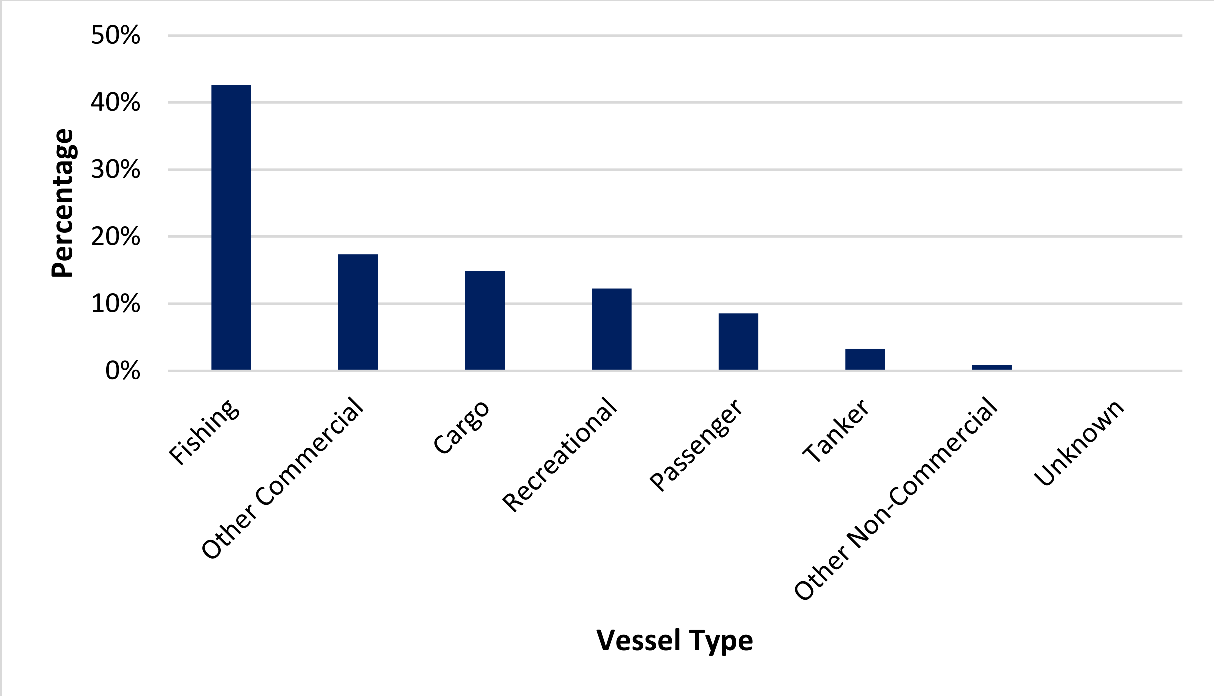

Figure C.6 MAIB Incident Types Breakdown within UK Waters (2002 to 2021)

586. 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%).

587. 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.

588. The distribution of fatalities in UK waters by vessel type and person category (crew, passenger and other) is presented in **Figure C.7**.

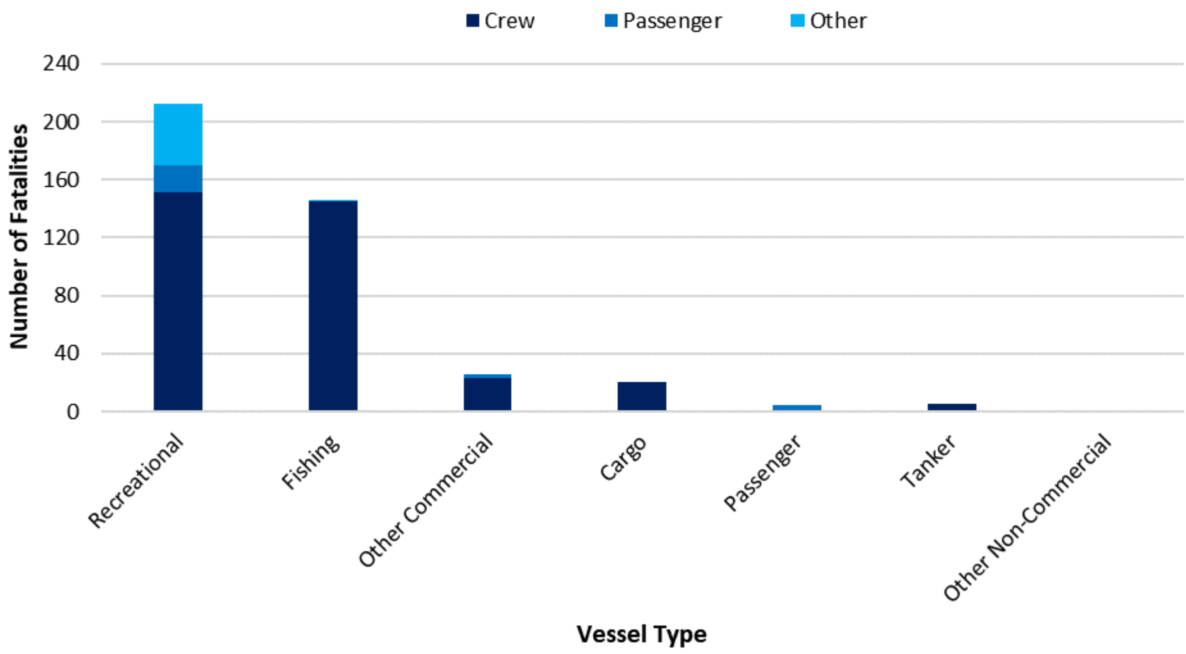

Figure C.7 MAIB Fatalities by Vessel Type within UK Waters (2002 to 2021)

589. 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

590. 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).

