



Bellrock Offshore Wind Farm

Wind Farm Development Area

Environmental Impact Assessment Report - Volume IV

Appendix 12.1: Navigational Risk Assessment

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Bellrock Offshore Wind Farm – Wind Farm Development Area Navigational Risk Assessment

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Glossary of Terms

Term	Definition
Allision	The act of striking or collision of a moving vessel against a stationary object.
Applicant	Bellrock Offshore Wind Farm Limited, the legal entity submitting Section 36 Consent and Marine Licence applications for the Bellrock Wind Farm Development Area.
Automatic Identification System	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status, e.g., under power. Most commercial vessels and United Kingdom/European Union fishing vessels over 15 metres length are required to carry Automatic Identification System.
Baseline	The existing conditions as represented by the latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of the Bellrock Wind Farm Development Area.
Bellrock Offshore Wind Farm (or the Bellrock Project)	<p>An offshore wind farm capable of exporting up to 1.8 GW of renewable energy to the National Electricity Transmission System.</p> <p>The Wind Farm Development Area is located 120 km east of Stonehaven, and will connect to the National Electricity Transmission System at the proposed SSEN Transmission Hurlie substation, west of Stonehaven in Aberdeenshire. The Bellrock Offshore Wind Farm comprises of the following Development Areas:</p> <ul style="list-style-type: none"> ▪ Wind Farm Development Area; ▪ Offshore Transmission Development Area; and ▪ Onshore Transmission Development Area.
Cable protection	Protective measure to minimise the effects of scour and hazards along the inter-array cables, and protecting these cables at infrastructure crossing points.
Collision	The act or process of colliding (crashing) between two moving objects.
Commencement of construction	<p>Commencement of construction to install the Wind Farm Infrastructure as authorised by the Wind Farm Development Area Section 36 Consent and Marine Licence (excluding site preparation works), being the earlier of:</p> <ul style="list-style-type: none"> ▪ Intrusive pre-installation surveys; ▪ Placement on or installation in the seabed of anchors and associated scour protection, and mooring lines; ▪ Trench excavation for inter-array cables; or ▪ Trenching for, or laying of inter-array cables on or in the seabed.
Construction port	Port that may be used during the construction of the Wind Farm Infrastructure and include integration port(s) and assembly port(s).
Dynamic inter-array cable	The section of inter-array cable between the floating substructure and the seabed, which is designed to accommodate the dynamic movement of the floating substructure.
EIA Regulations	Collectively the term used to refer to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and the Marine Works (Environmental Impact Assessment) Regulations 2007.

Term	Definition
Embedded mitigation measure	<p>Embedded mitigation measures (i.e. primary and tertiary measures), to avoid or reduce environmental effects that are treated as an inherent part of the Bellrock Wind Farm Development Area.</p> <p>Primary and tertiary mitigation is defined as follows:</p> <ul style="list-style-type: none"> ■ Primary mitigation: these measures are treated as an inherent part of the Bellrock Wind Farm Development Area. These may include modifications to the location or design made during the pre-application phase, e.g. adoption of methods and equipment for seabed preparation which have been designed to minimise the potential for sediment suspension and dispersal. ■ Tertiary mitigation: actions that would occur with or without input from the environmental impact assessment. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are standard practices used to manage commonly occurring environmental effects. These measures are treated as an inherent part of the Bellrock WFDA. This includes development and adherence to management plans, such as a Marine Pollution Contingency Plan and Environmental Management Plan.
Environmental impact assessment	The process of evaluating the likely significant environmental effects of a Wind Farm Infrastructure over and above the existing circumstances (or 'baseline').
Excursion limit	The maximum horizontal movement of a floating substructure from its design coordinates.
Floating offshore unit	The combined wind turbine generator and floating substructure.
Floating substructure	A floating structure which provides buoyancy and, in conjunction with the station keeping system, supports a superstructure (e.g. wind turbine generator or offshore substation), and maintaining its position within the structure's excursion limit.
Formal Safety Assessment	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity.
Future Case	The assessment of risk based on the predicted growth in future shipping densities and traffic types as well as foreseeable changes in the marine environment.
Inter-array cable	Armoured cable containing electrical and fibre optic cores, which link the wind turbine generators to each other and to the subsea cable hubs and/or the offshore substations and include dynamic inter-array cable and static inter-array cable sections.
Lowest Astronomical Tide	The lowest level that can be expected to occur under average meteorological conditions and under any combination of astronomical conditions.
Main commercial route	Defined transit route (mean position) of commercial vessels identified within each study area.
Marine Guidance Note	A system of guidance notes issued by the Maritime and Coastguard Agency which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Marine Licence	Licence granted under either the Marine and Coastal Access Act 2009 or the Marine (Scotland) Act 2010 in Scottish territorial waters.
Mean High Water Springs	The average over a year of the heights of two successive high waters during those periods of 24 hours (once every fortnight) when the range of the tide is greatest.

Term	Definition
Navigational Risk Assessment	A document which assesses the hazards to shipping and navigation of a proposed Offshore Renewable Energy Installation based upon Formal Safety Assessment.
Offshore Renewable Energy Installation	As defined by Marine Guidance Note 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations – Guidance on United Kingdom Navigational Practice, Safety and Emergency Response (Maritime and Coastguard Agency, 2021). For the purposes of this report and in keeping with the consistency of the Environmental Impact Assessment, Offshore Renewable Energy Installations can mean wind turbine generators and the associated electrical infrastructure such as offshore substations.
Offshore substation	An offshore platform which houses electrical equipment such as transformers, switchgear, and protection and control systems, enabling the wind farm’s renewable electricity to be received via inter-array cables and exported via the offshore export cables.
Operations and maintenance port	Port that may be used in the operations and maintenance phase of the Bellrock Wind Farm Development Area and mainly comprises of a day-to-day operation and maintenance port and other port(s) required for major maintenance.
Radio Detection and Ranging	An object-detection system which uses radio waves to determine the range, altitude, direction or speed of objects.
Regular Operator	Commercial operator whose vessel(s) are observed to transit through a particular region on a regular basis.
Safety Zone	An area of water around or adjacent to a floating offshore unit which is to be constructed, extended, operated or decommissioned, from which certain or all classes of vessels are excluded and within which activities can be regulated for the purpose of securing safety of individuals on the floating offshore unit and vessel, in line with Section 95 of the Energy Act 2004.
Scoping Opinion	The report adopted by the Marine Directorate – Licensing Operations Team on behalf of the Scottish Ministers.
Scoping Report	The report that was produced in order to request a Scoping Opinion from the Scottish Ministers.
Section 36 Consent	Consent to construct and operate an offshore generating station, under Section 36 of the Electricity Act 1989. This includes deemed planning permission for onshore works.
Site preparation works	Preparatory activities undertaken within the Wind Farm Development Area prior to the commencement of construction of the Wind Farm Infrastructure, which may comprise (and which may require separate consents): <ul style="list-style-type: none"> ▪ Geophysical surveys, geotechnical surveys, and non-archaeological/archaeological diver/remote operated vehicles surveys; ▪ Seabed preparation including sand wave levelling, slope levelling for gravity based anchors (if selected), boulder clearance, and pre-lay grapnel runs; ▪ Unexploded ordnance surveys and/or clearance; ▪ Debris clearance; and ▪ Out of service cable/pipeline removal.
Static inter-array cable	The section of inter-array cable that is not designed to move.

Term	Definition
Station keeping system	The system (including mooring lines and anchors) used to hold a floating offshore unit within its excursion limit and maintain the intended orientation of the floating offshore unit.
Study Area	A buffer of ten nautical miles applied around the Bellrock WFDA.
Subsea cable hub	A subsea device, with a gravel pad foundation, which allows the connection of multiple inter-array cables.
Towing	Transportation of a floating offshore unit or floating substructure between a port, and/or wet storage facility and/or the Wind Farm Development Area.
Unique Vessel	An individual vessel identified on any particular calendar day, irrespective of how many tracks were recorded for that vessel on that day. This prevents vessels being over counted. Individual vessels are identified using their Maritime Mobile Service Identity.
Wet storage	The temporary storage/anchorage of floating substructures and/or floating offshore units prior to their transportation to the Wind Farm Development Area.
Wind Farm Development Area	The boundary within which the Wind Farm Infrastructure will be constructed, operated and maintained, and decommissioned.
Wind Farm Infrastructure	Infrastructure located within the Wind Farm Development Area including wind turbine generators; floating substructures, station keeping systems and associated scour protection; inter-array cables and associated cable protection; and subsea cable hubs (including activities associated with the Wind Farm Infrastructure construction, operation and maintenance, and decommissioning).
Wind turbine generator	A wind turbine generator converts wind energy into electrical energy. The main components include rotor assembly (composed of three blades and a hub); nacelle (containing the generator, shaft and gearbox, power electronic converter and transformer); and a tower (containing lifting equipment and switchgear).

Abbreviations Table

Abbreviation	Definition
AC	Alternating current
AIS	Automatic Identification System
ALARP	As low as reasonably practicable
ALB	All-weather lifeboat
ARPA	Automatic Radar Plotting Aid
ATBA	Area to be avoided
AtoN	Aid to navigation
BBC	British Broadcasting Corporation
BSU	Bundesstelle für Seeunfalluntersuchung
BWEA	British Wind Energy Association
CA	Cruising Association
CAA	Civil Aviation Authority
CBA	Cost benefit analysis
CBRA	Cable burial risk assessment
CCTV	Closed circuit television
CD	Chart datum
CHIRP	Confidential Human Factors Incident Reporting Programme
CMS	Construction Method Statement
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
CTV	Crew Transfer Vessel
DF	Direction Finding
DfT	Department for Transport
DSC	Digital Selective Calling
DSLIP	Development Specification and Layout Plan
E	East
EIA	Environmental Impact Assessment
EMF	Electromagnetic field
EMP	Environmental Management Plan
EOWDC	European Offshore Wind Deployment Centre
ERCoP	Emergency Response Cooperation Plan
EU	European Union
FLO	Fisheries Liaison Officer

Abbreviation	Definition
FMMCP	Fisheries Mitigation, Monitoring and Communication Plan
FOU	Floating offshore unit
FPSO	Floating Production Storage and Offloading
FSA	Formal Safety Assessment
FSS	Floating substructure
GLA	General Lighthouse Authority
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
GRP	Glass Reinforced Plastic
GT	Gross tonnage
HAT	Highest Astronomical Tide
HF	High Frequency
HM	His Majesty's
HSE	Health and Safety Executive
HVAC	High voltage alternating current
HVDC	High voltage direct current
IALA	International Organization for Marine Aids to Navigation
IHO	International Hydrographic Organization
ILB	Inshore lifeboat
IMCA	International Marine Contractors Association
IMO	International Maritime Organization
IPS	Intermediate Peripheral Structure
kHz	Kilohertz
km	Kilometre
kt	Knot
LAT	Lowest Astronomical Tide
LiDAR	Light Detection and Ranging
LMP	Lighting and Marking Plan
LOA	Length overall
m ²	Square metre
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate – Licensing Operations Team

Abbreviation	Definition
MECP	Marine Environment Protection Committee
MEHRA	Marine Environmental High Risk Area
MF	Medium Frequency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMSI	Maritime Mobile Service Identity
MPCP	Marine Pollution Contingency Plan
MPS	Marine Policy Statement
MSI	Maritime Safety Information
MSL	Mean Sea Level
NLB	Northern Lighthouse Board
N	North
NAVTEX	Navigational Telex
nm	Nautical mile
nm ²	Square nautical mile
NMP	National Marine Plan
NRA	Navigational Risk Assessment
NUC	Not Under Command
O&M	Operation and maintenance
OfSS	Offshore substation
OfTDA	Offshore Transmission Development Area
OREI	Offshore Renewable Energy Installation
OWF	Offshore wind farm
PEXA	Practice and exercise area
PLA	Port of London Authority
PLL	Potential loss of life
PNT	Positioning, navigation and timing
POB	Person on board
QHSE	Quality, Health, Safety and Environment
Radar	Radio Detection and Ranging
RAM	Restricted in their ability to manoeuvre
REZ	Renewable Energy Zone
RIB	Rigid-hulled inflatable boat
RNLI	Royal National Lifeboat Institution

Abbreviation	Definition
RoPax	Roll-on/roll-off passenger
RoRo	Roll-on/roll-off cargo
RYA	Royal Yachting Association
s.36	Section 36
SAR	Search and Rescue
SCADA	Supervisory Control and Data Acquisition
SKS	Station keeping system
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
SONAR	Sound Navigation Ranging
SPFA	Scottish Pelagic Fishermen's Association
SPS	Significant Peripheral Structure
SWFPA	Scottish White Fish Producers Association
TCE	The Crown Estate
TPV	Third Party Verification
TJB	Transition Joint Bay
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
VHF	Very High Frequency
VMNSP	Vessel Management and Navigational Safety Plan
VTS	Vessel Traffic Service
W	West
WCS	Worst-case Scenario
WFDA	Wind Farm Development Area
WGS84	World Geodetic System 1984
WTG	Wind turbine generator

1 Introduction

1.1 Background

1. Anatec Limited was commissioned by Bellrock Offshore Wind Farm Limited, hereafter referred to as ‘the Applicant’, to undertake a Navigational Risk Assessment (NRA) for the Wind Farm Development Area (WFDA) of the proposed Bellrock Offshore Wind Farm (the ‘Bellrock Project’). The NRA has been undertaken with respect to the Wind Farm Infrastructure and surface piercing Offshore Transmission Infrastructure located within the Bellrock WFDA.
2. The Wind Farm Infrastructure considered within this NRA are the wind turbine generators (WTGs), associated floating substructures (FSSs) (collectively known as floating offshore units (FOUs)), station keeping systems (SKSs) and associated scour protection, inter-array cables (IACs) and associated cable protection, and subsea cable hub(s). For this NRA, surface piercing Bellrock Offshore Transmission Infrastructure as part of the Bellrock Offshore Transmission Development Area (OfTDA), however, located geographically within the Bellrock WFDA, consist only of the offshore substations (OfSSs). These are considered relevant for the Bellrock WFDA NRA in relation to hazards associated with allision risk and emergency response access on the basis that for these hazards the Bellrock WFDA layout encapsulates the FOUs and OfSSs. Other elements of the Bellrock Offshore Transmission Infrastructure, including interconnector cables, offshore export cables, associated cable protection, and reactive compensation station(s) (which are surface piercing infrastructure) outside the Bellrock WFDA will be considered in a separate application for the Bellrock OfTDA, inclusive of the elements geographically located within the Bellrock WFDA.
3. This NRA presents information only on the Bellrock WFDA relative to the existing and estimated future navigational activity and forms the technical appendix (Appendix 12.1) to **Chapter 12: Shipping and Navigation (Volume II)** of the **Bellrock WFDA EIA Report**. A separate assessment will be undertaken for the Bellrock OfTDA component of the Bellrock Project and will be submitted in support of the Bellrock OfTDA consent application in due course.
4. The figures presented in this NRA are also provided collectively in **Annex F**.

1.2 Navigational Risk Assessment

5. An EIA is a process which identifies the environmental risks of a project, both adverse and beneficial. A requirement of an EIA for offshore projects is the NRA. Following the relevant Maritime and Coastguard Agency (MCA) guidance, 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 developments;
 - Summary of the Bellrock WFDA description relevant to shipping and navigation;
 - Baseline characterisation of the existing environment;
 - Discussions of potential risks to navigation, communication and position fixing equipment;
 - Future case vessel traffic characterisation;
 - Collision and allision risk modelling;
 - Risk assessment (applying the Formal Safety Assessment (FSA) process);
 - Outline of embedded and additional mitigation measures as necessary; and
 - Outline of through life safety management features.
6. Potential hazards are considered for each phase of the Bellrock WFDA as appropriate:
- Construction;
 - Operation and maintenance (O&M); and
 - Decommissioning.
7. 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 Worst-Case Scenario (WCS) which has been defined for the NRA based on the information detailed in **Chapter 4: Project Description (Volume II)** of the **Bellrock WFDA EIA Report**.

2 Guidance and Legislation

2.1 Legislation

8. As part of the EIA Directive (2011/92/EU, as amended by Directive 2014/52/EU), an EIA Report is required to be undertaken and submitted to support the application for the Section 36 (s.36) consent for the Bellrock WFDA. The MCA require that, as part of the EIA Report, an NRA is undertaken to “*inform the Shipping and Navigation chapter of the EIA Report*” (MCA, 2021).

2.2 Primary Guidance

9. The primary guidance documents used during the assessment comprise the following:
- *Marine Guidance Note (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
 - *Revised Guidelines for FSA for Use in the Rule-Making Process* (International Maritime Organization (IMO), 2018).
10. MGN 654 highlights issues that shall be considered when assessing the risk to navigational safety from offshore renewable energy developments proposed in United Kingdom (UK) internal waters, territorial seas or Renewable Energy Zones (REZ).
11. The MCA require that their methodology (Annex 1 to MGN 654) is used as a template for preparing NRAs. It is centred on risk management and requires a submission that shows sufficient controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with mitigation (**Section 3.2**). Across **Chapter 12: Shipping and Navigation (Volume II)** of the **Bellrock WFDA EIA Report** and the NRA, both base and future case levels of risk have been identified, in addition to the measures required to ensure that both the future case remains broadly acceptable or tolerable with mitigation.

2.2 Other Guidance

12. Other guidance documents used during the assessment include:
- *MGN 372 Amendment 1 (Merchant and Fishing) Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs* (MCA, 2022);
 - *International Organization for Marine Aids to Navigation (IALA) Recommendation O-139 on The Marking of Man-Made Offshore Structures* (IALA, 2021);
 - *IALA Guideline G1162 The Marking of Offshore Man-Made Structures* (IALA, 2022);

- *IALA Guideline G1185 Enhancing the Safety and Efficiency of Navigation Around Offshore Renewable Energy Installations (IALA, 2024);*
- *The Royal Yachting Association’s (RYA) Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy (RYA, 2019);*
- *Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and Health and Safety Executive (HSE), 2017);*
- *Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020).*
- *Scottish National Marine Plan (NMP) (Scottish Government, 2015);*
- *UK Marine Policy Statement (MPS) (His Majesty’s (HM) Government, 2011); and*
- *Floating Offshore Wind Centre of Excellence Navigational Planning and Risk Assessment Summary Report (ORE Catapult, 2023).*

2.3 Lessons Learnt

13. 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 **Chapter 12: Shipping and Navigation (Volume II)** of the **Bellrock WFDA EIA Report**, includes general consideration for lessons learnt and expert opinion from previous offshore wind farm (OWF) developments and other sea users, capitalising upon the UK’s position as a leading generator of offshore wind power.
14. Data sources for lessons learnt include the following:
- *Sharing the Wind – Recreational Boating in the Offshore Wind Strategic Areas (RYA) and Cruising Association (CA), 2004);*
 - *Results of the Electromagnetic Investigations (MCA and QinetiQ, 2004);*
 - *Offshore Wind Farm Helicopter Search and Rescue Trials Undertaken at the North Hoyle Wind Farm (MCA, 2005);*
 - *Interference to 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 (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 2024 Incident Data Report (G+, 2025).*

3 Navigational Risk Assessment Methodology

3.1 Formal Safety Assessment Methodology

15. 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 and is reliant upon data, defined risk assessment criteria and expert judgement. The assessments presented herein for shipping and navigation users have considered the following criteria:

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

16. 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 (i.e., where gear is not deployed). A separate methodology and assessment have been applied in **Chapter 11: Commercial Fisheries (Volume II)** of the **Bellrock WFDA EIA Report** to consider hazards which are directly related to commercial fishing activity (as opposed to commercial fishing vessels in transit) including hazards of a commercial nature.

3.2 Formal Safety Assessment Process

17. In line with the standard approach to marine risk assessment the IMO FSA process (IMO, 2018), as approved by the IMO in 2018 under a session of the Maritime Safety Committee – Marine Environment Protection Committee (MECP), has been applied to the risk assessment within this NRA and informs **Chapter 12: Shipping and Navigation (Volume II)** of the **Bellrock WFDA EIA Report**.

18. The FSA process is a structured and systematic methodology based upon risk analysis and cost benefit analysis (CBA) (if applicable) to reduce risks to as low as reasonably practicable (ALARP). There are five basic steps within this process as illustrated 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 analysis (investigation of the causes and initiating events and consequences of the more important hazards identified in Step 1);

- **Step 3** – Risk control options (identification of measures to control and reduce the identified hazards);
- **Step 4** – CBA (if applicable, identification and comparison of the benefit and costs associated with the risk control options identified in Step 3) and/or additional mitigation measures (identification of necessary further risk control options beyond those identified in step 3); and
- **Step 5** – Recommendations for decision-making (defining of recommendations based upon Steps 1 to 4).



Figure 3.1 Flow Chart of the Formal Safety Assessment Methodology

3.3 Hazard Workshop Methodology

19. 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 stakeholders. The Hazard Workshop was held in-person in Edinburgh on 23 July 2025 and provided local and national marine stakeholders the opportunity to identify and discuss potential shipping and navigation hazards. Further information on the Hazard Workshop is included in **Section 4.3**.
20. 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. **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 Consequences 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
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	Less than 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

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

Table 3.3 Tolerability Matrix and Risk Rankings

Severity of Consequence	5					
	4					
	3					
	2					
	1					
		1	2	3	4	5
		Frequency of Occurrence				

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

22. Once identified, the significance of risk is assessed with the inclusion of risk control measures (mitigations) to ensure the risk is ALARP. Further risk control measures may be required to further mitigate a hazard in accordance with the ALARP principles. Broadly Acceptable and Tolerable with Mitigation risks are ALARP, whilst Unacceptable and Tolerable risks are not considered to be ALARP.

3.4 Cumulative Risk Assessment Methodology

23. The hazards identified in the FSA are also assessed for cumulative risks with the inclusion of other projects (i.e. offshore wind or industries). Given the varying type, status and location of developments in the vicinity of the Bellrock WFDA, a tiered approach to the cumulative risk assessment has been undertaken, which splits developments into tiers depending upon project status, proximity to the Bellrock WFDA 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.

24. 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 25 nautical miles (nm) of the Bellrock WFDA and may impact a main commercial route within 1 nm of the Bellrock WFDA but the development is only at the scoping stage, it may still be allocated to Tier 1.

Table 3.4 Cumulative Development Screening Summary

Tier	Minimum Development Status	Criterion	Data Confidence Level	Level of Cumulative Risk Assessment
1	Consent application submitted	<ul style="list-style-type: none"> ▪ May impact a main commercial route passing within 1 nm of the Bellrock WFDA and/or interacts with traffic which may be directly displaced by the Bellrock WFDA. ▪ Raised as having possible cumulative effect during the Applicant’s consultation. ▪ OWFs up to 25 nm. ▪ Oil and gas infrastructure up to 5 nm. ▪ Subsea cables up to 2 nm. 	High or medium	Quantitative cumulative re-routeing of main commercial routes
2	Consent application submitted	<ul style="list-style-type: none"> ▪ May impact a main commercial route passing within 1 nm of the Bellrock WFDA and/or interacts with traffic which may be directly displaced by the Bellrock WFDA. ▪ OWFs between 25 and 50 nm. ▪ Oil and gas infrastructure between 5 and 10 nm. ▪ Subsea cables up to 2 nm. 	High or medium	Quantitative cumulative re-routeing of main commercial routes
3	Scoped	<ul style="list-style-type: none"> ▪ Does not impact a main commercial route passing within 1 nm of the Bellrock WFDA and does not interact with traffic which may be directly displaced by the Bellrock WFDA. ▪ OWFs up to 50 nm. ▪ Oil and gas infrastructure up to 10 nm. ▪ Subsea cables up to 2 nm. 	Low	Qualitative assumptions of routeing only

3.5 Study Area

25. A buffer of up to 10 nm has been applied around the Bellrock WFDA (hereafter referred to as the ‘study area’), as shown in **Figure 3.2**. This is a standard size study area for a shipping and navigation assessment, which was discussed and agreed with the MCA and Northern Lighthouse Board (NLB), and presented to various other consultees including at the Hazard Workshop (**Section 4.3**). The 10 nm radius ensures that relevant routeing which may be affected is captured while still remaining specific to the area being studied.

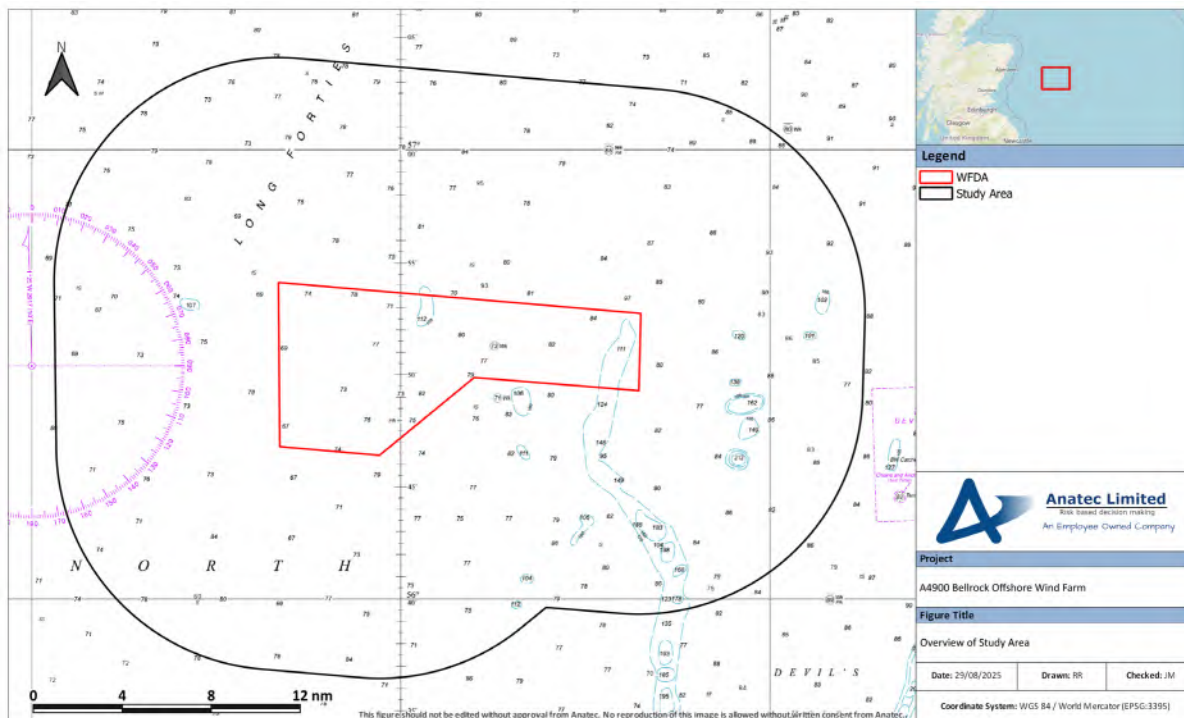


Figure 3.2 Overview of Bellrock Wind Farm Development Area Study Area

4 Consultation

4.1 Dedicated Meetings

26. Key shipping and navigation stakeholders have been consulted during the NRA process. Key discussion points and remarks from each meeting has been included and summarised within **Table 4.1**. The following stakeholders have been consulted via dedicated meetings (other than the Hazard Workshop – see **Section 4.3**):

- MCA;
- NLB; and
- UK Chamber of Shipping.

4.2 Regular Operators

27. As well as consulting with the organisations outlined above, 18 Regular Operators identified from the vessel traffic survey and long-term data analysis were provided with an overview of the Bellrock WFDA and offered the opportunity to provide comment (the full Regular Operator letter is presented in **Annex D**). The full list of Regular Operators identified is provided below:

- Altera Infrastructure Norway;
- Ambassador;
- Anglo-Eastern Ship Management;
- Aurora Offshore;
- Boskalis;
- DOF;
- Fjord Shipping AS-MAALOY;
- Fred Olsen Cruise;
- Island Offshore;
- Maersk Supply;
- North Star Shipping;
- REM Maritime;
- SMT Shipping;
- Technip;
- Tidewater Marine;
- Ulstein;
- Vroon Offshore; and
- Wilson Ship.

28. Shipping and navigation responses and inputs were received by Tidewater Marine and Fred Olsen Cruise, and have been included within **Table 4.1**. No other operators submitted a response.

4.3 Hazard Workshop

29. 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 undertaken in **Chapter 12: Shipping and Navigation (Volume II)** of the **Bellrock WFDA EIA Report**. This ensured that expert opinion and local knowledge was incorporated into the risk assessment process and that the hazard log was site-specific.

4.3.1 Hazard Workshop Attendance

30. The Hazard Workshop was held in Edinburgh on the 23 July 2025. The Hazard Workshop was attended by:

- Brown & May Marine;
- MCA;
- Montrose Port;
- NiMa Consultants (attended as the lead author of **Chapter 11: Commercial Fisheries (Volume II)** of the **Bellrock WFDA EIA Report**);
- NLB;
- RYA Scotland (also on behalf of the CA); and
- Scottish White Fish Producers Association (SWFPA).

31. Regular Operators identified in **Section 4.2** were given the opportunity to attend the Hazard Workshop, but no operators attended. Apologies were received from the UK Chamber of Shipping, CA, Royal National Lifeboat Institution (RNLI), and Scottish Pelagic Fishermen’s Association (SPFA). It is noted that a supplemental meeting was held with the UK Chamber of Shipping to discuss the Hazard Workshop and receive their input (see **Table 4.1**).

4.3.2 Hazard Workshop Process and Hazard Log

32. During the Hazard Workshop, key maritime hazards associated with the construction, O&M, and decommissioning of the Bellrock WFDA 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.

33. 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 those who attended the Hazard Workshop and UK Chamber of Shipping for comment and their feedback incorporated into the NRA. The hazard log has been used to inform the risk assessment from **Section 17** and is provided in full in **Annex B**.

4.4 Consultation Responses

34. Various responses have been received from stakeholders during consultation undertaken in the NRA process, either during dedicated meetings, via email correspondence, through the Bellrock WFDA Scoping Opinion (**Appendix 1.2** of the **Bellrock WFDA EIA Report (Volume IV)**) (hereafter referred to as the ‘Scoping Opinion’) or via the Hazard Workshop.

35. The key points and where they have been addressed within the NRA or **Chapter 12: Shipping and Navigation (Volume II)** of the **Bellrock WFDA EIA Report** are summarised in **Table 4.1**. It is noted that the Bellrock WFDA Scoping Opinion (**Appendix 1.2** of the **Bellrock WFDA EIA Report (Volume IV)** of the **Bellrock WFDA EIA Report**) has been reviewed, and responses align with input from shipping and navigation stakeholders including the MCA, NLB, UK Chamber of Shipping and RYA Scotland (which is summarised in **Table 4.1**).

Table 4.1 Summary of Key Points Raised During Consultation

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
MCA	21 December 2023, Email Correspondence	The MCA support waiving the MGN 654 requirement for dedicated winter vessel traffic survey and use of an Automatic Identification System (AIS) only dataset. However, this is a specific case and was made on the results of the summer survey, additional information provided and unique requirements as well as feedback from other consultation. This position will neither influence nor set a precedent to other proposed wind farm traffic surveys in the UK, which will continue to be assessed on a case-by-case basis.	The summer vessel traffic survey is compliant with MGN 654 requirements and a 12-month AIS only dataset has been used for the winter period in line with MCA agreement. Data sources are outlined in Section 5 .
UK Chamber of Shipping	Representation on the Bellrock WFDA Scoping Report (2024)	The Chamber agrees with the study area of 10 nm as industry standard, however, would like to see a cumulative routeing study area of 50 nm for the cumulative assessment. This is again industry standard for such projects.	A 50 nm study area has been used in the cumulative assessment screening exercise in Section 13 .
		The AIS data is as expected and in accordance with MGN 654. The Chamber welcomes the use of a full 12-months of AIS only data for seasonality. The Chamber expects this will be 2023 data but welcomes confirmation.	Vessel traffic surveys will be compliant with MGN 654 requirements with consultation on vessel traffic surveys included within the NRA and Bellrock WFDA EIA Report. It is noted that the summer 2024 vessel traffic survey will be supported by desk-based AIS data. The long-term (12-month) dataset was collected from 2023. Data sources are outlined in Section 5 .

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		<p>The Chamber expects to see a 20-year time period for Marine Accident Investigation Branch (MAIB) and RNLI accident data analysis. The data is available; its analysis has become the norm and provides for enhanced analysis given the long lifespan of the Bellrock WFDA.</p>	<p>The latest 20-years of MAIB incident data has been used and is analysed in Section 9.4. The latest 16-years of RNLI data is analysed in Section 9.2, noting no previous data is available.</p>
		<p>The Chamber believes that should the applicant proceed with floating turbines then loss of station of a turbine should be considered during the construction and decommissioning phases, in particular when the structures are in transit or under tow.</p>	<p>Loss of station is considered during all phases during the risk assessment in Section 18.</p>
		<p>Should the development use floating turbines then wet storage areas need to be considered from a navigational risk perspective, including loss of station from a wet storage area as well as displacement of vessels from areas that may typically be used for anchoring activity.</p>	<p>Temporary mooring of FSSs and/or FOU's (known as 'wet storage') will be undertaken at port(s) or dedicated mooring locations under Marine Licence(s) and other consents as required, secured by the relevant port(s)/storage locations.</p> <p>Wet storage is acknowledged in Section 6.4 but given the planned locations are not yet known this will be subject to a separate risk assessment undertaken by the wet storage provider/user (or port operator depending on location).</p>
		<p>The Chamber considers given the specific characteristics of a floating development there are some nuanced differences and additional things to consider. For example, the Lighting and Marking Plan (LMP), need to consider the removal of one or more lit turbines on the boundary for maintenance or repair and how lighting and marking will be managed in such an occurrence.</p>	<p>An Outline LMP (Volume V) is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.</p> <p>The full LMP will be developed post-consent in agreement with NLB and is included as an embedded mitigation measure in Section 21.</p>

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		The Chamber recommends the Bellrock WFDA fully consider the additional risk factors associated with floating offshore wind projects outside those for fixed projects, such a report was produced for ORE Catapult.	Relevant guidance in regard to floating OWFs have been considered as per Section 2.2 .
NLB	Representation on the Bellrock WFDA Scoping Report (2024)	NLB welcome the commitment to develop post-consent documentation including a LMP, Development Specification and Layout Plan (DSLPL) and a Navigational Safety Plan (NSP) as embedded mitigations across all phases of the Bellrock WFDA.	<p>Embedded mitigation measures are detailed in Section 21. All mitigation measures for the Bellrock WFDA are summarised in Appendix 5.1: Mitigation and Monitoring Register (Volume IV of the Bellrock WFDA EIA Report).</p> <p>An Outline LMP (Volume V) and Outline Vessel Management and Navigational Safety Plan (VMNSP) (Volume V) is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.</p>
		NLB note the proximity of other offshore wind projects, in particular the adjacent Ossian OWF, and welcome the inclusion of potential cumulative effects within the report, considering the cumulative impacts that these developments will have upon shipping and navigation in the area.	A cumulative screening is included in Section 13 with screened in developments included in the cumulative risk assessment in Section 19 .
		NLB do request that consideration is given within the EIA to the potential impact that a wreck (either that of a vessel or wind turbine generator (WTG)) could have upon navigation, both within the Bellrock WFDA and the immediate vicinity.	Acknowledged in the risk assessment in Section 18 .

Project A4900

Client Bellrock Offshore Wind Farm Limited

Title Bellrock Offshore Wind Farm – Wind Farm Development Area Navigational Risk Assessment

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
RYA Scotland	Representation on the Bellrock WFDA Scoping Report (2024)	Rather few recreational craft are expected to pass through the area. However, there will be some. I see no need to collect additional data on recreational craft.	Acknowledged in the baseline assessment of recreational vessels in Section 10.3.6 .
		The hazards listed are appropriate. Experience with other OWFs shows there is an additional risk from the loss of aids to navigation (AtoNs) due to storm damage and the difficulty of repairing them timeously. This is particularly relevant in the pre-construction phase when there may be metocean and other buoys deployed.	Acknowledged in the risk assessment in Section 18 .
		Note that there can be a considerable lag between information on the location of the scheme being sent to the UK Hydrographic Office (UKHO) and it being available on the electronic charts used by recreational boaters.	Promulgation of information, including the issue of Notifications to Mariners, is considered as an embedded mitigation measure in the NRA (Section 21). Notifications to Mariners will be issued through Kingfisher as well as locally to relevant stakeholders where agreed.
Forth Ports	Representation on the Bellrock WFDA Scoping Report (2024)	Forth Ports have no concerns in regard to the Bellrock WFDA.	Noted.
SFF	Representation on the Bellrock WFDA Scoping Report (2024)	When a number of WTGs have been installed or in case of decommissioning, when all WTGs and related infrastructures not yet removed, the risks of vessels to structure allision and 'loss of station' risk to other users of the sea exist/is imperative. Therefore, we propose the above two points to be also scoped in for construction and decommissioning phases.	During the construction and decommissioning phases, a buoyed construction/decommissioning area will be deployed to maximise awareness of the infrastructure in the Bellrock WFDA (will be set out in the LMP). Based on experience at previously under construction OWFs, this mitigation measure will discourage vessels from navigating internally within the Bellrock WFDA. Therefore, allision risk is not considered necessary to assess in detail for the

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
			<p>construction and decommissioning phases. Loss of station is considered during all phases during the risk assessment in Section 18.</p>
MCA	<p>Representation on the Bellrock WFDA Scoping Report (2024)</p>	<p>The EIA Report should supply detail on the possible impact on navigational issues for both commercial and recreational craft, specifically:</p> <ul style="list-style-type: none"> ▪ Collision risk; ▪ Navigational safety; ▪ Visual intrusion and noise; ▪ Risk management and emergency response; ▪ Marking and lighting of site and information to mariners; ▪ Effect on small craft in adverse weather or tidal conditions; and ▪ The likely squeeze of small craft into the routes of larger commercial vessels. <p>The development area carries a low to moderate amount of traffic with several important commercial shipping routes to/from UK ports and the North Sea. Attention will need to be paid to routeing, 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</p>	<p>The stated issues have been considered across this NRA and Chapter 12: Shipping and Navigation of the Bellrock WFDA EIA Report (Volume II). In particular, main commercial routes have been identified using the principles set out in MGN 654 and routeing displacement, including in adverse weather, has been considered in the assessment of effects in regard to navigational safety and collision risk in Section 18 for all vessel types, inclusive of recreational craft and the potential of internal navigation within the operational Bellrock WFDA.</p>

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		developments, other infrastructure, and the impact on safe navigable sea room.	
		An NRA will need to be submitted in accordance with MGN 654.	The NRA is undertaken in compliance with MGN 654 including the completion of the MGN 654 Checklist in Annex A .
		The DSLP will require MCA approval prior to construction to minimise the risks to surface vessels, including rescue boats, and Search and Rescue (SAR) aircraft operating within the site. Any additional navigation safety and/or SAR requirements, as per MGN 654 Annex 5, will be agreed at the approval stage.	The final Bellrock WFDA layout will be agreed with MCA and NLB post-consent and will comply with the requirements of MGN 654, noting that compliance with MGN 654 is considered as an embedded mitigation measure in Section 21 .
		The proximity to other OWFs in particular the proposed Ossian OWF will need to be fully considered, with an appropriate assessment of the distances between OREI boundaries and shipping routes as per MGN 654.	A full cumulative risk assessment is provided in Section 13 , including consideration of cumulative deviations of main commercial routes in the presence of the developments highlighted by the MCA.
		Attention should still be paid to cabling routes and where appropriate burial depth for which a Burial Protection Index study should be completed and subject to the traffic volumes, an anchor penetration study may be necessary. If cable protection measures are required e.g., rock bags or concrete mattresses, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to chart datum (CD).	Any cable protection will adhere to the requirements of MGN 654 – including in relation to reduction in surrounding depths – noting that compliance with MGN 654 is considered as an embedded mitigation measure in Section 21 .

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		<p>Compliance with regulatory expectations on moorings for floating wind and marine devices (HSE and MCA, 2017) is identified as a designed in mitigation measure for floating infrastructure. This guidance should be followed, and a Third-Party Verification (TPV) of mooring arrangements will be required.</p>	<p>The Regulatory Expectations document is included as an embedded mitigation measure in the NRA (Section 21), noting that this guidance requires TPV of the mooring system.</p>
		<p>As use of wet storage will be considered as the Bellrock WFDA develops, we would like to point out to the Applicant that any wet storage solutions should be discussed in consultation with relevant maritime stakeholders including MCA and NLB. We would also expect the NRA to be updated to include the proposals for any wet storage once they are known.</p>	<p>Temporary mooring of FSSs and/or FOU's (known as 'wet storage') will be undertaken at port(s) or dedicated mooring locations under Marine Licence(s) and other consents as required, secured by the relevant port(s)/storage locations.</p> <p>Wet storage is acknowledged in Section 6.4 but given the planned locations are not yet known this will be subject to a separate risk assessment undertaken by the wet storage provider (or port operator depending on location).</p>
		<p>Particular consideration will need to be given to the implications of the site size and location on SAR resources and Emergency Response Cooperation Plan (ERCoP). The report must recognise the level of Radio Detection and Ranging (Radar) surveillance, AIS and shore-based Very High Frequency (VHF) radio coverage and give due consideration for appropriate mitigation such as Radar, AIS receivers and in-field, Marine Band VHF radio communications aerial(s) (VHF voice with Digital Selective Calling (DSC)). A SAR checklist will also need to be completed in consultation with MCA, as per MGN 654 Annex 5 SAR requirements.</p>	<p>Navigation, communication, and position fixing equipment is detailed in Section 14.6.2. The NRA is fully compliant with MGN 654 including commitment to the completion of a SAR Checklist post-consent in consultation with the MCA (Section 21).</p>

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		<p>MGN 654 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organization (IHO) Order 1a standard, with the final data supplied as a digital full density dataset, and survey report to the MCA Hydrography Manager. Failure to report the survey or conduct it to Order 1a might invalidate the NRA if it was deemed not fit for purpose.</p>	<p>The Applicant will comply with MGN 654 requirements including detailed and accurate hydrographic surveys in Section 21.</p>
		<p>In the case of high voltage direct current (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 electromagnetic fields (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.</p>	<p>HVDC is not under consideration for the Bellrock WFDA as per Section 6. Should HDVC form part of the offshore transmission infrastructure within the OfTDA, a desk based compass deviation study will be prepared and submitted with the OfTDA consent application.</p>
MCA	5 March 2025, Post Scoping Meeting	The MCA is continuing to progress towage guidance which will be published in due course.	Acknowledged in the risk assessment in Section 18 .
UK Chamber of Shipping	5 March 2025, Post Scoping Meeting	Due to the distance offshore, towage operations will result in extended exposure hours and so increases overall risk.	Acknowledged in the risk assessment in Section 18 .

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
Tidewater Marine	3 June 2025, Regular Operator Response	Route between Aberdeen and the Elgin Oil Field occurs once or twice per week and passes approximately 11 nm north of the Bellrock WFDA.	Mean positions of base case main commercial shipping routes are presented in Section 11 , with future case routeing shown in 14. Main commercial shipping routes are considered within Section 18 .
	4 June 2025, Regular Operator Response	The vessel <i>Troms Mira</i> has been on charter for two years and will likely be for another year. The route that this vessel follows to the Fulmar, Clyde, and Auk platforms passes approximately 2 nm from the Bellrock OWF Light Detection and Ranging (LiDAR) buoy. This occurs four to six times per week depending on the charterer’s instructions and weather conditions.	Mean positions of base case main commercial shipping routes are presented in Section 11 , with future case routeing shown in 14. Main commercial shipping routes are considered within Section 18 . It is noted that the Bellrock OWF LiDAR was located within the Bellrock WFDA and is no longer in situ since April 2025.
Fred Olsen Cruise	18 June 2025, Regular Operator Response	The impact of the presence of the Bellrock WFDA will be minimal. The route between Newcastle and Aalesund (Norway) may require slight deviation of a few miles from the preferred/shortest path. The presence of cumulative developments will require longer journeys than preferred and will limit adverse weather routeing options. It is unlikely that vessels will choose to make passage through the Bellrock WFDA.	Mean positions of base case main commercial shipping routes are presented in Section 11 , with future case routeing shown in Section 14 , including with regards to cumulative developments in 14.6 . Main commercial shipping routes are considered within Section 18 . Adverse weather routeing is also considered within Section 18 alongside Section 12 .
NLB	23 July 2025, Hazard Workshop	Construction buoyage will require some thought as part of the post-consent LMP process. NLB would want the buoyage in place when anchor and mooring systems are in situ even in the absence of surface piercing structures.	An LMP will be developed and agreed with the NLB post-consent (see Section 21), which will include construction buoyage. An Outline LMP (Volume V) is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.
		The influence of surrounding developments on future traffic will need assessed.	Cumulative vessel routeing is considered in Section 14.6 .

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Removal of floating substructure (FSS) for maintenance will need to be considered in regard to lighting and marking.	<p>An LMP will be developed and agreed with the NLB post-consent (see Section 21), which will include potential removal of a lit structure for maintenance.</p> <p>An Outline LMP (Volume V) is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.</p>
RYA Scotland	23 July 2025, Hazard Workshop	Wet storage needs to be defined and agreed.	<p>Temporary mooring of FSSs and/or FOU (known as ‘wet storage’) will be undertaken at port(s) or dedicated mooring locations under Marine Licence(s) and other consents as required, secured by the relevant port(s)/storage locations.</p> <p>Wet storage is acknowledged in Section 6.4 but given the planned locations are not yet known this will be subject to a separate risk assessment undertaken by the wet storage provider (or port operator depending on location).</p>
		Confirming ports which will not be considered for wet storage would be useful.	<p>A list of ports which are under consideration for the construction and O&M phases has been provided in Section 6.5. It is noted that wet storage of FSS or FOU does not form part of the Bellrock WFDA EIA Report or consent applications.</p>
		All electronic charts, not just Admiralty charts, should be included as mitigation measures.	<p>This is included as an embedded mitigation measure in Section 21. All mitigation measures for the Bellrock WFDA are summarised in Appendix 5.1: Mitigation and Monitoring Register (Volume IV of the Bellrock WFDA EIA Report).</p>

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
SWFPA	23 July 2025, Hazard Workshop	Guard vessels may be required as vessels may transit through the Bellrock WFDA if no obvious activity is ongoing.	The use of guard vessels is included as an embedded mitigation measure in Section 21 , and will be determined by risk assessment output.
		The future effects on European Union (EU) vessels being allowed to fish in UK waters for the next 12 years should be considered.	As this is not a new ruling, it is considered that this is sufficiently captured within the baseline vessel traffic data (see Section 10). Additionally, a future case scenario of an increase in vessel traffic up to 20% is conservatively considered (see Section 14).
		Vessel increases due to decommissioning of certain oil and gas fields will need to be considered.	A future case scenario of an increase in all vessel traffic up to 20% is considered (see Section 14).
MCA	23 July 2025, Hazard Workshop	Excursion of the FSSs will need to be considered when developing the final layout.	A DSLP will be developed post-consent in consultation with the MCA and NLB to finalise the Bellrock WFDA layout, including consideration of the excursion of FSSs.
		Impacts on port access should be included if towage of infrastructure is an option.	Access to local ports, harbours, and related facilities has been included within the risk assessment in Section 18 for all phases.
UK Chamber of Shipping	2 October 2025, Hazard Workshop Follow-up	Depths of the mooring and dynamic cable arrangements may create a no-go zone around each turbine with increased risk of entanglement, particularly for drifting vessels.	Mooring lines and cables will be charted as per Section 21 . No drifting incidents have been recorded within the study area as per Section 9 . Section 10 shows that vessel traffic is low within the area. Section 18.2.6 assesses reduction in under keel clearance due to subsea infrastructure.
		Consideration of marking on Admiralty charts, particularly relating to vector charts. Charting should reflect differences between mooring types.	Charting of infrastructure is considered in Section 21 . The charting requirements will be determined by the UKHO.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		Shared anchors are considered to represent a worst-case and the Chamber is not supportive.	The use of shared anchors is considered in Section 18 .
		From a project vessel operator perspective, it would be useful to see the layout alongside the Bellrock WFDA boundary, mooring arrangements and navigable water depths.	Figure 16.10 presents the layout relative to the Bellrock WFDA and mooring arrangements for illustration.
		Loss of tow should be considered during all phases, and appropriate risk assessments at the time wet storage is known should be a commitment.	Wet storage is acknowledged in Section 6.4 but given the planned locations are not yet known this will be subject to a separate risk assessment undertaken by the wet storage provider/user (or port operator depending on location). Towage operations are considered across all phases in Section 18 .
		Does not support permanent operational Safety Zones as there is no evidence to date that they provide material navigational safety benefit.	An application for Safety Zones during construction, pre-commissioning, major maintenance and decommissioning is included as an embedded mitigation measure in Section 21 . Consideration will be given to an application for operational safety zones throughout the O&M phase.
		A passing distance of 1 nm may not be realistic given the total footprint of the mooring and cable arrangements, as well as controlling depths. A precautionary approach of 1 nm from the limits of the mooring arrangements should be used, and does not accept 1 nm from the WTGs.	The methodology for defining re-routeing is provided in Section 14.5.1 and acknowledges the Chamber's concern.

Stakeholder(s)	Date and form of correspondence	Point raised	Response and where addressed in the NRA
		A hazard to consider is the length of tow and the manoeuvrability of the towing vessel.	Full specifications relating to towage operations will be defined at the time and subject to a risk assessment. This is acknowledged in Section 18 .
NLB	23 February 2026, Email Correspondence	No objection to deployment of mooring buoys but would expect them to be lit and marked in line with relevant IALA guidelines which would be detailed as part of LMP discussions.	The need for adherence with IALA guidelines is acknowledged in Section 21.1
MCA	24 February 2026, Email Correspondence	Content for mooring buoys as charging stations to be further developed post consent and discussed as and when further when information is available. In principle, no major concerns with the inclusion of the mooring buoys.	The need for further assessment post-consent for functionality of mooring buoys as charging stations is acknowledged in Section 6.2.6 .
SFF	25 February 2026, Email Correspondence	Suggest explicit entries in hazard log for mooring buoys.	Mooring buoys are incorporated into the most likely consequences for allision risk in the hazard log (Annex B) and are considered as part of the allision risk hazard in the risk assessment (Section 18).
		Mooring buoys should be assessed in relation to loss of station and interaction with fishing vessels. The presence of mooring buoys will further constrain fishing activity internally within the operational array.	Mooring buoys are considered as appropriate in the risk assessment in Section 18 including in relation to loss of station and interaction, noting that the NRA assesses fishing vessels in transit only (Section 3.1); hazards directly related to commercial fishing activity are assessed in Chapter 11: Commercial Fisheries (Volume II) of the Bellrock WFDA EIA Report .
		The mooring buoys as charging stations should be re-assessed post-consent once design parameters are available.	The need for further assessment post-consent for functionality of mooring buoys as charging stations is acknowledged in Section 6.2.6 .

5 Data Sources

36. This section summarises the main data sources used to characterise the shipping and navigation baseline relative to the Bellrock WFDA.

5.1 Summary of Data Sources

37. The main data sources used to characterise the shipping and navigation baseline relative to the Bellrock WFDA are outlined in **Table 5.1**.

Table 5.1 Data Sources Used to Inform Shipping and Navigation Baseline

Data	Source(s)	Purpose
Vessel traffic	14-days AIS, Radar, and visual observation data recorded from the <i>GV Star of Hope</i> during a dedicated on-site vessel traffic survey covering the study area for a seasonal summer period from 16 to 30 August 2024.	Characterising vessel traffic movements within and in proximity to the boundary of the Bellrock WFDA in line with MGN 654 (MCA, 2021) requirements. Undertaken as the validity of the 2023 seasonal summer would have expired at the time of consents application.
	14-days AIS data recorded from terrestrial receivers covering the study area for a seasonal winter period from 4 to 17 December 2024.	
	12-months of AIS data recorded from onshore, offshore and satellite receivers covering the study area for the entirety of 2023.	Validation of the vessel traffic surveys and characterising seasonal variations and weather routing.
	14-days AIS, Radar, and visual observation data recorded from the <i>Karima</i> during a dedicated on-site vessel traffic survey covering the study area for a seasonal summer period from 17 to 31 August 2023.	Secondary source for characterising vessel traffic movements within and in proximity to the boundary of the Bellrock WFDA.
	Anatec’s Ship Routes database (2024).	Secondary source for characterising vessel traffic movements including cumulatively within and in proximity to the boundary of the Bellrock WFDA.
	Appendix 12.2: East Region Developers Group Cumulative Baseline for Shipping and Navigation (Volume IV) (Anatec, 2025)	Characterising potential future cumulative routing.
Maritime incidents	MAIB marine accidents database (2004 to 2023).	Review of maritime incidents within and in proximity to the boundary of the Bellrock WFDA.
	RNLI incident data (2008 to 2023).	
	Department for Transport (DfT) UK civilian SAR helicopter taskings (April 2015 to March 2024).	
Other navigational features	Admiralty Charts 1407, 1409, 273, 278, 268, and 2182B (UKHO, 2024).	

Data	Source(s)	Purpose
	<i>Admiralty Sailing Directions North Sea (West) Pilot NP54</i> (UKHO, 2021).	Characterising other navigational features in proximity to the boundary of the Bellrock WFDA.
	<i>Admiralty Sailing Directions North Coast of Scotland Pilot NP52</i> (UKHO, 2022).	
Weather	ERA5 reanalysis data from 1979 to 2024 including significant wave height and wind direction data (European Centre for Medium-Range Weather Forecasts (ECMWF), 2024).	Characterising weather conditions in proximity to the Bellrock WFDA.
	Tidal data provided by Admiralty Charts 273 and 278 (UKHO, 2023).	
	Visibility data provided in <i>Admiralty Sailing Directions North Sea (West) Pilot NP54</i> (UKHO, 2021).	
	<i>Case Studies of Past Weather Events</i> (Met Office, 2025).	Identifying periods of adverse weather in proximity to the Bellrock WFDA.

5.2 Vessel Traffic Survey

38. The vessel traffic survey was undertaken using a methodology agreed with the MCA and NLB. A 14-day AIS, Radar, and visual observation vessel-based survey undertaken in summer 2024 (16 to 30 August 2024) has been considered within the baseline. The results of this survey showed that low numbers of small craft were present within the Bellrock WFDA. Consequently, and in consideration of the distance of the Bellrock WFDA offshore as well as fisheries stakeholder consultation, the MCA granted the Applicant exemption from an on-site winter vessel traffic survey. It was agreed with the MCA that 14 days of AIS-only data recorded during winter 2024 (4 to 17 December 2024) would be sufficient as the primary dataset to characterise vessel traffic activity within and in proximity to the Bellrock WFDA. The 28 days of site-specific data is assessed in **Section 10**.
39. A previous 14-day vessel traffic survey during summer 2023 (17 to 31 August 2023) was also undertaken and is considered a secondary data source for this assessment. This dataset generally aligns with the data recorded during the summer 2024 survey. Additionally, a long-term dataset from 1 January 2023 to 31 December 2023 was used as validation (see **Section 5.3** and **Annex E**).
40. A number of vessel tracks recorded during the survey periods were classified as temporary (non-routeing), such as support vessels associated with surrounding projects as well as temporary survey and research vessels.

5.3 Long-term Vessel Traffic Data

41. Long-term vessel traffic data consisting of AIS covering 12 months between 1 January 2023 and 31 December 2023 was collected from offshore, coastal, and satellite receivers. Accounting for the distance offshore of the Bellrock WFDA (and subsequent level of AIS take-up), the long-term vessel traffic data is considered to be comprehensive for the study area. The assessment of this dataset allowed seasonal variations to be captured. The analysis of this dataset is presented in full in **Annex E**.

5.4 Data Limitations

5.4.1 Automatic Identification System Data

42. 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 m length overall (LOA).
43. 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 *Karima* (summer 2023 survey) and *GV Star of Hope* (summer 2024 survey). A proportion of smaller vessels also carry AIS voluntarily, typically utilising a Class B AIS device. Throughout both the summer 2024 and summer 2023 survey, over 99% of vessel tracks were recorded via AIS with the remainder recorded via Radar.
44. The long-term vessel traffic data and the 14-day winter 2024 vessel traffic data – AIS only datasets – assume that vessels under a legal obligation to broadcast via AIS will do so. Both the long-term vessel traffic data and the AIS component of the vessel traffic survey data assume that the details broadcast via AIS is accurate (such as vessel type and dimensions) unless there is clear evidence to the contrary.

5.4.2 Historical Incident Data

45. Although all UK commercial vessels are required to report accidents to the MAIB, non-UK vessels do not have to report unless they are in a UK port or within 12 nm territorial waters (noting that the study area is not located entirely within 12 nm territorial waters) or carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB.
46. The RNLI incident data cannot be considered comprehensive of all incidents in the study area. Although hoaxes and false alarms are excluded, any incident to which an RNLI resource was not mobilised has not been accounted for in this dataset.

5.4.3 United Kingdom Hydrographic Office Admiralty Charts

47. 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 AtoNs, only those charted and considered key to establishing the shipping and navigation baseline are shown. During consultation input has been sought from relevant stakeholders regarding the navigational features baseline. Navigational features are based upon the most recently available UKHO Admiralty Charts and Sailing Directions at the time of writing.

6 Project Design Relevant to Shipping and Navigation

48. The NRA reflects the information detailed in full in **Chapter 4: Project Description (Volume II)** of the **Bellrock WFDA EIA Report**. The following subsections outline the maximum extent of the Bellrock WFDA for which any shipping and navigation hazards are assessed.

6.1 Wind Farm Development Area

49. The Bellrock WFDA is located approximately 63 nm east of the north-east coast of Scotland with the closest point at Buchan Ness, south of Peterhead. The total area covered by the Bellrock WFDA is approximately 82 square nautical miles (nm²) with depths ranging between 69 and 121 metres (m) below Lowest Astronomical Tide (LAT).

50. All surface piercing structures FOU's and OfSS will be located entirely within the Bellrock WFDA, inclusive of blade overfly. The key coordinates defining the boundary of the Bellrock WFDA are illustrated in **Figure 6.1** and provided in **Table 6.1** using World Geodetic System 1984 (WGS84).

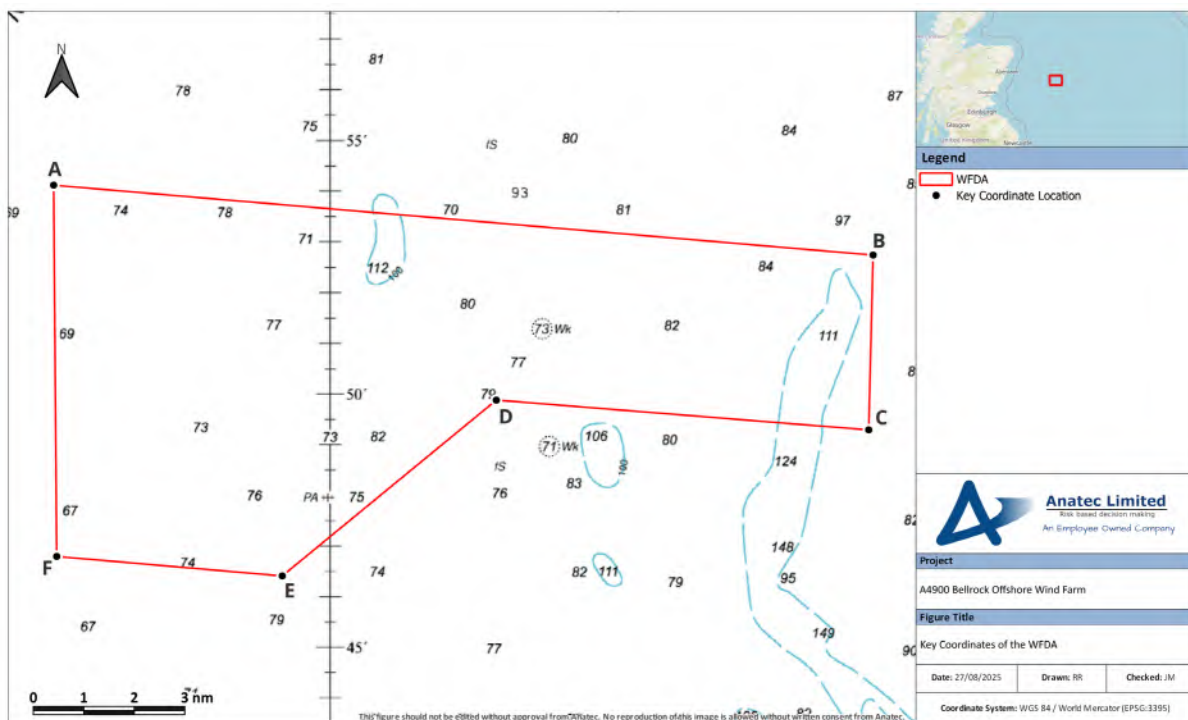


Figure 6.1 Key Coordinates of the Bellrock Wind Farm Development Area

Table 6.1 Key Coordinates of the Bellrock Wind Farm Development Area (Degrees Minutes Seconds, WGS84)

Point	Latitude	Longitude
A	56° 54' 06.4365" North (N)	000° 09' 56.9402" West (W)
B	56° 52' 43.9301" N	000° 19' 31.1369" East (E)
C	56° 49' 17.4321" N	000° 19' 21.6883" E
D	56° 49' 52.6410" N	000° 05' 58.1521"E
E	56° 46' 24.6090" N	000° 01' 43.7101" W
F	56° 46' 47.6908" N	000° 09' 50.3431" W

6.2 Surface Infrastructure

6.2.1 Indicative Worst-Case Scenario Layout

51. Up to 138 surface structures will be installed consisting of up to 132 FOU's and up to six OfSSs. Although the final locations of infrastructure have not yet been defined, an indicative WCS layout has been determined for shipping and navigation purposes and is presented in **Figure 6.2**.
52. The minimum spacing between FOU's (measured centre-to-centre) is 1,150 m with the indicative WCS layout consisting of a dense perimeter with an internal grid (multiple lines of orientation) set back 1 nm from the dense perimeter. This is considered MGN 654 compliant with the space between the perimeter and internal grid serving as a helicopter refuge area.
53. Noting that the WCS OfSS dimensions are larger than that of the FOU's (see **Table 6.3** and **Table 6.4**), the positions of the six OfSS were placed on the periphery of the layout, specifically at convex corners where possible, in order to maximise the exposed surface area to passing third-party vessels. This allows appropriate assessment of the WCS for vessel to structure collision risk.
54. The WCS are for the purposes of modelling/risk assessment only and the final Bellrock WFDA layout will be agreed with the MCA and NLB post-consent in line with consent conditions. The Applicant intends to build out a layout with at least two lines of orientation; however, the final layout will not be possible to determine until post-consent when all survey data has been collected and processed and detailed design has been undertaken. This will be regulated by the DSLP process, and should a single line of orientation layout be progressed instead then a safety justification would be undertaken in line with MGN 654 requirements.

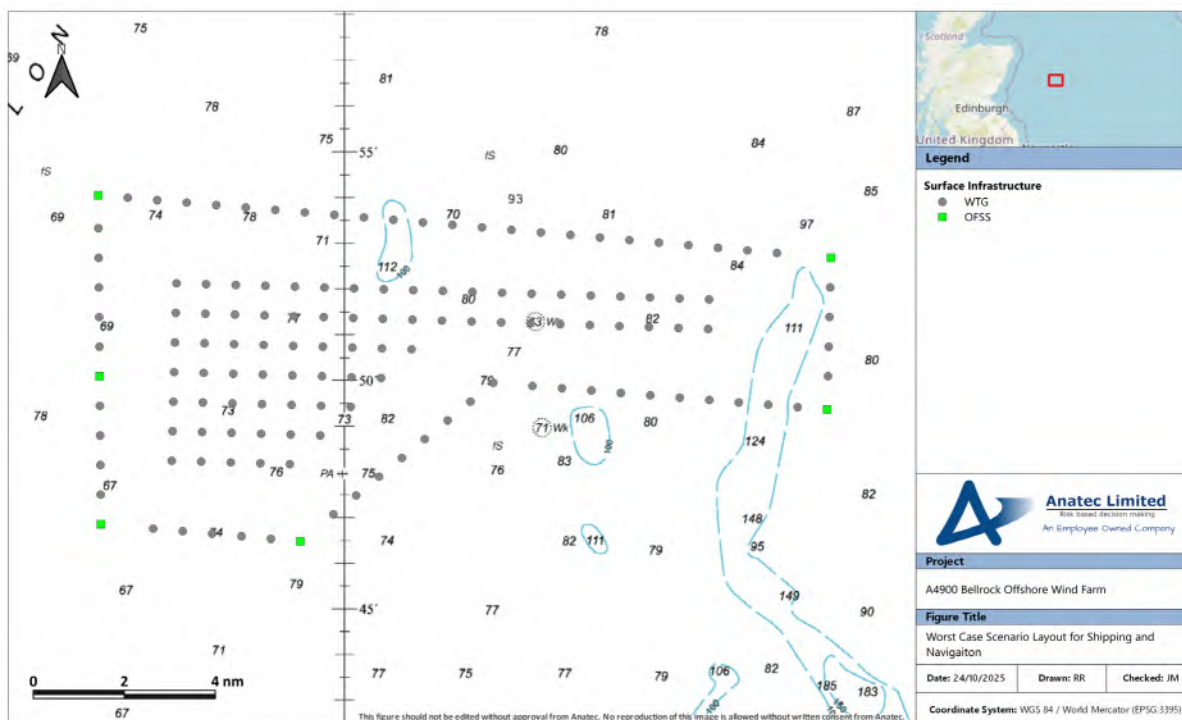


Figure 6.2 Indicative Worst-case Scenario Layout for Shipping and Navigation

6.2.2 Wind Turbine Generators

55. The WTGs within the indicative layout shown in **Figure 6.2** each have a maximum rotor diameter of 236 m and a maximum blade tip height (above MSL) of 271 m, noting that these values represent a WCS for shipping and navigation rather than the Bellrock WFDA as a whole, and fall within the scope of the Bellrock WFDA design in **Chapter 4: Project Description (Volume II)** of the **Bellrock WFDA EIA Report**.
56. The WCS WTG measurements are provided in **Table 6.2**, noting that the values provided are specific to the WCS selected for shipping and navigation (i.e. WTG Type 1 – see **Table 4.5 in Chapter 4: Project Description (Volume II)** of the **Bellrock WFDA EIA Report**) and do not necessarily represent the maximum design overall.

Table 6.2 Worst-case Scenario for Shipping and Navigation – Wind Turbine Generators

Parameter (Type 1 WTG)	WCS for Shipping and Navigation
Maximum blade tip height (above MSL)	271 m
Minimum air gap (above Mean High Water Springs (MHWS)) ¹¹	22 m
Maximum rotor diameter	236 m

6.2.3 Floating Substructures

57. The WCS parameters for the FSSs with regards to shipping and navigation are presented in **Table 6.3** below.

Table 6.3 Worst-case Scenario for Shipping and Navigation – Floating Substructures

Parameter	WCS for Shipping and Navigation
Substructure type	Semi-submersible, tension-leg platform, and barge
Maximum dimensions (m)	135 x 135
Draught (m)	30
Maximum height of FSS above waterline (m)	30
Minimum spacing from other structures (m)	1,150

6.2.4 Offshore Substations

58. The OfSSs within the indicative WCS layout for shipping and navigation are located on the periphery of the Bellrock WFDA. The maximum number of OfSSs will be required for a high voltage alternating current (HVAC) design (given fewer OfSSs will be required for a HVDC solution). Up to six OfSSs have therefore been assumed for the purpose of this NRA. This is representative of the WCS for shipping and navigation and is not considered final. The final positions of the OfSSs will be agreed with the MCA and NLB as part of the DSLP post-consent.

59. The OfSSs may be secured via fixed or floating substructures. FSSs are considered under the WCS for shipping and navigation, with parameters presented in **Table 6.4**.

¹ The minimum air gap is presented against a MHWS tidal level for the purpose of shipping and navigation assessment since this is the frame of reference used when considering minimum air gap in MGN 654 (MCA, 2021). See **Chapter 4: Project Description** of the **Bellrock WFDA EIA Report (Volume II)**.

Table 6.4 Worst-case Scenario for Shipping and Navigation – Offshore Substations

Parameter	WCS for Shipping and Navigation
Number	6
Maximum dimensions (m)	140 x 140
Minimum spacing from other structures (m)	1,000

6.2.5 Station Keeping System

60. The FSS will be attached to the seabed via a mooring and anchoring system (henceforth referred to as a ‘station keeping system’ (SKS)). The number of mooring lines per FSS within the Bellrock WFDA design (**Chapter 4: Project Description (Volume II) of the Bellrock WFDA EIA Report**) may range from a minimum of three to a maximum of nine. The maximum number of mooring lines presents the WCS for shipping and navigation in regard to under keel clearance and anchor interaction, as it increases the risk of SKS interaction with a third-party vessel.
61. The WCS for loss of station considers the minimum number of mooring lines per FSS as this presents the highest risk of a total mooring failure. This value has been considered where relevant throughout the NRA. Catenary, taut, semi-taut and tension mooring line options are being considered, with the WCS for shipping and navigation semi-taut mooring lines as these create the shallowest angle of descent through the water column which presents the greatest risk of vessel interaction.
62. Under the WCS, the mooring lines will connect to the deck level on the FSS at 30 m above the sea surface with a shallowest rate of descent to the seabed shown in **Section 6.2**. The overall footprint of the mooring lines will be a 1,300 m radius centred on the FSS. **Figure 6.3** illustrates this WCS inclusive of a semi-taut mooring line with a connection point at the deck level (top of the FSS).
63. Up to nine anchors will be deployed (corresponding to the number of mooring lines) with drag embedment anchors, suction pile, driven pile, and gravity based anchors under consideration. Shared anchors² are also under consideration.

6.2.6 Mooring Buoys

64. There is potential for up to two mooring buoys to be installed within the Bellrock WFDA. These would have a maximum surface diameter of 12 m and up to three gravity based anchors or suction pile anchors.
65. The mooring buoys may serve both as a mooring point and charging station for project vessels, with the latter purpose served by a dynamic power cable. Use of the

² Rather than individual mooring lines connecting to a dedicated anchor, shared anchors connect multiple mooring lines from multiple FOUs to a single anchor point, thereby reducing the number of anchors required.

mooring buoys for charging during O&M remains an innovative technology and subsequently there is insufficient design detail to allow a comprehensive assessment. Therefore, this NRA qualitatively assesses the physical presence of the mooring buoys where relevant as part of the WCS for each hazard but does not assess the operation of using a mooring buoy for charging a project vessel; this facet of the mooring buoys would be assessed post-consent when detailed parameters are available and in compliance with any relevant MCA guidance published at the time. This aligns with MCA feedback and SFF expectations.

6.2.7 Metocean Buoys

66. There is potential for up to two metocean buoys during construction and up to two metocean buoys during O&M within the Bellrock WFDA. These would have a maximum surface diameter of 5 m and up to three mooring points.

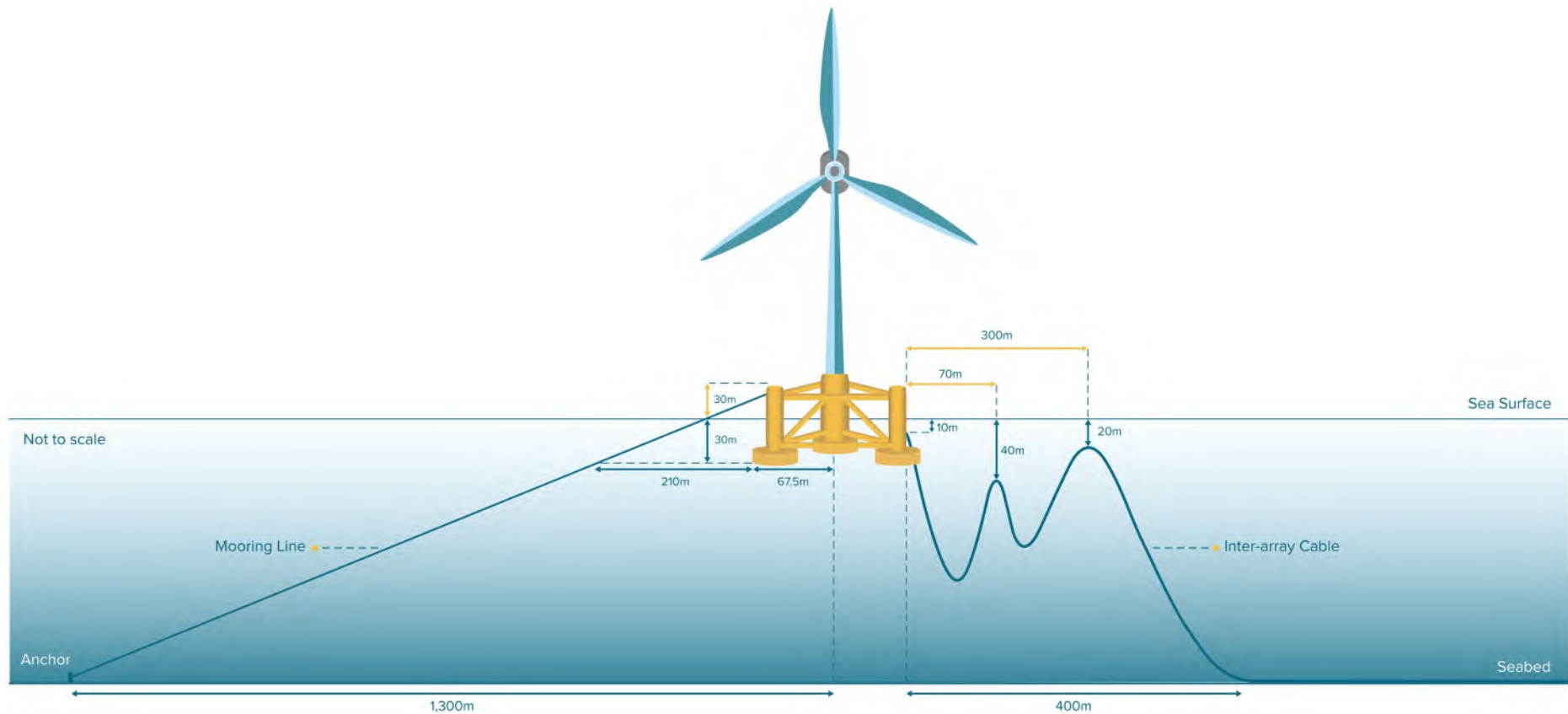


Figure 6.3 Indicative Floating Substructures Worst-case Scenario Arrangements for Shipping and Navigation Considerations

6.3 Subsea Cables

6.3.1 Inter-array Cables

67. The IACs will connect individual WTGs to OfSSs. Up to 162 nm (300 km) of IACs will be required with the final length dependent on the final Bellrock WFDA layout. All IACs will be installed within the Bellrock WFDA, with up to three associated with each WTG.
68. The dynamic sections of the IACs will have a maximum length in the water column of 350 m, with a maximum radius to seabed connection (zero dynamic tension) of 400 m, and a minimum FSS connection point depth below the sea surface of 10 m.
69. As part of the WCS, a 'lazy wave' configuration may be adopted for the IACs. If so the minimum depth of the IAC below the sea surface will be 20 m located at a maximum distance of 300 m from the FSS, illustrated also in **Figure 6 3**.
70. Up to 18 subsea cable hubs may also be installed on the seabed, each with a maximum height of 3.5 m.

6.3.2 Cable Burial

71. Where available, the primary means of cable protection for IACs on the seabed will be by seabed burial. The extent and method by which the IACs will be buried will depend on the results of a detailed seabed survey of the final cable routes and associated cable burial risk assessment (CBRA).
72. It is estimated that up to 225 km of the IACs will be buried. Where cable burial is not possible, alternative cable protection methods such as rock placement may be deployed which will again be determined within the CBRA and the maximum height of any cable protection will be 0.5 m for the IACs. Up to three cable crossings for the IACs are considered, though none are planned. It is anticipated that up to 26.2 km of IACs may require additional cable protection.
73. No pipeline or existing cable crossings are expected for any cables within the Bellrock WFDA.
74. Cable burial and protection is captured in the embedded mitigation measures (**Section 21**).

6.4 Wet Storage

75. Temporary storage/anchorage of FSSs and/or FOU's (known as 'wet storage') will be undertaken at port(s) or dedicated mooring locations under the relevant consents. In such instances it would be the responsibility of the relevant port authority and/or wet storage operator/user to conduct their own risk assessment regarding wet storage operations and therefore this aspect of wet storage is also scoped out of the risk assessment.

6.5 Ports

76. This section provides a brief overview of ports that are under consideration for the construction and O&M phases of the Bellrock WFDA. Further information on ports can be found in **Chapter 16: Socioeconomics, Tourism and Recreation (Volume II)** of the **Bellrock WFDA EIA Report**.

6.5.1 Construction Port(s)

77. It is not yet known which construction port(s)³ will be utilised as a base for construction activities; however, those under consideration are as follows:

- Aberdeen;
- Ardersier;
- Burntisland;
- Cromarty Firth;
- Kishorn;
- Leith
- Methil;
- Nigg;
- Orkney (Scapa);
- Peterhead; and
- Rosyth.

6.5.2 O&M Port(s)

O&M port(s)⁴ to be utilised during daily maintenance and major maintenance of the O&M phase are not yet finalised although those under consideration are as follows:

- Aberdeen;
- Ardersier;
- Burntisland;
- Cromarty Firth;
- Fraserburgh;
- Leith;
- Montrose;
- Nigg; and
- Peterhead.

6.6 Site Preparation Phase and Construction Phase

78. Site preparation works will be undertaken up to one year before commencement of construction, at which point they may continue alongside construction works. **Figure 6.4** outlines an indicative construction programme for the Bellrock WFDA which indicates the maximum duration of construction for each element.

79. Although site preparation works are undertaken ahead of the commencement of construction, these activities have been assessed as construction activities in the NRA for completeness. Therefore, this NRA has assessed one year of site preparation

³ Construction port(s) are defined as port(s) that may be used during the construction phase of the Bellrock WFDA and include integration port(s) and assembly port(s). Marshalling port(s) and vessel support based port(s) are not yet identified and are therefore not included in the definition of construction port(s).

⁴ Operations and maintenance port(s) are defined as port(s) that may be used in the operations and maintenance phase of the Bellrock WFDA and mainly comprises of a day-to-day operation and maintenance port and other port(s) required for major maintenance.

works plus seven years of construction activities (overall eight years of activities for Bellrock WFDA).

80. It is acknowledged that under this construction programme, anchor and mooring installation will commence prior to the towage of FSSs to the Bellrock WFDA. Based on feedback from NLB at the Hazard Workshop, it is anticipated that the buoyed construction area will be in place in anticipation of the anchors and moorings being in situ.

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	Activities	Year 0 (2030)				Year 1 (2031)				Year 2 (2032)				Year 3 (2033)				Year 4 (2034)				Year 5 (2035)				Year 6 (2036)				Year 7 (2037)							
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
WFDA	Step 1: Site Preparation Works																																	Commercial Operation Date			
	Step 2: Installation of SKSs																																				
	Step 3: Towing FOU and Connection to the SKSs																																				
	Step 4: Installation of Subsea Cable Hubs																																				
	Step 5: Installation of IACs																																				
	Step 6: Integration with Offshore Transmission Infrastructure, Testing & Commissioning																																				
	Step 7: Wind Farm Infrastructure Snagging and Repairs																																				

Figure 6.4 Indicative Construction Programme

6.7 Indicative Vessel and Helicopter Numbers

6.7.1 Construction Vessels

81. As stated in Section 4.5 of **Chapter 4: Project Description (Volume II)** of the **Bellrock WFDA EIA Report**, site preparation works are not being consented as part of the Bellrock WFDA consent application. However, to ensure a comprehensive approach that considers and assesses all impacts expected as part of the Bellrock the construction of the Wind Farm Infrastructure, vessel numbers for site preparation works have been included, and for the purposes of the EIA have been considered within the construction phase, as presented in **Table 6.5** below.
82. Up to 1,615 return trips⁵ by up to a peak of 34 construction vessels may be made throughout the construction phase, breaking down as summarised in **Table 6.5**.

Table 6.5 Anticipated Maximum Vessel Numbers per Construction Activity

Construction Activity	Maximum Number of Vessels	Maximum Number of Return Trips
Site preparation works	8	93
Pre-installation surveys (prior to anchor installation)	2	28
Pre-lay grapnel run	1	14
Anchor installation and scour protection installation	3	276
Mooring line installation	2	140
FOU tow to Bellrock WFDA and hook up	6	328
IAC installation and burial including post burial survey	3	201
Subsea cable hub installation and testing	1	42
IAC termination and testing	2	69
WTG electrical completion	4	138
Guard Vessel	2	286
Total	34	1,615

83. Additionally, up to 816 total return trips by helicopter are possible throughout the construction phase.

⁵ One return trip comprises two movements (i.e. one to and one from the WFDA).

6.7.2 O&M Phase

84. Up to 211 return trips per year by up to a peak of 21 O&M vessels at any one time, may be made throughout a maximum 35-year operational lifetime, breaking down as summarised in **Table 6.6**.
85. During both the construction and operation, and maintenance phases, logistics will be managed by a marine coordination team with an integrated Quality, Health, Safety and Environment (QHSE) management system in place to ensure control of all vessels and their respective works. The Bellrock WFDA will be operational 24/7.

Table 6.6 Anticipated Maximum Vessel Numbers per Operation and Maintenance (O&M) Activity per Year

O&M Activity	Annual Maximum Number of Vessels On-Site	Maximum Number of Return Trips per Year
WTG maintenance	7	84
Subsea cable and subsea cable hub maintenance	6	9
Other maintenance	8	118
Total	21	211

86. Additionally, up to 986 annual return trips by helicopter are possible.

6.7.3 Decommissioning Phase

87. The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of vessels. The decommissioning duration of the Bellrock WFDA and OfSSs is anticipated to take seven years.

6.8 Worst-case Scenario

88. The WCS for each shipping and navigation hazard is provided in **Table 6.7** and is based on the parameters described in the previous subsections.

Table 6.7 Worst-case Scenario for Shipping and Navigation by Hazard

Potential Hazard	Phase	WCS for Shipping and Navigation	Justification
Vessel displacement resulting in increased third-party collision risk	Construction	<ul style="list-style-type: none"> ▪ Construction phase of seven years, plus one year of site preparation works; ▪ Buoyed construction area around full extent of the Bellrock WFDA; ▪ Full build-out of the Bellrock Wind Farm Infrastructure; ▪ 500 m Safety Zones around FSS locations during active construction works and 50 m pre-commissioning Safety Zones; and ▪ Up to 34 project vessels on site at any one time with up to 1,615 return trips. 	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel displacement and subsequent vessel to vessel collision risk.
	O&M	<ul style="list-style-type: none"> ▪ O&M phase of up to 35 years; ▪ Full extent of the Bellrock WFDA; ▪ 500 m Safety Zones around FSS locations during major maintenance activities; ▪ Up to 132 WTGs with FSS dimensions up to 135 m x 135 m; ▪ Dynamic section of IAC up to 350 m in length per WTG, with total IAC length of 162 nm; and ▪ Up to 21 project vessels on site at any one time with up to 211 return trips annually. 	

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Potential Hazard	Phase	WCS for Shipping and Navigation	Justification
	Decommissioning	<ul style="list-style-type: none">Decommissioning phase of seven years;Buoyed decommissioning area around full extent of the Bellrock WFDA;Full removal of the Bellrock Wind Farm Infrastructure;500 m Safety Zones around FSS locations during active decommissioning works; andUp to 34 project vessels on site at any one time with up to 1,615 return trips.	
Collision risk between third-party vessel and project vessels	Construction	<ul style="list-style-type: none">Construction phase of seven years, plus one year of site preparation works;Buoyed construction area around full extent of the Bellrock WFDA;Dynamic section of IAC up to 350 m in length per WTG connection, with total IAC length of 162 nm;Full build-out of the Bellrock Wind Farm Infrastructure; andUp to 34 project vessels on site at any one time with up to 1,615 return trips.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel to vessel collision risk involving a third-party vessel and a project vessel.
	O&M	<ul style="list-style-type: none">O&M phase of up to 35 years;Full extent of the Bellrock WFDA;Up to 132 WTGs with FSS dimensions up to 135 m x 135 m;Dynamic section of IAC up to 350 m in length per WTG, with total IAC length of 162 nm; andUp to 21 project vessels on site at any one time with up to 211 return trips annually.	

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Potential Hazard	Phase	WCS for Shipping and Navigation	Justification
	Decommissioning	<ul style="list-style-type: none"> ▪ Decommissioning phase of seven years; ▪ Full removal of the Bellrock Wind Farm Infrastructure; ▪ Dynamic section of IAC up to 350 m in length per WTG, with total IAC length of 162 nm; and ▪ Up to 34 project vessels on site at any one time with up to 1,615 return trips. 	
Reduced access to local ports and harbours	Construction	<ul style="list-style-type: none"> ▪ Construction phase of seven years, in addition to one year of site preparation works; and ▪ Up to 1,615 project vessel return trips to and from the construction port(s). 	Largest possible extent, greatest number of vessel activities associated with the Bellrock WFDA and greatest duration resulting in the maximum spatial and temporal effect on access to local ports.
	O&M	<ul style="list-style-type: none"> ▪ O&M phase of up to 35 years; and ▪ Up to 211 project vessel return trips annually to and from the O&M port(s). 	
	Decommissioning	<ul style="list-style-type: none"> ▪ Decommissioning phase of seven years; and ▪ Up to 1,615 project vessel return trips to and from the decommissioning port(s). 	
Loss of station	Construction	<ul style="list-style-type: none"> ▪ Construction phase of seven years, plus one year of site preparation works; ▪ Full build-out of the Bellrock Wind Farm Infrastructure; ▪ Up to 132 WTGs with FSS dimensions up to 135 m x 135 m; and ▪ Minimum of three SKSs per FSS. 	Maximum number of WTGs with greatest surface dimensions and greatest duration resulting in the maximum spatial and temporal effect on loss of station risk.
	O&M	<ul style="list-style-type: none"> ▪ O&M phase of 35 years; ▪ Full extent of the Bellrock WFDA; ▪ Up to 132 WTGs with FSS dimensions up to 135 m x 135 m; and ▪ Minimum of three SKSs per FSS. 	

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Potential Hazard	Phase	WCS for Shipping and Navigation	Justification
	Decommissioning	<ul style="list-style-type: none">Decommissioning phase of seven years;Full removal of the Bellrock Wind Farm Infrastructure;Up to 132 WTGs with FSS dimensions up to 135 m x 135 m; andMinimum of three SKSs per FSS.	
Reduction of under keel clearance due to presence of sub-surface infrastructure	O&M	<ul style="list-style-type: none">O&M phase of up to 35 years;Full extent of the Bellrock WFDA;Up to 132 WTGs with FSS dimensions up to 135 m x 135 m;Up to 18 subsea cable hubs with footprint of 13 m x 13 m and height of up to 3.5 m above seabed;Maximum of nine mooring lines per FSS;Dynamic section of IAC up to 350 m in length per WTG, with total IAC length of 162 nm;IAC minimum depth of 20 m at 300 m from FSS;IAC touchdown point 400 m from FSS;Up to three IAC crossings;External maximum height of cable protection 0.5 m; andUp to two mooring buoys with dimensions up to 12 m diameter and up to two metocean buoys with dimensions up to 5 m diameter.	Largest possible extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on under keel clearance.
Surface structure allision risk	O&M	<ul style="list-style-type: none">O&M phase of up to 35 years;Full extent of the Bellrock WFDA;Up to 132 WTGs with FSS dimensions up to 135 m x 135 m;Up to six OfSS with FSS dimensions up to 140 m x 140 m; andUp to two mooring buoys with dimensions up to 12 m diameter and up to two metocean buoys with dimensions up to 5 m diameter.	Largest possible extent of surface infrastructure, greatest number of surface structures and greatest duration resulting in the maximum spatial and temporal effect on vessel to structure allision risk.