591. A total of 504 collision incidents were reported to the MAIB in UK waters between 2002 and 2021.

592. The locations of collision incidents reported in proximity to the UK are presented in **Figure C.8**.

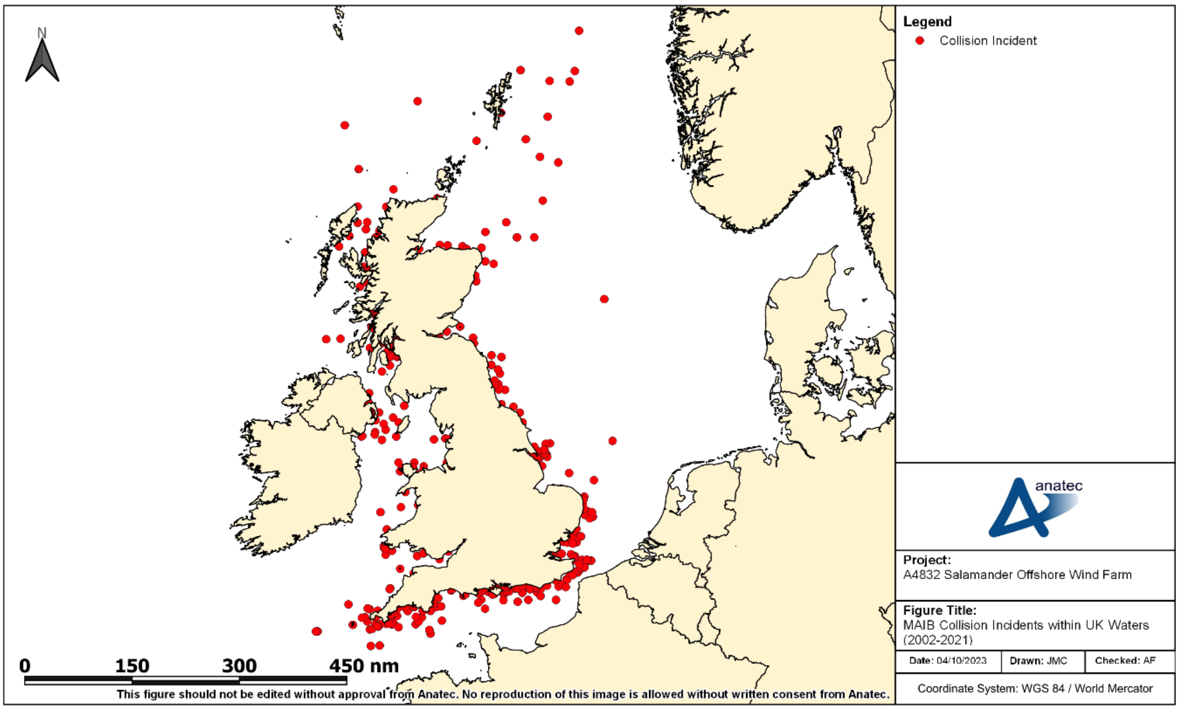

Figure C.8 MAIB Collision Incident Locations within UK Waters (2002 to 2021)

593. The distribution of collision incidents per year is presented in **Figure C.9**.

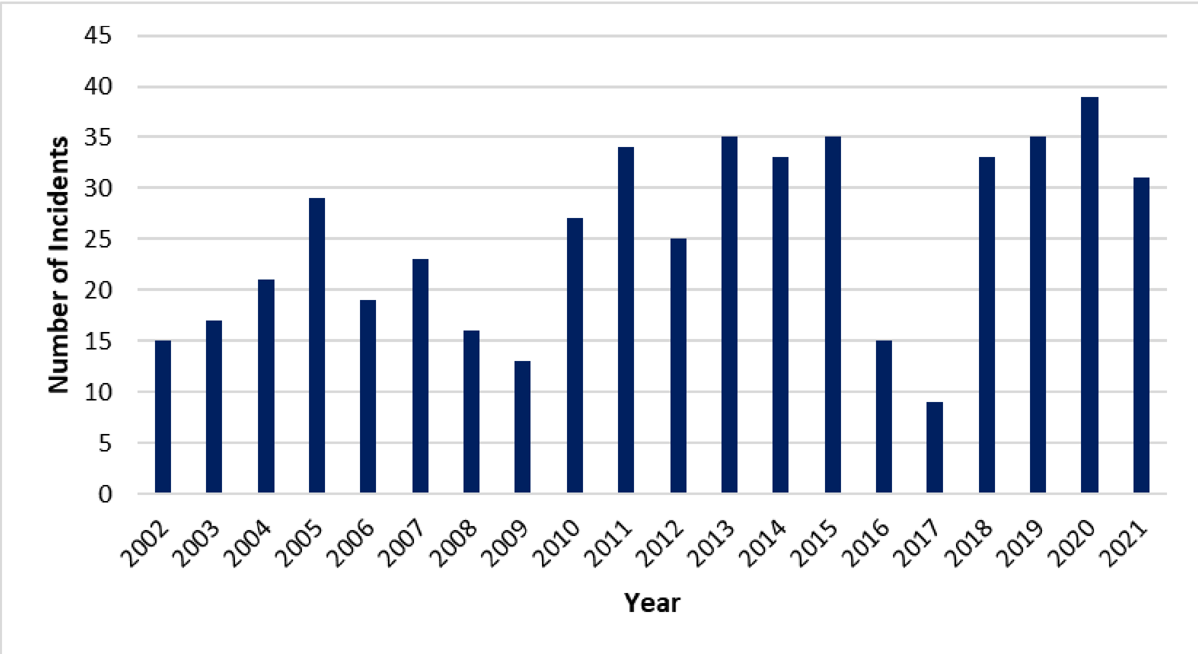

Figure C.9 MAIB Annual Collision Incidents within UK Waters (2002 to 2021)

594. 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.