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Potential Hazard	Phase	WCS for Shipping and Navigation	Justification
Anchor interaction with sub-surface infrastructure	O&M	<ul style="list-style-type: none">▪ O&M phase of up to 35 years;▪ Full extent of the Bellrock WFDA;▪ Up to 132 WTGs with FSS dimensions up to 135 m x 135 m;▪ Up to nine SKSs per FSS;▪ Dynamic section of IAC up to 350 m in length per WTG, with total IAC length of 162 nm;▪ IAC touchdown point 400 m from FSS;▪ Up to three IAC crossings;▪ Up to 18 subsea cable hubs with 13 m x 13 m footprint and height of up to 3.5 m above seabed Up to three IACs per WTG; and▪ Up to two mooring buoys with dimensions up to 12 m diameter and three anchors and up to two metocean buoys with dimensions up to 5 m diameter and up to three mooring points.	Largest possible extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on anchor interaction with subsea cables.
Interference with navigation, communications, and position-fixing equipment	O&M	<ul style="list-style-type: none">▪ O&M phase of up to 35 years;▪ Full extent of the Bellrock WFDA;▪ Up to 132 WTGs with FSS dimensions up to 135 m x 135 m;▪ Dynamic section of IAC up to 350 m in length per WTG, with total IAC length of 162 nm;▪ IAC touchdown point 400 m from FSS; and▪ Up to three IACs per WTG.	Largest possible extent of surface infrastructure, greatest number of surface structures and greatest duration resulting in the maximum spatial and temporal effect on use of navigation, communications and position-fixing equipment.

Potential Hazard	Phase	WCS for Shipping and Navigation	Justification
Reduction of SAR capability due to surface infrastructure	O&M	<ul style="list-style-type: none"> ▪ O&M phase of up to 35 years; ▪ Full extent of the Bellrock WFDA; ▪ Up to 132 WTGs with FSS dimensions up to 135 m x 135 m; ▪ Up to six OfSSs with FSS dimensions up to 140 m x 140 m; ▪ Dynamic section of IAC up to 350 m in length per WTG, with total IAC length of 162 nm; ▪ Minimum spacing of 1,150 m between WTGs and 1,000 m between OfSS and other structures; and ▪ Up to 21 project vessels on site at any one time with up to 211 return trips annually. 	Largest possible extent, greatest number of surface structures, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on emergency response capability.

7 Navigational Features

89. An overview of navigational features within and in proximity to the Bellrock WFDA 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 Charts available as well as information from *Admiralty Sailing Directions North Sea (West) Pilot NP54* (UKHO, 2021).
90. It is noted that no IMO routeing measures, marine aggregate dredging areas, military practice and exercise areas (PEXA), anchorage areas or spoil and dumping grounds were identified in proximity to the Bellrock WFDA.

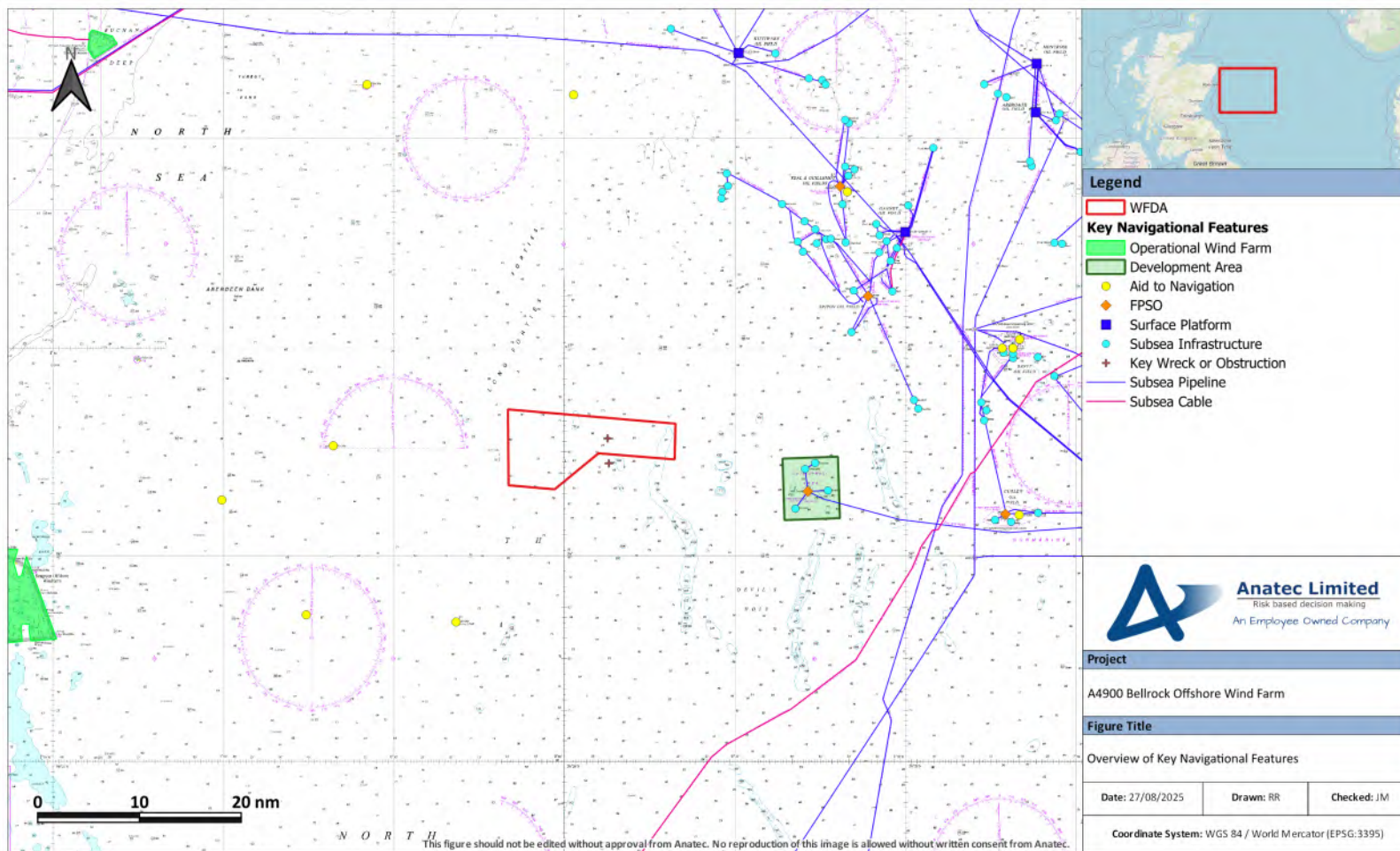


Figure 7.1 Overview of Navigational Features

7.1 Oil and Gas Infrastructure

91. To the east of the Bellrock WFDA, at approximately 10.5 nm, is an oil and gas development area within the Catcher Oil Field. Included in this development area is a floating production storage and offloading (FPSO) vessel, the *BW Catcher*. Several subsea wells and subsea pipelines associated with the FPSO are located within the area also, with the closest well and subsea pipeline located at a distance of 12.6 nm from the Bellrock WFDA.
92. There are two further FPSOs located to the north-east of the Bellrock WFDA; the *Triton* FPSO located within the Triton Oil Field at 22 nm from the Bellrock WFDA and the *Anasuria* FPSO located within the Teal & Guillemot Oil Fields at 28 nm from the Bellrock WFDA.

7.2 Offshore Wind Developments

93. Several operational OWFs are located to the west of the Bellrock WFDA with the closest being the Seagreen OWF at 46 nm south-west of the Bellrock WFDA. Seagreen OWF became fully operational in October 2023.
94. Hywind Scotland OWF is located at 51 nm north-west of the Bellrock WFDA. Hywind Scotland became operational in October 2017.
95. Closer to the coastline and between Seagreen and Hywind Scotland, Kincardine OWF and Aberdeen OWF (also known as European Offshore Wind Deployment Centre (EOWDC)) are located at 54 nm and 62 nm from the Bellrock WFDA, respectively. Kincardine OWF became fully operational in October 2021 with Aberdeen OWF fully operational in September 2018.
96. These operational OWFs are already in-situ and so considered part of the baseline assessment for the Bellrock WFDA. Those OWFs scoped into the Bellrock cumulative assessment are considered in **Section 13**.

7.3 Aids to Navigation

97. As of November 2025, the closest AtoN to the Bellrock WFDA is the *BW Catcher*. There are two charted metocean buoys situated to the southwest and west of the Bellrock WFDA. However, these were deployed for the Ossian OWF development, and were removed in April 2025 (Kingfisher Bulletin, 2025).

7.4 Key Ports and Harbours and Related Facilities

98. The key ports and harbours in closest proximity to the Bellrock WFDA are presented in **Figure 7.2** and are described below.

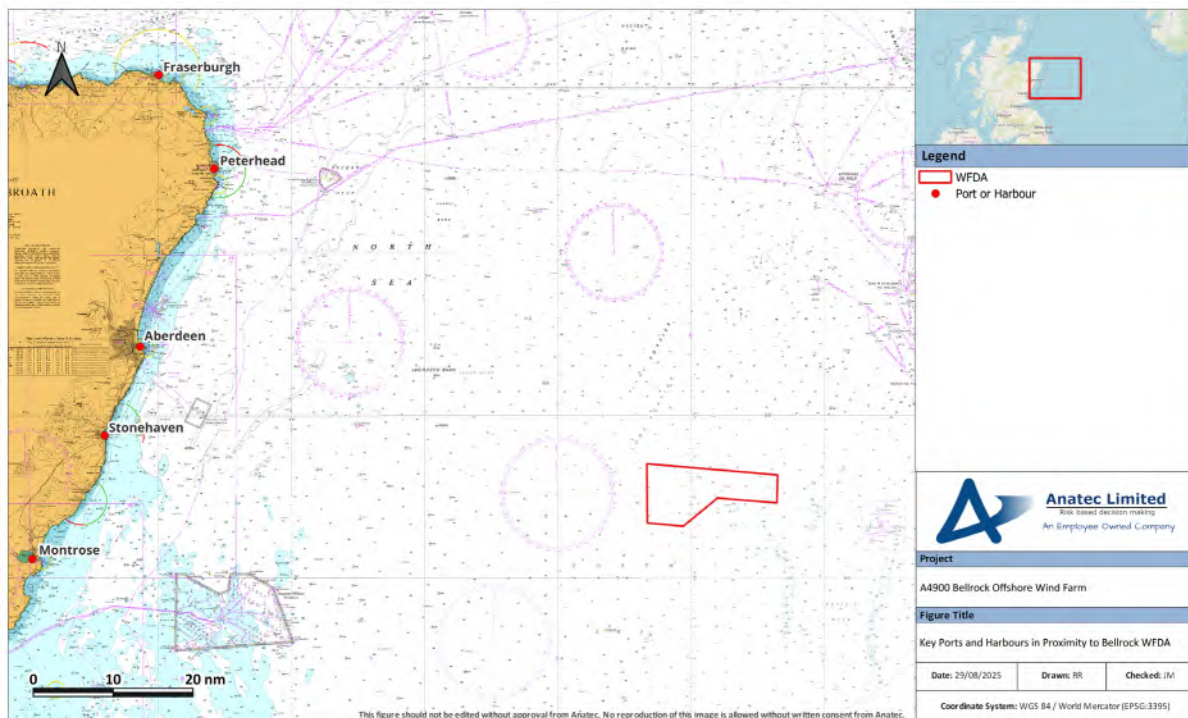


Figure 7.2 Key Ports and Harbours in Closest Proximity to the Bellrock Wind Farm Development Area

7.4.1 Peterhead Port

99. Peterhead Port is located to the northwest of the Bellrock WFDA and is one of the closest ports to the Bellrock WFDA at approximately 64 nm. Peterhead Port is the largest fishing port in Europe as well as being an important base for serving a range of commercial vessels (Peterhead Port Authority, 2024). Peterhead Port Authority are currently proposing a quay extension of 85 m to facilitate increased berthing capacity (Peterhead Port Authority, 2025).

100. A pilot boarding station is located approximately 2 nm offshore from the port. The Admiralty Sailing Directions NP54 (UKHO, 2021) advise that pilotage is compulsory for:

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

- Vessels carrying more than 12 passengers.

101. Peterhead Port Authority operates a vessel traffic service (VTS) with Radar surveillance.
102. Anchoring within Peterhead Bay and the Peterhead VTS area is prohibited unless in an emergency or authorised by the Harbour Master or his deputies (UKHO, 2021).
103. Within Peterhead Port is Peterhead Bay Marina which is a common stopping point for transiting recreational vessels.

7.4.2 Port of Aberdeen

104. The Port of Aberdeen is also located 64 nm to the west of the Bellrock WFDA. The Port of Aberdeen is Scotland's largest berthage port and facilitates oil and gas, renewables, decommissioning, cargo, cruise liners, and commercial ferry services (Port of Aberdeen, 2025a). Aberdeen South Harbour was commissioned in August 2023 as an expansion of the Port offering *"2,800 m of deep-water berths to a maximum depth of -14.8 m, ultra heavy-lift capability up to 140 tonnes / square metre, more than 692,000 square metres of flexible laydown space, and ample project areas to support your requirements"* (Port of Aberdeen, 2025b).
105. A pilot boarding station is located 1.5 nm from the entrance to the Port of Aberdeen and pilotage is available 24/7 and, as per the Admiralty Sailing Directions NP54 (UKHO, 2021), is compulsory for all vessels except for:
 - Vessels under 60 m in length;
 - Vessels between 60 m and 75 m in length, which are fitted with an operation bow thruster unit; and
 - Vessels moving within the harbour from berth to berth with permission of the harbour master.

106. The Port of Aberdeen operates a VTS and when vessels are 3 nm from the Fairway Light Buoy, they must request permission to enter the VTS area. A designated anchorage area is located with Aberdeen Bay which also contains several patches of foul ground within the anchorage itself (UKHO, 2021).

7.4.3 Fraserburgh Harbour

107. Fraserburgh Harbour is located approximately 76 nm north-west of the Bellrock WFDA.
108. The Admiralty Sailing Directions NP52 (UKHO, 2022) describes Fraserburgh Harbour as *"mainly a fishing port with a large locally-based fishing fleet. There is also commercial traffic."* Outer anchorage areas are available for vessels within Fraserburgh Bay, situated to the east of the harbour entrance. Pilotage is compulsory

for vessels of 300 GT and over noting some may be exempt due to legislation (UKHO, 2022). The Admiralty Sailing Directions also note that dockside assistance is essential for entry to the inner harbours and basins (UKHO, 2022).

7.4.4 Stonehaven Harbour

109. Stonehaven Harbour is located 67 nm to the west of the Bellrock WFDA. Stonehaven Harbour was previously a fishing port but currently is mainly used by recreational vessels and a few inshore fishing vessels (UKHO, 2021). Pilotage is not compulsory at this harbour.

110. The harbour is limited by water depths and controlling tides with a maximum depth of 3.9 m recorded at spring tide, depths in the outer harbour can be reduced to 0.6 m as well as the inner harbour drying to sand and mud (UKHO, 2021).

111. Anchoring is available in Stonehaven Bay with small craft also able to anchor closer to the shore (UKHO, 2021).

7.4.5 Montrose Port

112. Montrose Port is located 76 nm west of the Bellrock WFDA. Montrose Port is used primarily for oil and gas, offshore renewables, and decommissioning projects; however, it also operates as a commercial port for imports and exports as well as welcoming occasional cruise liners. The port is also classed as “*one of the largest Chain and Anchor ports globally*” (Montrose Port, 2025).

113. A pilot boarding station is located 0.7 nm from Scurdie Ness and, as per the Admiralty Sailing Directions NP54 (UKHO, 2021) pilotage is compulsory for:

- Merchant vessels above 40 m in length,
- Vessels entering/leaving with the assistance of tugs; and
- All vessel carrying dangerous goods as defined by *The Dangerous Goods in Harbour Areas Regulations 2016*.

114. A harbour tug is also available when given adequate advance notice as well as two pilot boats which can aid in berthing and turning if required (UKHO, 2021).

7.5 Other Navigational Features

115. The closest subsea cable to the Bellrock WFDA is 25 nm to the east and is the North Sea Link electricity interconnector between the UK and Norway.

116. There are two charted subsea wrecks in proximity to the Bellrock WFDA; one located within the Bellrock WFDA itself at a depth of 73 m below CD and one located 0.8 nm south of the Bellrock WFDA at a depth of 71 m below CD. Uncharted wrecks and obstructions, which are not considered a danger to safe navigation, are considered in **Chapter 14: Marine Infrastructure and Other Users (Volume II)** of the **Bellrock WFDA EIA Report**.

8 Meteorological Ocean Data

8.1 Wind Distribution

117. Wind direction data was recorded from a location 1.7 nm south of the Bellrock WFDA (at 56°45'0"N, 000°0'0"E), 10m above MSL. Based on this wind direction data provided by the Applicant, the distribution of wind direction data within each 30-degree interval is presented in **Figure 8.1**, in the form of a wind rose. This data has been validated against metocean data collected at 12m above MSL within the Bellrock WFDA (EOLOS, 2025).

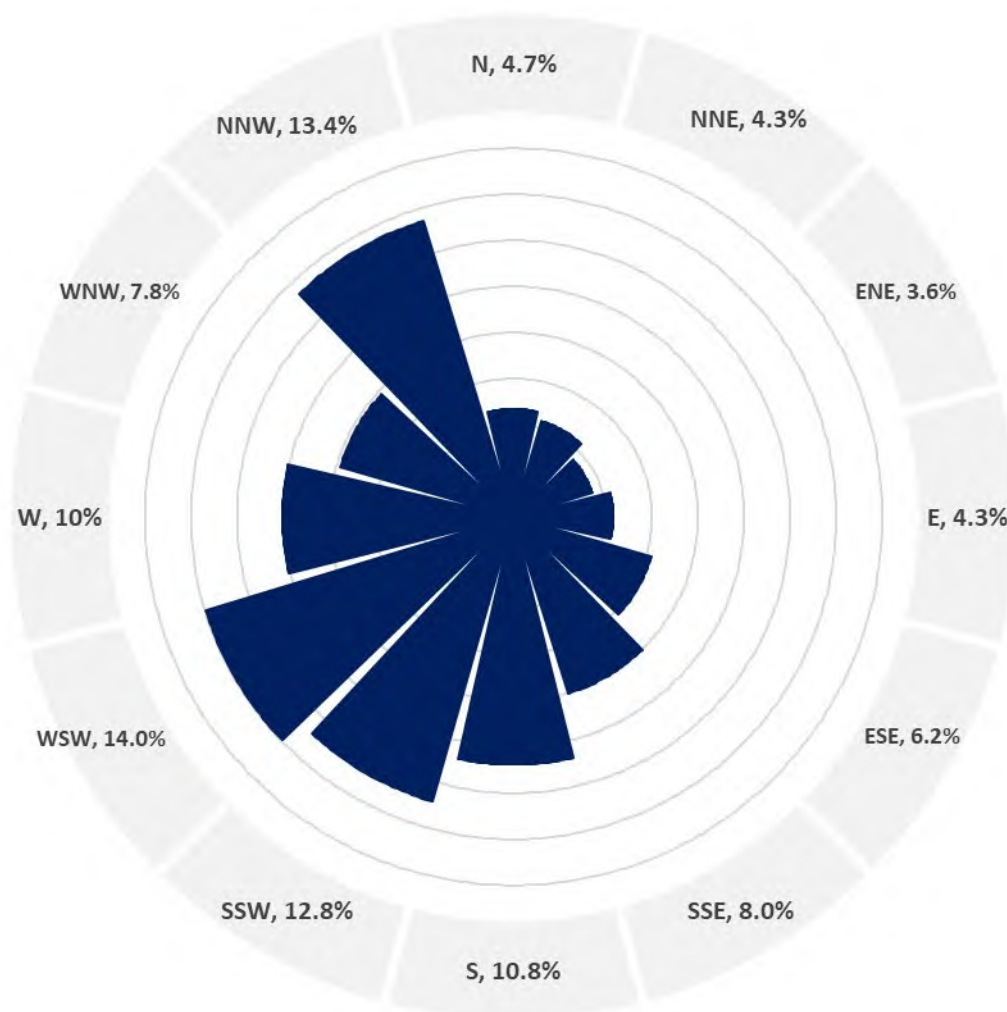


Figure 8.1 Wind Direction Distribution within the Bellrock Wind Farm Development Area

118. Winds are predominantly from the west-south-west (14%) and north-north-west (13.8%).

8.2 Significant Wave Height

119. Significant wave height data was recorded from the same location as the wind distribution data, 1.7 nm south of the Bellrock WFDA. **Table 8.1** presents the proportion of the significant wave height within each of three defined ranges which are categorised as calm, moderate and severe sea states. This data has been validated against metocean data collected within the Bellrock WFDA (EOLOS, 2025).

Table 8.1 Sea State Distribution in Proximity to Bellrock Wind Farm Development Area

Significant Wave Height (m)	Sea State	Proportion (%)
Less than 1	Calm	23
1 to 5	Moderate	76
More than or equal to 5	Severe	1

8.3 Visibility

120. The annual average incidence of poor visibility for the central North Sea (defined as the proportion of a year where the visibility can be expected to be less than 1 kilometre (km)) is 2%. This is based upon information available within Admiralty Sailing Directions North Sea (West) NP54 Pilot (UKHO, 2021).

8.4 Tidal Speed and Direction

121. **Table 8.2** presents the peak flood and ebb direction and speed values obtained from UKHO Admiralty Charts local to the Bellrock WFDA.

Table 8.2 Peak Flood and Ebb Speed and Direction Data

UKHO Admiralty Chart	Tidal Diamond	Flood		Ebb	
		Direction (°)	Speed (knots (kts))	Direction (°)	Speed (kts)
273	A	16	0.7	118	0.7
273	B	21	0.6	205	0.7
278	E	12	0.7	118	0.7

122. Based upon the available data, no impacts are expected at high water that would not also be expected at low water, and vice versa. The Bellrock Wind Farm Infrastructure and OfSSs in the Bellrock WFDA is not expected to have any additional impact on the existing tidal streams in relation to their effect on existing shipping and navigation users.

9 Emergency Response and Incident Overview

123. 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 Bellrock WFDA.

9.1 Search and Rescue Helicopters

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

125. The SAR helicopter service is currently operated out of ten base locations around the UK, with the closest to the Bellrock WFDA being Inverness, located approximately 133 nm to the northwest of the Bellrock WFDA. This base operates two Leonardo Agusta Westland 189 helicopters.

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

127. The locations of SAR helicopter taskings within the study area are presented in **Figure 9.1**, colour-coded by tasking type.

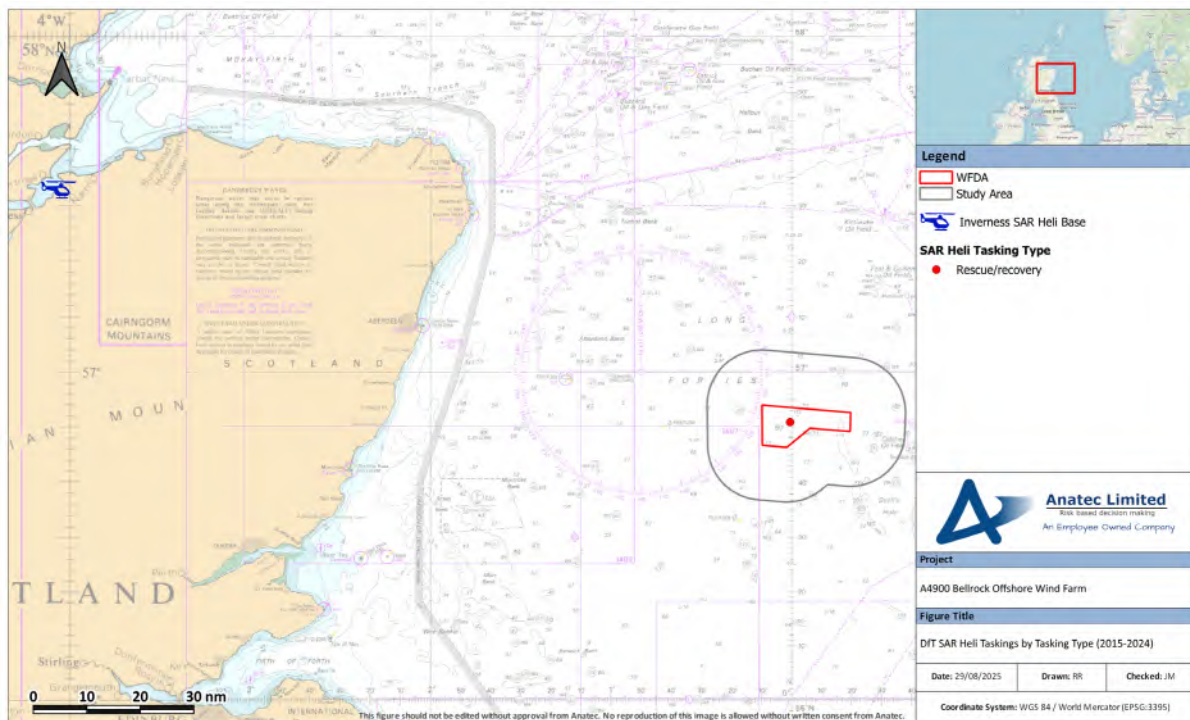


Figure 9.1 SAR Heli Tasking Data Within the Study Area by Tasking Type (2015-2024)

128. Only one helicopter tasking was recorded within the study area across the 9-year period, and was also recorded within the Bellrock WFDA itself. This tasking was a 'rescue/recovery' and was responded to by the Inverness base.

9.2 Royal National Lifeboat Institution

129. The RNLI is organised into six divisions, with the relevant region for the Bellrock WFDA being the 'Scotland' division. Based out of more than 230 stations throughout the UK, there are over 400 active lifeboats across the RNLI fleet, including both all-weather lifeboats (ALB) and inshore lifeboats (ILB). There are a number of RNLI stations in proximity to the Bellrock WFDA, as illustrated in **Figure 9.2**.
130. The closest RNLI station to the Bellrock WFDA is at Peterhead (64 nm northwest of the Bellrock WFDA), where an ALB is in use. The Aberdeen and Stonehaven RNLI stations are also within 70 nm of the Bellrock WFDA, both to the west of the Bellrock WFDA. The Aberdeen station again utilises an ALB as well as an ILB, while Stonehaven RNLI station utilises two ILBs.
131. Given that the RNLI have an operational limit of 100 nm, it is anticipated that an incident occurring in proximity to the Bellrock WFDA may result in a response from an RNLI asset.
132. A 10-year dataset of RNLI incidents, recorded between 2014 and 2023, was analysed to identify any incidents that occurred within the study area. Two incidents within the RNLI dataset were located within the study area; however, these incidents were responded to by RNLI stations on the west coast of Scotland and, upon further investigation, it has been verified that these incidents did not take place within the study area (i.e. they have been recorded in error). Thus, throughout the 10 year-period, no valid incidents were recorded within the study area.
133. A review of older data, spanning 2008 to 2013 was also undertaken; again, no incidents were recorded within the study area over this timeframe.

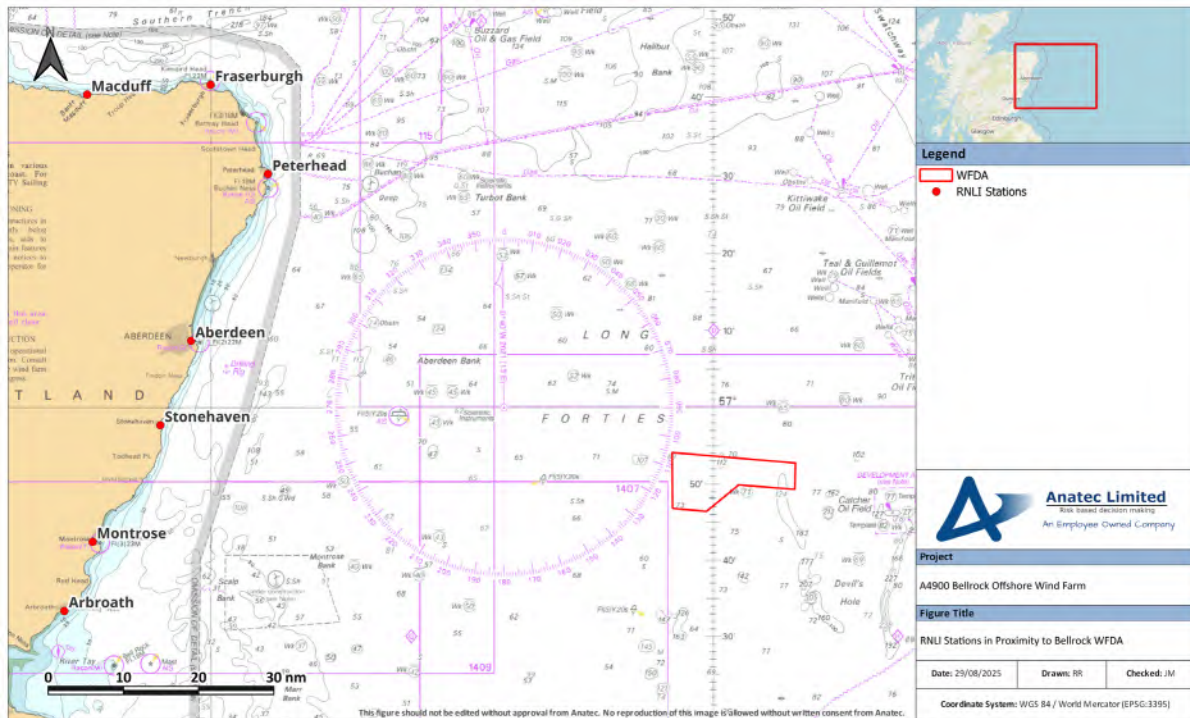


Figure 9.2 Royal National Lifeboat Institution Stations in Proximity to the Bellrock Wind Farm Development Area

9.3 Global Maritime Distress and Safety System

134. The Global Maritime Distress and Safety System (GMDSS) is a maritime communications system used for emergency and distress messages, vessel to vessel routing 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.
135. There are four GMDSS sea areas and vessels in proximity to the Bellrock WFDA, located approximately 63 nm offshore, will likely be located within an A2 sea area, as shown in **Figure 9.3** (MCA, 2021). Therefore, in the event of an emergency involving a vessel located further offshore within sea area A1 or A2, vessels are able to contact coastal stations using High Frequency (HF) or Medium Frequency (MF) radio or otherwise contact other offshore resources.

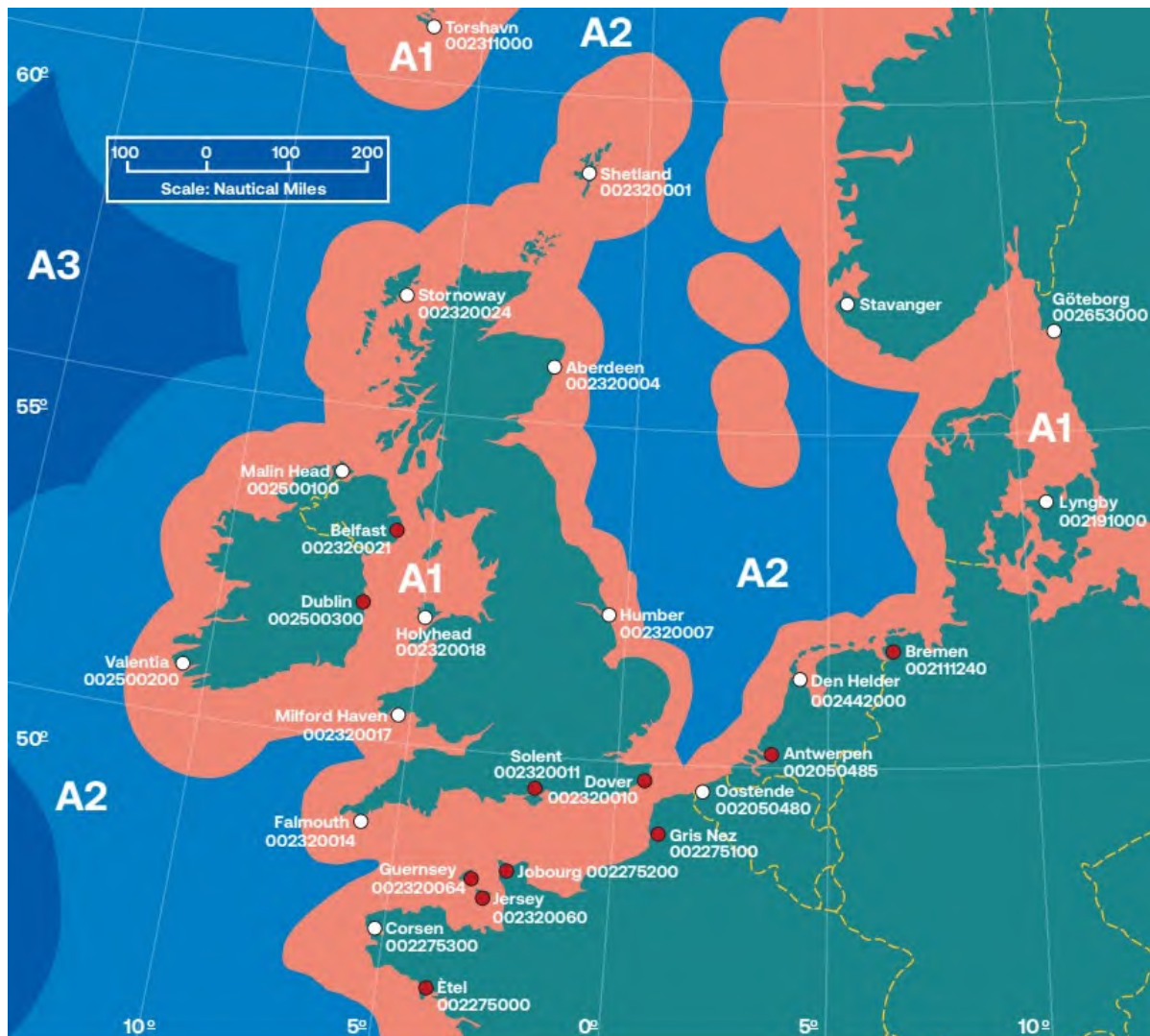


Figure 9.3 Global Maritime Distress and Safety System Sea Areas

9.4 Marine Accident Investigation Branch

136. All UK flagged vessels and non-UK flagged vessels in UK territorial waters (12 nm), in 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. No incidents were recorded within the study area during the ten-year period between 2014 and 2023.
137. A review of older MAIB incident data from 2004 to 2013 recorded two unique incidents within the study area. These incidents involved fishing vessels with one incident involving two fishing vessels in a potential hazardous incident when vessels got into a close quarter situation, but no contact was made. The other incident

occurred within the Bellrock WFDA and was an accident to person onboard a fishing trawler.

9.5 Historical Offshore Wind Farm Incidents

9.5.1 Incidents Involving United Kingdom Offshore Wind Farm Developments

138. As of December 2025, there are 44 operational OWFs in the UK, ranging from the first, North Hoyle OWF (fully commissioned in 2003) to the latest, Seagreen OWF (fully commissioned in March 2025). Between them, these developments encompass approximately 28,269 fully constructed years for structures.
139. MAIB incident data has been used to collate a list of reported historical collision and allision incidents involving UK OWF developments⁶, which is summarised in **Table 9.1**. Other sources have also been used to produce this list including the UK Confidential Human Factors Incident Reporting Programme (CHIRP) for Aviation and Maritime, International Marine Contractors Association (IMCA) and basic web searches.

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 ¹	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

⁶ Includes only incidents reported to an accident investigation branch or an anonymous reporting service.

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage ¹	Harm to Persons	Source
Project	Allision	18 November 2011	Cable-laying vessel allision with WTG foundation following watchkeeping failure. Two hull breaches to vessel.	Major	None	MAIB
Project/ project	Collision	2 June 2012	Crew Transfer Vessel (CTV) collision with flotel. Nine persons safely evacuated and transferred to nearby vessel before being brought back into port.	Moderate	None	UK CHIRP
Project	Allision	20 October 2012	Project vessel allision with WTG monopile following human error (misjudgement of distance). Minor damage sustained by vessel.	Minor	None	MAIB
Project	Allision	21 November 2012	Passenger transfer catamaran allision with buoy following navigational error. Vessel abandoned by crew of 12 having been holed, causing extensive flooding but no injuries sustained.	Major	None	MAIB
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)

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Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage ¹	Harm to Persons	Source
Project	Allision	14 February 2019	Survey vessel allision 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 WTG. Minor damage to vessel and WTG sustained, with no personal injuries.	Minor	None	Marine Safety Forum
Project	Allision	February 2021	The deckhand engineer fell asleep whilst supposed to be on watch, resulting in a CTV making contact with a WTG at low speed.	None	None	MAIB
Project	Allision	12 April 2021	An allision occurred with a WTG resulting in a passenger suffering a chest injury and was attended to by paramedics upon the vessel's return to port.	None	Injury	MAIB
Project	Allision	May 2021	A CTV was drifting towards the WTG it was tied off to. The Master started the engines but was with insufficient time to avoid contact. Upon returning to port the vessel began listing due to substantial water ingress.	Moderate	None	MAIB
Third-party	Allision	9 June 2022	Fishing vessel allision with WTG resulting in damage to vessel and two minor injuries for crew members. RNLI lifeboat escorted vessel under its own power to port.	Minor	Injury	Web search (RNLI, 2022)
Project	Allision	October 2022	A project vessel allision with the boat landing for a WTG causing a deformation to the port side midship area.	Minor	None	MAIB

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage ¹	Harm to Persons	Source
Project	Allision	November 2022	A high speed craft allision with a WTG whilst the vessel propulsion was in neutral resulting in damage to the starboard jet platform and bucket.	Minor	None	MAIB
Project	Allision	April 2023	A supply vessel was drifting after deploying personnel to WTGs. The Master was reportedly distracted and failed to notice that the vessel was closing on a WTG. An allision occurred at 5 knots resulting in one crew member falling and suffering a rib fracture. No damage was caused to the vessel or the WTG and there was no pollution.	None	Injury	MAIB
Project	Allision	November 2023	A trainee on a CTV misjudged the wind and current causing the vessel to drift sideways and make contact with a WTG resulting in a broken window but no reported injuries.	Minor	None	MAIB
Third-party	Allision	January 2024	A stern trawler was navigating through an OWF when it collided with one of the WTGs. Cosmetic damage to the vessel was reported and it was able to make its own way back to port. No injuries were reported.	Minor	None	MAIB
Third-party	Allision	April 2024	Whilst undertaking fishing operations a crew member made a navigational error resulting in turning towards an OWF, and subsequently an allision occurred. Minor damage to the bow and paint marks were sustained, with the vessel able to maintain their fishing operations and land their catch in a port. No injuries were reported.	Minor	None	MAIB

Incident Vessel	Incident Type	Date	Description of Incident	Vessel Damage ¹	Harm to Persons	Source
Project	Allision	19 September 2024	An SOV allided with a WTG causing damage to the starboard side above the waterline and the helideck.	Minor	None	Web search (Maritime Executive, 2024)
Notes: ¹ As per incident reports.						

140. As of December 2025, there have been no third-party collisions directly as a result of the presence of an OWF in the UK. The only reported third-party collision incident in relation to a UK OWF involved a project vessel hitting a third-party vessel whilst in harbour.
141. As of December 2025, there have been 23 reported cases of an allision between a vessel and a WTG (under construction, operational or disused) in the UK, with all but four involving a support vessel for the development and the errant vessel in each case under power rather than drifting. Therefore, there has been an average of 1,229 years per structure allision incident in the UK, noting that this is a conservative calculation given that only fully constructed structure hours have been included (whereas allision incidents counted include under-construction structures).
142. On an individual development basis, there has been an average of 0.024 allision incidents per operational OWF year, noting this is an average across the 22-year period since the first UK OWF became operational.
143. The presence of OWFs and associated activities does increase the likelihood of an incident occurring. This includes the Bellrock WFDA given that it will represent new infrastructure and activities. The analysis above incorporates only collision and allision incidents since these are more likely to result in notable consequences and thus are more comprehensively reported and are also of primary interest to the NRA. The worst consequences reported for vessels involved in a collision or allision incident involving a UK OWF development has been flooding, with no life-threatening injuries to persons reported.
144. Other types of incidents (such as medical incidents) may also require emergency response and therefore the rates reported above should not be considered comprehensive for all emergency response incidents. An accident to person requiring medical attention (which may include emergency response) is considered the most likely type of incident that may occur at an OWF.

9.5.2 Incidents Involving Non-United Kingdom Offshore Wind Farms

145. There have also been collision and allision incidents involving non-UK OWF developments. However, it is not possible to maintain a comprehensive list of such incidents and the associated operational hours.
146. One high profile non-UK incident of relevance involved a bulk carrier in January 2022 which broke its anchor chain during a storm in Dutch waters and collided with a nearby anchored vessel. The vessel began to take on water, leading to all crew members being evacuated by helicopter. The vessel then continued to drift towards shore including through an under construction OWF where it allided with a WTG foundation and a platform foundation before being taken under tow (Marine Safety Investigation Unit, 2024).
147. Additionally, during April 2023, a general cargo vessel allided with a WTG within the Godewind 1 OWF in the German North Sea, resulting in tearing of the starboard side of the bow leading to water ingress. The vessel made its own way to port. The WTG suffered minor damage. A report was published for this incident by the Bundesstelle für Seeunfalluntersuchung (BSU) in January 2025 (BSU, 2025).

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

148. Although the presence of OWFs and associated activities does increase the likelihood of an incident requiring emergency response it is also acknowledged that the presence of project vessels can aid with emergency response efforts, particularly for OWFs located further offshore (such as the Bellrock WFDA) where a project vessel is more likely to be able to serve as the first responder to an incident.
149. From news reports, web searches and experience working with existing OWF developments, a list has been collated of historical incidents responded to by vessels associated with UK OWF developments, which is summarised in **Table 9.2**. The initial cause of these incidents is not related to the OWF in question.

Table 9.2 Historical Incidents Responded to by Vessels Associated with Non-United Kingdom Offshore Wind Farms Developments

Incident Type	Date	Related Development	Description of Incident	Source
Capsize	21 June 2018	Walney	HM Coastguard issued mayday relay broadcast following a trimaran capsized. Support vessel for Walney OWF arrived and recovered two persons from the water who were then winched onboard a Coastguard helicopter.	Web search (4C Offshore, 2018)
Capsize	5 November 2018	Race Bank	Fishing vessel capsized resulting in two persons in the water. Vessel operating at the nearby Race Bank OWF were reported to have assisted with	Web search (British Broadcasting

Incident Type	Date	Related Development	Description of Incident	Source
			the rescue which also involved a Belgian military helicopter and the RNLI.	Corporation (BBC), 2018)
Vessel in distress	15 May 2019	London Array	Yacht in difficult sought shelter by tying up to a WTG but suffered damage and a person in the water. Support vessel for London Array OWF identified and secured the casualty vessel and recovered the person in the water. The support vessel raised the alarm to the Coastguard. The Coastguard later instructed the support vessel to return to port and seek medical assistance for the casualty vessel's occupant.	Web search (The Isle of Thanet News, 2019)
Drifting	7 July 2019	Gwynt y Môr	Speedboat suffered mechanical failure stranding four persons. Support vessel for Gwynt y Môr OWF responded to an 'all-ships' broadcast from the Coastguard and prevented the casualty vessel drifting into the Gwynt y Môr OWF. The support vessel later towed the casualty vessel back towards port.	Web search (Renews, 2019)
Machinery failure	28 September 2019	Race Bank	Fishing vessel suffered mechanical failure and launched flares. Guard vessel and SOV for Race Bank OWF both immediately offered assistance until the MCA's arrival on-scene.	Internal daily progress report received by Anatec
Vessel in distress	13 December 2019	Race Bank	Passing vessel got into difficulty and guard vessel for Race Bank OWF 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	Coastguard contacted guard vessel for Walney OWF reporting red flare sighting at the OWF. Guard vessel proceeded to undertake search but did not find anything to report.	Internal daily progress report received by Anatec
Aircraft crash	15 June 2020	Hornsea Project One	United States jet crashed into sea during a routine flight. CTVs and SOVs for Hornsea Project One OWF joined the search for the missing pilot.	Web search (4C Offshore, 2020)
Fire/explosion	15 December 2020	Dudgeon	Fishing vessel experienced explosions on board with crew injured. SOV for Dudgeon OWF deployed its Fast Rescue Boat and evacuated the casualty vessel.	Web search (Offshore WIND, 2020)
Person in danger	10 July 2021	Unknown (East Irish Sea)	Two swimmers were in difficulty against a rising tide near to Talacre beach. An RNLI lifeboat was launched but a commercial OWF vessel recovered the swimmers from the water. They were then transferred to the lifeboat.	Web search (RNLI, 2021)

Incident Type	Date	Related Development	Description of Incident	Source
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 OWF was able to retrieve the children.	Web search (Edinburgh Evening News, 2021)
Vessel in distress	01 September 2022	Rampion	A recreational motorboat experienced power failure and anchored near Rampion OWF. The anchor could then not be recovered and Coastguard assistance was requested. A CTV for Rampion OWF responded and towed the vessel back to port.	MAIB
Machinery failure	01 December 2022	Unknown	A survey vessel suffered an engine failure and was towed back to port by a OWF RIB.	MAIB
Person in danger	12 July 2024	Stromar	A deckhand on a fishing vessel became entangled in a creel rope and was pulled overboard. The vessel's crew alerted HM Coastguard and manoeuvred to attempt a rescue. The deckhand was recovered on board and attempts to revive were supported by a paramedic from a HM Coastguard helicopter, an RNLI lifeboat and crew from a nearby survey vessel for the proposed Stromar OWF.	Web search (BBC, 2024)

150. The presence of OWFs creates new emergency response resources which can be mobilised to attend a third-party incident in liaison with HM Coastguard. This will include the Bellrock WFDA, with project vessel compliance with international marine regulations including the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974) and pollution planning included as embedded mitigation measures (see **Section 21**). Additionally, an ERCoP will be completed post-consent in consultation with the MCA.

10 Vessel Traffic Movements

10.1 Overview of Vessel Traffic

151. This section presents an overview of vessel traffic movements within the study area, primarily based upon the findings of the summer vessel traffic survey undertaken in August 2024 and the winter AIS data collected from December 2024 (**Section 5.2**).
152. A plot of the vessel tracks recorded during the 2024 14-day summer survey period within the study area, colour-coded by vessel type and excluding temporary traffic, is presented in **Figure 10.1**. Following this, **Figure 10.2** presents the same data converted to a density heat map.

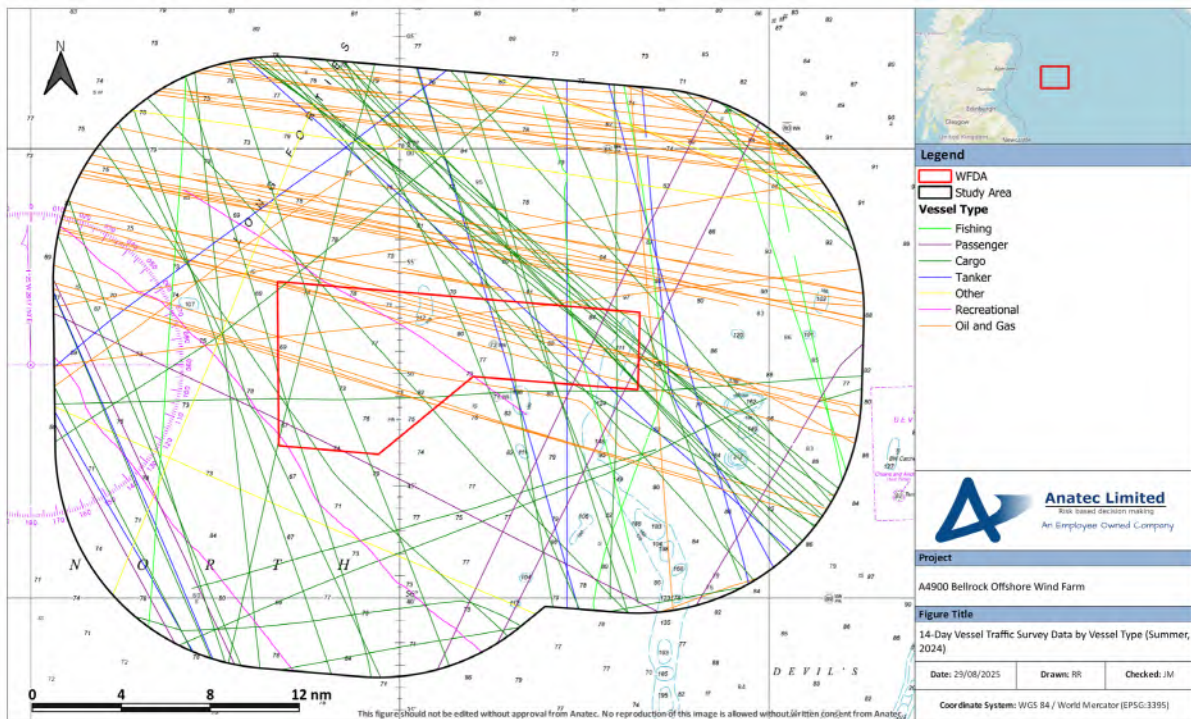


Figure 10.1 14-Day Vessel Traffic Survey Data by Vessel Type (Summer, 2024)

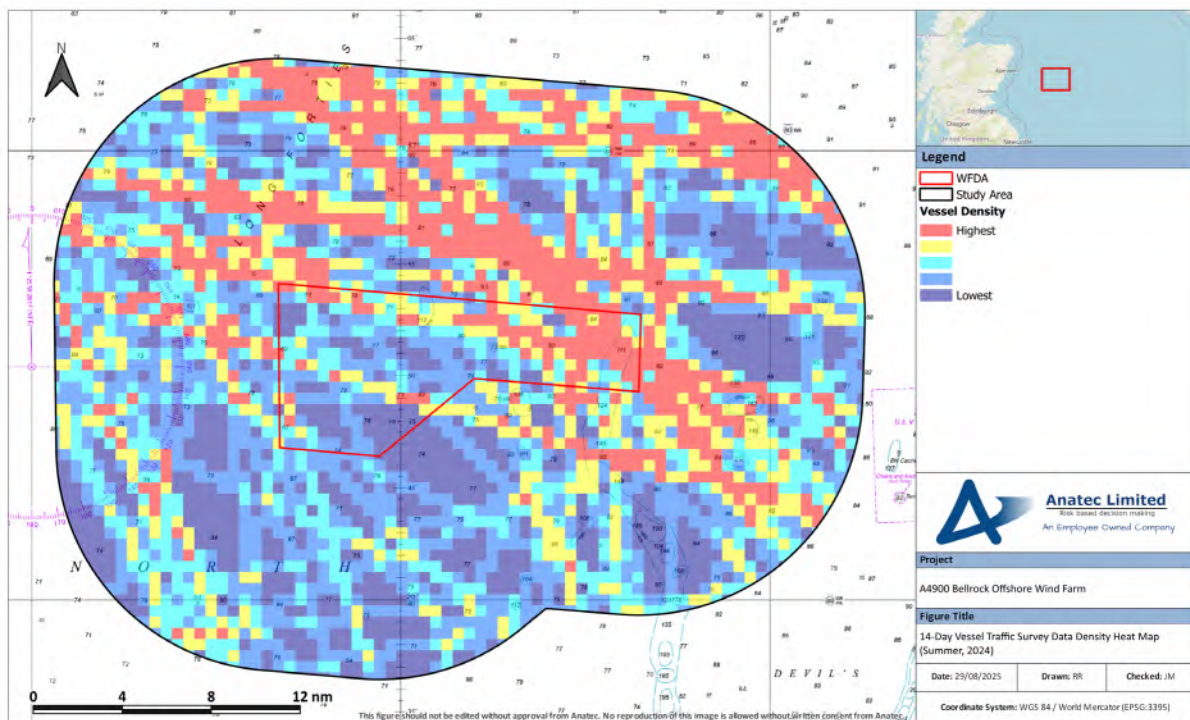


Figure 10.2 14-Day Vessel Traffic Survey Data Density Heat Map (Summer, 2024)

153. A plot of the vessel tracks recorded during the 2024 14-day winter data period within the study area, colour-coded by vessel type and excluding temporary traffic, is presented in **Figure 10.3**. Following this, **Figure 10.4** presents the same data converted to a density heat map. The same vessel density ranges have been used for the winter data as were used in the summer survey data to allow for a direct comparison.

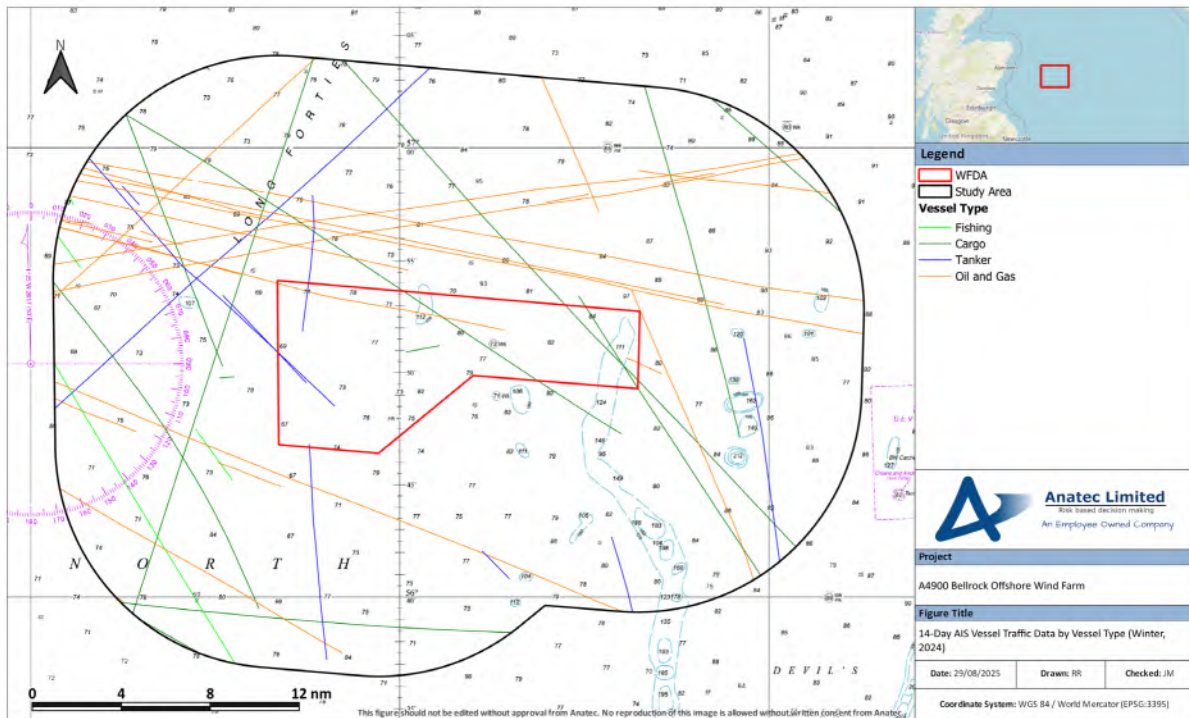


Figure 10.3 14-Day Automatic Identification System Vessel Traffic Data by Vessel Type (Winter, 2024)

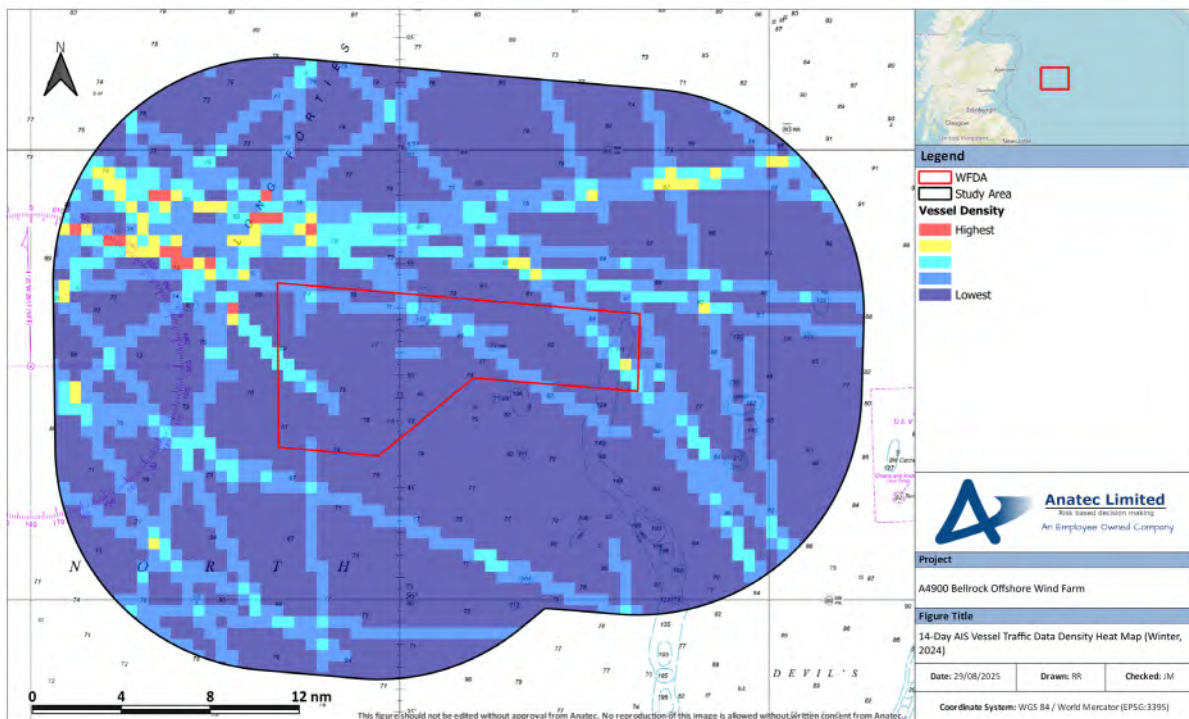


Figure 10.4 14-Day Automatic Identification System Vessel Traffic Data Density Heat Map (Winter, 2024)

10.2 Vessel Counts

154. **Figure 10.5** illustrates the daily number of unique vessels recorded within the study area as well as intersecting the Bellrock WFDA during the 2024 summer survey period. It is noted that partial survey days are represented by hatched colouring and have been taken into consideration where relevant during the analysis.

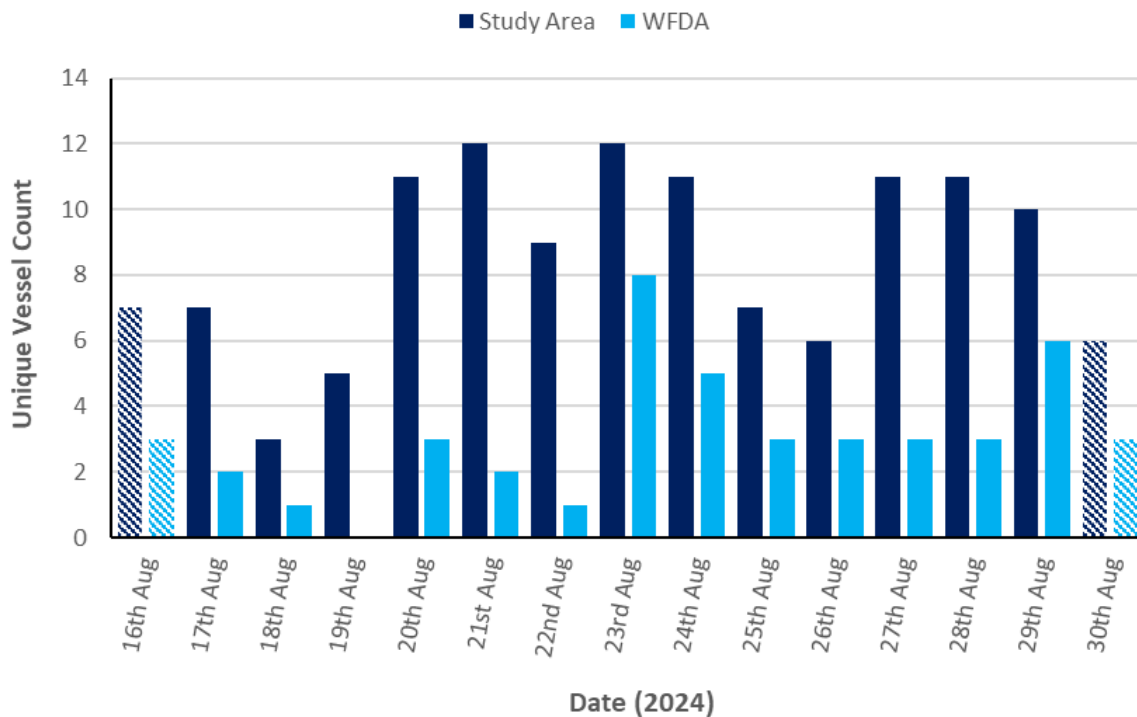


Figure 10.5 Daily Unique Vessel Counts (Summer, 2024)

155. Over the 14-day summer survey period, there was an average of nine unique vessels per day recorded within the study area. An average of three unique vessels per day were recorded intersecting the Bellrock WFDA, or 36% of all vessel traffic recorded during the summer survey period.

156. The busiest full days recorded within the study area throughout the summer survey period was 21 and 23 August 2024, when 12 unique vessels were recorded each day. The busiest full day recorded during the summer survey period within the Bellrock WFDA was also 23 August 2024, when eight unique vessels were recorded intersecting the Bellrock WFDA.

157. The quietest full day recorded within the study area throughout the summer survey period was 18 August 2024, when three unique vessels were recorded. The quietest full day recorded during the summer survey period within the Bellrock WFDA was 19 August 2024, when no vessels were recorded intersecting the Bellrock WFDA.

158. **Figure 10.6** illustrates the daily number of unique vessels recorded within the study area as well as intersecting the WFDA during the 2024 winter data period.

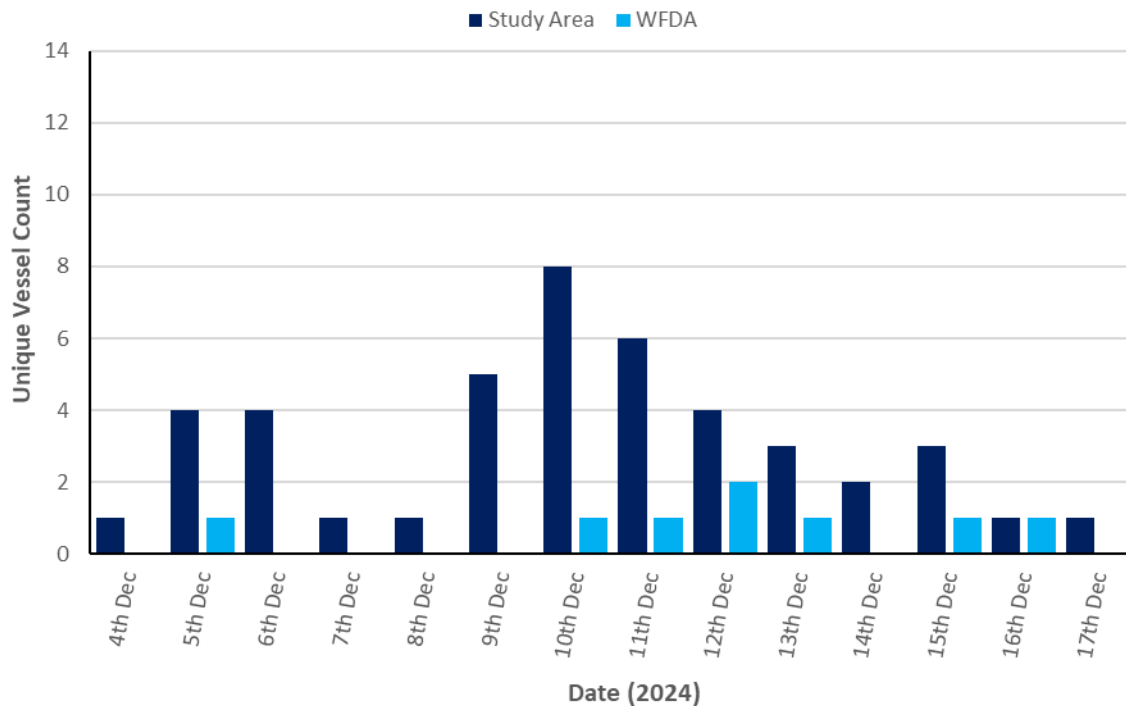


Figure 10.6 Daily Unique Vessel Counts (Winter, 2024)

159. Over the 14-day winter data period, there was an average of three unique vessels per day recorded within the study area. An average of one unique vessels every two days was recorded intersecting the Bellrock WFDA, or 18% of all vessel traffic recorded during the winter survey period.

160. The busiest full day recorded within the study area throughout the winter data period was 10 December 2024, when eight unique vessels were recorded. The busiest full day recorded during the winter data period within the Bellrock WFDA was 12 December 2024, when two unique vessels were recorded intersecting the Bellrock WFDA.

161. The quietest full days recorded within the study area throughout the winter data period were five separate days, when one unique vessel was recorded. The quietest full days recorded during the winter data period within the Bellrock WFDA were seven separate days, when no vessels were recorded intersecting the Bellrock WFDA.

10.3 Vessel Type

162. The percentage distribution of the main vessel types recorded passing within the study area as well as intersecting the Bellrock WFDA during the 2024 summer survey

period is presented in **Figure 10.7**. The same distribution for the 2024 winter survey data is presented in **Figure 10.8**.

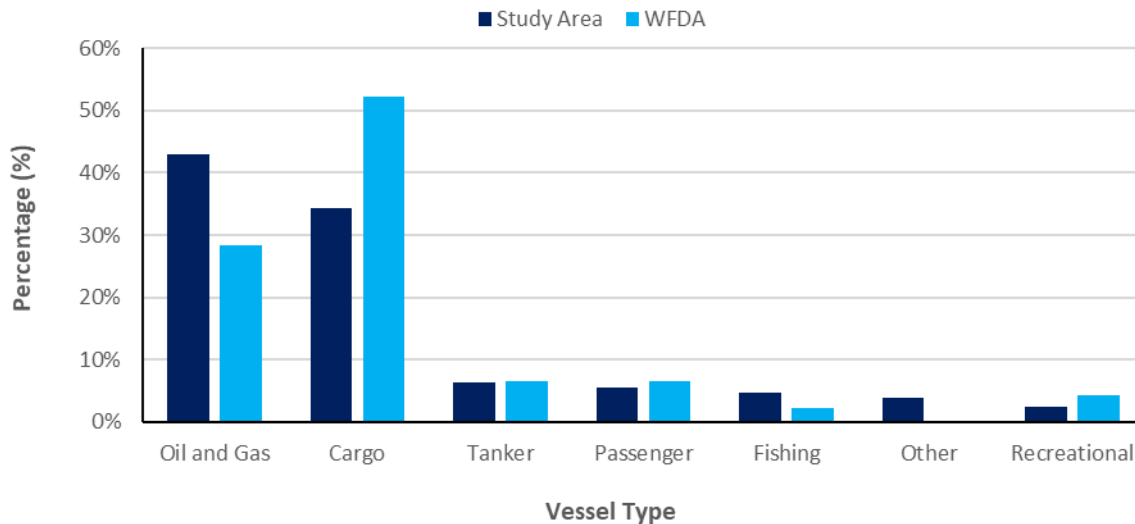


Figure 10.7 Vessel Type Distribution within Study Area and Bellrock Wind Farm Development Area (WFDA) (Summer 2024)

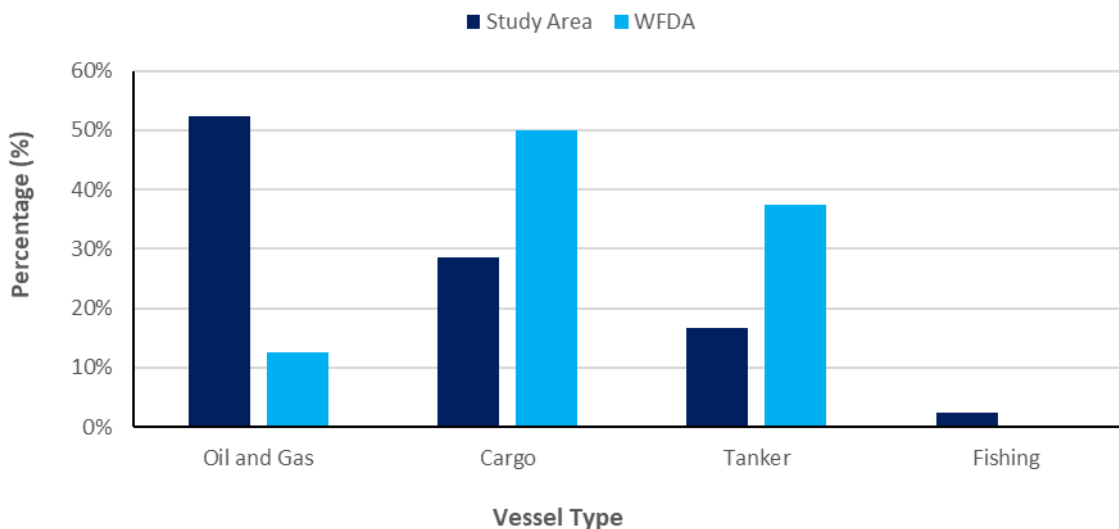


Figure 10.8 Vessel Type Distribution within Study Area and Bellrock Wind Farm Development Area (WFDA) (Winter 2024)

163. Throughout the summer survey period, the main vessel type recorded within the study area was oil and gas vessels which accounted for 43% of all vessels recorded with cargo vessels (34%) also commonly recorded. Tankers (6%) and passenger vessels (6%) were the only other vessel types recorded greater than 5% of all vessels.

Of vessels intersecting the Bellrock WFDA, cargo vessels were the greatest recorded with 52% of all intersecting vessels.

164. Throughout the winter data period, the main vessel type recorded within the study area was oil and gas vessels which accounted for 52% of all vessels recorded with cargo vessels (29%) also commonly recorded. Tankers (17%) and fishing vessels (2%) were the only other vessel types recorded during the winter data period. Of vessels intersecting the Bellrock WFDA, cargo vessels (50%) and tankers (38%) were the main vessel types intersecting.
165. It is noted that no recreational vessels or passenger vessels were recorded during the winter survey period within the study area. This is to be expected given the distance offshore and less favourable weather conditions in winter.
166. The following subsections consider each of the main vessel types recorded individually, over the combined (summer and winter 2024) data periods.

10.3.1 Oil and Gas Vessels

167. Oil and gas vessels recorded during the combined data periods are presented in **Figure 10.9**.

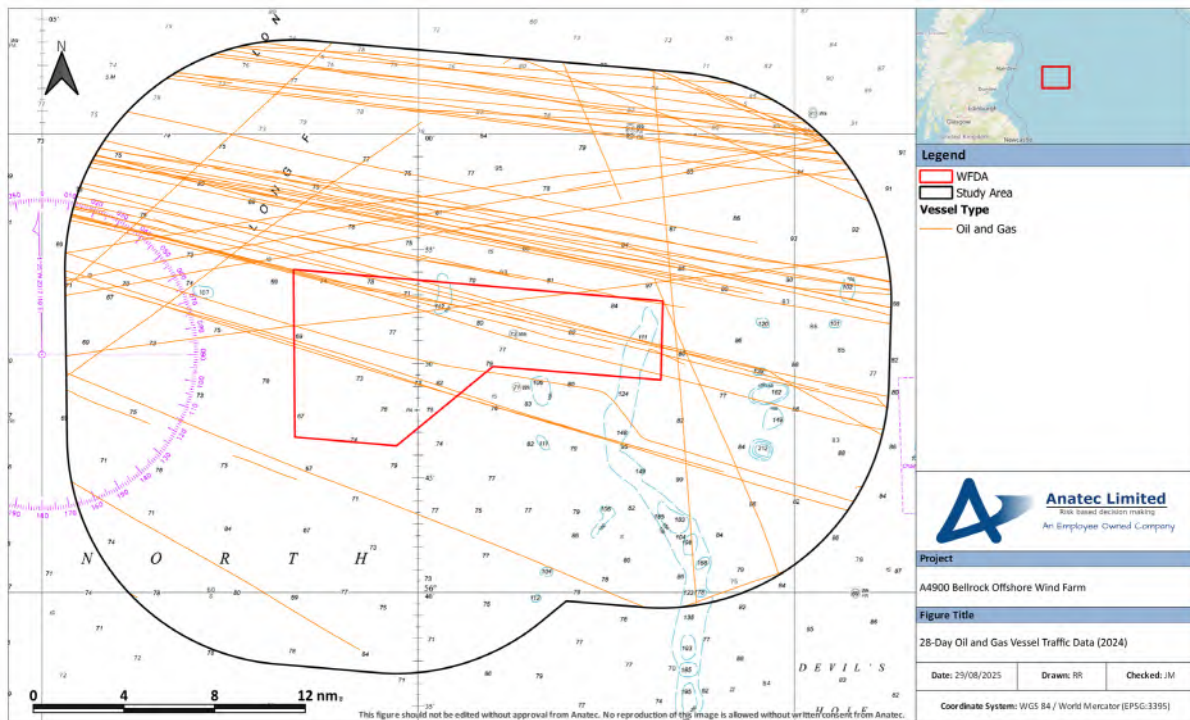


Figure 10.9 28-Day Oil and Gas Vessel Traffic Data (2024)

168. An average of three oil and gas vessels were recorded per day during the combined data periods. Oil and gas vessel volumes were greater in the 2024 summer survey period with an average of four vessels per day when compared to the 2024 winter data period which recorded one to two vessels per day. An average of one unique oil and gas vessel intersected the Bellrock WFDA every two days, or 18% of all oil and gas vessels recorded within the study area.
169. The majority of oil and gas vessels were routing north-west south-east to/from ports on the Scottish east coast; primarily Aberdeen (UK), with Peterhead (UK) and Montrose (UK) also recorded, and to oil and gas fields in the North Sea to the east of the Bellrock WFDA, notably the Catcher and Judy fields. Oil and gas vessels were mostly recorded in the northern portion of the study area with several routes intersecting the Bellrock WFDA. Routing of oil and gas vessels are detailed further in **Section 11.2**.

10.3.2 Cargo Vessels

170. Cargo vessels recorded during the combined data periods are presented in **Figure 10.10**.

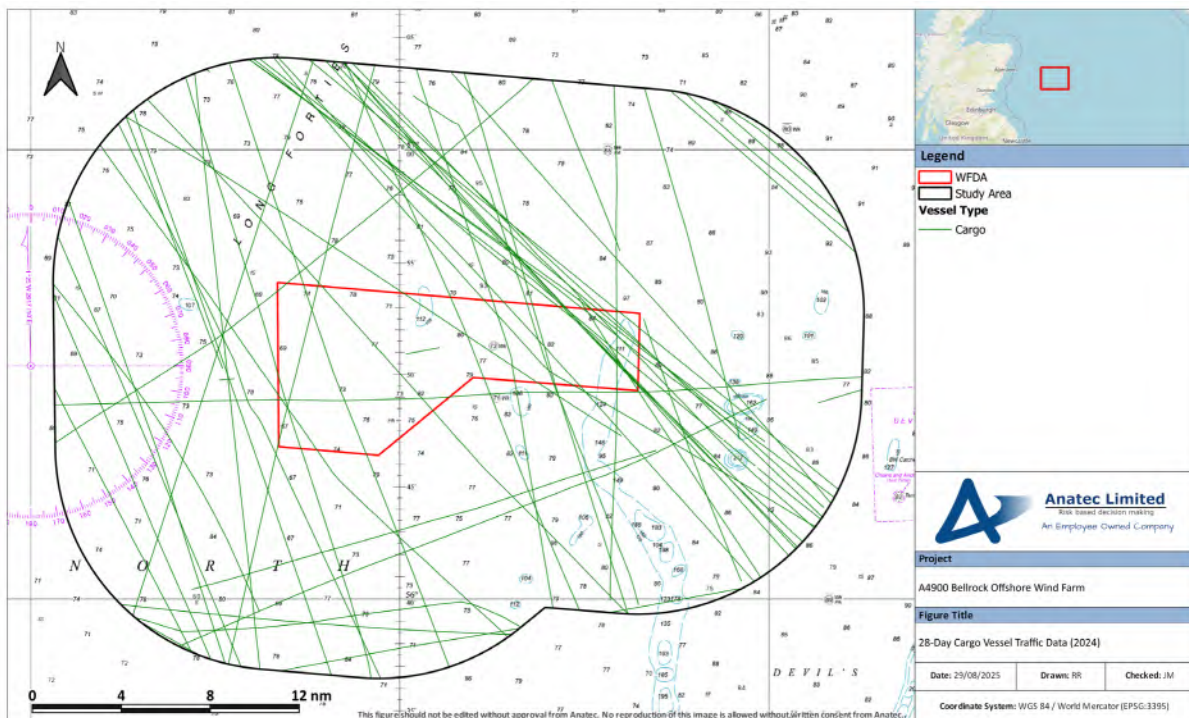


Figure 10.10 28-Day Cargo Vessel Traffic Data (2024)

171. An average of two cargo vessels were recorded per day during the combined data periods. Cargo vessel volumes were greater in the 2024 summer survey period with an average of three vessels per day when compared to the 2024 winter data period which recorded one vessel per day. An average of one unique cargo vessel intersected the Bellrock WFDA per day, or 50% of all cargo vessels recorded within the study area.
172. The main cargo sub-types recorded across the combined data periods include bulk carriers (34%), part containerised (27%), general cargo (16%), and container cargo (14%). It is noted that no roll-on/roll-off cargo (RoRo) vessels were recorded across either data period.
173. The majority of cargo vessels were routing north-west/south-east through the study area with a well-defined route intersecting the east of the Bellrock WFDA. This route comprised of multiple vessels routing between mainland Europe and the United States and Canada. Details on main commercial routes are outlined in **Section 11.2**.

10.3.3 Tankers

174. Tankers recorded during the combined data periods are presented in **Figure 10.11**.

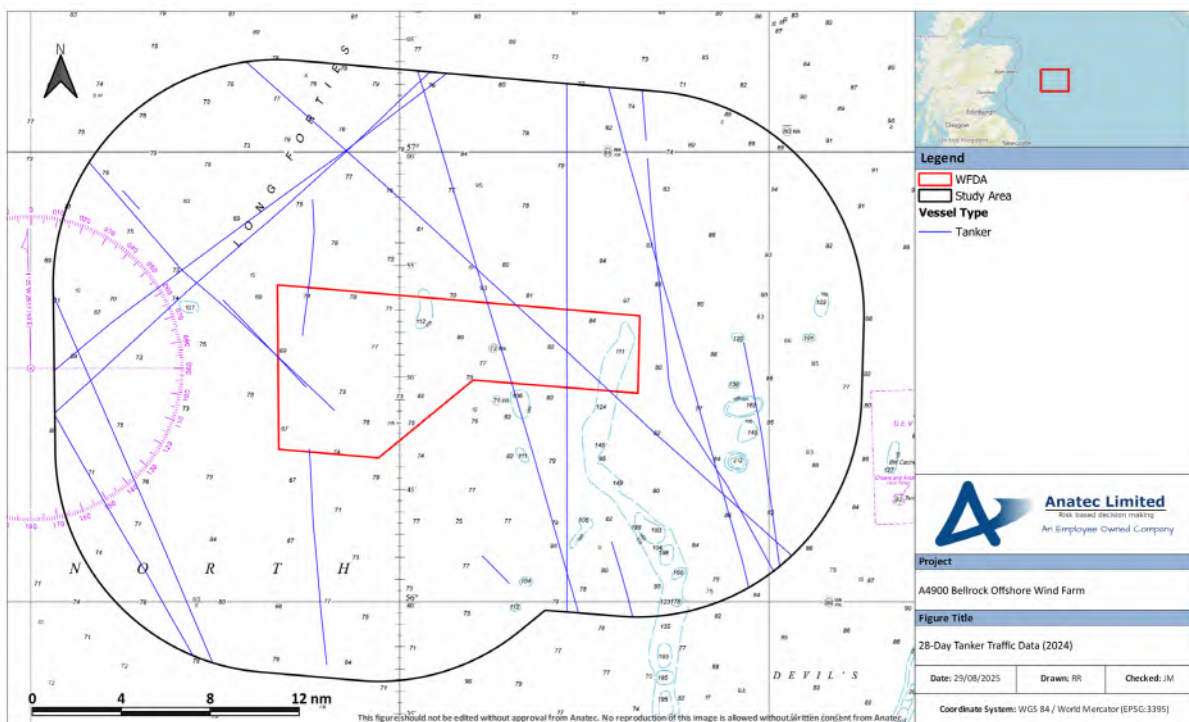


Figure 10.11 28-Day Tanker Traffic Data (2024)

- 175. An average of one tanker was recorded every two days during the combined data periods. There was no seasonality in tanker activity with the same vessel counts recorded across both data periods. An average of one unique tanker intersected the Bellrock WFDA every five days, or 40% of all tankers recorded within the study area.
- 176. The tanker sub-types recorded were and crude oil tankers (60%), combined oil/chemical tankers (27%) and product tankers (13%).
- 177. The majority of tankers were routeing north-west south-east through the study area with no well-defined routes.

10.3.4 Passenger Vessels

- 178. Passenger vessels recorded during the combined data periods are presented in **Figure 10.12**.

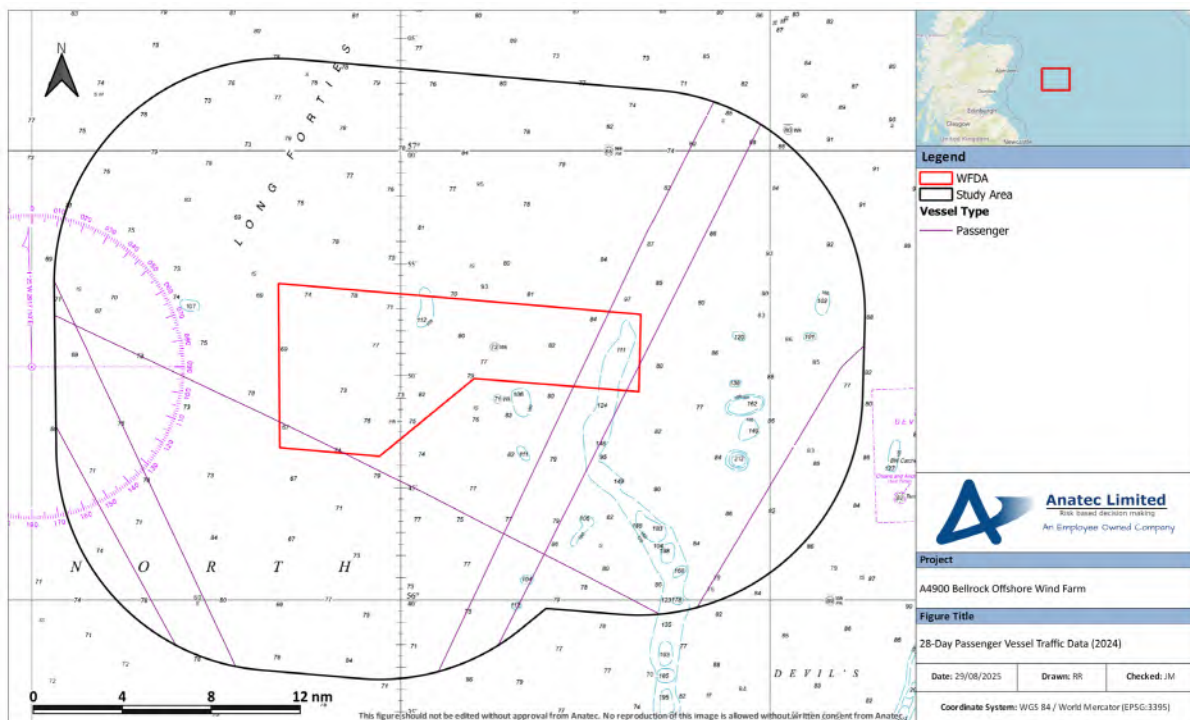


Figure 10.12 28-Day Passenger Vessel Traffic Data (2024)

- 179. An average of one passenger vessel was recorded every three to four days during the combined data periods. However, passenger vessels were only recorded within the summer survey period, at one vessel every two days. An average of one unique passenger vessel intersected the Bellrock WFDA every four to five days, or 50% of all passenger vessel recorded within the study area during the summer survey period.
- 180. All passenger vessels recorded during the summer survey period were cruise liners. No roll-on/roll-off passenger (RoPax) vessels were recorded. Those cruise liners

intersecting the Bellrock WFDA were routing between Tyne (UK) and Olden (Norway) (Fred Olsen Cruise) to the east of the Bellrock WFDA and to Denmark at the south-west.

10.3.5 Fishing Vessels

181. Fishing vessels recorded during the combined data periods are presented in **Figure 10.13**. It is noted that all fishing vessels recorded during the 2024 summer survey period were recorded via AIS. More consideration of baseline fishing activity is detailed in **Chapter 11: Commercial Fisheries (Volume II)** of the **Bellrock WFDA EIA Report**.

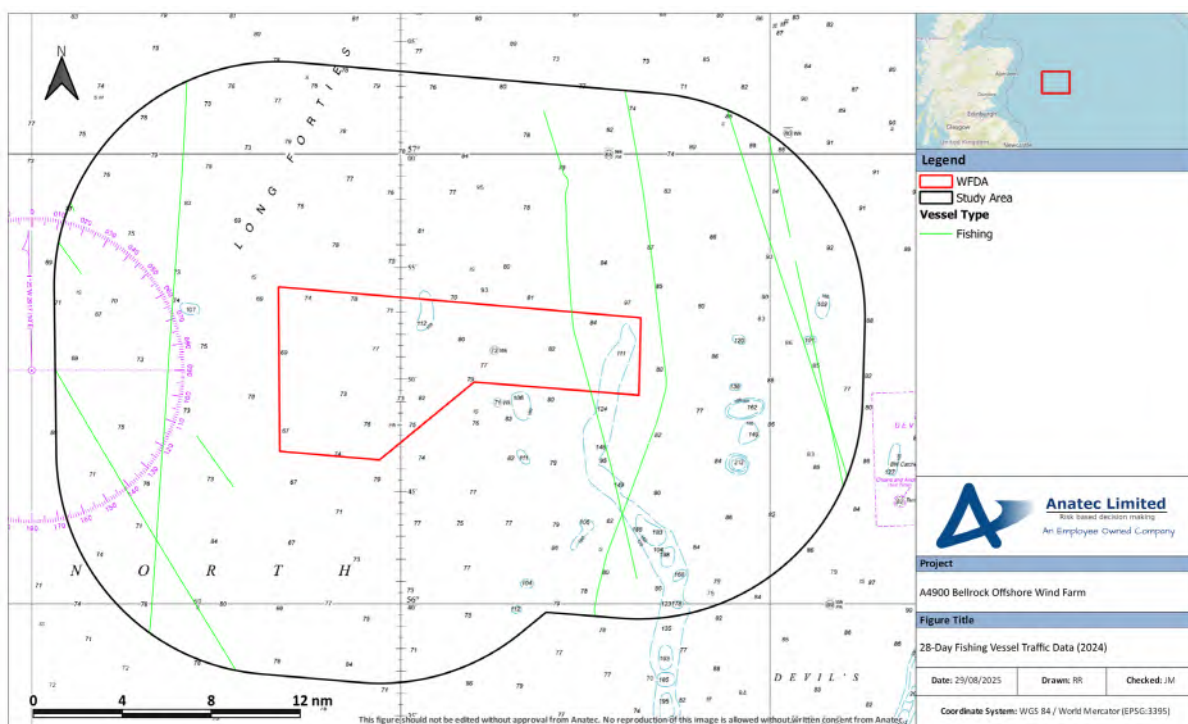


Figure 10.13 28-Day Fishing Vessel Traffic Data (2024)

182. An average of one fishing vessel was recorded every three to four days during the combined data periods. However, fishing vessels were primarily recorded within the 2024 summer survey period, at one vessel every two to three days with only one transit recorded during the winter data period. Only one unique fishing vessel intersected the Bellrock WFDA during the combined data period, or 14% of all fishing vessels recorded within the study area.