595. The distribution of vessel types involved in collision incidents is presented in **Figure C.10**.

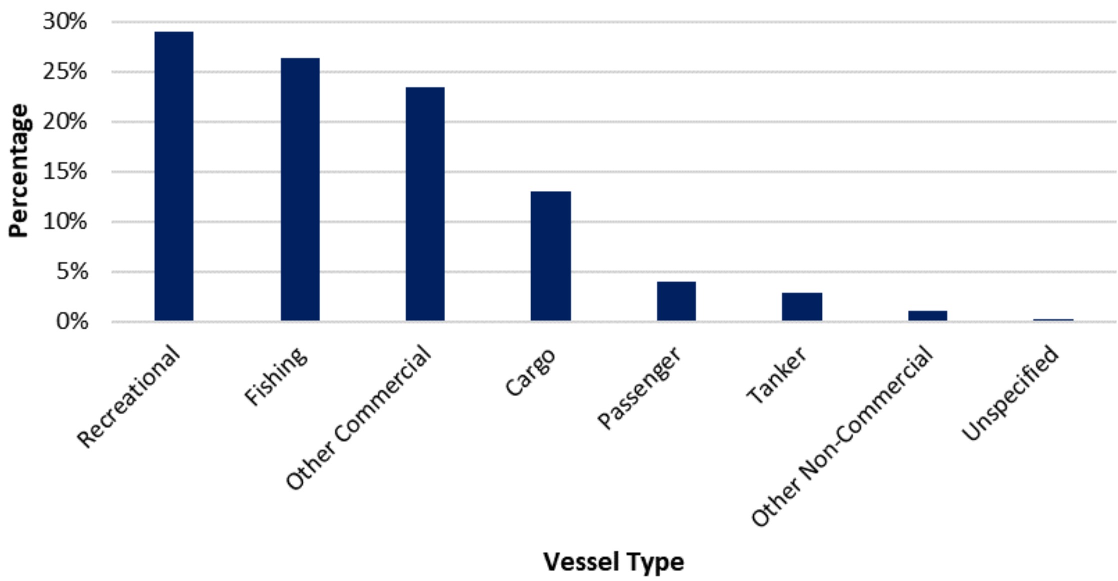

Figure C.10 MAIB Collision Incidents by Vessel Type within UK Waters (2002 to 2021)

596. The most frequent vessel types involved in collision incidents were recreational vessels (29%), fishing vessels (26%), other commercial vessels (24%) and cargo vessels (13%).

597. 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 to 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

Date	Description	Fatalities
June 2015	Collision between Rigid-hulled Inflatable Boat (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

598. 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.

599. A total of 119 allision incidents were reported to the MAIB within UK waters between 2002 and 2021 involving 119 vessels.

600. The locations of allision incidents reported in proximity to the UK are presented in **Figure C.11**.

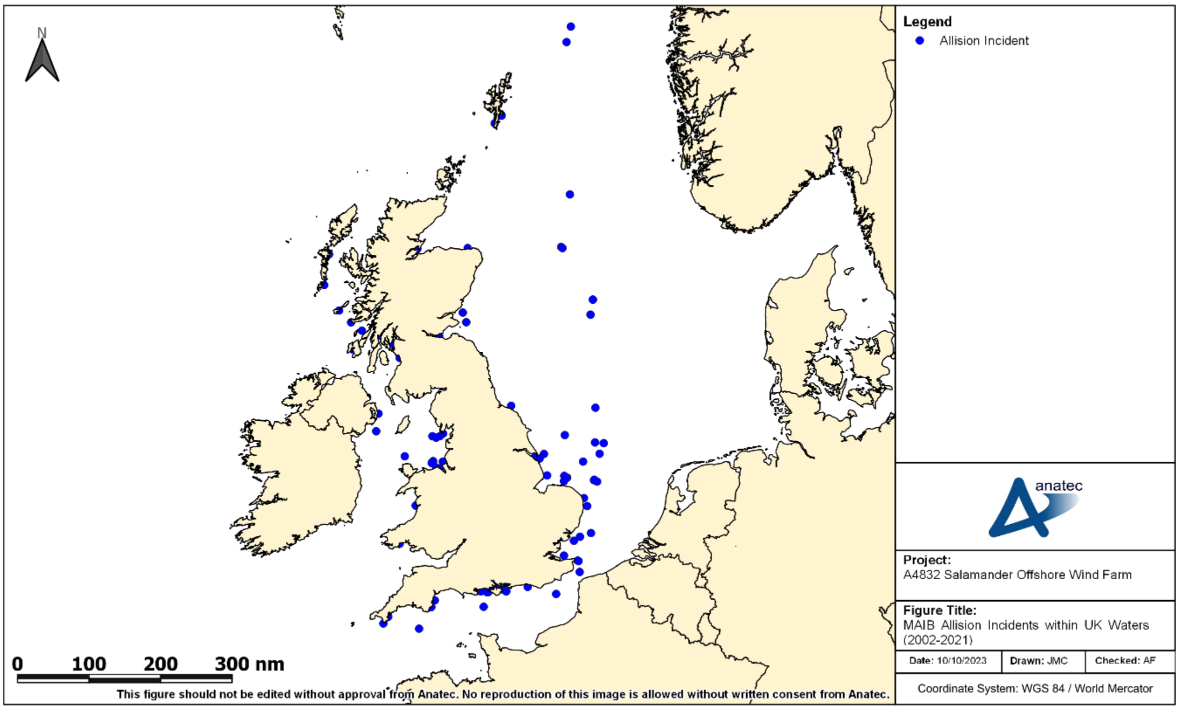

Figure C.11 MAIB Allision Incident Locations within UK waters (2002 to 2021)