183. A review of vessel behaviour, track speed and navigational status (for those fishing vessels broadcasting via AIS) has been undertaken to identify possible cases of active fishing activity. After these criteria were applied, vessels were all deemed to be on transit as opposed to active fishing. However, based on a review of long-term AIS

data and collaboration with the commercial fisheries specialist for the Bellrock Project, some active fishing is known to occur in the area, particularly nephrops within the deepwater trench located at the eastern extent of the Bellrock WFDA. This can be seen in **Annex E**.

10.3.6 Recreational Vessels

184. Recreational vessels recorded during the combined data periods are presented in **Figure 10.13**. It is noted that all recreational vessels recorded during the 2024 summer survey period were recorded via AIS.

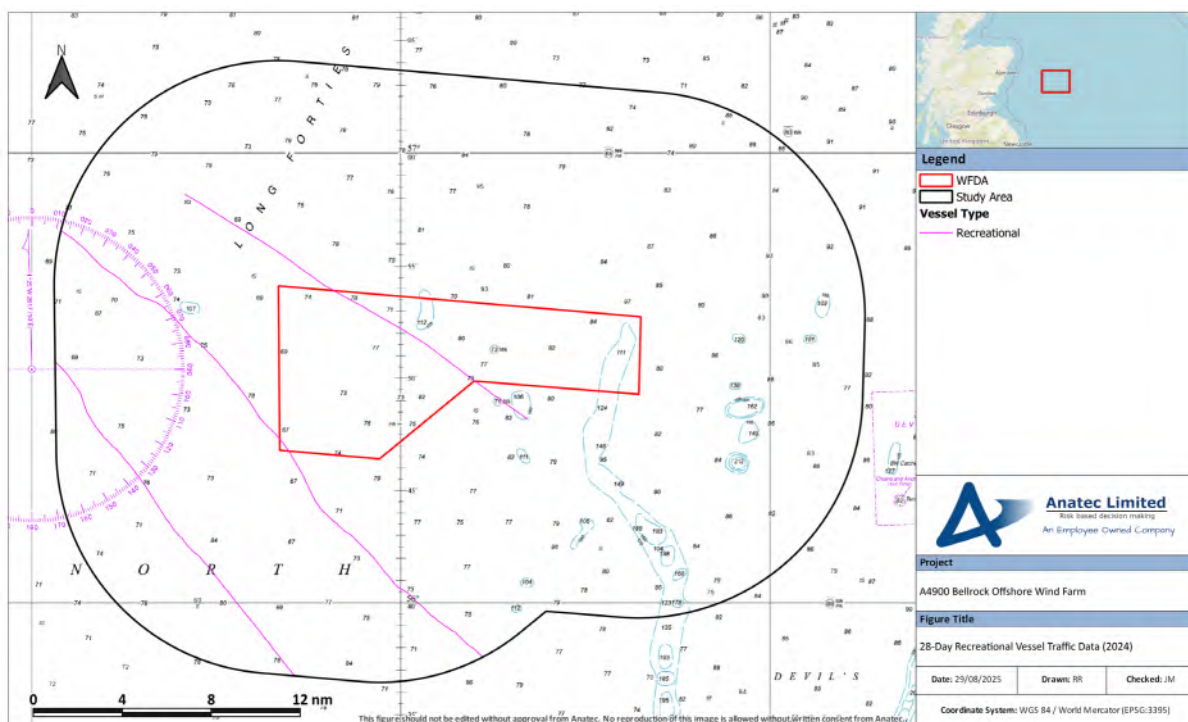


Figure 10.14 28-Day Recreational Vessel Traffic Data (2024)

185. An average of one recreational vessel was recorded every nine days during the combined data periods. However, recreational vessels were only recorded within the 2024 summer survey period, at one vessel every four to five days. All recreational vessels were on north-west south-east transits with two of the three recreational vessels recorded intersecting the Bellrock WFDA. This level of recreational vessel traffic is expected, as per consultation output outlined in **Table 4.1**.

10.3.7 Anchored Vessels

186. Anchored vessels can be identified based upon the AIS navigational status which is programmed on the AIS transmitter on board a vessel. However, information is manually entered into the AIS and therefore it is common for vessels not to update

their navigational status if only at anchor for a short period of time. For this reason, vessels which travelled at a speed of less than 1 kt for more than 30 minutes are assumed to potentially be at anchor. Such cases have therefore been identified and checked for likely anchoring activity along with vessel track behaviour and AIS broadcasted navigational status.

187. After applying the criteria, no vessels were deemed to be at anchor within the study area across the combined data periods.

10.4 Vessel Size

10.4.1 Vessel Length

188. Vessel LOA was available for all vessels recorded throughout the combined data periods. The combined 28-days vessel traffic data is presented in **Figure 10.15**, colour-coded by LOA. Following this, a distribution of these vessel LOA is presented in **Figure 10.16**.

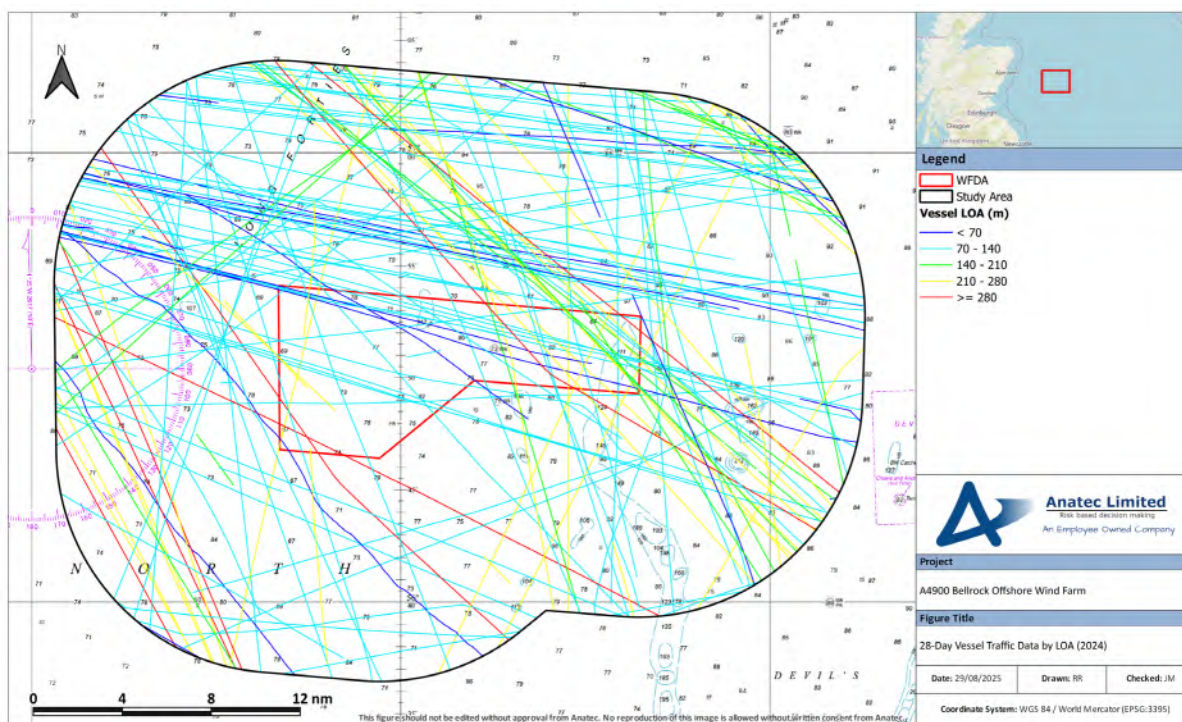


Figure 10.15 28-Day Vessel Traffic Data by Length Overall (LOA) (2024)

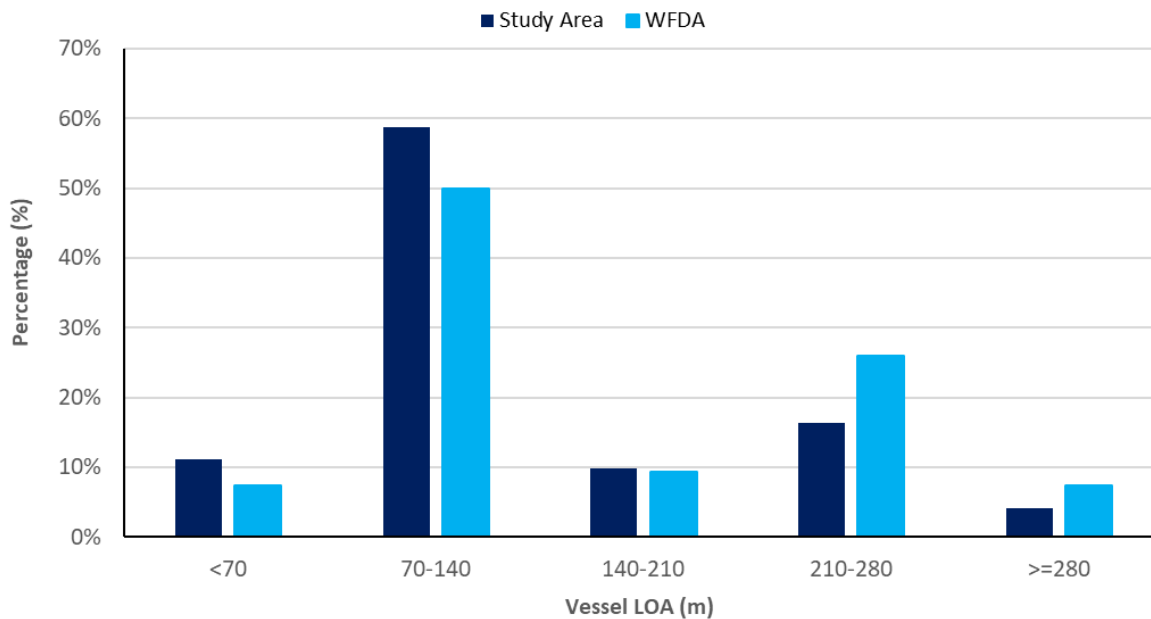


Figure 10.16 Vessel Length Overall (LOA) Distribution (2024)

189. For all vessels within the study area, the average vessel LOA recorded was 127 m. Vessel LOA ranged from 10 m recreational sailing vessels to 300 m for a bulk carrier. The majority of vessels had an LOA which ranged between 70 to 140 m (59% of all vessels) and were primarily oil and gas vessels. Vessels with greater LOA were mainly cargo vessels and tankers, with those of smaller LOA being recreational and fishing vessels as well as small oil and gas vessels.
190. For vessels intersecting the Bellrock WFDA, the average vessel LOA recorded was 149 m. Vessel LOA ranged from 10 m to 300 m; with the same vessels being recorded in the study area.

10.4.2 Vessel Draught

191. Vessel draught was available for approximately 95% of all vessels recorded throughout the combined data periods. Vessels with unspecified vessel draughts were recorded via AIS and were mainly oil and gas and recreational vessels, with several commercial vessels also. Vessels with unspecified draughts have been removed from the analysis where relevant.
192. The combined 28-days vessel traffic data is presented in **Figure 10.17**, colour-coded by vessel draught. Following this, a distribution of these vessel draughts is presented in **Figure 10.18**.

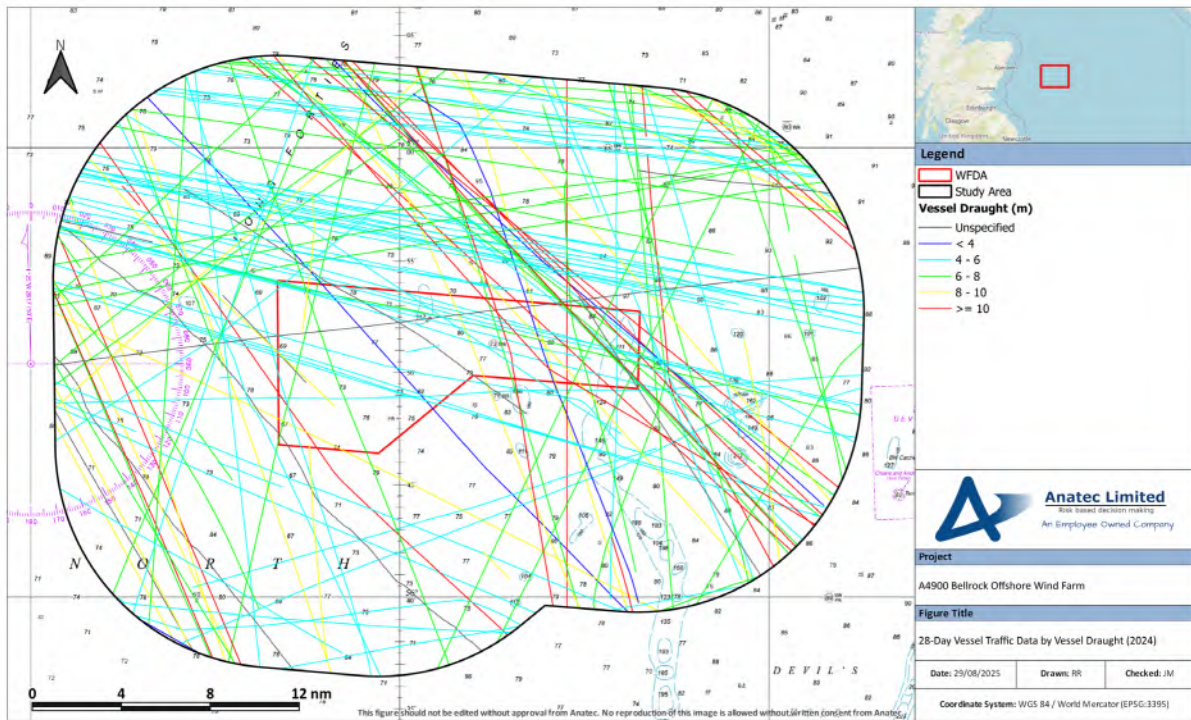


Figure 10.17 28-Day Vessel Traffic Data by Vessel Draught (2024)

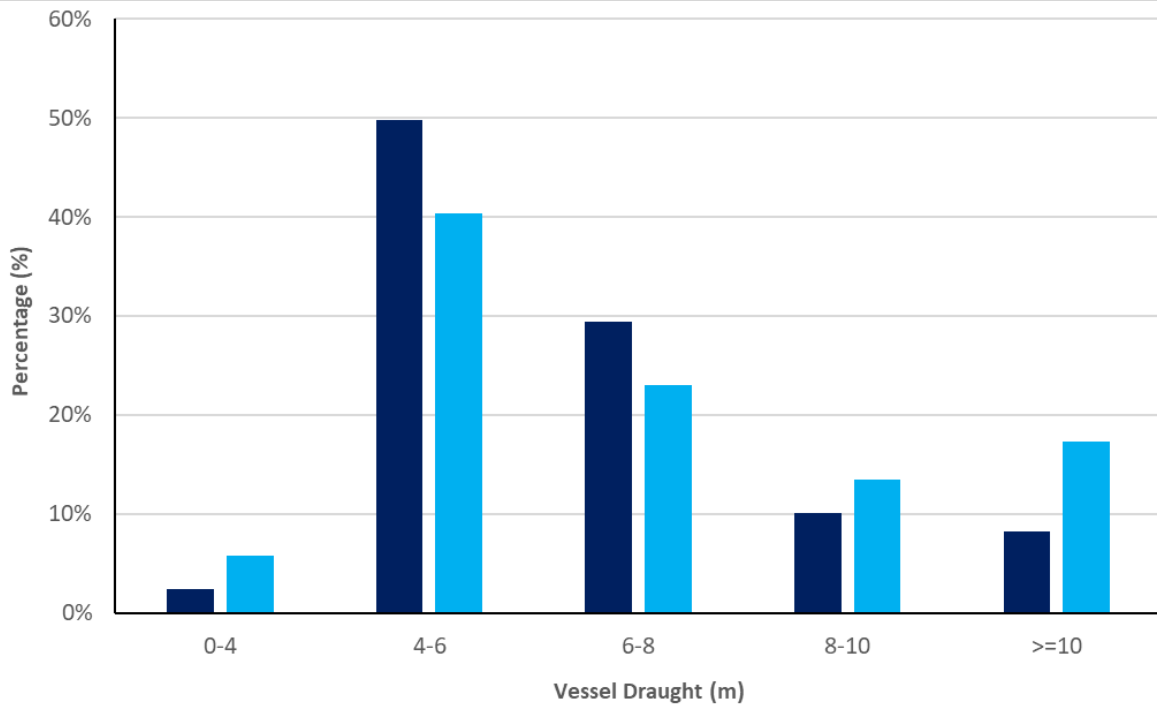


Figure 10.18 Vessel Draught Distribution (2024)

193. Of vessels which broadcast a valid vessel draught, the average draught recorded was 6.5 m within the study area. Vessel draught ranged from 3.1 m for a general cargo vessel to 16.2 m for a bulk carrier which intersected the south-west corner of the Bellrock WFDA. The majority of vessels had a draught which ranged between 4 to 6 m (50% of all vessels with a valid draught). Vessels with a draught 10 m and above accounted for 8% and were larger cargo vessels and tankers.
194. For vessels intersecting the Bellrock WFDA, the average vessel draught recorded was 7.2 m. Vessel draught ranged from 3.1 m to 16.2 m; with these extremes being the same vessels recorded in the study area.

11 Base Case Vessel Routeing

11.1 Definition of a Main Commercial Route

195. 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**.

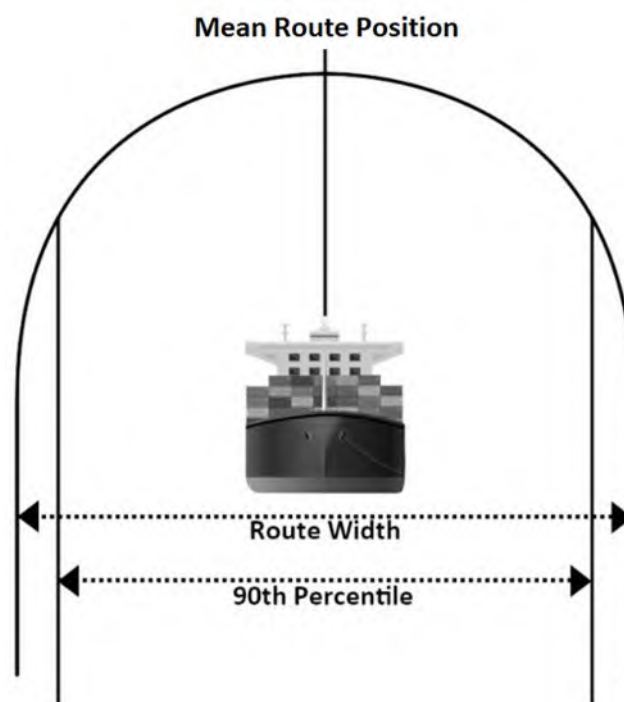


Figure 11.1 Illustration of a Main Route Calculation

11.2 Pre Bellrock Wind Farm Development Area Main Commercial Routes

196. A total of ten main commercial routes were identified within the study area from the vessel traffic data (including both the vessel traffic surveys and the long-term vessel traffic data) i.e., the pre Bellrock WFDA scenario. These main commercial routes and corresponding 90th percentiles within the study area are shown (and numbered) relative to the Bellrock WFDA in **Figure 11.2**. Following this, a description of each route is provided in **Table 11.1**, including the average number of vessels per week, start and end locations, main vessel types, and details of any commercial ferry routeing where applicable.

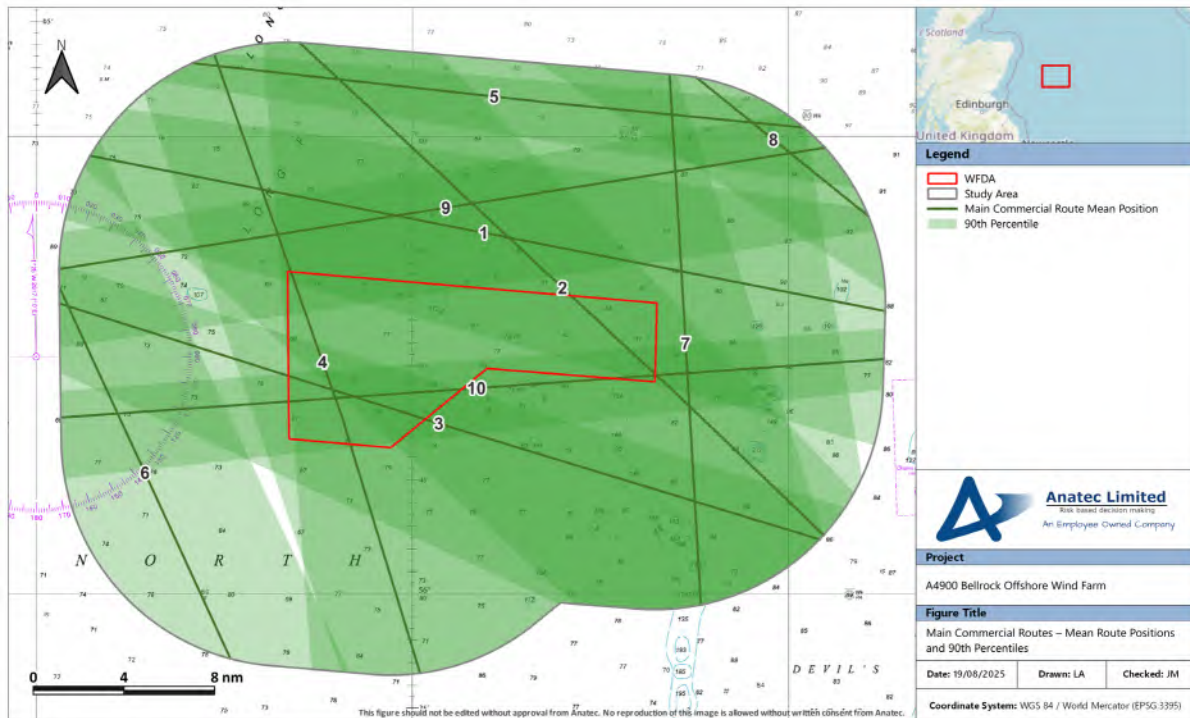


Figure 11.2 Main Commercial Routes – Mean Route Positions and 90th Percentiles

Table 11.1 Main Commercial Route Details

Route Number	Number of Vessels per Week	Route Details
1	4	Aberdeen – Stella Field/Catcher Field/J-Area. (95% oil and gas vessels).
2	2-3	North America – Germany. (75% cargo, 10% tanker, 10% passenger vessels).
3	1-2	Aberdeen – Fulmar Field. (88% oil and gas vessels).
4	1-2	Iceland/Faroe Islands – Rotterdam. (48% cargo vessels, 36% tankers).
5	1-2	Aberdeen – Elgin Field. (97% oil and gas vessels).
6	1-2	North America – Rotterdam. (52% cargo, 25% tanker, 20% passenger vessels).
7	Less than 1	Tetney – Shetland. (72% tankers, 16% cargo vessels).

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Route Number	Number of Vessels per Week	Route Details
8	1	Germany – North America. (96% cargo vessels).
9	Less than 1	Montrose – Sweden. (52% oil and gas, 48% cargo vessels).
10	Less than 1	Montrose – Sweden. (88% cargo, 11% oil and gas vessels).

12 Adverse Weather Routeing

197. Some vessels may operate alternative routes during periods of adverse weather. This section focuses on vessel movements during these periods. This takes into consideration the implications of a scenario when a commercial vessel is unable to make passage, or a small craft is unable to access safe havens in adverse weather due to the presence of the Bellrock WFDA or activities associated with the Bellrock WFDA.
198. Adverse weather includes wind, wave, and tidal conditions as well as reduced visibility due to fog that may hinder a vessel’s standard route, speed of navigation and/or ability to enter the destination port. Adverse weather routes are assessed to be significant course adjustments to mitigate vessel motion in adverse weather conditions. When transiting in adverse weather conditions, a vessel is likely to encounter various types of weather and tidal phenomena, which may lead to severe roll motions, potentially causing damage to cargo, equipment and/or discomfort and danger to persons on board. The sensitivity of a vessel to these phenomena depends upon the vessel’s actual stability parameters, the vessel hull geometry, and the vessel type, size, and speed.

12.1 Identification of Periods of Adverse Weather

199. The vessel traffic survey data and long-term vessel traffic data has been checked for instances of adverse weather. Based on the weather log maintained by the on-site survey vessel, the sea state was recorded as rough between the 17 and 27 August 2024, with wind speeds up to 35 kts recorded on the 22 August 2024.
200. Historical weather information provided by the Met Office (Met Office, 2024) has been used to identify periods of adverse weather during the 12-month period of January 2023 – December 2023 (covering the long-term vessel traffic data), during the 14-day summer survey period in July 2024 and during the 14-day AIS data period in December 2024. By investigating such identified periods, cases where routes may have been altered or cancelled can then be identified. The key weather events identified, and the overlap with each dataset, are detailed in **Table 12.1** (Met Office, 2024).

Table 12.1 Key Weather Events Relevant to the Bellrock Wind Farm Development Area

Weather Event	Date	Dataset Overlap	Details
Storm Otto	17 February 2023	Long-term data	Storm Otto brought gusts of over 60 kts to parts of northern and eastern Scotland and northeast England. The storm tracked rapidly eastwards across northern Scotland before moving across the North Sea toward Norway.

Weather Event	Date	Dataset Overlap	Details
Storm Agnes	27 to 28 September 2023	Long-term data	Storm Agnes brought strong winds and heavy rain, with gusts of over 50 kts.
Storm Babet	18 to 21 October 2023	Long-term data	Storm Babet brought exceptional rainfall to parts of eastern Scotland, with wind gusts at over 50 kts across northeast England and much of Scotland.
Storm Gerrit	27 to 28 December 2023	Long-term data	Storm Gerrit brought damaging winds and heavy rain to the UK. In the most exposed locations, winds gusted at over 70 kts while heavy rain led to increased flooding concerns.
Storm Lilian	23 August 2024	14-day vessel traffic survey summer 2024	Storm Lilian brought strong winds and heavy rain to northern England and Wales, and parts of Scotland.

12.2 Adverse Weather Effects of Vessel Traffic

201. The 2024 vessel traffic survey data and the long-term vessel traffic data was assessed for any vessel movements which could be associated with periods of adverse weather, with particular consideration of those periods overlapping with reported adverse weather. No routeing activity specific to adverse weather conditions were identified.
202. In consultation, Fred Olsen Cruise did indicate that the cumulative presence of the Bellrock WFDA alongside other OWF developments will limit adverse weather routeing options. This is considered further in **Section 19**.

13 Cumulative Screening

203. Cumulative effects have been considered for activities in combination and cumulatively with the Bellrock WFDA. This section provides an overview of cumulative developments screened into the cumulative risk assessment based on the criteria outlined in **Section 3.4**, which includes the tiering system applied.
204. The outputs of the cumulative risk assessment are then provided in **Section 19**.

13.1 Offshore Wind Farm Developments

205. In addition to the Bellrock WFDA, there are several other proposed OWF projects located in the northern North Sea. During consultation, various stakeholders expressed an interest in the cumulative build out of OWF projects.
206. Operational OWFs are present in proximity to the Bellrock WFDA but have been screened out due to being part of the baseline assessment. These include Hywind OWF, Aberdeen OWF, Kincardine OWF, and Seagreen OWF. However, these are shown below in **Figure 13.1** for illustrative purposes.
207. The closest screened in OWF to the Bellrock WFDA is the Ossian OWF, located approximately 4.7 nm south-west of the Bellrock WFDA. Other relevant screened in OWFs within 50 nm of the Bellrock WFDA are detailed in **Table 13.1** along with their associated tier based on the criteria outlined in **Section 3.4** and distance from the Bellrock WFDA. Following this, these developments are illustrated in **Figure 13.1**.

Table 13.1 Cumulative Screening Summary for Offshore Wind Farm Developments

OWF Project	Status (as of August 2025)	Distance from Bellrock WFDA (nm)	Data Confidence	Tier
Ossian	Consent Application Submitted	4.7	High	1
Cedar	Pre-scoping	11.6	Medium	2
CampionWind	Scoped	12.8	High	1
Morven	Scoped	18.9	High	1
Muir Mhòr	Consent Application Submitted	28.3	High	2
Cenos	Consent Application Submitted	33.1	High	3
Bowdun	Scoped	33.6	High	2
Aspen	Consent Application Submitted	44	High	3

OWF Project	Status (as of August 2025)	Distance from Bellrock WFDA (nm)	Data Confidence	Tier
Berwick Bank	Consented	46.4	High	3
Flora	Pre-scoping	47.6	Medium	3

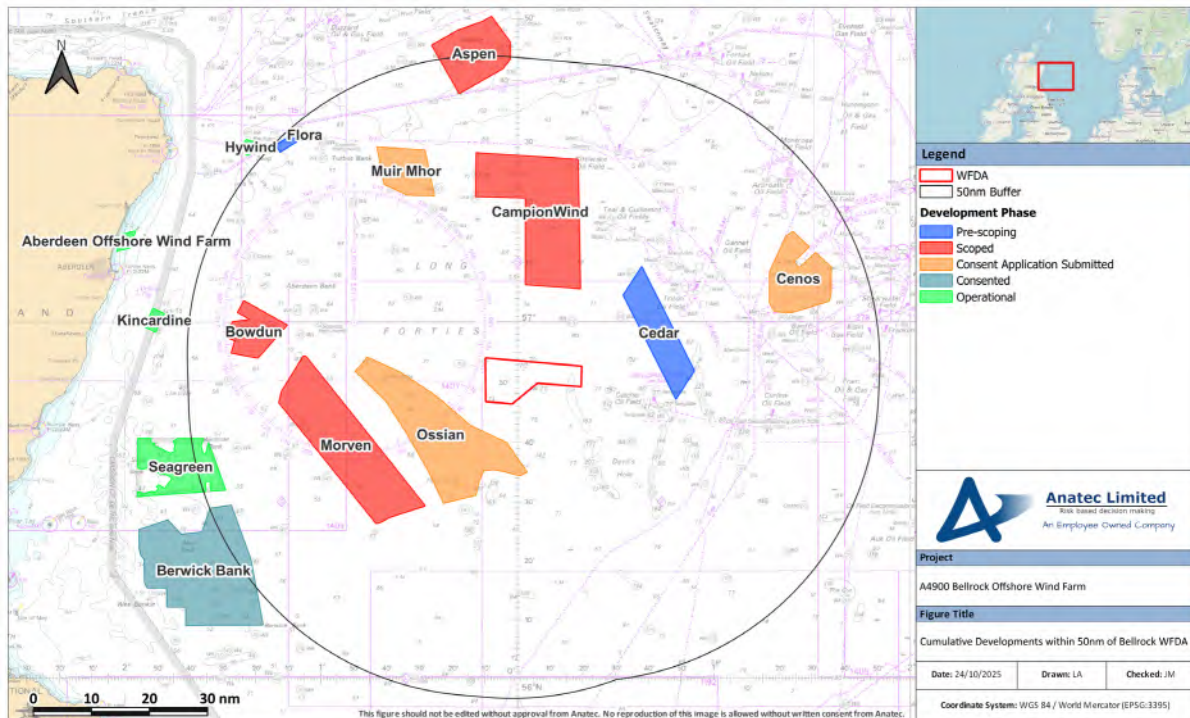


Figure 13.1 Cumulative Developments within 50 nm of Bellrock Wind Farm Development Area

13.2 Other Cumulative Developments

208. It is noted that no subsea cables, pipelines, oil and gas infrastructure, marine aggregate dredging areas, port developments, or wave/tidal developments have been screened into the cumulative assessment. This is due either to any identified projects already being operational and already active (and thus part of the baseline assessment), no clear pathway through which a potentially significant hazard may arise, or low data confidence. This includes the Bellrock OfTDA and Bellrock OnTDA – the former is screened out due to the absence of detailed information on the anticipated location of any surface piercing infrastructure (i.e. reactive compensation station(s)), while the latter is screened out due to the lack of a clear impact-receptor pathway through which shipping and navigation impacts may arise.

14 Future Case Vessel Traffic

209. The vessel traffic baseline established in **Section 10** is used as input into the risk assessment (**Section 18**). However, it is also necessary to consider potential future case vessel traffic in terms of general volume and size changes, port developments which may influence movements, and changes to movements associated with the presence of the Bellrock WFDA (the post Bellrock WFDA scenario).
210. The following subsections outline the future case scenarios which have been used to inform the risk assessment, and which has also been applied to the collision and allision risk modelling in **Section 16**.

14.1 Increases in Commercial Vessel Activity

211. Given future commercial traffic trends are dependent on various factors, and are hence difficult to predict, the NRA has assumed potential increases in vessel transits of 10% and 20% within the commercial traffic allision and collision modelling. The consideration of a range of conservative values is considered as covering potential increases over the course of the Bellrock WFDA's operational lifespan. For example, Peterhead Port Authority is proposing an 85 m quay extension to facilitate additional berthing capacity and economic growth, and to support offshore activities (Peterhead Port Authority, 2025). This may increase commercial activity in proximity to the Bellrock WFDA. The 10% and 20% traffic increases were proposed during the Hazard Workshop, and no concerns were raised by attendees.
212. These values overlook that oil and gas vessels may decrease over time due to the decommissioning of oil and gas structures in the North Sea. However, oil and gas vessels may be repurposed across the offshore wind industry and may balance out the reduction in oil and gas movements; therefore, the increases outlined above are conservatively also applied for oil and gas vessels.

14.2 Increases in Commercial Fishing Activity

213. Indicative 10% and 20% increases in commercial fishing vessel transits have been considered in the modelling undertaken within the NRA. These values are used due to there again being limited reliable information on future activity levels upon which any firm assumption can be made. It is noted that additional information on commercial fishing trends is contained within **Chapter 11: Commercial Fisheries (Volume II)** of the **Bellrock WFDA EIA Report**.

14.3 Increases in Recreational Activity

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

14.4 Increase Associated with Bellrock Wind Farm Development Area Activities

215. The anticipated number of vessels associated with the Bellrock WFDA during the construction, and O&M phases are presented in **Section 6.7**. A shortlist of potential construction, and O&M port(s) has also been identified (see **Section 6.5**); however, no decisions have yet been made for any phase of the Bellrock WFDA and therefore it is not possible to provide any detailed overview of the likely pattern of project vessel movements.

14.5 Commercial Traffic Routeing (Bellrock Wind Farm Development Area in Isolation)

14.5.1 Methodology

216. It is not possible to consider all potential alternative routeing options for commercial traffic and therefore alternatives have been based upon the Bellrock WFDA WCS to ensure exposure to Wind Farm Infrastructure and OfSSs within the Bellrock WFDA is maximised.

217. Assumptions for re-routeing include:

- All alternative routes maintain a minimum mean distance of 1 nm from offshore installations and existing OWF boundaries in line with industry experience (this being measured from the Bellrock WFDA to encompass potential deviations due to subsea infrastructure). This distance is considered for shipping and navigation from a safety perspective as explained below; and
- All mean routes take into account known routeing preferences including consideration of banks/shallows, AtoNs and development areas.

218. Annex 1 of MGN 654 defines a methodology for assessing passing distance from OWF boundaries, noting that it also states that the methodology is “*not a prescriptive tool but needs intelligent application*” (MCA, 2021).

219. 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 OWFs (including between distinct developments), and these distances vary depending upon the sea space 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.

220. The NRA also aims to establish the worst-case based on navigational safety parameters. On this basis the most conservative realistic scenario for vessel routeing is considered to be mean route positions passing 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 conditions at the time.

- 221. The UK Chamber of Shipping raised during consultation that a 1 nm passing distance from a FOU may not be realistic given the total footprint of the mooring and cable arrangements. Given the lack of commercial-scale floating developments to date there is inadequate evidence to support an alternative approach, and it is noted that all subsea infrastructure would be contained within the charted boundary of the Bellrock WFDA.

14.5.2 Main Commercial Route Deviations

- 222. The methodology detailed in **Section 14.5.1** has been applied to potential deviations that may arise to the base case routes identified and discussed in **Section 11.2**.
- 223. An illustration of the anticipated worst-case shift in the mean route positions of the main commercial routes within the study area following the development of the Bellrock WFDA is presented (and numbered) in **Figure 14.1**.

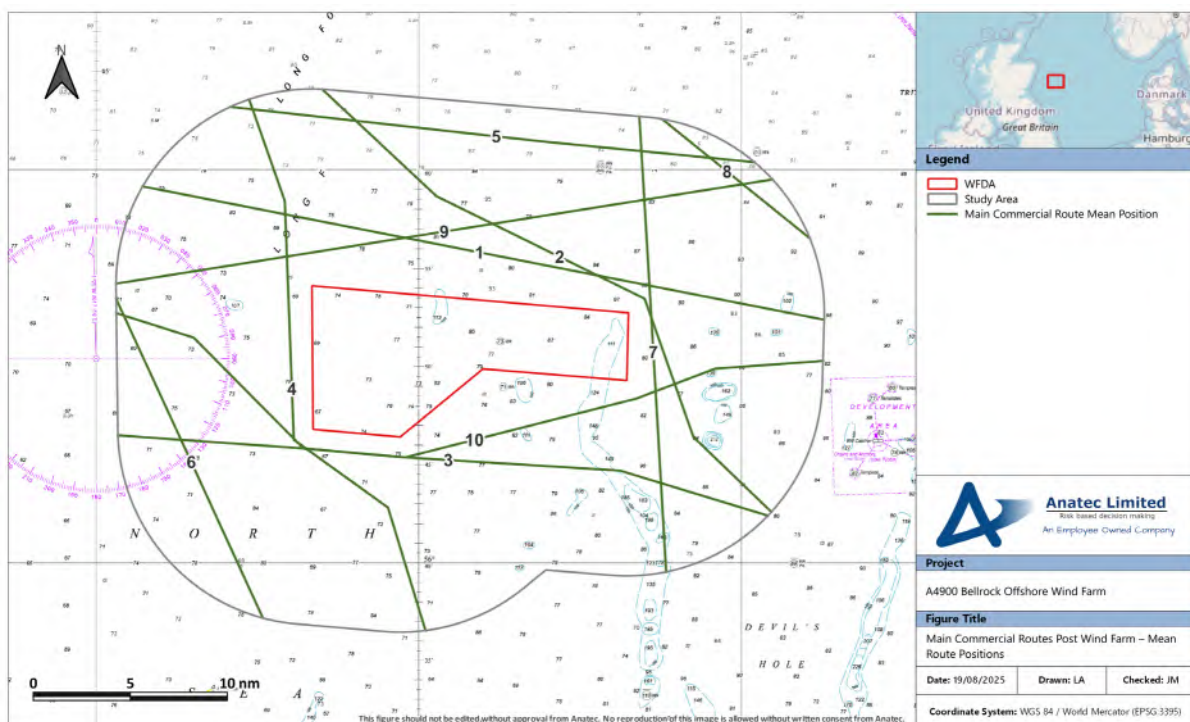


Figure 14.1 Main Commercial Routes Post Bellrock Wind Farm Development Area – Mean Route Positions

224. Deviations of main commercial routes from the pre Bellrock WFDA development scenario would be required for four out of ten main commercial routes identified, with deviations ranging from 0.7 nm to 1.6 nm.
225. Deviated routes are detailed further in **Table 14.1**.

Table 14.1 Summary of Post Bellrock WFDA Deviated Main Commercial Routes

Route Number	Increase in Route Length (nm)	Percentage Change in Total Route Length (%)	Nature of Deviation
2	1.4	<1	Passing around the north-east corner of the Bellrock WFDA.
3	1.4	1	Passing around the south-west corner of the Bellrock WFDA.
4	1.6	<1	Passing around the south-west corner of the Bellrock WFDA.
10	0.7	<1	Passing south of the Bellrock WFDA.

14.6 Commercial Traffic Routeing (Cumulative)

14.6.1 Routeing within Proximity to the Bellrock Wind Farm Development Area

226. An illustration of the anticipated worst-case shift in the mean positions of the main commercial routes within a 50 nm buffer following the development of the Bellrock WFDA and Tier 1 and Tier 2 cumulative projects (**Section 13.1**) is presented (and numbered) in **Figure 14.2**. Again, these deviations are based on Anatec’s assessment of the worst-case and follow the same methodology outlined for deviations due to the Bellrock WFDA in isolation (**Section 14.5.1**).

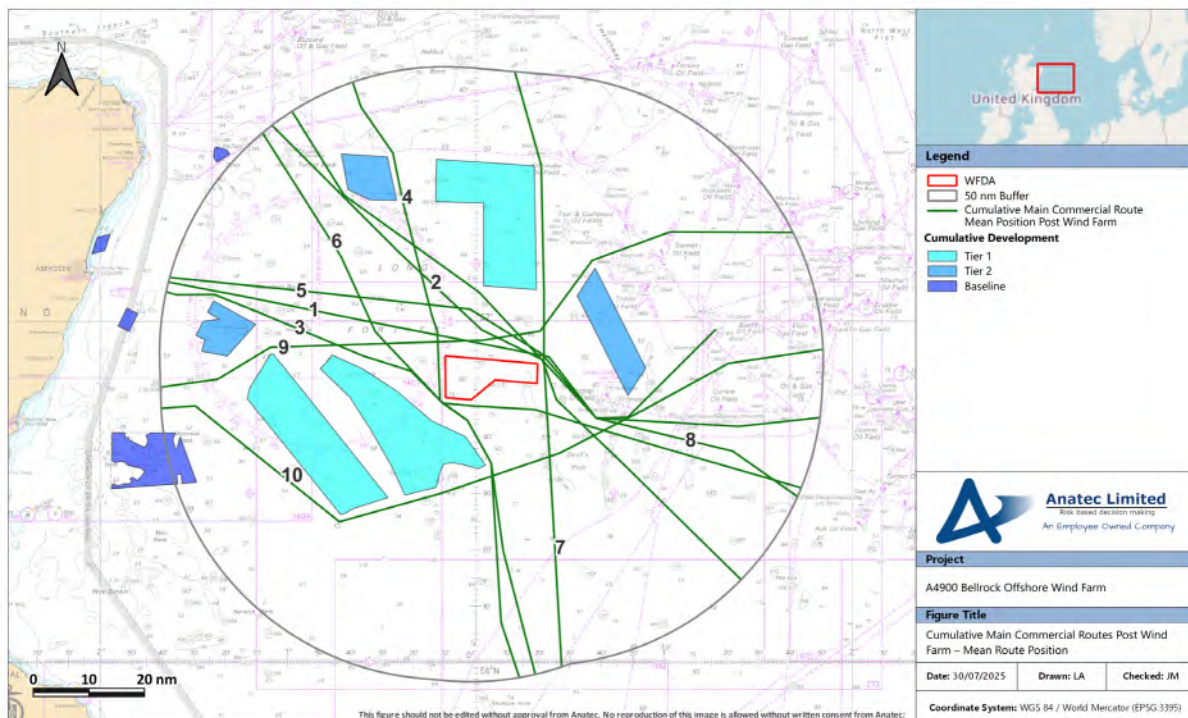


Figure 14.2 Cumulative Main Commercial Routes Post Bellrock Wind Farm Development Area – Mean Route Position

227. All ten main commercial routes identified in **Section 11** have been estimated to require deviations at a cumulative level post Bellrock WFDA. Route 2 is the only route that is unlikely to be further affected by Tier 1 and Tier 2 cumulative developments compared to the in isolation scenario, with post Bellrock WFDA deviations remaining as presented in **Section 14.5.2**.
228. Routes 1, 5, 6, and 8 will not require a deviation when considering the in isolation scenario (see **Section 14.5.2**); however, given the estimated deviations necessitated due to nearby cumulative developments, it is likely that the presence of the Bellrock WFDA will result in further deviations. Additionally, vessels on Routes 1, 5, and 8 will be constrained by the presence of the operational Catcher Area Development located approximately 10.5 nm to the south-east of the Bellrock WFDA.
229. Route 10, which is predicted to deviate for the in isolation scenario (see **Section 14.5.2**), will likely be unaffected by the Bellrock WFDA when considering cumulative deviations around Tier 1 and Tier 2 cumulative developments in the future.
230. Routes 7 and 9 are not estimated to experience any direct impact from the presence of the Bellrock WFDA, though will likely require a deviation should the Tier 1 and Tier 2 cumulative developments be progressed to construction.

231. Therefore, a total of six main commercial routes are anticipated to require an increased deviation (compared to the Bellrock WFDA in isolation scenario) due to the presence of the Bellrock WFDA and other nearby developments in combination. These are detailed further in **Table 14.2** and a summary of the estimated cumulative interactions between developments broken down by main commercial route is provided in **Table 14.3**.

Table 14.2 Summary of Post Bellrock Wind Farm Development Area Deviated Cumulative Main Commercial Routes (Where Deviation Involves the Bellrock Wind Farm Development Area and Cumulative Developments)

Route Number	Increase in Route Length (nm)	Percentage Change in Total Route Length (%)	Nature of Deviation
1	4.7	3.4	Passing between the Bellrock WFDA, Cedar OWF and Catcher Area Development.
3	1.8	1.3	Passing south of the Bellrock WFDA and north of Bowdun OWF.
4	2.5	0.3	Passing between the Bellrock WFDA and Ossian OWF, and east of Muir Mhòr OWF.
5	13.8	12.6	Passing between the Bellrock WFDA and Catcher Area Development and south of Cedar OWF.
6	3.5	0.2	Passing between the Bellrock WFDA and Ossian OWF.
8	3.9	0.2	Passing between the Bellrock WFDA and Catcher Area Development and southwest of Muir Mhòr OWF, ChampionWind OWF and Cedar OWF.

Table 14.3 Cumulative Routeing Interaction Summary

Route Number	Route Deviated in Isolation	Bellrock	Tier 1 Developments			Tier 2 Developments		
			Ossian OWF	CampionWind OWF	Morven OWF	Cedar OWF	Muir Mhòr OWF	Bowdun OWF
1	x	✓	x	x	x	✓	x	x
2	✓	✓	x	x	x	x	x	x
3	✓	✓	x	x	x	x	x	✓
4	✓	✓	✓	x	x	x	✓	x
5	x	✓	x	x	x	✓	x	x
6	x	✓	✓	x	x	x	x	x
7	x	x	x	✓	x	x	x	x
8	x	✓	x	✓	x	✓	✓	x
9	x	x	✓	x	✓	✓	x	x
10	✓	x	✓	x	✓	✓	x	x

14.6.2 North/South Routeing in the Wider Area

232. From a cumulative baseline produced by the ScotWind East Region Developers Group (**Appendix 12.2: East Region Developers Group Cumulative Baseline for Shipping and Navigation (Volume IV)**, Anatec, 2025), which includes the Applicant, it is recognised that there are notable volumes of north/south commercial routeing located in the region but beyond the study area.
233. Given the location of potential future OWF developments, it is possible that this north/south vessel traffic is deviated either towards the east coast of Scotland or further offshore, with the latter resulting in increased exposure for the Bellrock WFDA. This section aims to provide an overview of future north/south routeing which has not been captured within the study area. This section assumes that all planned OWFs will be progressed to construction and exist concurrently, potentially across various phases.
234. **Figure 14.3** presents the north/south routeing options for vessels alongside future cumulative OWF developments, colour-coded by phase.

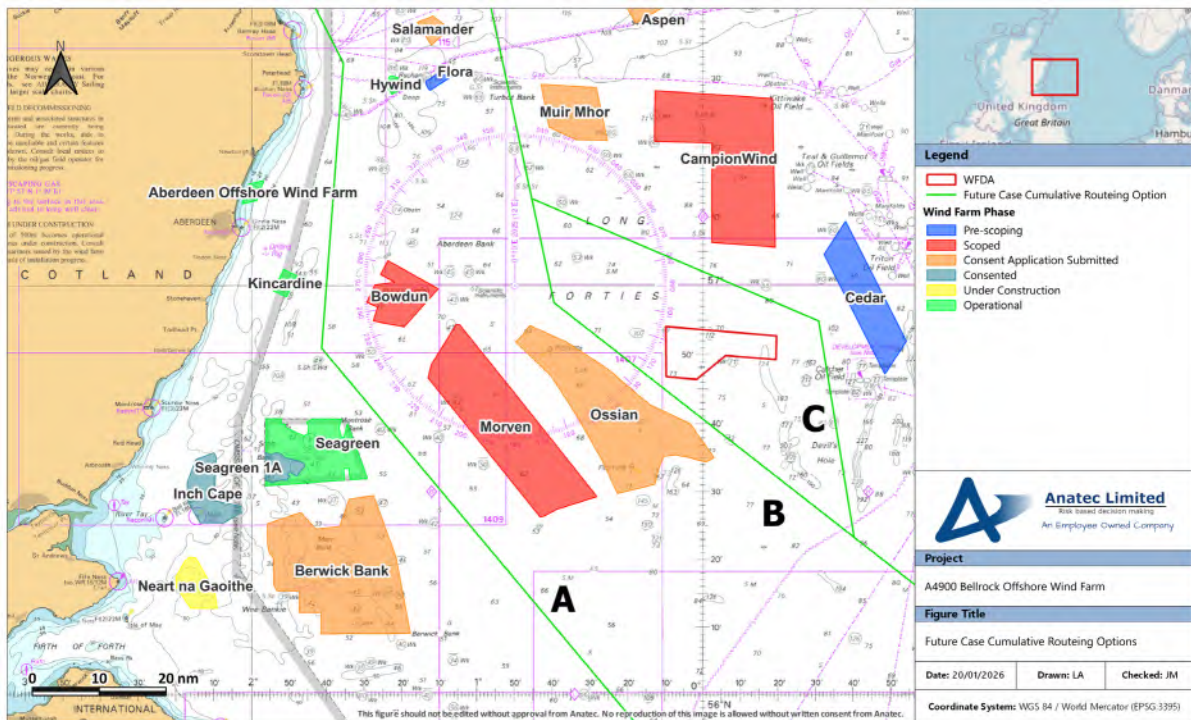


Figure 14.3 Future Case Cumulative Routing Options

235. There are three clear cumulative routing options for north/south commercial traffic:
- Route A: Pass west of Hywind, Salamander and Flora OWFs and west of Bowdun and Morven OWFs;
 - Route B: Pass east of Hywind, Salamander and Flora OWFs and between the Bellrock WFDA and Ossian OWF; or
 - Route C: Pass east of Hywind, Salamander and Flora OWFs and between the Bellrock WFDA and Cedar OWF.
236. The first of these options does not increase the potential future case commercial traffic passing in proximity to the Bellrock WFDA and therefore is not considered further. The remaining two options are considered in the cumulative risk assessment (Section 19). Figure 14.4 and Figure 14.5 presented below, provide spatial context for the sea room available for these options which is addressed in the cumulative risk assessment.

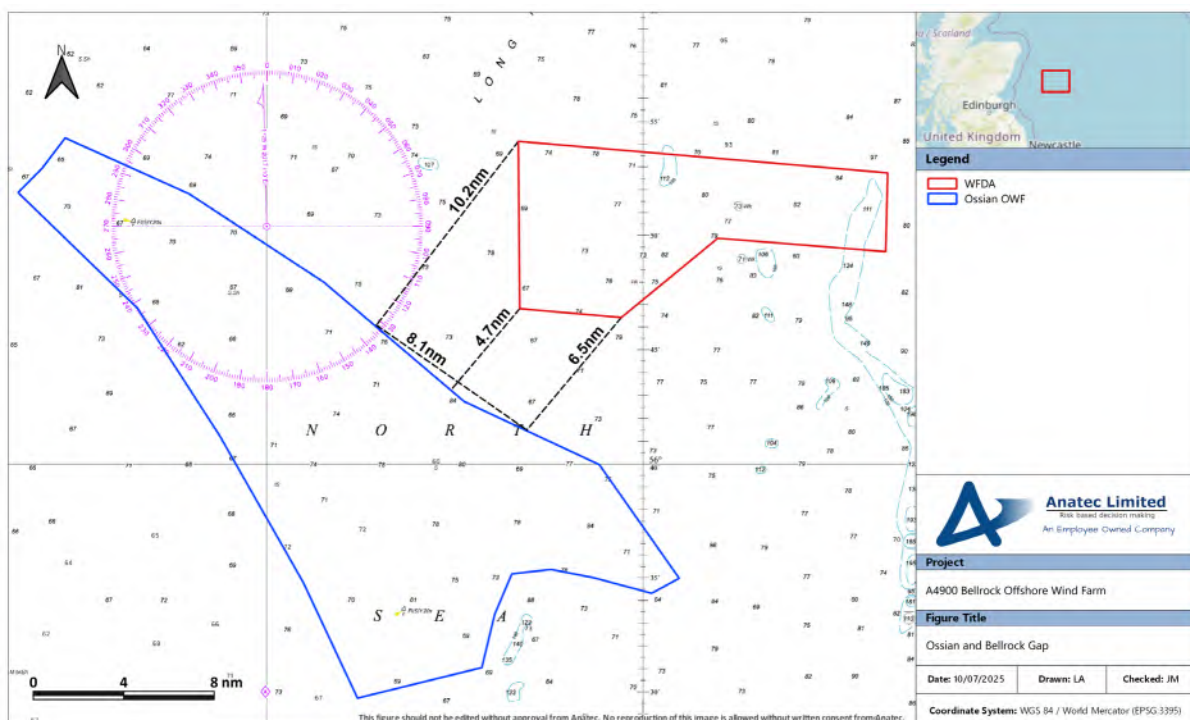


Figure 14.4 Spatial Context Between Ossian Offshore Wind Farm and Bellrock Wind Farm Development Area

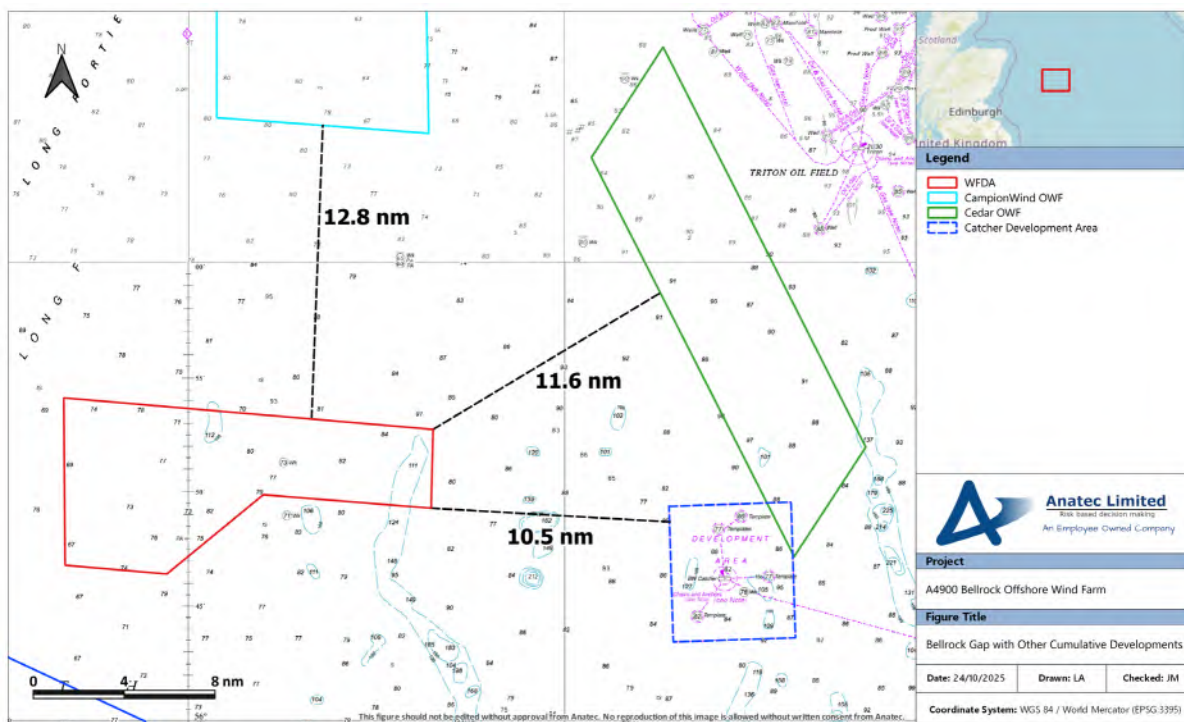


Figure 14.5 Spatial Context Between Bellrock Wind Farm Development Area and Other Cumulative Developments

15 Navigation, Communication, and Position Fixing Equipment

237. 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 Bellrock WFDA.

15.1 Very High Frequency Communications (including Digital Selective Calling)

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

239. The WTGs had no noticeable effect on voice communications within the North Hoyle 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.

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

241. Furthermore, as part of SAR trials carried out at the North Hoyle OWF in 2005, radio checks were undertaken between the Sea King helicopter and both Holyhead and Liverpool coastguards. The aircraft was positioned at a location offshore of the Bellrock WFDA 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).

242. In addition to the North Hoyle trials, a desk-based study was undertaken for the Horns Rev 3 OWF in Denmark in 2014 where 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).

243. 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 Bellrock WFDA is anticipated to have no significant impact upon VHF communications.

15.2 Very High Frequency Direction Finding

244. During the North Hoyle OWF 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) (MCA and QinetiQ, 2004). This is deemed to be a relatively

small-scale impact due to the limited use of VHF DF equipment and will not impact operational or SAR activities (MCA and QinetiQ, 2004).

245. Throughout the 2005 SAR trials carried out at North Hoyle, the Sea King radio homer system was tested (MCA, 2005). 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 (MCA, 2005).
246. Since the trials detailed above, no significant issues with regards to VHF DF have been observed or reported, and therefore the presence of the Bellrock WFDA is anticipated to have no significant impact upon VHF DF equipment.

15.3 Automatic Identification System

247. No significant issues with interference to AIS transmission from operational OWFs have been observed or reported to date. Such interference was also absent in the trials carried out at the North Hoyle OWF (MCA and QinetiQ, 2004).
248. 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 Bellrock WFDA.

15.4 Navigational Telex System

249. 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.
250. 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.
251. 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.
252. 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 Bellrock WFDA.

15.5 Global Positioning Service

253. Global Positioning System (GPS) is a satellite based navigational system. GPS trials were also undertaken throughout the 2004 trials at North Hoyle OWF, and it was stated that *“no problems with basic GPS reception or positional accuracy were reported during the trials”* (MCA and QinetiQ, 2004).
254. 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).
255. Therefore, there are not expected to be any significant impacts associated with the use of GPS systems within or in proximity to the Bellrock WFDA, noting that there have been no reported issues relating to GPS within or in proximity to any operational OWFs to date.

15.6 Electromagnetic Interference

256. 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.
257. 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 EMF are minimised to ensure continued safe navigation.
258. The vast majority of commercial traffic uses non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by EMF. Therefore, it is considered highly unlikely that any interference from EMF as a result of the presence the Bellrock WFDA 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.

15.6.1 Subsea Cables

259. The subsea cables being consented for the Bellrock WFDA (IACs) will be alternating current (AC) with studies indicating that AC does not emit an EMF significant enough to impact marine magnetic compasses (Background Document on Potential Problems Associated with Power Cables Other Than Those for Oil and Gas Activities (OSPAR Convention, 2008)). Therefore, electromagnetic interference due to cables associated with the Bellrock WFDA are not considered any further.

15.6.2 Wind Turbine Generators

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

15.6.3 Experience at Operational OWFs

261. 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 OWFs.

15.7 Marine Radar

262. This section summarises the results of trials and studies undertaken in relation to Radar effects from OWFs 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 necessary at the time of the studies being undertaken, which is beneficial in terms of Radar interference effects (and surface navigation in general) as detailed below.

15.7.1 Trials

263. 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.
264. In 2004, trials undertaken at the North Hoyle OWF (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).
265. 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 15.1**.

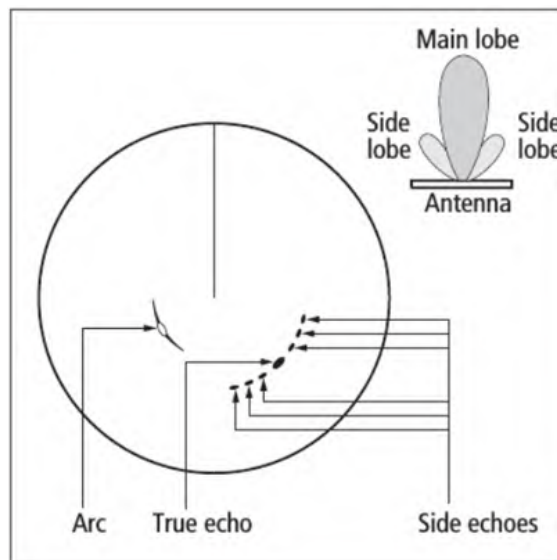


Figure 15.1 Illustration of Side Lobes on Radar Screen

266. Multiple reflected echoes are returned from a real target by reflection from some object in the Radar beam. Indirect echoes or ‘ghost’ images have the appearance of true echoes but are usually intermittent or poorly defined; such echoes appear at a false bearing and false range, as illustrated in **Figure 15.2**.

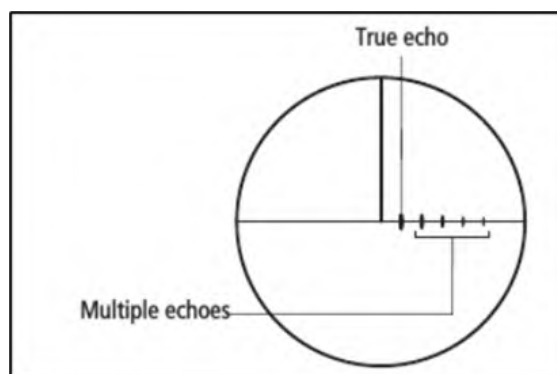


Figure 15.2 Illustration of Multiple Reflected Echoes on Radar Screen

267. Based on the results of the North Hoyle trials (MCA and QinetiQ, 2004; MCA, 2005), the MCA produced a Shipping Route Template designed to give guidance to mariners on the distances which should be established between shipping routes and OWFs. However, as experience of effects associated with use of marine Radar in proximity to OWFs grew, the MCA refined their guidance, offering more flexibility within the most recent Shipping Route Template contained within MGN 654 (MCA, 2021).

268. A second set of trials conducted at Kentish Flats OWF 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.
269. Theoretical modelling of the effects of the development of the proposed Atlantic Array OWF, which was to be located off the south coast of Wales, on marine Radar systems was undertaken by the Atlantic Array project (Atlantic Array, 2012) and considered a wider spacing of WTGs than that considered within the early trials. The main outcomes of the modelling were the following:
- Multiple and indirect echoes were detected under all modelled parameters;
 - The main effects noticed were stretching of targets in azimuth (horizontal) and appearance of ghost targets;
 - There was a significant amount of clear space amongst the returns to ensure recognition of vessels moving amongst the WTGs and safe navigation;
 - Even in the worst-case with Radar operator settings artificially set to be poor, there is significant clear space around each WTG that does not contain any multipath or side lobe ambiguities to ensure safe navigation and allow differentiation between false and real (both static and moving) targets;
 - Overall, it was concluded that the amount of shadowing observed was very little (noting that the model considered lattice-type foundations which are sufficiently sparse to allow Radar energy to pass through);
 - The lower the density of WTGs the easier it is to interpret the Radar returns and fewer multipath ambiguities are present;
 - In dense, target rich environments S-Band Radar scanners suffer more severely from multipath effects in comparison to X-Band Radar scanners;
 - It is important for passing vessels to keep a reasonable separation distance between the WTGs in order to minimise the effect of multipath and other ambiguities;
 - The Atlantic Array study undertaken in 2012 noted that the potential for Radar interference was mainly a problem during periods of reduced visibility when mariners may not be able to visually confirm the presence of other vessels in proximity (those without AIS installed which are usually fishing and recreational craft). It is noted that this situation would arise with or without WTGs in place; and
 - There is potential for the performance of a vessel’s ARPA to be affected when tracking targets in or near the array. Although greater vigilance is required, during the Kentish Flats trials it was shown that false targets were quickly identified as such by the mariners and then by the equipment itself.

270. In summary, experience in UK waters has shown that mariners have become increasingly aware of any Radar effects as more OWFs 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”.
271. The MCA has also produced guidance to mariners operating in proximity to OREIs in the UK which highlights Radar issues amongst others to be taken into account when planning and undertaking voyages in proximity to OREIs (MCA, 2008a). The interference buffers presented in **Table 15.1** are based on MGN 654 (MCA, 2021), MGN 371 (MCA, 2008a), MGN 543 (MCA, 2016) and MGN 372 (MCA, 2008b).

Table 15.1 Distance at which Impacts of Marine Radar Occur

Distance at which Effect Occurs (nm)	Identified Effects
0.5	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ 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.

272. As noted in **Table 15.1**, 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 the International Regulations for Preventing Collisions at Sea (COLREGs) Rule 6 Safe Speed are particularly applicable and must be observed with due regard to the prevailing circumstances (IMO, 1972/77). In restricted visibility, Rule 19 Conduct of Vessels in Restricted Visibility applies and compliance with Rule 6 becomes especially relevant. In such conditions mariners are required, under Rule 5 Look-out to take

into account information from other sources which may include sound signals and VHF information, for example from a VTS or AIS (MCA, 2016).

15.7.2 Experience from Operational Developments

273. The evidence from mariners operating in proximity to existing OWFs is that they quickly learn to adapt to any effects. **Figure 15.3** presents the example of the Galloper and Greater Gabbard OWFs, which are located in proximity to IMO routing measures. Despite this proximity to heavily trafficked Traffic Separation Scheme (TSS) lanes, there have been no reported incidents or issues raised by mariners who operate within the vicinity. The interference buffers presented in **Figure 15.3** are as per **Table 15.1**.

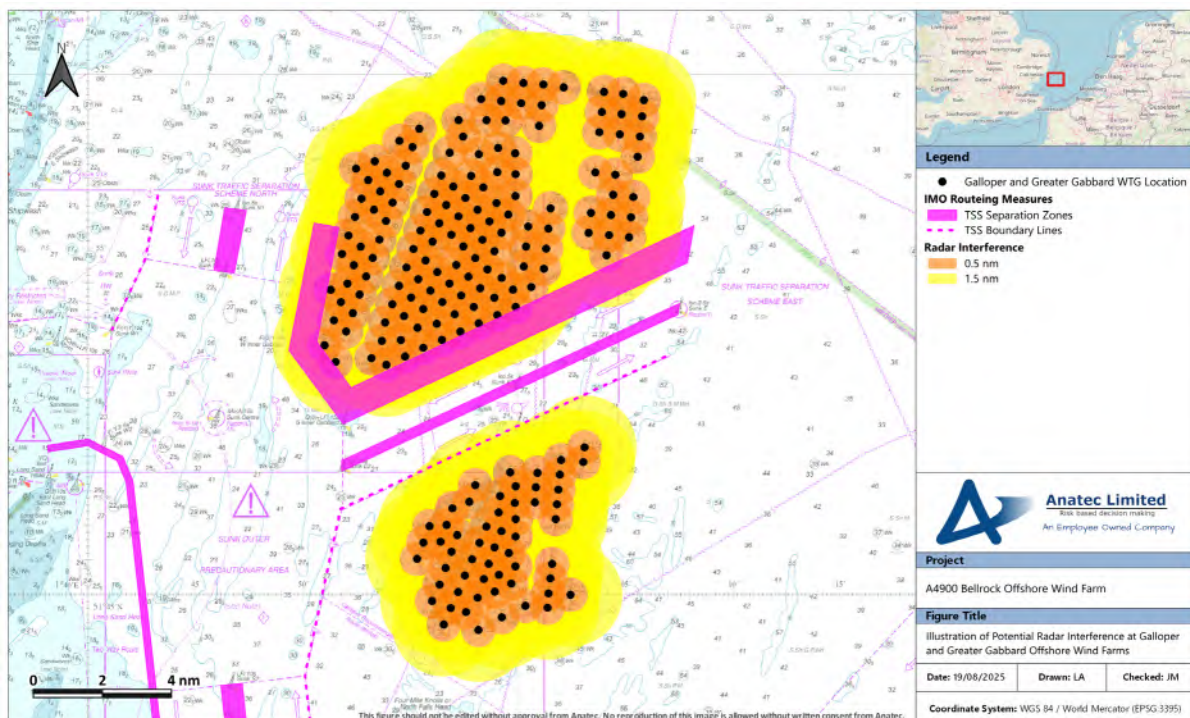


Figure 15.3 Illustration of Potential Radar Interference at Greater Gabbard and Galloper Offshore Wind Farms

274. As indicated by **Figure 15.3**, vessels utilising the 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.

275. 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 1.7% of the vessel traffic recorded within the study

area was under 15 m LOA, although throughout the vessel traffic surveys approximately 99% of vessel tracks during the summer survey period were recorded on AIS, indicating a high level of AIS take-up among vessels for which AIS carriage is not mandatory. Due to the distance offshore, smaller vessels which would not normally carry AIS are less likely to transit as far from the coast.

276. 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 OWF.
277. **Figure 15.4** presents an illustration of potential Radar interference due to the Bellrock WFDA relative to the post Bellrock WFDA routing illustrated in **Section 13**. The Radar effects have been applied to the indicative Bellrock WFDA layout introduced in **Section 6.2.1**.

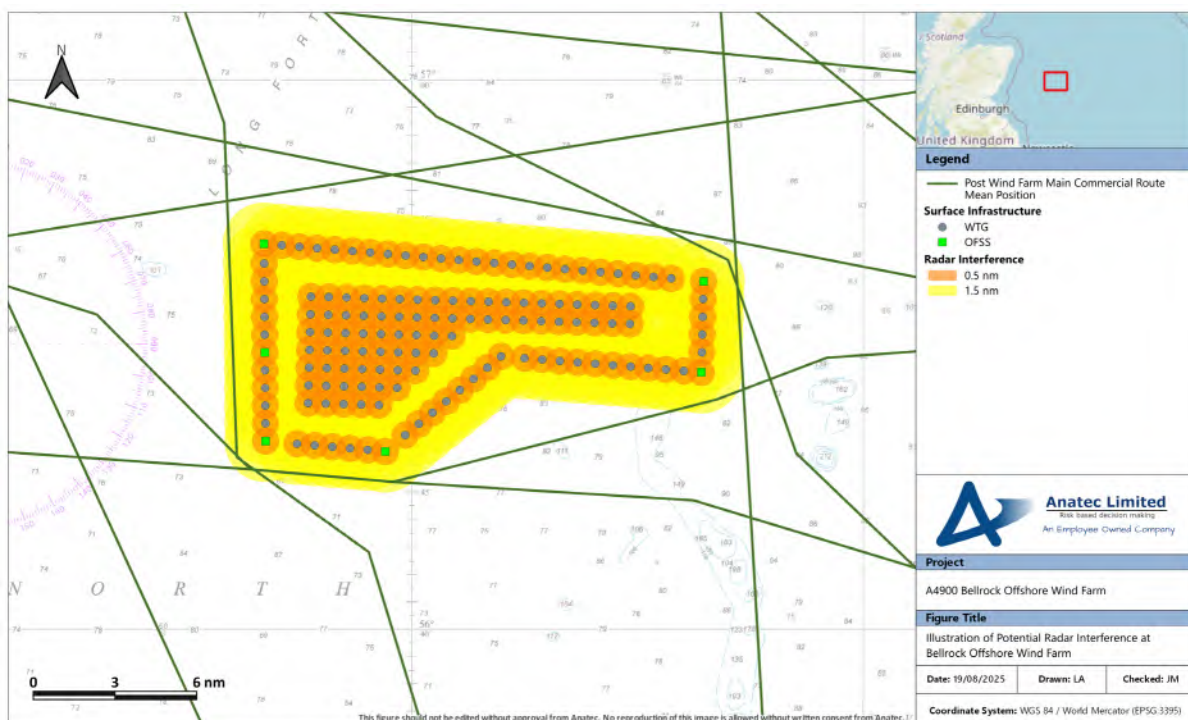


Figure 15.4 Illustration of Potential Radar Interference at the Bellrock Wind Farm Development Area

278. Vessels passing within the Bellrock WFDA will be subject to a greater level of interference with impacts becoming more substantial in close proximity to WTGs or OfSSs. 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.

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

15.8 Sound Navigation and Ranging System

280. No evidence has been found to date with regard to existing OWFs 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 Bellrock WFDA.

15.9 Noise

281. No evidence has been found to date with regard to existing OWFs to suggest that prescribed sound signals are in any way impacted by acoustic noise produced by OWFs.

15.10 Summary of Potential Effects on Use

282. Based on the detailed technical assessment of the effects due to the presence of the Bellrock WFDA on navigation, communication and position fixing equipment in the previous subsections, **Table 15.2** summarises the assessment of frequency and consequence and the resulting risk for each component of this hazard.

Table 15.2 Summary of Risk to Navigation, Communication, and Position Fixing Equipment

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

283. On the basis of these findings, associated risks are screened out of the risk assessment undertaken in **Sections 18 and 19**.

16 Collision and Allision Risk Modelling

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

16.1 Hazards Under Consideration

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

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

286. The pre Bellrock WFDA assessment has been informed by the vessel traffic survey data (**Section 10**) in combination with the outputs of consultation (**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 Bellrock WFDA.

287. The methodology for determining the post Bellrock WFDA routeing is outlined in **Section 14.5.1** with the subsequent route deviations used throughout this section for post Bellrock WFDA modelling.

16.2 Scenarios Under Consideration

288. For each element of the quantitative assessment both a pre and post Bellrock WFDA scenario with base and future case vessel traffic levels have been considered. As a result, four distinct scenarios have been modelled:

- Pre Bellrock WFDA with base case traffic levels;
- Pre Bellrock WFDA with future case traffic levels defined by a:
 - 10% increase in traffic; and
 - 20% increase in traffic.
- Post Bellrock WFDA with base case traffic levels; and
- Post Bellrock WFDA with future case traffic levels defined by a:
 - 10% increase in traffic; and
 - 20% increase in traffic.

289. 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 16.5**.

16.3 Pre Bellrock Wind Farm Development Area Modelling

16.3.1 Vessel to Vessel Encounters

290. An assessment of current vessel to vessel encounters has been undertaken by replaying at high speed the vessel traffic data collected as part of the primary vessel traffic dataset (**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 OWF, could potentially increase congestion and therefore also increase the risk of encounters and collision. No account of whether encounters are head on or stern on are given; only close proximity is accounted for.
291. The identified encounters were manually checked to determine whether there were any clear cases of non-genuine encounters (e.g., towing operations). Any such instances have been removed, and the final encounters are illustrated in **Figure 16.1**, colour-coded by vessel type.

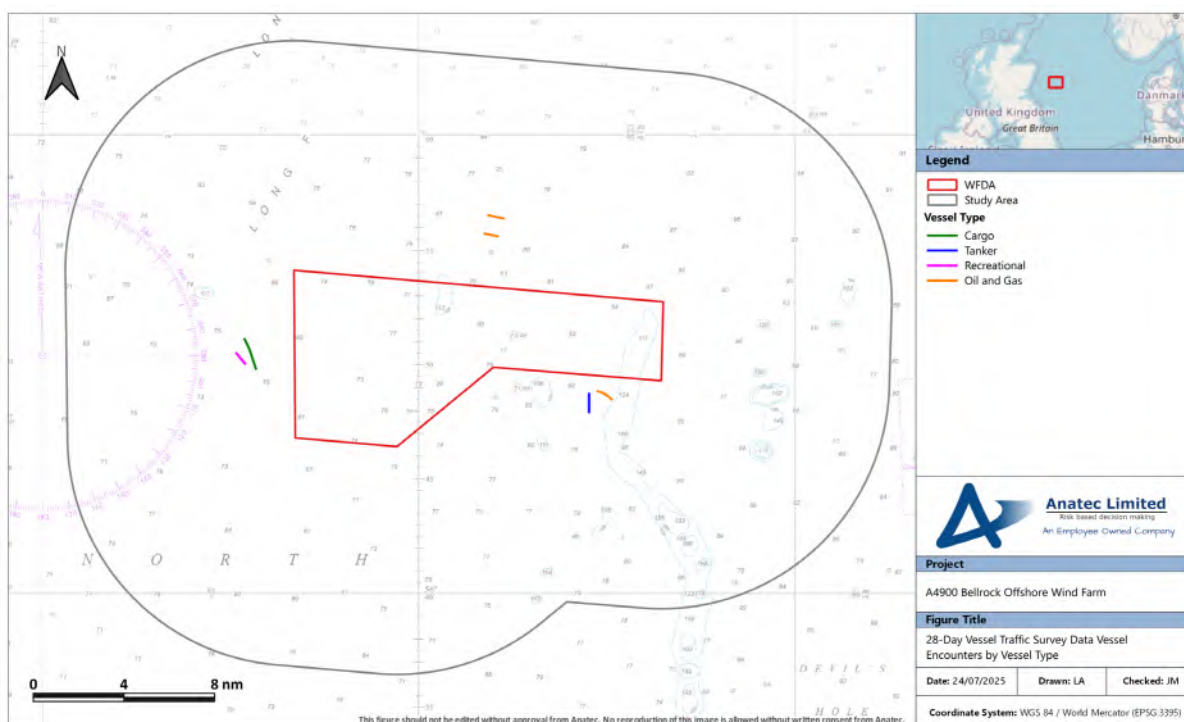


Figure 16.1 28-Day Vessel Traffic Survey Data Vessel Encounters by Vessel Type

292. A total of three encounters were recorded during the data periods resulting in an average of one encounter every nine to ten days within the study area. Half of vessels involved in encounters were oil and gas vessels broadcasting destinations of Aberdeen and the Judy Field. One tanker, recreational, and cargo vessel were also recorded to be involved in an encounter during the 28-day data period. All three

encounters were recorded during the summer survey period and located in proximity to (but outside) the Bellrock WFDA.

16.3.2 Vessel to Vessel Collisions

293. Using the pre Bellrock WFDA vessel routeing as input, Anatec’s COLLRISK model has been run to estimate the existing vessel to vessel collision risk in proximity to the Bellrock WFDA.

294. 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 16.2**.

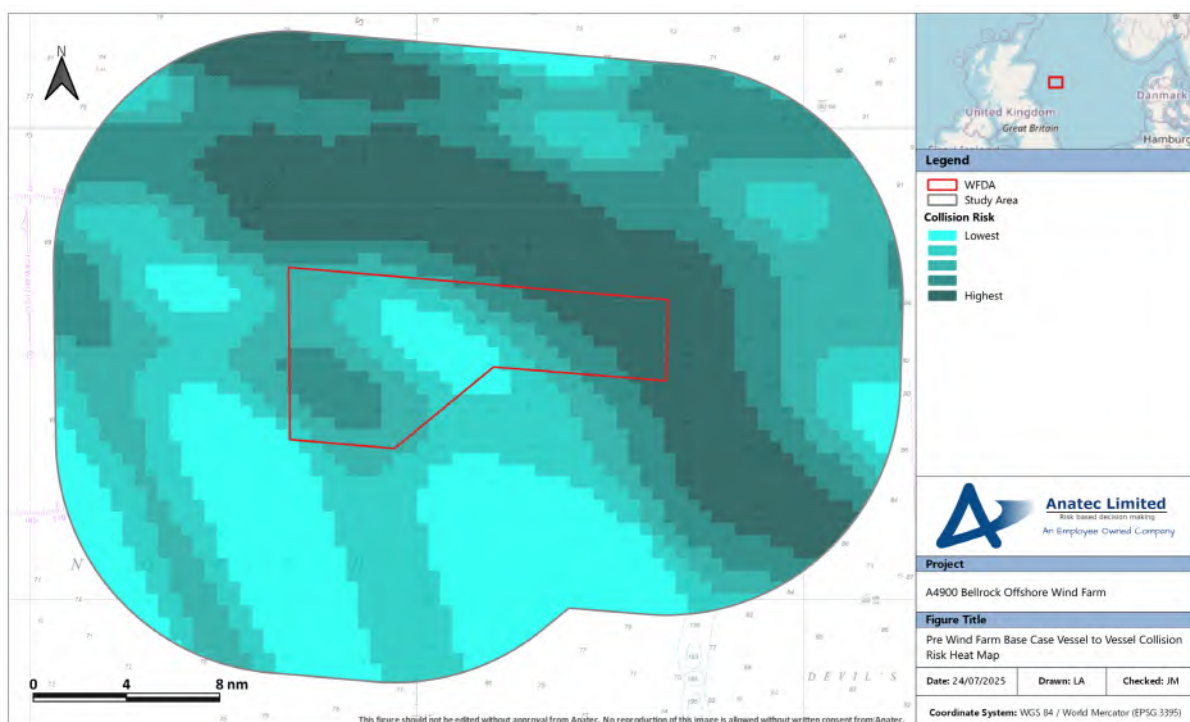


Figure 16.2 Pre Bellrock Wind Farm Development Area Base Case Vessel to Vessel Collision Risk Heat Map

295. Assuming base case vessel traffic levels, the annual collision frequency pre Bellrock WFDA was estimated to be 1.03×10^{-4} , corresponding to a return period of approximately one in 9,729 years. This is below average for UK OWF developments that have been modelled in NRAs given the distance offshore of the Bellrock WFDA and the comparatively lower volumes of traffic. The greatest collision risk density was located to the north of the Bellrock WFDA, associated with several north-west/south-east and east/west routes.

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

16.4 Post Bellrock Wind Farm Development Area Modelling

16.4.1 Simulated Automatic Identification System

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

298. A plot of 28 days of simulated AIS (to match the total duration of the vessel traffic data) within the study area based on the deviated main commercial routes is presented in **Figure 16.3**.

299. It is noted that the simulated AIS represents an WCS based on a mean 1 nm passing distance from the Bellrock WFDA for routes.

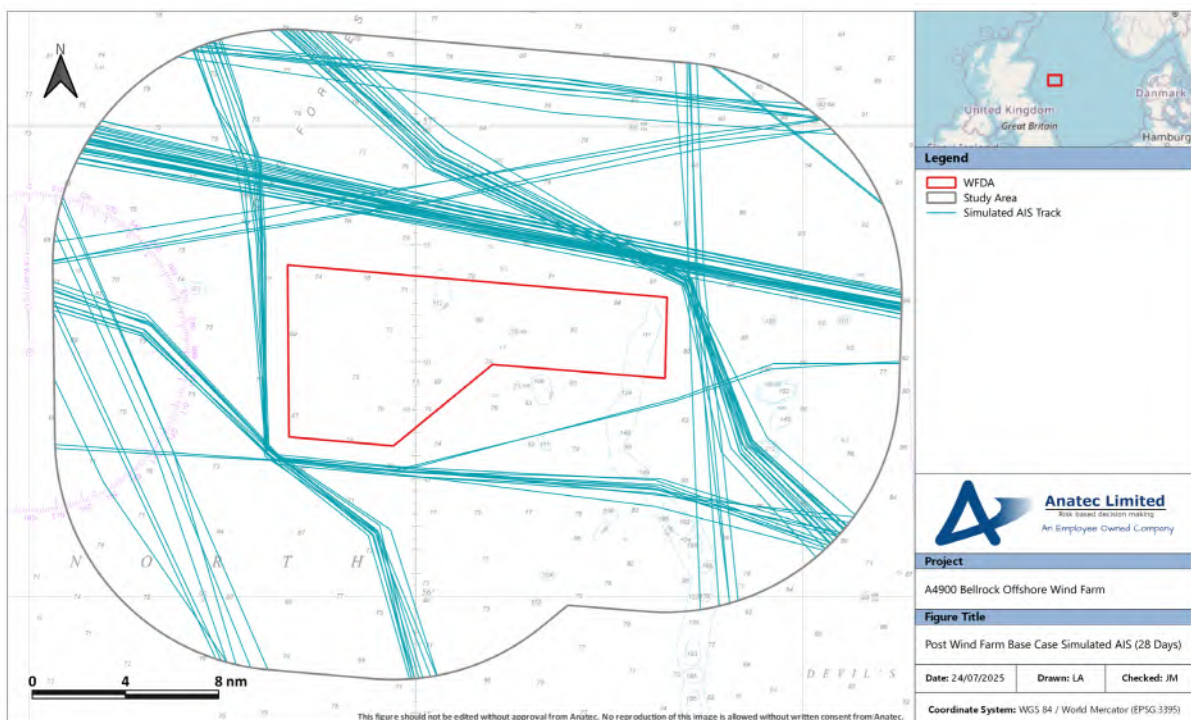


Figure 16.3 Post Bellrock Wind Farm Development Area Base Case Simulated Automatic Identification System (28 Days)

16.4.2 Vessel to Vessel Collisions

300. Using the post Bellrock WFDA routing as input, Anatec’s COLLRISK model has been run to estimate the anticipated vessel to vessel collision risk in proximity to the Bellrock WFDA.
301. 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 16.4**.

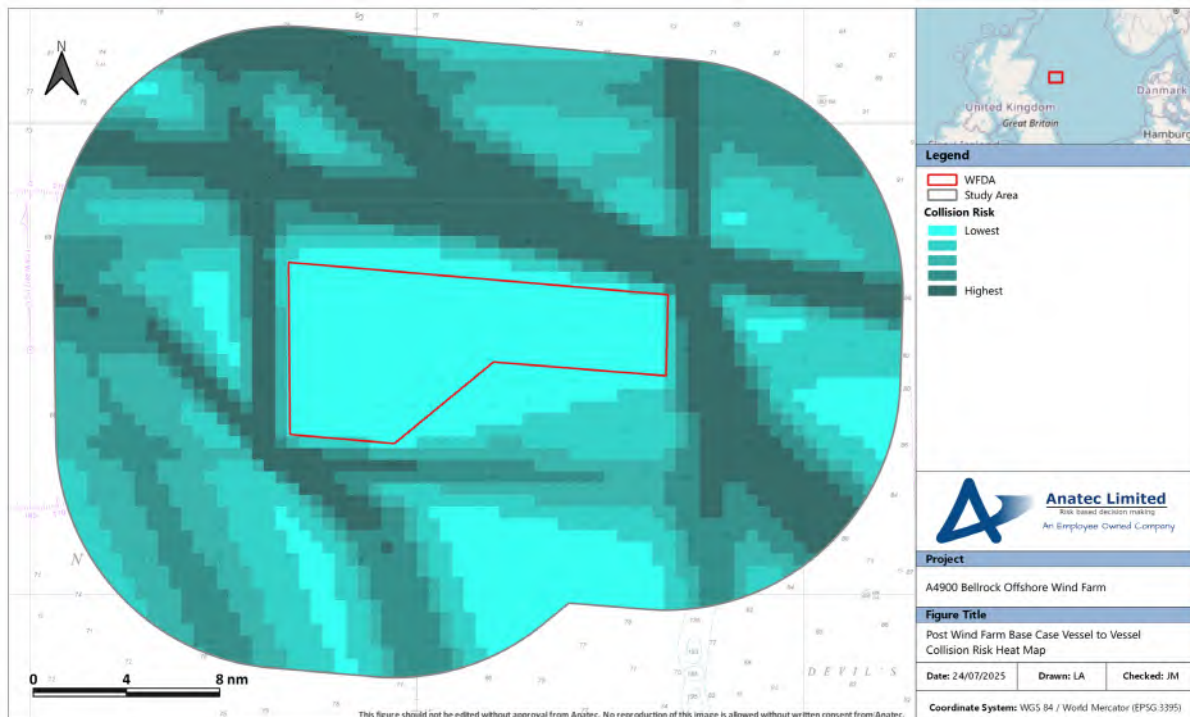


Figure 16.4 Post Bellrock Wind Farm Development Area Base Case Vessel to Vessel Collision Risk Heat Map

302. Assuming base case traffic levels, the annual collision frequency post Bellrock WFDA was estimated to be 1.88×10^{-4} which corresponds to a return period of approximately one in 5,327 years. The represents an 83% increase in collision frequency compared to the pre Bellrock WFDA base case results, but remains relatively low compared to other areas within the North Sea.
303. The greatest increase in collision risk between the base cases for pre and post Bellrock WFDA scenarios is seen outside the north-west corner of the Bellrock WFDA, where two higher use routes cross.