601. The distribution of allision incidents per year is presented in **Figure C.12**.

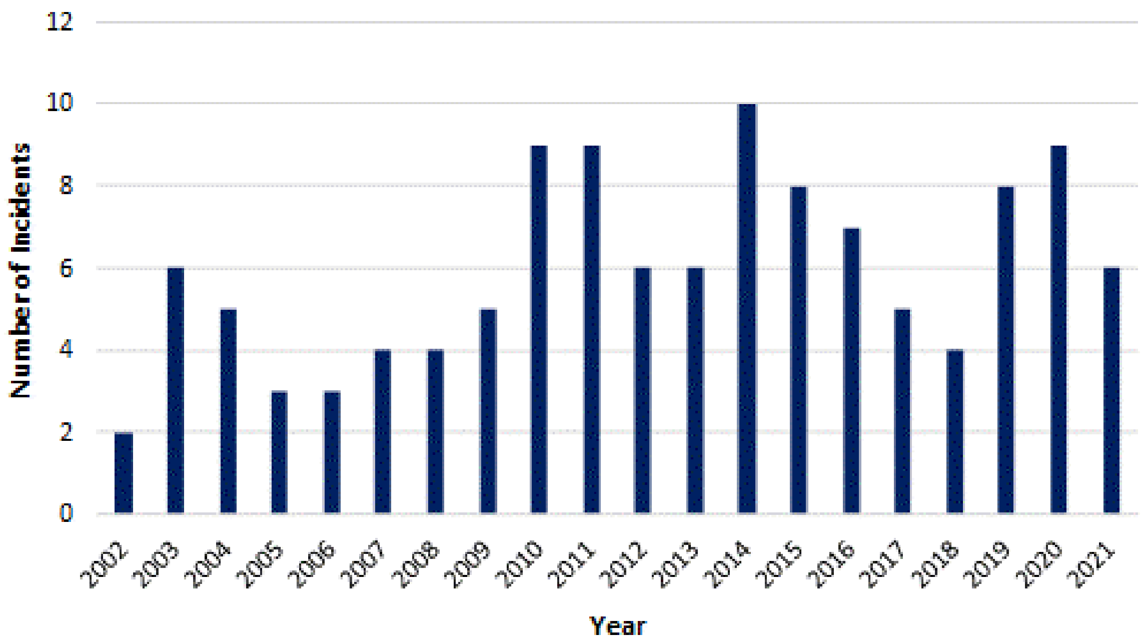

Figure C.12 MAIB Allision Incidents per Year within UK Waters (2002 to 2021)

602. 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.

603. The distribution of vessel types involved in allision incidents is presented in **Figure C.13**.

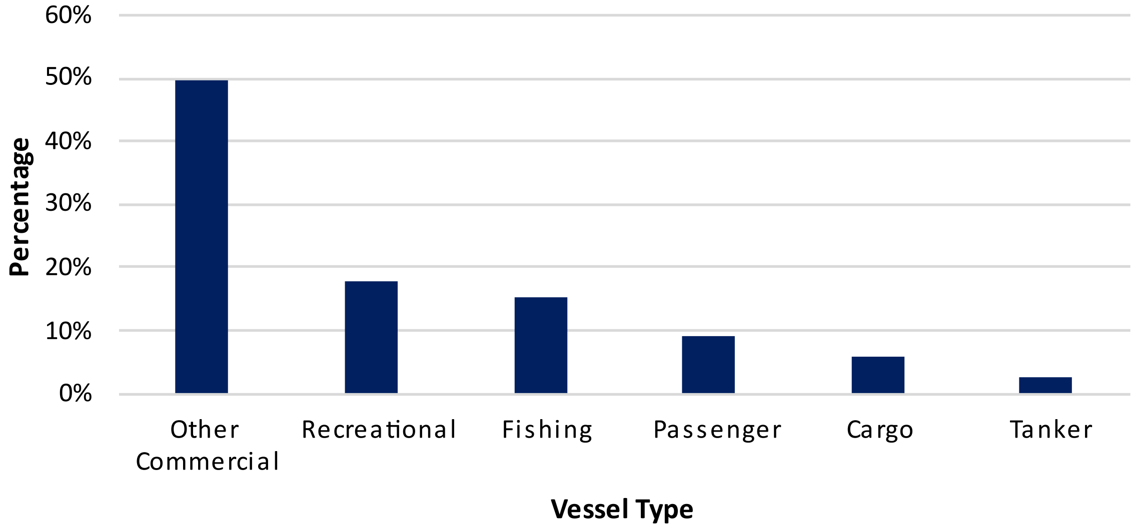

Figure C.13 MAIB Allision Incidents by Vessel Type within UK Waters (2002 to 2021)

604. The most frequent vessel types involved in allision incidents were other commercial vessels (50%), recreational vessels (18%) and fishing vessels (15%).

605. 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

606. 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 Offshore Array.

607. The Offshore Array 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.

608. Of these incident types, only vessel to vessel collisions match the MAIB definition of collisions and hence the fatality analysis presented in **Section C.3.2** is considered directly applicable to these types of incidents.