16.4.3 Powered Vessel to Structure Allision Risk

304. Based upon the vessel routing identified in the study area, the anticipated re-routing as a result of the presence of the Bellrock WFDA, and assumptions that

relevant embedded mitigation measures are in place (**Section 21**), the frequency of an errant vessel under power deviating from its route to the extent that it came into proximity with a structure associated with the Bellrock WFDA is considered to be low.

305. From consultation with the shipping industry, it is also assumed that commercial vessels would be highly unlikely to navigate between structures in the Bellrock WFDA due to the restricted sea space, and so will instead be directed by the aids to navigation located in the region and those present at the Bellrock WFDA. During the construction and decommissioning phases this will primarily consist of the buoyed construction/decommissioning area, whilst during the O&M phase this will primarily consist of the lighting and marking of the structures in the Bellrock WFDA themselves.
306. Using the post Bellrock WFDA routeing as input, together with the WCS indicative Bellrock WFDA 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 structures within the Bellrock WFDA whilst under power. To maintain an WCS, the model did not consider one structure shielding another.
307. A plot of the annual powered allision frequency per structure for the base case is presented in **Figure 16.5**, with the chart background removed to increase the visibility of those structures with lower allision frequencies.

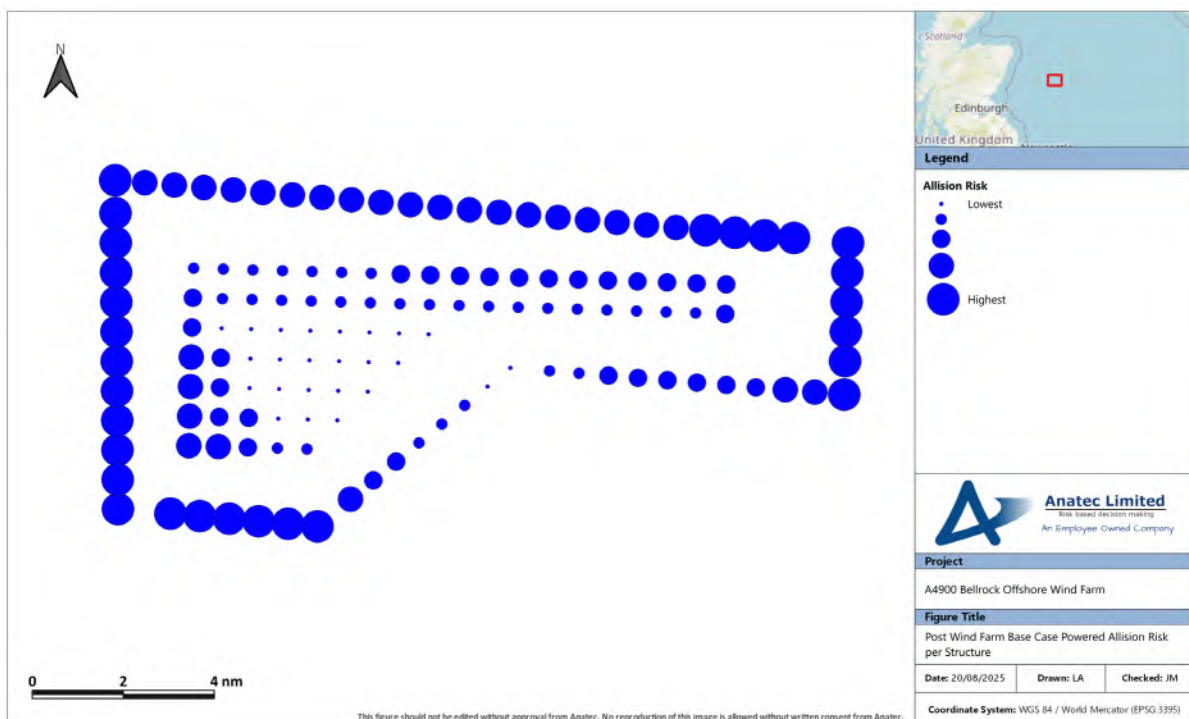


Figure 16.5 Post Bellrock Wind Farm Development Area Base Case Powered Allision Risk Per Structure

308. Assuming base case vessel traffic levels, the annual powered allision frequency was estimated to be 7.36×10^{-4} , corresponding to a return period of approximately one in 1,358 years. This is low for UK OWF developments which have been modelled in NRAs and reflects the distance offshore of the Bellrock WFDA and the low volume of vessel traffic in the study area.
309. The greatest powered vessel to structure allision risk was associated with structures at the north-east corner of the Bellrock WFDA, where the two busiest routes pass the Bellrock WFDA.

16.4.4 Drifting Vessel to Structure Allision Risk

310. Using the post Bellrock WFDA routeing as input, together with the WCS indicative layout and local meteorological ocean data, Anatec's COLLRISK model was run to estimate the likelihood of a commercial vessel alliding with one of the structures within the Bellrock WFDA. 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.
311. The exposure times for a drifting scenario are based upon the vessel hours spent in proximity to the Bellrock WFDA (up to 10 nm from the Bellrock WFDA). These have been estimated based on the vessel traffic levels, speeds, and revised routeing patterns. The exposure is divided by vessel type and size to ensure that these specific factors, which based upon analysis of historical incident data have been shown to influence incident rates, are taken into account for the modelling.
312. Using this information, the overall rate of mechanical failure in proximity to the Bellrock WFDA was estimated. The probability of a vessel drifting towards a structure in the Bellrock WFDA 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 7.1**:
- Wind;
 - Peak spring flood tide; and
 - Peak spring ebb tide.
313. 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 structure in the Bellrock WFDA. 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.

314. After modelling the three drifting scenarios, it was established that the wind dominated scenario produced the worst-case results. A plot of the annual powered allision frequency per structure for the base case is presented in **Figure 16.6**.

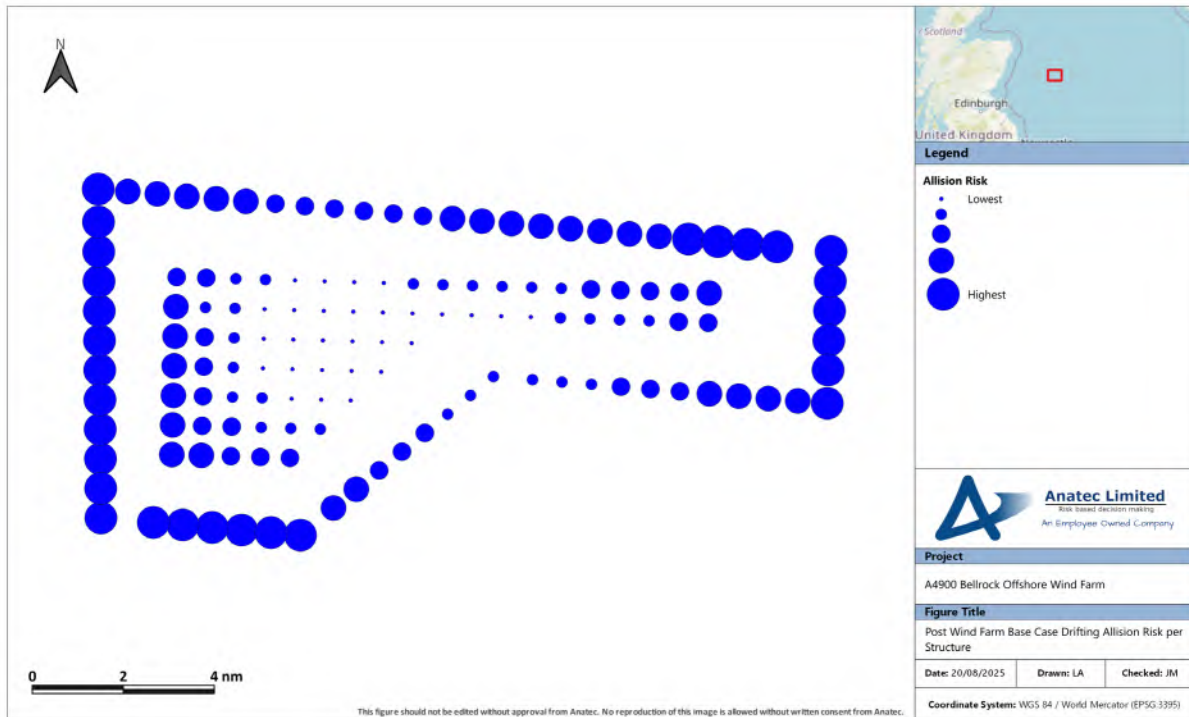


Figure 16.6 Post Bellrock Wind Farm Development Area Base Case Drifting Allision Risk Per Structure

315. Assuming base case vessel traffic levels, the annual drifting allision frequency was estimated to be 8.13×10^{-5} , corresponding to a return period of approximately one in 12,299 years. This is low for UK OWF developments which have been modelled in NRAs and reflects the distance offshore of the Bellrock WFDA and the low volume of vessel traffic in the study area, particularly to the south-west of the Bellrock WFDA which would be most severely affected by the predominant wind direction.
316. The greatest drifting vessel to structure allision risk was associated with structures at the north-east and south-west corners of the Bellrock WFDA, as well as the western periphery.
317. Historically, there have been no reported drifting allision incidents with OWF structures in the UK. Whilst drifting vessel scenarios 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 under tow).

16.4.5 Fishing Vessel to Structure Allision Risk

318. Using the vessel traffic survey data as input, Anatec’s COLLRISK model was run to estimate the likelihood of a fishing vessel alliding with one of the structures within the Bellrock WFDA.
319. A fishing vessel allision is classified separately from other allisions since, unlike in the case of the commercial traffic characterised using the main commercial routes, fishing vessels may be either in transit or actively fishing within the study area. Moreover, fishing vessels could be observed internally within the Bellrock WFDA in addition to externally. Anatec’s COLLRISK model uses vessel numbers, sizes (length and beam), WFDA 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 OWF arrays.
320. The model conservatively assumes no change in baseline fishing activity i.e. no account is made of vessels passing over or in close proximity to structure locations choosing to increase passing distance post Bellrock WFDA. This is considered an extremely conservative assumption.
321. A plot of the annual fishing vessel allision frequency per structure for the base case is presented in **Figure 16.7**.

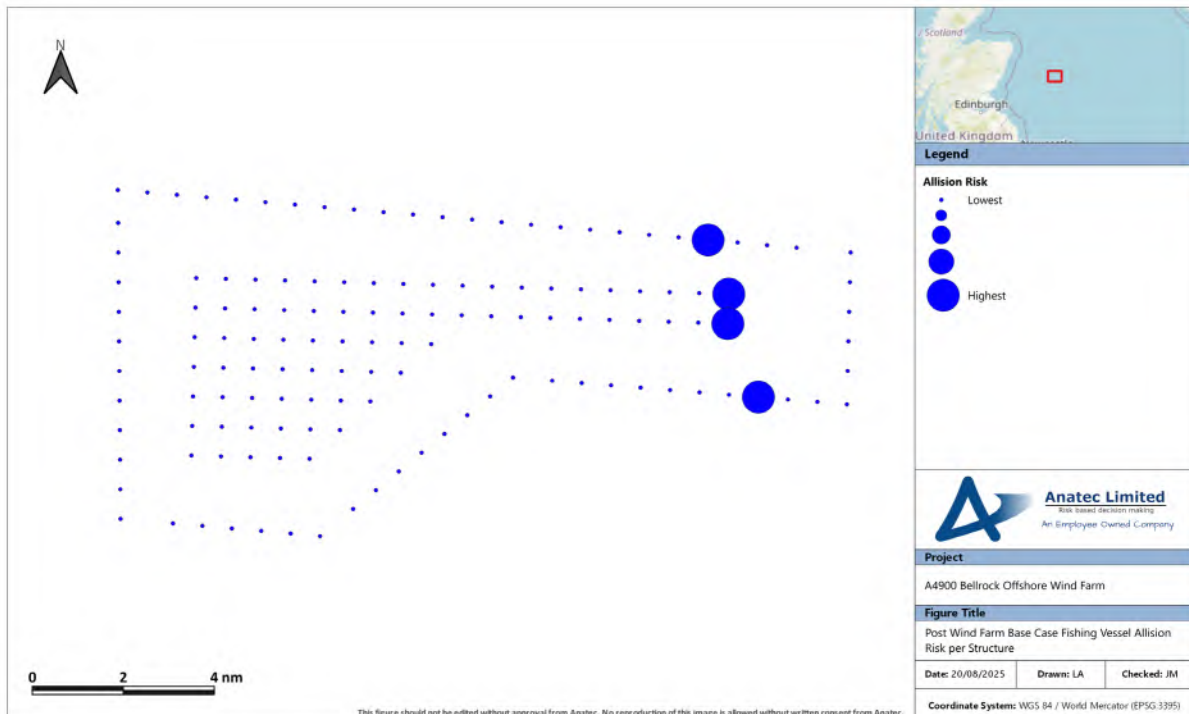


Figure 16.7 Post Wind Farm Development Area Base Case Fishing Allision Risk Per Structure

322. Assuming base case traffic levels, the annual fishing vessel to structure allision frequency was estimated to be 4.71×10^{-3} , corresponding to a return period of approximately one in 212 years.
323. Fishing vessel to structure allision risk was highest associated with structures to the east of the Bellrock WFDA, as a result of a single vessel recorded in transit within the Bellrock WFDA (see **Section 10.3.5**). It is acknowledged that should WTGs be located within the deepwater trench towards the eastern extent of the Bellrock WFDA the allision risk associated with such structures may be greater, although based on the long-term vessel traffic data in **Annex E**, the frequency with which fishing activity occurs in this area is relatively low. Therefore, it is not anticipated that this would materially affect the quantitative findings of the model.
324. The model is calibrated against known allision incidents within UK OWFs (see **Section 9.5**). Most likely consequences will be a low impact/minor contact with no significant damage, no injuries to persons, and no pollution (in line with incident statistics to date as per **Section 9.5.1**).

16.5 Risk Results Summary

325. The previous sections modelled two scenarios, namely the pre and post Bellrock WFDA scenarios with base case traffic levels. To incorporate the potential for future traffic growth pre and post Bellrock WFDA scenarios each with future case traffic levels have also been modelled (10% and 20% increases). **Table 16.1** summarises the results of all six scenarios.

Table 16.1 Risk Results Summary

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Bellrock WFDA	Post Bellrock WFDA	Change
Vessel to vessel collision	Base case	1.03×10^{-4} (1 in 9,729 years)	1.88×10^{-4} (1 in 5,327 years)	8.49×10^{-5} (1 in 11,773 years)
	Future case (10%)	1.42×10^{-4} (1 in 7,066 years)	2.57×10^{-4} (1 in 3,893 years)	1.15×10^{-4} (1 in 8,669 years)
	Future case (20%)	1.63×10^{-4} (1 in 6,125 years)	2.97×10^{-4} (1 in 3,368 years)	1.34×10^{-4} (1 in 7,485 years)
Powered vessel to structure allision	Base case	-	7.36×10^{-4} (1 in 1,358 years)	7.36×10^{-4} (1 in 1,358 years)
	Future case (10%)	-	8.87×10^{-4} (1 in 1,127 years)	8.87×10^{-4} (1 in 1,127 years)
	Future case (20%)	-	9.46×10^{-4} (1 in 1,057 years)	9.46×10^{-4} (1 in 1,057 years)

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Bellrock WFDA	Post Bellrock WFDA	Change
Drifting vessel to structure allision	Base case	-	8.13×10^{-5} (1 in 12,299 years)	8.13×10^{-5} (1 in 12,299 years)
	Future case (10%)	-	8.94×10^{-5} (1 in 11,181 years)	8.94×10^{-5} (1 in 11,181 years)
	Future case (20%)	-	9.76×10^{-5} (1 in 10,249 years)	9.76×10^{-5} (1 in 10,249 years)
Fishing vessel to structure allision	Base case	-	4.71×10^{-3} (1 in 212 years)	4.71×10^{-3} (1 in 212 years)
	Future case (10%)	-	5.18×10^{-3} (1 in 193 years)	5.18×10^{-3} (1 in 193 years)
	Future case (20%)	-	5.65×10^{-3} (1 in 176 years)	5.65×10^{-3} (1 in 176 years)
Total	Base case	1.03×10^{-4} (1 in 9,729 years)	5.71×10^{-3} (1 in 174 years)	5.61×10^{-3} (1 in 178 years)
	Future case (10%)	1.42×10^{-4} (1 in 7,066 years)	6.41×10^{-3} (1 in 155 years)	6.27×10^{-3} (1 in 159 years)
	Future case (20%)	1.63×10^{-4} (1 in 6,125 years)	6.99×10^{-3} (1 in 143 years)	6.83×10^{-3} (1 in 146 years)

16.6 Mooring Lines and Dynamic Inter-array Cables

326. This section considers the mooring lines and dynamic IACs associated with the FOU⁷ relative to baseline traffic volumes and draughts to determine potential risk associated with under keel interaction. The outputs have been fed into the qualitative risk assessment of under keel interaction undertaken in **Section 18**.
327. Based on operational experience of existing OWFs and consultation undertaken for the Bellrock WFDA, it is likely that commercial vessels will deviate to avoid the Bellrock WFDA. On this basis, considering the vessel types recorded within the Bellrock WFDA (**Section 10**), the key vessel type that must be considered is fishing. It is noted that recreational vessels were not recorded regularly within the Bellrock

⁷ Only WTGs and OfSSs are considered since limited design information is available in relation to mooring/metocean buoys; however, it is anticipated that the horizontal footprint in the water column of mooring lines and dynamic IACs associated with mooring/metocean buoys will be much more limited than for WTGs and OfSSs.

WFDA in the vessel traffic data and RYA Scotland confirmed that vessel transits as far offshore as the Bellrock WFDA are less likely, with any mariners doing so highly experienced.

328. The focus of this assessment on fishing vessels is considered appropriate on the basis that they will also typically have larger draughts than recreational vessels and based on the available information and consultation are more prevalent than other vessel types in the area.

16.6.1 Vessel Draught

329. The distribution of fishing vessel draughts recorded within the Bellrock WFDA during the 28 days of vessel traffic survey data are presented in **Figure 16.8**. All fishing vessels recorded during the survey broadcast a valid draught.

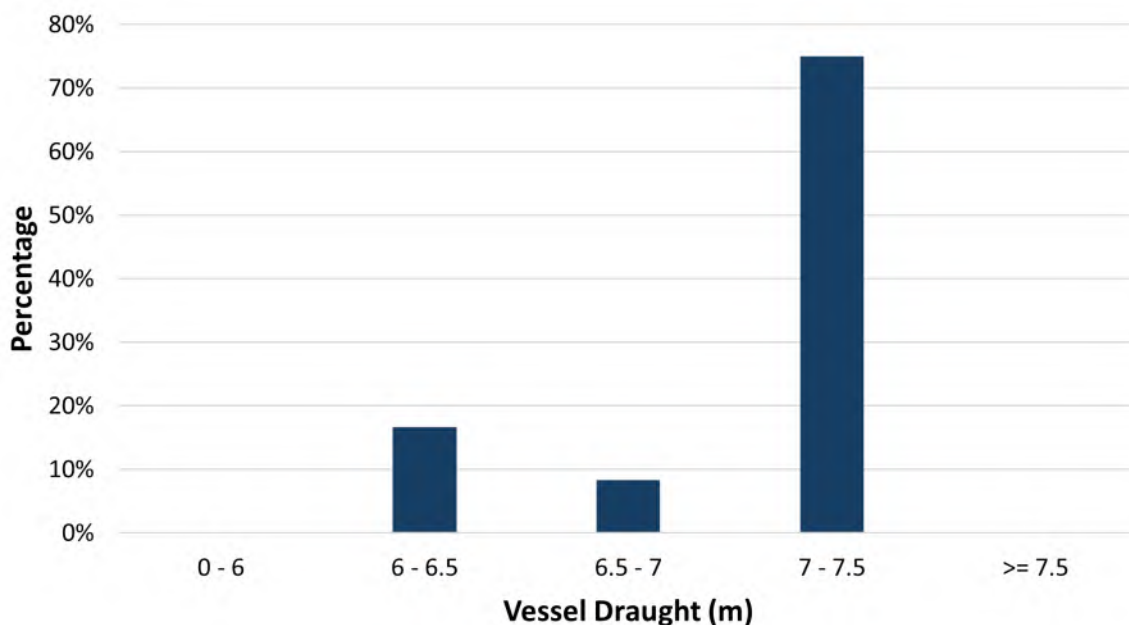


Figure 16.8 28-Day Automatic Identification System Fishing Vessel Draught Distribution (2024)

330. The maximum draught recorded was 7.3 m, with the average being approximately 6.9 m. As shown, the majority of fishing vessels within the study area had draughts of between 7 m and 7.5 m (75%).

16.6.2 Mooring Line Interaction

331. Based on the substructure types and mooring line arrangements under consideration, as illustrated in **Figure 6.3** (see **Section 6**), the use of semi-taut mooring lines is considered the WCS for under keel interaction.

332. On this basis, the approximate descent of the mooring lines in the vicinity of the FSS is shown in **Figure 16.9**. The average and maximum fishing vessel draughts recorded in the study area are shown for reference as well as commercial vessels for comparison. It is noted that the values detailed above have been assumed for the purposes of this interaction assessment and that it will be necessary to assess final under keel clearance available post installation.
333. The assessment has been undertaken up to 1,300 m from the centre of the FSS (1,232 m from the edge of the FSS), noting that this is the maximum horizontal distance of the mooring line from the edge of the FSS to the anchor.

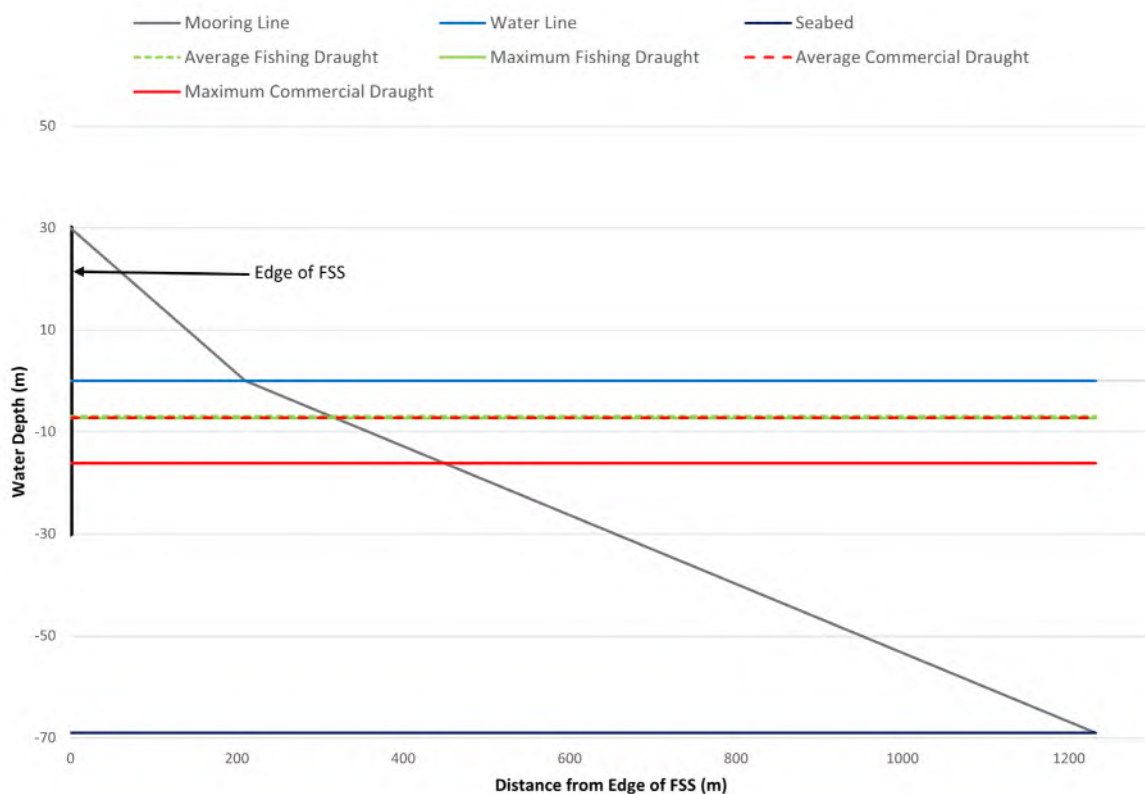


Figure 16.9 Mooring Line Relative to Maximum Vessel Draught

334. As shown, a fishing vessel with the maximum draught recorded (7.3 m) should avoid an under keel interaction beyond approximately 319 m from a FSS. A fishing vessel of average draught (6.9 m) would achieve this beyond 313 m from a barge FSS.
335. For completeness, a commercial vessel with the largest draught recorded (16.2 m) should avoid an under keel interaction beyond approximately 451 m from a FSS. A commercial vessel of average draught (7.2 m) would achieve this beyond 317 m from a FSS. However, it is again acknowledged that commercial vessels are not expected to navigate internally within the Bellrock WFDA.

336. Although these distances are substantial (and extend beyond the maximum rotor diameter of the WTGs), the mooring line does not break the surface of the water until approximately 210 m from the edge of the FSS, i.e., there is a visual aid which may assist fishing vessels with avoiding an under keel interaction risk.
337. Given that fishing vessels may choose to transit internally within the Bellrock WFDA, **Figure 16.10** presents the worst-case layout for shipping and navigation alongside areas of potential interaction between fishing vessels and the mooring lines, based on the maximum fishing vessel draught recorded within the study area and the angle of descent of the mooring lines. It should be noted that this figure is for illustrative purposes only, all subsea infrastructure including the mooring lines will be located entirely within the Bellrock WFDA.

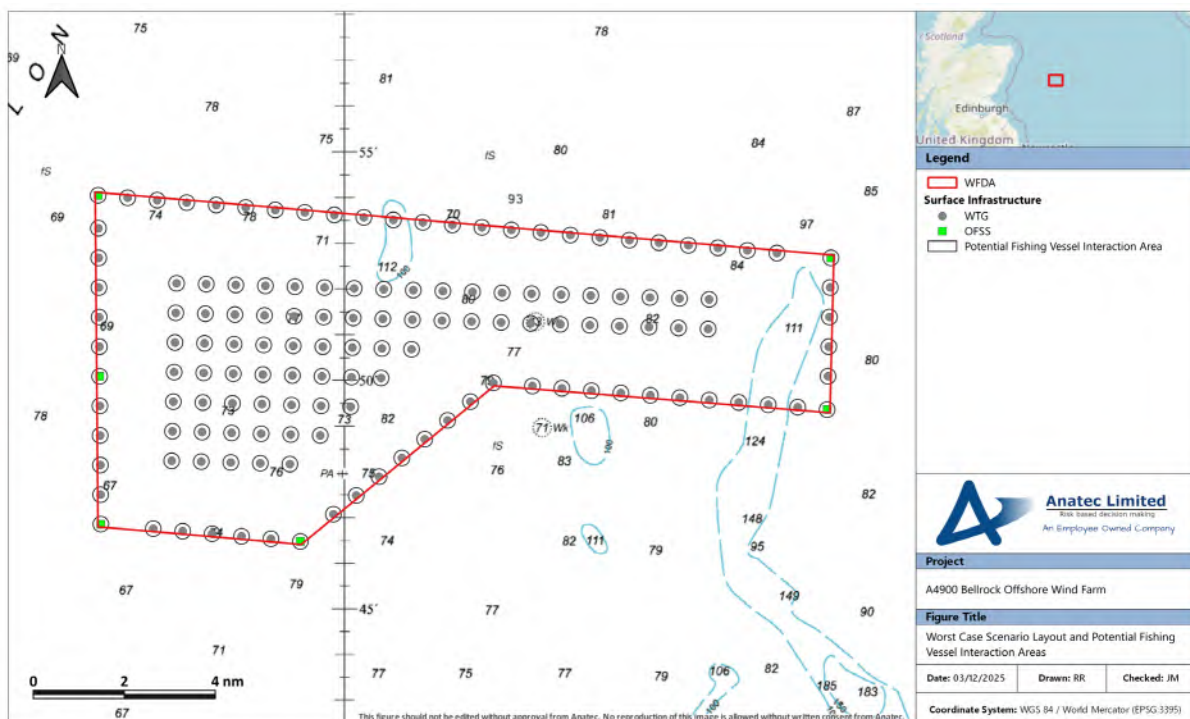


Figure 16.10 Worst-Case Scenario Layout and Potential Fishing Vessel Interaction Areas

338. The potential interaction areas for fishing vessels represent a minority of the Bellrock WFDA (approximately 15%) and there is adequate space for fishing vessels to navigate, including entering and exiting the array at the dense perimeter.
339. The potential for interaction with the mooring lines has been assessed within the O&M phase risk assessment in **Section 18.2.6**. The potential that the mooring system will fail leading to a loss of station incident is assessed in through all phases of the Bellrock WFDA in **Section 18**.

340. As part of this, consideration has been given in the risk assessment, to an ORE Catapult report which investigated potential hazards relating to the use of floating technology including mooring lines, dynamic IACs and towage operations (ORE Catapult, 2023).

16.6.3 Dynamic Inter-array Cables

341. A bend may be incorporated into the dynamic IAC design. If so the minimum depths of the dynamic IAC below the sea surface will be 10 m at the connection point of the FSS, as well as at 20 m at a maximum distance of 300 m from the edge of the FSS. From this point, the dynamic IAC will fall at an angle to the seabed. This arrangement is assumed as the worst-case.
342. The descents of the dynamic IACs from the connection point and bend are shown in **Figure 16.11**. The average and maximum fishing vessel draughts recorded in the study area are shown for reference (**Section 16.6.1**) with commercial vessels again as comparison. It is again noted that the values detailed above have been assumed for the purposes of this interaction assessment and that it will be necessary to assess final under keel clearance available post installation.
343. This assessment has been undertaken from the connection point and the 300 m distance from the edge of the FSS due to the potential of a bend occurring within the dynamic IACs. As these are the minimum depths, the risk has been calculated from these points.

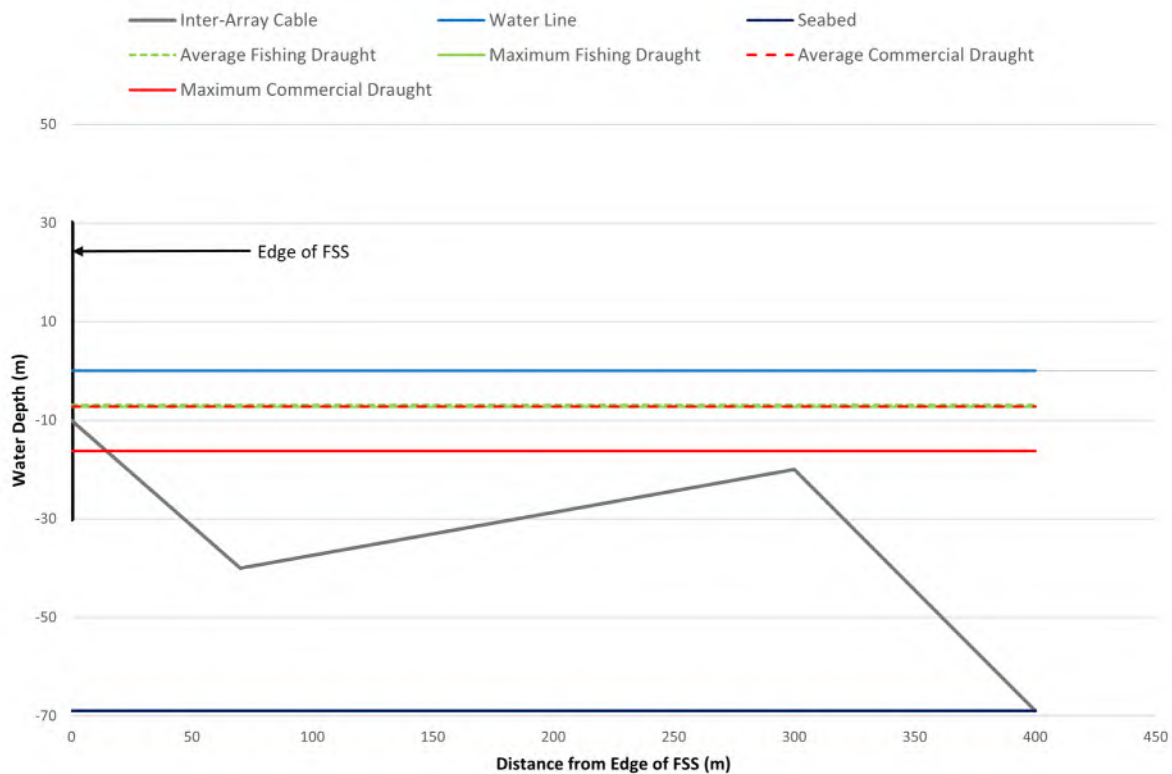


Figure 16.11 Dynamic Inter-array Cables Relative to Maximum Vessel Draught

344. As shown, a fishing vessel with the maximum draught recorded (7.3 m), or the average draught recorded (6.9 m), will likely avoid an under keel interaction with an dynamic IAC. Similarly, a commercial vessel of average draught (7.2 m) will also likely avoid an under keel interaction with a dynamic IAC given that the minimum IAC depth is 10 m.
345. A commercial vessel with the largest draught recorded (16.2 m) should avoid an under keel interaction beyond approximately 15 m from the FSS. This distance is less substantial than those associated with the mooring lines. The distance is well within the range of a 500 m Safety Zone (where deployed) and the maximum rotor diameter of the WTGs.
346. It is not anticipated that third-party vessels will choose to transit within 15 m of the FSS. Given this, it is considered more likely that vessels may transit above the dynamic IACs where the minimum depth is at least 20 m. This depth is expected to be sufficient to avoid under keel interaction, as illustrated by **Figure 16.11**.
347. The potential for interaction with the dynamic IACs has been assessed within the O&M phase risk assessment in **Section 18**.

348. As noted above, consideration has been given to an ORE Catapult report which investigated potential hazards relating to the use of floating technology (ORE Catapult, 2023).

17 Introduction to Risk Assessment

349. **Sections 18** and **19** provides a qualitative and quantitative risk assessment (using FSA) for the hazards identified due to the Bellrock WFDA in isolation, based on baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments. The hazards assessed are as follows:

- Vessel displacement resulting in increased third-party collision risk;
- Collision risk between third-party and project vessels;
- Reduced access to local ports and harbours;
- Surface structure allision risk (powered and drifting);
- Loss of station;
- Reduction of under keel clearance due to presence of sub-surface infrastructure;
- Anchor interaction with sub-surface infrastructure; and
- Reduction of SAR capability due to surface infrastructure.

350. The shipping and navigation users considered are as follows:

- Commercial vessels;
- Recreational vessels;
- Commercial fishing vessels in transit;
- Emergency responders; and
- Local ports and services.

351. For each hazard, embedded mitigation measures which have been identified as relevant to reducing risk are listed, with full descriptions provided in **Section 21**. This is followed by statements defining the frequency of occurrence, severity of consequence, and subsequent significance of risk based on the methodology defined in **Section 3**.

352. The cumulative risk assessment is detailed in **Section 19** and provides a qualitative and quantitative risk assessment (using FSA) for the hazards identified due to the Bellrock WFDA cumulatively with those other developments identified from the cumulative screening (**Section 13**). The same inputs outlined for the 'in isolation risk assessment are applicable.

353. The hazards assessed within the cumulative risk assessment are as per the in isolation risk assessment noted above, with the exception of loss of station, reduction of under keel clearance due to presence of sub-surface structures, and anchor interaction with sub-surface infrastructure. These hazards have been scoped out of the cumulative risk assessment due to the local nature of the hazard which results in a limited pathway by which the hazard could become cumulative in nature.

354. The risk control log (**Section 20**) summarises the risk assessment and a concluding risk statement is provided (**Section 23.4**).

18 Risk Assessment

18.1 Construction Phase

18.1.1 Vessel Displacement Resulting in Increased Third-party Collision Risk

355. *Vessel displacement as a result of construction activities associated with the Bellrock WFDA may increase encounters and collision risk between third-party vessels operating in the area.*

18.1.1.1 Qualification and Quantification of Risk

356. Although there will be no restrictions on entry to the Bellrock WFDA other than through any active Safety Zones, based on experience at previously under construction OWFs, it is anticipated that commercial vessels will choose to not to navigate internally within the buoyed construction area. From the vessel traffic data collected, it was estimated that four of the ten main commercial routes would likely deviate as a result of the construction of the Bellrock WFDA. This could lead to increased vessel densities in the surrounding area, which could in turn lead to an increase in vessel to vessel encounters and therefore increased collision risk.

357. Based on the methodology for post Bellrock WFDA deviations outlined in **Section 14.5**, deviations to main commercial routes have been defined and are as follows:

- Route 2 (between Germany and North America) would deviate north-east of the Bellrock WFDA resulting in a journey increase of 1.3nm (less than 1% of the total route length);
- Route 3 (between Aberdeen and the Fulmar Field) would deviation south-west of the Bellrock WFDA resulting in a journey increase of 1.4nm (1%);
- Route 4 (between Rotterdam and Iceland/Faroe Islands) would deviate west of the Bellrock WFDA leading to a journey increase of 1.6nm (less than 1%); and
- Route 10 (between Montrose and Sweden) would deviate south of the Bellrock WFDA, resulting in a journey increase of 0.7nm (less than 1%).

358. The busiest of these main commercial routes is Route 2, which accommodates an average of four unique vessels per week. Given the relatively low frequency of vessel routeing, it is not expected that the likelihood of vessel to vessel encounters would significantly increase within the proximity of the Bellrock WFDA. Furthermore, ample sea space exists surrounding the Bellrock WFDA which can be utilised with early course alterations and passage planning.

359. This includes with consideration of the Catcher Area Development located to the east of the Bellrock WFDA. As shown in **Figure 14.5**, there is in excess of 10 nm between both developments which is considered sufficient sea space for multiple passing vessels.

360. Based on the post OWF scenario, the baseline collision frequency for commercial vessel traffic was estimated at one in 5,327 years. This represents an increase of 83% compared to the pre OWF scenario. When anticipating the potential for an increase in vessels, up to a 20% increase in overall vessel numbers was also considered, with an estimated vessel to vessel collision frequency of one every 3,368 years. Overall, this is regarded as a low collision risk relative to other locations within the North Sea.
361. From the vessel traffic data and consultation with Regular Operators, no routing activity specific to adverse weather conditions was identified and therefore it is not anticipated that any displacement due to the Bellrock WFDA in isolation would result in vessels being unable to undertake passages due to restricted options in adverse weather.
362. For small craft, experience at previously under construction OWFs again indicates that fishing vessels and recreational vessels will choose not to navigate internally within the buoyed construction area. From the long-term vessel traffic data there are fishing vessel transits through the Bellrock WFDA which will be displaced and this may increase interaction with commercial vessels. From the vessel traffic data recreational vessel transits are infrequent and, at the distance offshore, typically undertaken by experienced mariners who will likely be familiar with the Bellrock WFDA and passage plan accordingly.
363. Embedded mitigation measures in place to reduce risk include promulgation of information including in relation to construction buoyage location, as well as appropriate marking on nautical charts. These measures will ensure mariners are aware of construction activities and can passage plan in advance to reduce the likelihood of vessel encounters.
364. If an encounter does occur, third-party vessel compliance with Flag State regulations including the COLREGs (IMO, 1972/77) will mitigate collision risk, ensuring that the likelihood of an encounter developing into a collision remains low. This is supported by experience at previous under construction OWFs, where no collision incidents involving two third-party vessels have been reported.
365. Historical collision incident data (see **Section 9.5**) indicates that, in the event of a collision between third-party vessels, the most likely consequences are minor contact between the vessels resulting in minor damage and no injuries to persons, with both vessels able to resume their passage and undertake a full inspection at the next port. The consequences may be greater in the event of the collision featuring a commercial vessel and a small craft. As an unlikely worst-case, one or more of the vessels could be foundered resulting in potential loss of life (PLL) and pollution. Adherence to the **Marine Pollution Contingency Plan (MPCP) (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will aid in managing the risk to the environment and personnel.

18.1.1.2 Embedded Mitigation Measures

366. Embedded mitigation measures considered relevant to reducing risk are as follows:
- All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
 - The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - Ongoing liaison with fishing fleets will be maintained during construction operations via an appointed Fisheries Liaison Officer (FLO);
 - Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and Civil Aviation Authority (CAA) including the buoyed construction area via the development of and adherence to an LMP (an Outline LMP is provided in **Volume V**);
 - Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident; and
 - Advance warning and accurate location details of construction operations, associated Safety Zones, and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins.

18.1.1.3 Frequency of Occurrence

367. The frequency of occurrence in relation to increased third-party to third-party vessel collision risk during the construction phase of the Bellrock WFDA is considered to be **Remote**.

18.1.1.4 Severity of Consequence

368. The severity of consequence in relation to increased third-party to third-party vessel collision risk during the construction phase of the Bellrock WFDA is considered to be **Moderate**.

18.1.1.5 Significance of Risk

369. Taking the frequency of occurrence as **Remote** and the severity of consequence as **Moderate**, the overall significance of risk for increased third-party to third-party vessel collision risk during the construction phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.1.2 Collision Risk Between Third-party and Project Vessels

370. *The presence of vessels associated with the construction of the Bellrock WFDA may increase collision risk between project vessels and third-party vessels already operating in the area.*

18.1.2.1 Qualification of Risk

371. Up to 1,615 return trips may be made by project vessels throughout the construction phase and during pre-construction activities. This includes vessels that may be restricted in their ability to manoeuvre (RAM).
372. Project vessel to third-party vessel encounters will be mitigated by marine coordination including implementation of traffic management procedures, noting that compliance with COLREGs will remain paramount. Such procedures may include the designation of entry and exit points to/from the buoyed construction area and indicative transit corridors between the Bellrock WFDA and the construction port(s). These measures will be set out in the VMNSP. All project vessels will carry AIS and will be compliant with Flag State regulations including SOLAS (IMO, 1974) and COLREGs (IMO, 1972/77). Additionally, ongoing liaison with fishing fleets will be maintained during the construction phase via an appointed FLO.
373. Safety Zones of up to 500 m will be applied for during the construction of each FOU, with an application for Safety Zones of 50 m surrounding each partially-completed or completed FOU for the duration of construction. Safety Zones will protect project vessels involved in construction activities including those that may be RAM. As defined by risk assessments, guard vessels may be deployed to monitor Safety Zone activity, and minimum advisory safe passing distances may also be applied. Advance warning and details of Safety Zones and any minimum advisory safe passing distances will be promulgated via Notifications to Mariners and Kingfisher Bulletins.
374. The presence of the buoyed construction area will further mitigate collision risk between project vessels and third-party vessels by providing a visual aid as set out in IALA Recommendation O-139 (IALA, 2021) and G1162 (IALA, 2022) to maximise mariner awareness. Furthermore, the construction buoyage will be appropriately marked on nautical charts allowing passage planning in advance.
375. The likelihood of a collision between a project vessel and third-party vessel is higher during restricted visibility, as identification of a project vessel entering the Bellrock WFDA may be encumbered. However, vessel movements during adverse weather are regulated through COLREGs compliance, namely reduction of vessel speed to allow greater time for collision avoidance action in the event of an encounter. The carriage of AIS by all project vessels alongside these mitigation measures will reduce the likelihood of a collision between a project vessel and third-party vessel.
376. Collision risk between project vessels and third-party vessels is also increased during towage operations of FOUs from the construction port or wet storage to the Bellrock WFDA given the restricted manoeuvrability of the project vessels. This may be exacerbated by the distance offshore of the Bellrock WFDA and the number of FOUs being towed simultaneously, as noted by the UK Chamber of Shipping during consultation. All project vessels involved in towing procedures will be lit and marked as required under COLREGs (IMO, 1972/77). Should a towage operation fail (most

likely in adverse weather conditions when such operations are less likely to proceed), the FOU could drift into areas of high vessel density increasing collision risk. Towing of FOU's will be subject to a dedicated risk assessment at the time of the towing operation when full specifications relating to the operation are available and this will include consideration of upcoming MCA guidance relating to towing requirements for offshore floating structures.