609. The other scenarios of powered vessel to structure allision, drifting vessel to structure allision and fishing vessel to structure allision are not clearly represented

by the MAIB data (as discussed in **Section C.3.3**). Additionally, none of the allision incidents reported by the MAIB between 2002 and 2021 resulted in a fatality.

610. Therefore, the MAIB collision fatality risk rate has also been conservatively applied for the allision incident types.

C.4.2 Fatality Probability

611. 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.

612. 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 people on board (POB) estimated for each category of vessel navigating in proximity to the Offshore Array. For passenger vessels this is based upon information available for the specific vessels recorded in the vessel traffic survey data. 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	RoRo passenger, cruise liner, etc.	Vessel traffic survey data / online information	2,025
Fishing	Trawler, potter, dredger, etc.	MAIB incident data	3.3
Recreational	Yacht, small commercial motor yacht, etc.	MAIB incident data	3.3

613. 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, particularly when noting that the average POB for the dominant vessel category (passenger) is based upon the vessel traffic survey data where possible.

614. Using the average POB, along with the vessel type information involved in collision incidents reported by the MAIB (see **Section C.3.2**), there was an estimated 89,795 POB the vessels involved in the collision incidents.

615. Based upon five fatalities during the period 2002 to 2021, the overall fatality probability in a collision for any individual onboard is approximately 5.57×10^{-5} per collision.

616. 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**. 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	87,845	1.14×10^{-5}	1997 to 2021 (25 years)
Fishing	Trawler, potter, dredger, etc.	2	927	2.2×10^{-3}	2002 to 2021 (20 years)
Recreational	Yacht, small commercial motor yacht, etc.	3	1,023	2.9×10^{-3}	2002 to 2021 (20 years)

C.4.3 Fatality Risk due to the Offshore Array

617. The base case and future case annual collision frequency levels pre and post wind farm for the Offshore Array are summarised in **Table C.5.**

Table C.5 Summary of Annual Collision and Allision Risk Results

Risk	Scenario	Annual Frequency		
		Pre Wind Farm	Post Wind Farm	Increase
Vessel to vessel collision	Base case	8.43×10^{-4} (1 every 1,186 years)	8.72×10^{-4} (1 every 1,147 years)	2.85×10^{-5}
	Future case (10%)	1.04×10^{-3} (1 every 965 years)	1.07×10^{-3} (1 every 933 years)	3.52×10^{-5}
	Future case (20%)	1.23×10^{-3} (1 every 814 years)	1.27×10^{-3} (1 every 788 years)	4.16×10^{-5}
Powered vessel to structure allision	Base case	-	6.29×10^{-4} (1 every 1,589 years)	-
	Future case (10%)	-	6.92×10^{-4} (1 every 1,444 years)	-
	Future case (20%)	-	7.55×10^{-4} (1 every 1,324 years)	-
Drifting vessel to structure allision	Base case	-	2.15×10^{-5} (1 every 46,451 years)	-
	Future case (10%)	-	2.37×10^{-5} (1 every 42,229 years)	-
	Future case (20%)	-	2.58×10^{-5} (1 every 38,710 years)	-
Fishing vessel to structure allision	Base case	-	8.25×10^{-2} (1 every 12 years)	-
	Future case (10%)	-	9.07×10^{-2} (1 every 11 years)	-
	Future case (20%)	-	9.90×10^{-2} (1 every 10 years)	-
Total	**Base case**	8.43×10^{-4} (1 every 1,186 years)	8.40×10^{-2} (1 every 12 years)	8.32×10^{-2}
	Future case (10%)	1.04×10^{-3} (1 every 965 years)	9.25×10^{-2} (1 every 11 years)	9.15×10^{-2}
	Future case (20%)	1.23×10^{-3} (1 every 814 years)	1.01×10^{-1} (1 every 10 years)	9.98×10^{-2}

618. 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 Offshore Array for the base case and future case are presented in **Figure C.14**.

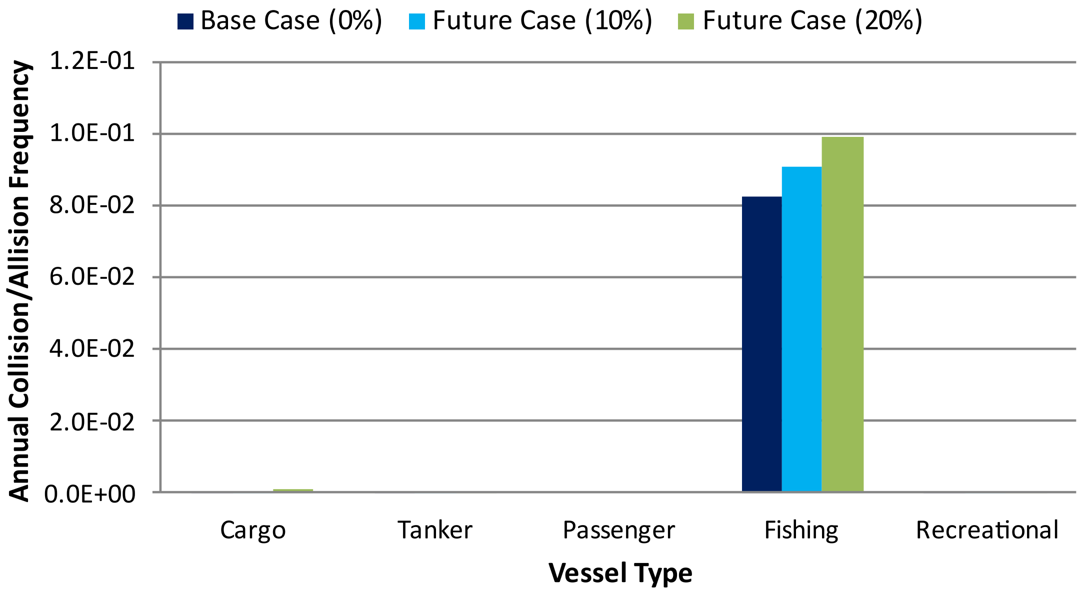

Figure C.14 Estimated Change in Annual Collision and Allision Frequency by Vessel Type

619. Combining the annual collision and allision frequency (see **Table C.5**), estimated number of POB for each vessel type (see **Table C.3**) and the estimated fatality probability for each vessel type category (see **Table C.4**), the annual increase in PLL due to the presence of the Offshore Array for the base case is estimated to be 5.54×10^{-4}, equating to one additional fatality every 1,804 years.

620. The estimated incremental increases in PLL due to the Offshore Array, distributed by vessel type and for the base case and future case, are presented in **Figure C.15**.

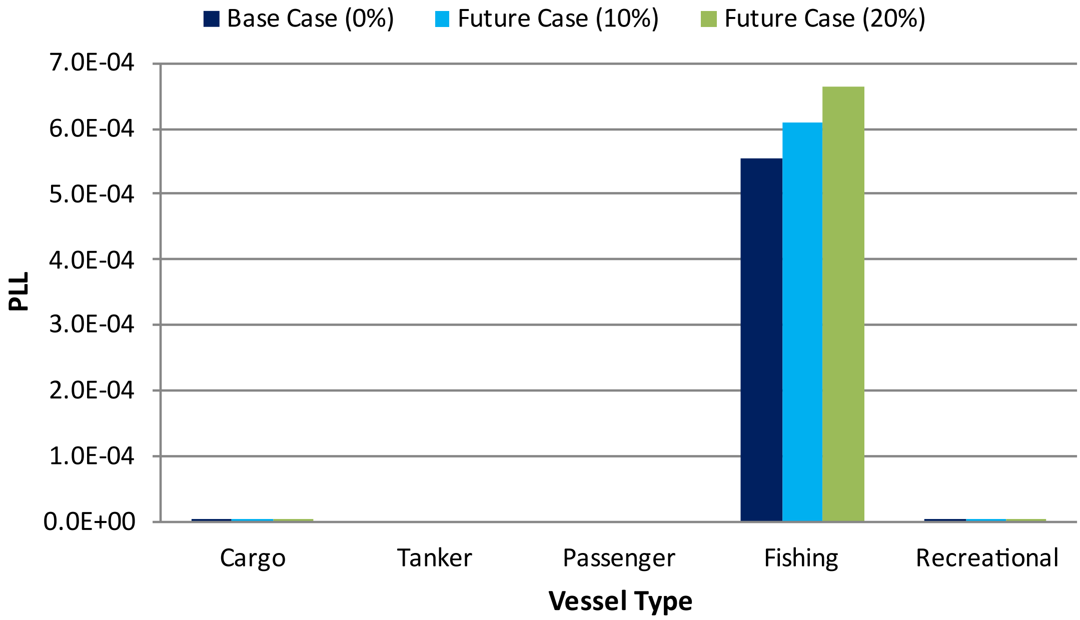

Figure C.15 Estimated Change in Annual PLL by Vessel Type

621. The majority of change in PLL was observed to be associated with fishing vessels. This is due to the estimated allision frequencies for fishing vessels. It is noted that the conservative assumptions of the associated modelling should be considered in this regard (see **Section 15.4.5**).

622. Converting the PLL to individual risk based upon the average number of people exposed by vessel type, the results are presented in **Figure C.16**.

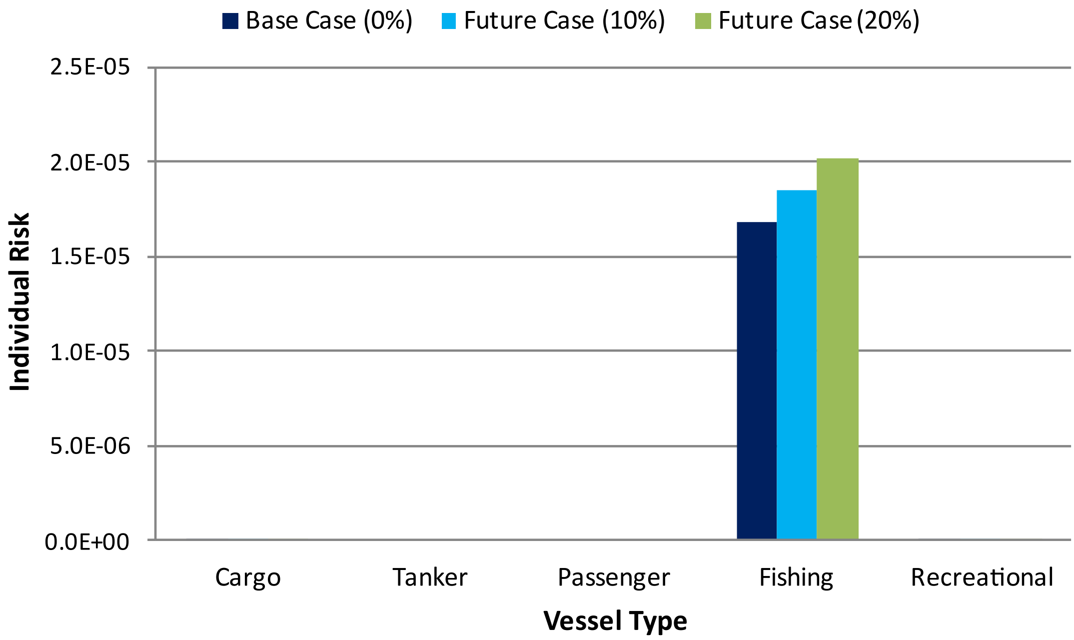

Figure C.16 Estimated Change in Individual Risk by Vessel Type

623. As for PLL, the majority of change in individual risk was observed to be associated with fishing vessels. This is due to the estimated allision frequencies for fishing vessels. It is noted that the conservative assumptions of the associated modelling should be considered in this regard (see **Section 15.4.5**).

C.4.4 Significance of Increase in Fatality Risk

624. In comparison to MAIB statistics, which indicate an average of 21 fatalities per year in UK territorial waters during the 20-year period between 2002 and 2021 (see **Section C.3.1**), the overall increase for the base case in PLL of one additional fatality per 1,804 years represents a low change.

625. In terms of individual risk to people, the change for commercial vessels attributed to the Offshore Array (approximately 8.49×10^{-10} for the base case) is negligible compared to the background risk level for the UK sea transport industry of 2.9×10^{-4} per year.

626. For fishing vessels, the change in individual risk attributed to the Offshore Array (approximately 1.68×10^{-5} for the base case) is low 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

627. 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).

628. Two types of oil spill are considered in this assessment:

- Fuel oil spills from bunkers (all vessel types); and
- Cargo oil spills (laden tankers).

629. The research undertaken as part of the DfT's Marine Environmental High Risk Areas (MEHRAs) project (DfT, 2001) has been used as 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.17**.

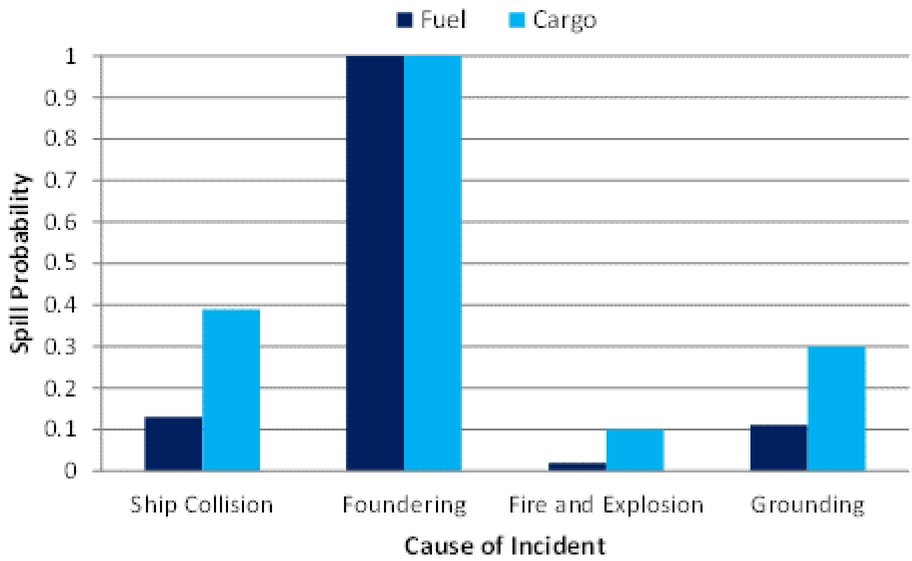

Figure C.17 Probability of an Oil Spill Resulting from an Accident

630. 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.

631. 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.

632. For the types and sizes of vessels exposed to the Offshore Array, an average spill size of 100 tonnes of fuel oil is considered a conservative assumption.

633. 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.

634. Based upon this data and the tankers transiting in proximity to the Offshore Array, an average spill size of 400 tonnes is considered a conservative assumption.

635. 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 Offshore Array

636. Applying the above probabilities to the annual collision and allision frequency by vessel type presented in **Table C.5** and the average spill size per vessel, the amount of oil spilled per year due to the impact of the Offshore Array is estimated to be 0.22 tonnes per year for the base case, 0.24 tonnes per year for the 10% future case and 0.26 tonnes per year for the 20% future case.

637. The estimated increase in tons of oil spilled, distributed by vessel type, for the base case and future case are presented in **Figure C.18**.

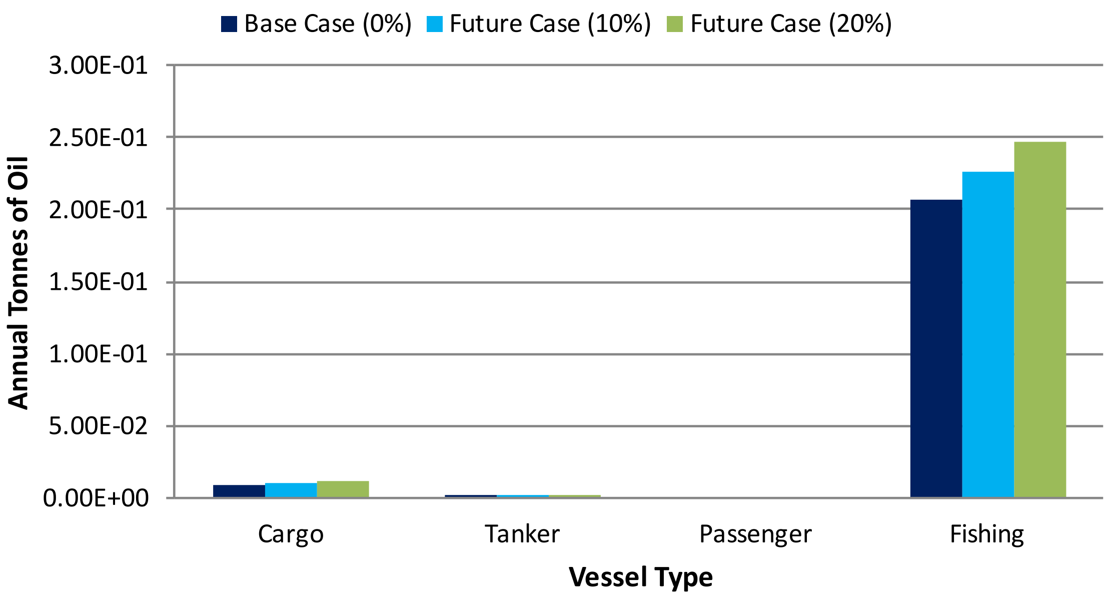

Figure C.18 Estimated Change in Pollution by Vessel Type

638. As shown, fishing vessels represented the largest contributor for potential pollution. This is due to the estimated allision frequencies for fishing vessels. It is noted that the conservative assumptions of the associated modelling should be considered in this regard (see **Section 15.4.5**).

C.5.3 Significance of Increase in Pollution Risk

639. To assess the significance of the increased pollution risk from vessels caused by the Offshore Array, historical oil spill data for the UK has been used as a benchmark.

640. 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 to 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%.

641. The overall increase in pollution estimated due to the Offshore Array of 0.22 tonnes 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

642. This appendix has quantitively assessed the fatality and pollution risk associated with the Offshore Array in the event of a collision or allision incident occurring. The assessment indicates that the change in fatality and pollution risk associated with fishing vessels is the greatest.

643. Overall, the impact of the Offshore Array 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 UK as a whole.

Appendix D Regular Operator Consultation

644. As part of the consultation process for the Offshore Development, regular vessel operators identified (from the vessel traffic survey data) that may be required to deviate their routes due to the Offshore Array were consulted via electronic mail. An example of the correspondence sent to the regular operators is presented below.

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Date: 13/09/2023
Ref: A4832-SB-RO-1

Stakeholder Consultation on Impacts Relating to Shipping and Navigation for the Proposed Salamander Offshore Wind Farm

Dear Stakeholder,

Simply Blue Energy (Scotland) Limited (the 'Applicant') is the developer of the proposed Salamander Offshore Wind Farm (the 'Salamander Project'), which is to be located in the North Sea approximately 18 nautical miles (nm) off the northeast coast of Aberdeenshire and will be comprised of up to seven floating turbines. Further information relating to the Salamander Project is available here.

Following a Scoping Report for the Salamander Project submitted to Marine Scotland in February 2023 (see here), the Applicant is proceeding to create the associated Navigational Risk Assessment (NRA) which will inform the shipping and navigation assessment undertaken for the application.

As part of the NRA process, we would like to ensure that comprehensive consultation is undertaken and to identify any potential impacts that the Salamander Project may have upon shipping and navigation. To analyse shipping movements within and in the vicinity of the site, Automatic Identification System (AIS), Radar data, and visual observations obtained from traffic surveys undertaken during 2023 have been collected and assessed and will feed into the NRA as required by the Maritime and Coastguard Agency (MCA).

According to the assessment of the available datasets, your company's vessel(s) have been recorded navigating within and/or in the vicinity of the Offshore Array Area. Consequently, your company has been identified as a potential marine stakeholder for the Salamander Project. We therefore invite your feedback on the potential development including any impact it may have upon the navigation of vessels.

An overview of the Offshore Array Area for the Salamander Project is provided in Figure 1. Also shown, for reference, is the boundary of the Offshore Export Cable Corridor and the boundary of the nearby Hywind Scotland Offshore Wind Farm (located approximately 6.3nm southwest of the Offshore Array Area).

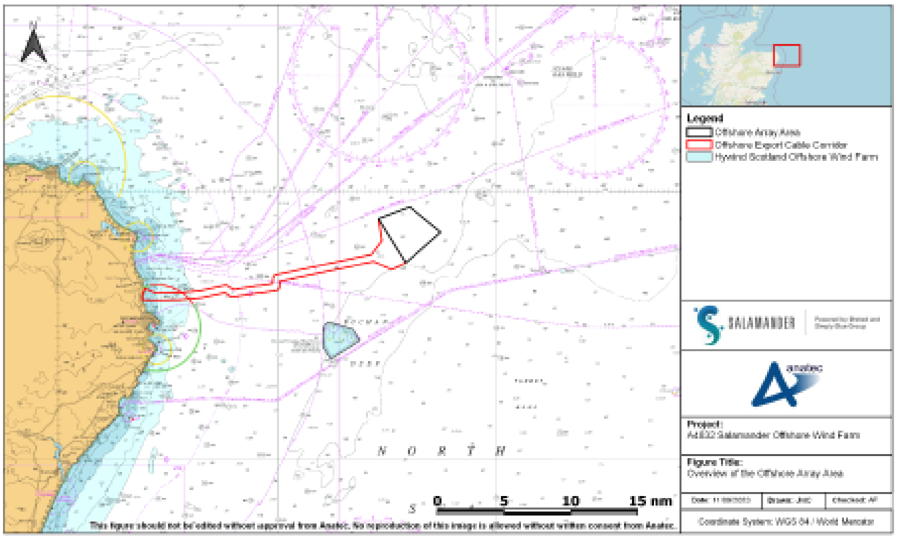

Figure 1 Overview of the Offshore Array Area

We would be grateful if you could provide us with any comments or feedback that you may have by the 22nd September. 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 Salamander Project 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 Salamander 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 virtual Hazard Workshop in late September, where impacts related to shipping and navigation will be discussed.

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.

Yours sincerely,

[redacted]

Anatec Ltd.

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