377. Based on historical incident data, there has been one instance of a third-party vessel colliding with an OWF project vessel in the UK (see **Section 9.5**). As a result of this incident, moderate vessel damage was reported but there was no harm to persons. This incident occurred in 2011 and awareness of OWF developments and application of the industry standard measures outlined above has improved and been refined considerably in the interim, with no further collision incidents reported since.
378. Similar to collision risk between third-party vessels (see **Section 18.1.1**), should an encounter occur between a project vessel and third-party vessel, the encounter is likely to be localised and short in duration. With collision avoidance action implemented in line with the COLREGs (IMO, 1972/77), the vessels involved will likely be able to resume their respective passages and/or activities with no long-term consequences.
379. Should a collision occur, the most likely consequences will be similar to that outlined for the case of a collision between two third-party vessels (see **Section 18.1.1**), namely minor contact between the vessels resulting in 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 or more of the vessels could founder resulting in PLL and pollution. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will aid in managing the risk to the environment and personnel.

18.1.2.2 Embedded Mitigation Measures

380. The embedded mitigation measures relevant to reducing risk are as follows:
- Applications will be made post-consent for Safety Zones including up to 500 m around each FOU during its construction, with Safety Zones up to 50 m during its pre-commissioning.
 - All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
 - The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - Ongoing liaison with fishing fleets will be maintained during construction operations via an appointed FLO;
 - Where appropriate, guard vessels will be used to ensure adherence with Safety Zones or advisory passing distances;

- Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA including the buoyed construction area via the development of and adherence to an LMP (an Outline LMP is provided in **Volume V**);
- Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident;
- Advance warning and accurate location details of construction operations, associated Safety Zones, and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins;
- A VMNSP will be developed post-consent to describe measures put in place relating to navigational safety, confirm the types and numbers of vessels that will be engaged in activities associated with the Bellrock WFDA, and to consider vessel coordination including indicative transit route planning (an Outline VMNSP is provided in **Volume V**);
- Marine coordination will be implemented to manage project vessels throughout construction phase including in liaison with relevant ports and harbours; and
- Project vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974).

18.1.2.3 Frequency of Occurrence

381. The frequency of occurrence in relation to increased project vessel to third-party vessel collision risk during the construction phase of the Bellrock WFDA is considered to be **Extremely Unlikely**.

18.1.2.4 Severity of Consequence

382. The severity of consequence in relation to increased project vessel to third-party vessel collision risk during the construction phase of the Bellrock WFDA is considered to be **Serious**.

18.1.2.5 Significance of Risk

383. Given that the frequency of occurrence is **Extremely Unlikely** and the severity of consequence is **Serious**, the overall significance of risk in relation to increased project vessel to third-party vessel collision risk during the construction phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.1.3 Reduced Access to Local Ports and Harbours

384. *The presence of project vessels may reduce third-party access to the construction port(s) during the construction phase.*

18.1.3.1 Qualification of Risk

385. Peterhead Port and the Port of Aberdeen are the closest ports to the Bellrock WFDA, located approximately 64 nm north-west and 64 nm west respectively. Both of these ports are under consideration for the construction phase of the Bellrock WFDA. Peterhead Port is the largest fishing port in Europe, and the Port of Aberdeen is Scotland’s largest berthage port and a key hub for offshore energy.
386. Given the distance offshore of the Bellrock WFDA, it is not anticipated that surface-piercing structures or project vessels operating within the construction buoyage area will reduce access to nearby ports or harbours. However, should any port listed in **Section 6.5** be utilised by project vessels during construction, their presence may restrict access to local third-party vessels.
387. Based on feedback during the Hazard Workshop (July 2025), the key element of the Bellrock WFDA considered to give rise to port access issues is towage operations given the restricted navigation possible during such activities. Towage operations will be subject to a dedicated risk assessment at the time of the towage operation when full specifications relating to the operation are available. The operation itself would be coordinated in liaison with the statutory harbour authority for the assembly port to ensure any access limitations were minimised.
388. In general, all project vessels will be managed by marine coordination, and will also carry AIS and be compliant with Flag State regulations including the COLREGs (IMO, 1972/77). Promulgation of information will also increase mariner awareness of project activity, including towage operations, allowing for consideration of these works when passage planning. Furthermore, the positions of indicative transit routes within the VMNSP will account for the presence of any anchorage areas, pilotages, or other features relating to local ports. These mitigation measures will ensure any impacts on third-party access to ports are reduced.
389. The most likely consequence of reduced access to ports and harbours is a minor increase in journey time but no disruption to schedules or berthing times. As an unlikely worst-case, schedules may be disrupted with vessels unable to make their berth, but this is considered unlikely given the international nature of vessel routeing and the ability to passage plan given the promulgation of information.

18.1.3.2 Embedded Mitigation Measures

390. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- Ongoing liaison with fishing fleets will be maintained during construction operations via an appointed FLO;
 - Marine coordination will be implemented to manage project vessels throughout construction periods including in liaison with relevant ports and harbours;

- Project vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974);
- Advance warning and accurate location details of construction operations associated Safety Zones and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins; and
- A VMNSP will be developed post-consent to describe measures put in place relating to navigational safety, confirm the types and numbers of vessels that will be engaged in activities associated with the Bellrock WFDA, and to consider vessel coordination including indicative transit route planning (an Outline VMNSP is provided in **Volume V**).

18.1.3.3 Frequency of Occurrence

391. The frequency of occurrence relating to reduced access to local ports, harbours and facilities during the construction phase of the Bellrock WFDA is considered to be **Remote**.

18.1.3.4 Severity of Consequence

392. The severity of consequence relating to reduced access to local ports, harbours and facilities during the construction phase of the Bellrock WFDA is considered to be **Minor**.

18.1.3.5 Significance of Risk

393. Taking the frequency of occurrence as **Remote** and the severity of consequence as **Minor**, the overall significance of risk in relation to reduced access to local ports, harbours and facilities during the construction phase of the Bellrock WFDA is deemed to be **Broadly Acceptable**.

18.1.4 Loss of Station

394. *Loss of station of a FOU or mooring/metocean buoy may occur due to the failure of its SKS and/or mooring lines.*

18.1.4.1 Qualification of Risk

395. Loss of station of FOU or mooring/metocean buoys positioned within the Bellrock WFDA may present a hazard to third-party vessels operating in the area during the construction phase if the lost FOU or mooring/metocean buoy drifts outside of the Bellrock WFDA. This hazard would be most likely to occur during periods of adverse environmental conditions, which could damage the SKS leading to mooring failure, and create difficult sailing conditions that may hinder collision avoidance action by vessels, whilst potentially accelerating the drift of the errant FOU.

396. As part of the WCS, there may be a minimum of three mooring lines per FSS each connected to an anchor. Anchors may be shared between FSS. All anchors and/or

mooring lines connected to a FSS would have to fail prior to a loss of station event. The anchor options with the design envelope are driven pile, suction pile, drag embedment or gravity based anchors.

397. Compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017) will ensure integrity of the SKS is maintained throughout the lifetime of the surface structures. This includes TPV of the mooring system by an independent competent person or body. Additionally, any modification of the SKS or any newly available information regarding its reliability will be subject to further TPV.
398. If damage to the SKS occurred, the most likely consequence would be failure of one mooring line and/or anchor leading to a larger excursion zone than typical. Any such faults would be identified through continuous monitoring of the FOU's via GPS or other suitable means in line with the regulatory expectations.
399. From a navigational safety perspective, the most likely consequence as a result of loss of station is the recovery of the lost FOU or mooring/metocean buoy prior to an encounter with a passing vessel. This will be facilitated by continuous monitoring of the FOU or mooring/metocean buoy in line with regulatory expectations as noted above, as well as the promulgation of information to third-party vessels specifying the exact location of the errant FOU or mooring/metocean buoy to be avoided. During the construction phase there is potential that a project vessel within the Bellrock WFDA may be able to take action to limit the extent to which a lost FOU or mooring/metocean buoy drifts from its original position.
400. As an unlikely worst-case, the use of shared anchors could lead to multiple adrift FOU's resulting in a collision with a third-party vessel with vessel damage, PLL, or pollution. For the mooring/metocean buoys, this worst-case is considered unlikely given the scale of the mooring/metocean buoys relative to FOU's. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will help to manage the risk to the environment and personnel.

18.1.4.2 Embedded Mitigation

401. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - The Applicant will ensure compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017);
 - Ongoing liaison with fishing fleets will be maintained during construction operations via an appointed FLO;

- Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident;
- Project vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974);
- Advance warning and accurate location details of construction operations associated Safety Zones and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins; and
- Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA, via the development of and adherence to an LMP (an Outline LMP is provided in **Volume V**).

18.1.4.3 Frequency of Occurrence

402. The frequency of occurrence in relation to loss of station risk during the construction phase of the Bellrock WFDA is considered to be **Negligible**.

18.1.4.4 Severity of Consequence

403. The severity of consequence in relation to loss of station risk during the construction phase of the Bellrock WFDA is considered to be **Serious**.

18.1.4.5 Significance of Risk

404. Taking the frequency of occurrence as **Negligible** and the severity of consequence as **Serious**, the overall significance of risk in relation to loss of station risk during the construction phase of the Bellrock WFDA is deemed **Broadly Acceptable**.

18.2 Operation and Maintenance

18.2.1 Vessel Displacement Resulting in Increased Third-party Collision Risk

405. *Vessel displacement as a result of surface-piercing structures within the Bellrock WFDA may increase encounters and collision risk between third-party vessels operating in the area.*

18.2.1.1 Qualification and Quantification of Risk

406. Based on experience at existing operational OWFs and consultation undertaken (see **Table 4.1**), it is understood that commercial vessels will generally choose to avoid navigating internally within an OWF array. Therefore, route deviations discussed in relation to the construction phase (see **Section 18.1.1.1**) are anticipated to be analogous to those observed during the O&M phase, with the likelihood of an encounter occurring between third-party vessels also remaining the same. As discussed in **Section 18.1.1.1**, the baseline collision frequency for the post OWF

scenario (one in 5,327 years) represents a low collision frequency compared to other OWFs in the North Sea.

407. Fishing and recreational vessels may choose to navigate internally within the Bellrock WFDA during the O&M phase more so than the construction phase due to the lower volumes of construction vessels and absence of buoyage. As such, an additional collision risk is associated whereby WTGs or OfSSs may collectively obscure vessels from one another potentially resulting in an encounter requiring late course alterations. However, with the application of good seamanship and the high minimum spacing between FSSs (1,150 m), there is not expected to be visual obstruction to vessels passing at the end of a WTG row; the concertina effect will only manifest when vessels are at opposite ends of a WTG row. Additionally, from the vessel traffic data recreational vessel transits are infrequent and, at the distance offshore, typically undertaken by experienced mariners who will likely be familiar with the Bellrock WFDA and passage plan accordingly.
408. Similar to the construction phase hazard, embedded mitigation measures in place to reduce risk include promulgation of information relating to any maintenance activities as well as appropriate marking on nautical charts. These measures will ensure mariners are aware of construction activities and can passage plan in advance to reduce the likelihood of vessel encounters. Additionally, the risk will be reduced further through liaising with commercial fisheries via an appointed FLO.
409. As per the equivalent construction phase effect, 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. The consequences may be greater in the event of the collision featuring a commercial vessel and a small craft. As an unlikely worst-case, one or more of the vessels could founder resulting in PLL and pollution. Adherence to the **MPCP (Volume V) of the Bellrock WFDA EIA Report** and an ERCoP will aid in managing the risk to the environment and personnel.

18.2.1.2 Embedded Mitigation Measures

410. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
 - The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - Ongoing liaison with fishing fleets will be maintained during maintenance operations via an appointed FLO;

- Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA via the development of and adherence to an LMP (an Outline LMP is provided in **Volume V**);
- Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident; and
- Advance warning and accurate location details of maintenance operations, associated Safety Zones and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins.

18.2.1.3 Frequency of Occurrence

411. The frequency of occurrence in relation to increased third-party to third-party vessel collision risk during the O&M phase of the Bellrock WFDA is considered to be **Remote**.

18.2.1.4 Severity of Consequence

412. The severity of consequence in relation to increased third-party to third-party vessel collision risk during the O&M phase of the Bellrock WFDA is considered to be **Moderate**.

18.2.1.5 Significance of Risk

413. Taking the frequency of occurrence as **Remote** and the severity of consequence as **Moderate**, the overall significance of risk in relation to increased third-party to third-party vessel collision risk during the O&M phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.2.2 Collision Risk Between Third-party and Project Vessels

414. *The presence of vessels associated with maintenance of the Bellrock WFDA may increase collision risk between project vessels and third-party vessels already operating in the area.*

18.2.2.1 Qualification of Risk

415. Up to 211 annual return trips by O&M vessels may be made throughout the lifetime of the Bellrock WFDA, including RAM vessels. Overall, this represents a slight increase in project vessel movements compared to the construction phase.
416. As per the construction phase hazard, project vessel to third-party vessel encounters will be mitigated by marine coordination including the VMNSP, as well as the carriage of AIS and compliance with Flag State regulations including SOLAS (IMO, 1974) and COLREGs (IMO, 1972/77). Additionally, ongoing liaison with fishing fleets will be maintained during the O&M phase via an appointed FLO. Safety Zones of up to 500 m will be applied for FOU during any major maintenance, protecting project vessels

that may be RAM. Guard vessels and minimum advisory safe passing distances, as defined by risk assessments, may also be implemented. Advance warning and details will be promulgated via Notifications to Mariners and Kingfisher Bulletins.

417. During the O&M phase, operational marine lighting and marking of the Bellrock WFDA will be implemented in line with IALA Recommendation O-139 (IALA, 2021) and G1162 (IALA, 2022), in agreement with the NLB and MCA, which will aid in maximising mariner awareness along with the appropriate marking of WTGs on nautical charts. As per the construction phase hazard, project vessel to third-party vessel collision risk during reduced visibility is regulated through COLREGs compliance (reduced speeds) and carriage of AIS.
418. During periods of major maintenance, FOU's may be towed from the Bellrock WFDA to port for repairs. All project vessels involved in towing procedures will be lit and marked as required under COLREGs (IMO, 1972/77).
419. Similar to collision risk between third-party vessels (see **Section 18.2.1**), should an encounter occur between a project vessel and third-party vessel, the encounter is likely to be localised and short in duration. With collision avoidance action implemented in line with the COLREGs (IMO, 1972/77), the vessels involved will likely be able to resume their respective passages and/or activities with no long-term consequences.
420. Should a collision occur, the most likely consequences will be similar to that outlined for the case of a collision between two third-party vessels (see **Section 18.2.1**), namely minor contact between the vessels resulting in 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 or more of the vessels could founder resulting in PLL and pollution. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will help to manage the risk to the environment and personnel.

18.2.2.2 Embedded Mitigation Measures

421. The embedded mitigation measures relevant to reducing risk are as follows:
- Applications will be made post-consent for Safety Zones including up to 500 m around each FOU during major maintenance;
 - All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
 - The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - Ongoing liaison with fishing fleets will be maintained during O&M operations via an appointed FLO;

- Where appropriate, guard vessels will be used to ensure adherence with Safety Zones or advisory passing distances;
- Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA via the development of and adherence to an LMP (an **Outline LMP** is provided in **Volume V**);
- Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident;
- Advance warning and accurate location details of O&M operations, associated Safety Zones, and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins;
- A VMNSP (an **Outline VMNSP** is provided in **Volume V**) will be developed post-consent to describe measures put in place relating to navigational safety, confirm the types and numbers of vessels that will be engaged in activities associated with the Bellrock WFDA, and to consider vessel coordination including indicative transit route planning;
- Marine coordination will be implemented to manage project vessels throughout the O&M phase including in liaison with relevant ports and harbours; and
- Project vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974).

18.2.2.3 Frequency of Occurrence

422. The frequency of occurrence in relation to increased third-party vessel to project vessel collision risk during the O&M phase of the Bellrock WFDA is considered **Extremely Unlikely**.

18.2.2.4 Severity of Consequence

423. The severity of consequence in relation to increased third-party to project vessel collision risk during the O&M phase of the Bellrock WFDA is **Serious**.

18.2.2.5 Significance of Risk

424. Taking the frequency of occurrence as **Extremely Unlikely** and the severity of consequence as **Serious**, the overall significance of risk of increased third-party vessel to project vessel collision risk during the O&M phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.2.3 Reduced Access to Local Ports and Harbours

425. *The presence of project vessels may reduce third-party access to the operational port(s) during the O&M phase.*

18.2.3.1 Qualification of Risk

426. As noted in relation to the construction phase, Peterhead Port and the Port of Aberdeen are the closest ports to the Bellrock WFDA, located approximately 64 nm north-west and west, respectively. Both of these ports are under consideration for the O&M phase.
427. Given the distance offshore of the Bellrock WFDA, it is not anticipated that surface-piercing structures or project vessels operating within the Bellrock WFDA will reduce access to nearby ports or harbours. However, should any port listed in **Section 6.5** be utilised by project vessels during construction, their presence may restrict access to local third-party vessels.
428. As per the equivalent construction phase hazard, towage operations are considered the key element of the Bellrock WFDA which could give rise to port access issues. During the O&M phase such activities will be limited to where major maintenance of a FOU is required, and it is taken off-site. Towage operations will be subject to a dedicated risk assessment at the time of the towage operation when full specifications relating to the operation are available. The operation itself would be coordinated in liaison with the statutory harbour authority for the assembly port to ensure any access limitations were minimised.
429. It is not yet known which ports will be used for the O&M phase, however, in any case, all project vessels will be managed by marine coordination, and will also carry AIS and be compliant with Flag State regulations including the COLREGs (IMO, 1972/77). Promulgation of information will also increase mariner awareness of project activity, including towage operations, allowing for consideration of these works when passage planning. Furthermore, the positions of indicative transit routes within the VMNSP will account for the presence of any anchorage areas, pilotages, or other features relating to local ports. These mitigation measures will ensure any impacts on third-party access to ports are reduced.
430. The most likely consequence of reduced access to ports and harbours is a minor increase in journey time but no disruption to schedules or berthing times. As an unlikely worst-case, schedules may be disrupted with vessels unable to make their berth but this is considered unlikely given the international nature of vessel routing and the ability to passage plan given the promulgation of information.

18.2.3.2 Embedded Mitigation Measures

431. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- Ongoing liaison with fishing fleets will be maintained during operations via an appointed FLO;
 - Marine coordination will be implemented to manage project vessels throughout maintenance periods including in liaison with relevant ports and harbours;

- Project vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974);
- Advance warning and accurate location details of maintenance operations associated Safety Zones and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins; and
- A VMNSP will be developed post-consent to describe measures put in place relating to navigational safety, confirm the types and numbers of vessels that will be engaged in activities associated with the Bellrock WFDA, and to consider vessel coordination including indicative transit route planning (an **Outline VMNSP** is provided in **Volume V**).

18.2.3.3 Frequency of Occurrence

432. The frequency of occurrence in relation to reduced access to local ports, harbours, and facilities during the O&M phase of the Bellrock WFDA is considered to be **Extremely Unlikely**.

18.2.3.4 Severity of Consequence

433. The severity of consequence in relation to reduced access to local ports, harbours, and facilities during the O&M phase of the Bellrock WFDA is considered to be **Minor**.

18.2.3.5 Significance of Risk

434. Taking the frequency of occurrence as **Extremely Unlikely**, and the severity of consequence as **Minor**, the overall significance of risk regarding reduced access to local ports, harbours, and facilities during the O&M phase of the Bellrock WFDA is deemed **Broadly Acceptable**.

18.2.4 Surface Structure Allision Risk (Powered and Drifting)

435. *The presence of surface piercing structures will create allision risk for vessels operating within and in proximity to the Bellrock WFDA.*

436. The spatial extent of this hazard is small given that a vessel must be in close proximity to a structure within the Bellrock WFDA for an allision incident to occur. Each allision element is considered in turn in terms of frequency of occurrence, severity of consequence and the significance of risk. The various forms of allision considered are:

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

18.2.4.1 Powered Allision Risk

437. A powered allision event may result from failure of navigational aids, human/navigational error, and/or unfamiliarity with the Bellrock WFDA.

Qualification and Quantification of Risk

438. Knowledge of existing operational OWFs indicates that vessel Masters routinely choose to pass at least 1 nm from an OWF array, likely maintaining the deviations established during the construction phase of the development. Given this, it is likely that Masters will passage plan in advance of approaching the Bellrock WFDA, and will allow ample sea space between the vessel and the FOUs to reduce the risk of allision.
439. Based on the results of quantitative modelling (see **Section 16.4.3**), the base case annual powered vessel to structure allision frequency was estimated to be one in 1,358 years. This is a low return period compared to that estimated in relation to other UK OWF developments, and is reflective of the relatively low volume of vessel traffic in the vicinity of the Bellrock WFDA. When considering a future increase of 20% in vessel traffic, the annual powered vessel to structure allision frequency was estimated to be one in 1,057 years. These frequencies do not account for the mooring/metocean buoys, but given their extent it is not anticipated that they would materially affect the modelling results.
440. There have been four reported instances of a third-party vessel alliding with an operational OWF structure in the UK (see **Section 9.5.1**). These incidents occurred within the Irish Sea during 2016, the Southern North Sea during 2022, and two in the Central North Sea during 2024. Each incident involved vessel damage with the two earlier incidents attended by an RNLI lifeboat, and the 2016 incident also attended by a helicopter given a head injury sustained by one of the crew. For the 2022 and 2024 incidents the vessel was able to may its way back to port.
441. Vessels are expected to comply with international Flag State regulations such as SOLAS (IMO, 1974) and COLREGs (IMO, 1972/77), and will, via the promulgation of information including appropriate marking of structures on all physical and electronic charts as distributed by the UKHO, be able to plan in advance to account for potential passage alterations. Furthermore, during the O&M phase, operational marine lighting and marking will be implemented on the WTGs in line with IALA Recommendation O-139 (IALA, 2021) and G1162 (IALA, 2022), and in agreement with the NLB and MCA.
442. There is also a related allision risk in the event that an AtoN associated with the lighting and marking scheme goes off station. The LMP would be implemented to ensure the off station AtoN is recovered as soon as, noting that this was raised as a concern by RYA Scotland in consultation. The protocol for such a scenario will be discussed with NLB as the LMP is developed.

443. The final layout will be agreed with the MCA and NLB to ensure that allision risk is minimised from a surface navigation safety perspective. Additionally, there will be a minimum spacing of 1,150 m between FOU's plus a minimum 1,000 m between OfSSs and other structures within the final layout, which will reduce the likelihood of an allision incident occurring should a vessel under power come into close proximity of the Bellrock WFDA.
444. Should an allision incident occur, the consequences will depend on multiple factors including the energy of the impact, structural integrity of the vessel, the sea state at the time of the impact, and the type of structure contacted (worst-case an OfSS, best-case a mooring/metocean buoy). The most likely consequences of an allision incident will be minor damage with the vessel able to resume passage and undertake a full inspection at the next port. As an unlikely worst-case, the vessel could founder resulting in PLL and pollution. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will help to manage the risk to the environment and personnel.

Embedded Mitigation Measures

445. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
 - The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB;
 - Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA via the development of and adherence to an LMP (an Outline LMP is provided in **Volume V** of the **Bellrock WFDA EIA Report**); and
 - Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident.

Frequency of Occurrence

446. The frequency of occurrence in relation to vessel to structure allision risk during the O&M phase of the Bellrock WFDA is considered to be **Remote**.

Severity of Consequence

447. The severity of consequence in relation to vessel to structure allision risk during the O&M phase of the Bellrock WFDA is considered to be **Serious**.

Significance of Risk

448. Taking the frequency of occurrence as **Remote**, and the severity of consequence as **Serious**, the overall significance of risk in relation to vessel to structure allision risk during the O&M phase of the Bellrock WFDA is deemed **Tolerable with Mitigation**.

18.2.4.2 Drifting Allision Risk

449. A drifting allision may arise due to technical or mechanical failure of the vessel, adverse weather, and/or navigational system failure.

Qualification and Quantification of Risk

450. A drifting allision may only occur where the errant vessel is located in proximity to the Bellrock WFDA and the wind and/or tide directs the vessel towards a surface structure.
451. In the event of a vessel becoming adrift, there are actions that can be taken to prevent an allision occurring, for example power may be regained prior to reaching the Bellrock WFDA by rectifying any faults. If this is not possible, the vessel's emergency procedures would be implemented. This could include emergency anchoring, which would be subject to an assessment of the relevant nautical charts to ensure no further hazards are created.
452. If deploying an anchor is not possible, such as the case for small craft, any project vessels on-site may be able to render assistance in liaison with the MCA and in line with SOLAS obligations under Regulation 33 (IMO, 1974). This response will be managed via HM Coastguard and marine coordination and depends on the type and capability of vessels on-site. This would be particularly relevant for sailing vessels relying on metocean conditions for propulsion, noting if the vessel becomes adrift in proximity to a structure there may be limited time to render assistance.
453. Based on quantitative modelling (see **Section 16.4.4**), the base case annual drifting vessel to structure allision frequency was estimated to be 8.13×10^{-5} , corresponding to a return period of one in 12,299 years. This is a low return period compared to that estimated for other UK OWF developments and is reflective of the relatively low volume of vessel traffic passing in proximity to or within the Bellrock WFDA, particularly south-west of the Bellrock WFDA from which is the predominant wind direction (see **Section 8.1**). This frequency does not account for the mooring/metocean buoys, but given their extent it is not anticipated that they would materially affect the modelling results.
454. Should an allision occur, the consequences will be similar to those noted for the case of a powered allision including the unlikely worst-case of foundering and pollution. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will help to manage the risk to the environment and personnel. Additionally, a drifting vessel is likely to transit at a reduced speed compared to a powered vessel,

thus reducing the energy of the impact, including in the case of a recreational vessel under sail.

Embedded Mitigation Measures

455. The embedded mitigation measures considered relevant to reducing risk are as follows:
- The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA; and
 - Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident.

Frequency of Occurrence

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

Severity of Consequence

457. The severity of consequence in relation to drifting vessel to structure risk during the O&M phase of the Bellrock WFDA is considered to be **Serious**.

Significance of Risk

458. Taking the frequency of occurrence as **Extremely Unlikely** and the severity of consequence as **Serious**, the overall significance of risk in relation to drifting vessel to structure risk during the O&M phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.2.4.3 Internal Allision Risk

459. Internal allision may arise from vessels choosing to navigate internally within the Bellrock WFDA.

Qualification and Quantification of Risk

460. Based on experience at operational OWFs, it is anticipated that commercial vessels will choose to not to navigate internally within the Bellrock WFDA. This has been corroborated by Fred Olsen Cruise during Regular Operator consultation (see **Table 4.1**), hence this hazard is most applicable to smaller vessels such as commercial fishing vessels and recreational craft.
461. Based on experience of currently operational OWFs, fishing and recreational vessels may choose to transit within the Bellrock WFDA, particularly during favourable weather conditions. However, these transits may be less likely given that the design

parameters include FOU and OfSSs, which pose additional risks such as snagging on dynamic IACs and/or mooring lines. SFF have confirmed during consultation that the presence of the mooring buoys will further constrain fishing activity. Additionally, fishing and especially recreational vessel activity is expected to be limited within the Bellrock WFDA, as per the vessel traffic survey data (see **Sections 10.3.5** and **10.3.6**) when considering the distance offshore.

462. Based on historical incident data, there have been no instances of a third-party vessel alliding with an operational OWF structure whilst Not Under Command (NUC). The incident data reviewed in proximity to the Bellrock WFDA indicates an absence of incidents, including those relating to machinery failure which may associated with a vessel NUC. Therefore, the likelihood of a vessel being NUC in proximity to the Bellrock WFDA is very low.
463. Should a vessel choose to make passage internally within the Bellrock WFDA, the minimum spacing of 1,000 m (associated with OfSSs) is considered sufficient for safe navigation, allowing ample clearance from OWF structures. Additionally, the minimum blade tip height of 22 m above MHWS will mitigate the allision risk subjected to masted recreational vessels in the vicinity of the WTG blades, in line with RYA recommendations (RYA, 2019) and MGN 654 (MCA, 2021).
464. Furthermore, vessels are expected to passage plan in accordance with SOLAS regulations (IMO, 1974), with promulgation of information to keep mariners informed. Awareness will also be maximised through operational marine lighting and marking in place on WTGs as per IALA Recommendation O-139 (IALA, 2021) and G1162 (IALA, 2022), which will be agreed with the NLB and MCA. This will include unique identification of each WTG in a comprehensible alpha-numeric system to prevent mariners becoming disorientated while navigating internally within the Bellrock WFDA. WTG identification will be visible from all directions, and the exact locations of WTGs will be appropriately marked on nautical charts. The final layout and locations of the WTGs will be agreed with the MCA and NLB prior to construction through the DSLP process.
465. Should a recreational vessel under sail enter the proximity of a WTG, there is also potential for effects such as wind shear, masking and turbulence to occur. From previous studies of OWF 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 OWF developments.
466. Based on quantitative internal allision modelling (see **Section 16.4.5**), the base case annual fishing vessel to structure allision frequency is 4.71×10^{-3} , which corresponds to a return period of one every 212 years. The approach taken to calculate this

frequency conservatively assumes that fishing activity observed within the vessel traffic survey data will remain unchanged post-construction, however, it is likely that fishing vessels will account for the presence of WTGs, especially given that FSSs will be used. Likewise, these frequencies do not account for the mooring/metocean buoys, but given their extent it is not anticipated that they would materially affect the modelling results and again fishing vessels are expected to account for their presence.

467. In the event of an allision internally within the Bellrock WFDA, the consequences are likely to be similar to that of a powered or drifting allision as noted in **Sections 18.2.4.1** and **18.2.4.2** respectively, with minor damage to vessels though able to continue passage to the next port for a full inspection. As an unlikely worst-case, the vessel may founder resulting in PLL and pollution. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will aid to mitigate the effects to the environment and personnel. Additionally, as a precaution, a vessel is likely to transit at a reduced speed within the Bellrock WFDA, thus reducing the energy of the impact, including in the case of a recreational vessel under sail.

Embedded Mitigation Measures

468. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
 - The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB;
 - Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA via the development of and adherence to an LMP (an Outline LMP is provided in **Volume V**);
 - Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident;
 - There will be a minimum blade tip clearance of at least 22 m above MHWS; and
 - Advance warning and accurate location details of maintenance operations associated Safety Zones and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins.

Frequency of Occurrence

469. The frequency of occurrence in relation to internal allision risk during the O&M phase of the Bellrock WFDA is considered to be **Extremely Unlikely**.

Severity of Consequence

470. The severity of consequence in relation to internal allision risk during the O&M phase of the Bellrock WFDA is considered to be **Serious**.

Significance of Risk

471. Taking the frequency of occurrence as **Extremely Unlikely** and the severity of consequence as **Serious**, the overall significance of risk regarding internal allision risk during the O&M phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.2.5 Loss of Station

472. *Loss of station of a FOU or mooring/metocean buoy may occur due to the failure of its SKS and/or mooring lines.*

18.2.5.1 Qualification of Risk

473. Loss of station may present a hazard to third-party vessels operating in the area if the lost FOU or mooring/metocean buoy drifts outside of the Bellrock WFDA. This hazard would be most likely to occur during periods of adverse environmental conditions, which could damage the SKS leading to mooring failure, and create difficult sailing conditions that may hinder collision avoidance action by vessels, whilst potentially accelerating the drift of the errant FOU.
474. As part of the WCS, there may be a minimum of three mooring lines per FSS each connected to an anchor. Anchors may be shared between FSSs at a minimum of three anchors per FOU. All anchors and/or mooring lines connected to a FSS would have to fail prior to a loss of station event. The shared anchor design is compatible with catenary and semi-taut mooring designs, and with driven pile, suction pile and gravity-based anchors.
475. As noted for the equivalent construction phase hazard, compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017) will ensure integrity of the SKS is maintained throughout the lifetime of the surface structures.
476. Additionally, adherence to the LMP will manage the effects of a loss of navigational aid within the Bellrock WFDA if the lost FOU had been lit and marked as a key structure within the Bellrock WFDA layout – the protocol for such a scenario will be discussed with NLB as the LMP is developed.

477. If damage to the SKS occurred, the most likely consequence would be failure of one mooring line and/or anchor leading to a larger excursion zone than typical. Any such faults would be identified through continuous monitoring of the WTGs via GPS or other suitable means in line with the regulatory expectations. Given that fewer project vessels may be on-site at any particular time during the O&M phase there may be a greater reliance on a GPS based approach. However, once FOU are installed and have been subject to TPV, the potential for an anchor/mooring failure is considered to be lower.
478. As with the equivalent construction phase hazard, the most likely consequence as a result of loss of station is the recovery of the lost FOU or mooring/metocean buoy prior to an encounter with a passing vessel. As an unlikely worst-case, the use of shared anchors could lead to multiple adrift FOU's resulting in a collision with a third-party vessel with vessel damage, PLL, and pollution. For the mooring/metocean buoys, this worst-case is considered unlikely given the scale of the mooring/metocean buoys relative to FOU's.

18.2.5.2 Embedded Mitigation Measures

479. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - The Applicant will ensure compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017);
 - Ongoing liaison with fishing fleets will be maintained during maintenance operations via an appointed FLO;
 - Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident;
 - Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA via the development of and adherence to an LMP (an **Outline LMP** is provided in **Volume V**);
 - Project vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974); and
 - Advance warning and accurate location details of maintenance operations associated Safety Zones and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins.

18.2.5.3 Frequency of Occurrence

480. The frequency of occurrence in relation to loss of station risk during the O&M phase of the Bellrock WFDA is considered to be **Negligible**.

18.2.5.4 Severity of Consequence

481. The severity of consequence in relation to loss of station risk during the O&M phase of the Bellrock WFDA is considered to be **Serious**.

18.2.5.5 Significance of Risk

482. Taking the frequency of occurrence as **Negligible** and the severity of consequence as **Serious**, the overall significance of risk in relation to loss of station risk during the O&M phase of the Bellrock WFDA is deemed **Broadly Acceptable**.

18.2.6 Reduction of Under Keel Clearance due to Presence of Sub-Surface Infrastructure

483. *The presence of dynamic IACs and mooring lines within the Bellrock WFDA will reduce the under keel clearance for vessels choosing to navigate in proximity to the FSSs. The presence of IAC protection such as rock berms will also reduce under keel clearance for vessels transiting above.*

484. Embedded mitigations suitably manage the risk during the construction and decommissioning phases, most notably the buoyed construction/decommissioning area which will limit third-party navigation in proximity to the subsea components.

18.2.6.1 Qualification and Quantification of Risk

485. During the O&M phase, it is expected that up to 162 nm of IACs may be in place within the Bellrock WFDA, with dynamic buoyant sections up to 350 m in length corresponding to 25 nm in total. The minimum draught of the dynamic IACs associated with the WTGs will be 10 m, occurring at the connection point with the FSS. A draught of 20 m for the dynamic IACs will be achieved 300 m from the FSS. For the mooring/metocean buoys, it is anticipated that the horizontal footprint of the IACs in the water column will be much less extensive than for WTGs, and therefore these are not considered further.

486. Buoyancy modules may be used for the IACs to maintain the lazy-S configurations of the dynamic portions of the cables to allow for adequate extension of the cable during normal movements of the FSSs. **Section 16.6.3** considers the WCS parameters for IACs and demonstrates that under keel clearance will be reduced; at the point where the minimum water depth of 20 m occurs, this corresponds to a 3.8 m clearance from the largest recorded vessel draught (16.2 m). It is considered unlikely that a large vessel with such a draught would navigate at this point given its proximity to the FOU. Likewise, where the IAC depth is less than 20 m towards the connection point, any interaction resulting from reduced under keel clearance would be highly unlikely for the majority of vessels, since this would require navigating within 15 m

- of the WTG and would incur a high risk of blade allision. Furthermore, vessel traffic levels are low overall given the distance offshore. The final design will be confirmed during the DSLP process and agreed within the MCA and NLB, to ensure a suitable under keel clearance is maintained for safe navigation.
487. There may also be subsea cable hubs associated with the IACs, with maximum height of 3.5 m on the seabed. If located in the shallowest water depth within the Bellrock WFDA (69 m below LAT) this would represent a reduction of approximately 5.1% in navigable water depth, i.e., around the 5% threshold in the requirements of MGN 654. Should this threshold be exceeded then further consultation will be required with MCA and NLB, although the navigable water depth would remain far in excess of that necessary for vessels in the area.
488. Burial is the anticipated method of cable protection for the static IACs; however, up to 138 nm of the static IACs may be surface laid and require protection from rock berm placement, with an indicative height of 0.5 m. The CBRA will confirm target burial depths depending on ground conditions and highlight where burial cannot be achieved and alternate protection is needed. Given that water depths within the Bellrock WFDA are between 69 m and 121 m below LAT and considered in excess of that necessary for safe navigation. It is unlikely that reduced under keel clearance due to cable protection will have any effect on passing vessels, particularly given that all cable protection will be contained within the Bellrock WFDA.
489. As part of the WCS, up to nine mooring lines per FOU may be utilised. FSSs considered within the design include semi-submersible, barge, and tension-leg platform. The maximum touch down point of the mooring lines from the centre of the FSS is a distance of 1,300 m. **Section 16.6.2** considers mooring lines based on WCS parameters and demonstrates that vessels are unlikely to experience an under keel interaction beyond 451 m from the FSS, with smaller vessels, such as fishing vessels, avoiding interaction beyond 319 m. As with dynamic IACs, it is anticipated that third-party vessels will not typically navigate this close to a FOU and there is adequate space to allow smaller vessels navigating internally to keep clear of the potential interaction areas (see **Figure 16.10**). Again, vessel traffic levels are low overall given the distance offshore. Final mooring line configurations will be agreed with the MCA and NLB through the DSLP process, to ensure that the final design of the mooring lines will maintain suitable under keel clearance for safe navigation.
490. Promulgation of information relating to the positions of FOUs, mooring lines, and subsea cables will alert mariners to the hazards within the Bellrock WFDA. Additionally, appropriate marking on nautical charts of all subsea infrastructure will further increase awareness of the Bellrock WFDA and encourage caution when navigating in proximity to FOUs.
491. If an underwater allision event occurs, the most likely consequences are minor damage incurred with an unlikely worst-case of vessel foundering resulting in PLL

and pollution. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will aid in managing the risk to the environment and personnel.

18.2.6.2 Embedded Mitigation Measures

492. The embedded mitigation measures identified as relevant to reducing risk are as follows:

- A CBRA will be prepared where IACs are proposed to be buried to determine the target burial depth. The burial depths may vary and will be dependent on risk and ground conditions. The CBRA will also highlight instances where adequate burial cannot be achieved, and alternative protection is needed. Any damage, destruction, or decay of cables will be notified to MCA, NLB, Kingfisher, and UKHO;
- All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
- The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
- A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB; and
- Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident.

18.2.6.3 Frequency of Occurrence

493. The frequency of occurrence in relation to reduction in under keel clearance during the O&M phase of the Bellrock WFDA is considered **Negligible**.

18.2.6.4 Severity of Consequence

494. The severity of consequence in relation to reduction in under keel clearance during the O&M phase of the Bellrock WFDA is considered **Moderate**.

18.2.6.5 Significance of Risk

495. Taking the frequency of occurrence as **Negligible** and the severity of consequence as **Moderate**, the overall significance of risk in relation to reduction of under keel clearance during the O&M phase of the Bellrock WFDA is deemed as **Broadly Acceptable**.

18.2.7 Anchor Interaction with Sub-Surface Infrastructure

496. *The presence of SKS and subsea cables increases the potential for vessel interaction including via anchors of third-party vessels.*

18.2.7.1 Qualification of Risk

497. The spatial extent of this hazard is limited to within the Bellrock WFDA. During the O&M phase, vessels may be more likely to enter the Bellrock WFDA following the removal of the construction buoyage. Embedded mitigations suitably manage the risk during the construction and decommissioning phases, most notably the buoyed construction/decommissioning area which will limit third-party navigation in proximity to the subsea components.
498. Scenarios that may lead to anchor interaction with subsea components include the following:
- Vessel anchoring in an emergency over an SKS or subsea cable;
 - Vessel suffering mechanical failure and inadvertently dropping anchor over an SKS or subsea cable;
 - Lack of awareness from mariners leading to planned anchoring over an SKS or subsea cable; and
 - Anchor dragging over an SKS or subsea cable due to anchor failure.
499. Given the distance offshore and the water depths within the Bellrock WFDA, it is expected that planned anchoring activity will be limited. This aligns with the vessel traffic data presented in Section 10, as well as the long-term dataset in **Annex E**, which showed no anchoring activity recorded within or in proximity to the Bellrock WFDA, nor were any charted anchorages identified nearby. Additionally, in line with SOLAS regulations (IMO, 1974), charted locations of hazards should be taken into account by vessel Masters when determining where to anchor.
500. The primary means of cable protection will be burial where practicable. The extent and method by which the static portion of the IACs will be buried will be determined by the results of a detailed seabed survey and associated CBRA. Dynamic IACs will not be protected, however vessel interaction with these sections is considered unlikely given their proximity to surface-piercing structures. Buoyant sections of the IACs will be within 300 m of the FSSs, which further reduces the likelihood of vessels transiting in close proximity to unprotected subsea cables. Additionally, as noted above, it is likely that anchoring will not be attempted (outside of an emergency) given the water depths within the Bellrock WFDA, which range from 69 m to 121 m LAT.
501. Mooring lines also present an anchor interaction hazard; however, as per the risk presented by subsea cables, vessels will be unlikely to anchor within proximity to infrastructure given the appropriate charting of infrastructure locations, promulgation of information, and the substantial water depths.
502. The SKS and subsea cable configurations will be agreed with the MCA and NLB as part of the DSLP process to ensure that navigational safety is retained within the Bellrock WFDA. Furthermore, the Applicant will comply with regulatory expectations

on moorings for floating wind and marine devices, which states that the design of the OREI and its mooring should retain sufficient integrity to enable action to be taken to safeguard the health and safety of persons on or near it, including in the event of unplanned vessel impacts (MCA and HSE, 2017). Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will help to manage the risk to the environment and personnel.

503. Should vessel interaction with a subsea cable occur, the most likely consequences will be minor based on historical interaction incidents, with no damage incurred to the subsea cable or the vessel. As an unlikely worst-case, a snagging incident could occur resulting in vessel and cable damage, as well as loss of vessel stability. Although no interaction incident data exists relating to mooring lines, it is likely the consequences will be similar to that of subsea cables.

18.2.7.2 Embedded Mitigation Measures

504. The embedded mitigation measures identified as relevant to reducing risk are as follows:
- A CBRA will be prepared where IACs are proposed to be buried to determine the target burial depth. The burial depths may vary and will be dependent on risk and ground conditions. The CBRA will also highlight instances where adequate burial cannot be achieved, and alternative protection is needed. Any damage, destruction, or decay of cables will be notified to MCA, NLB, Kingfisher, and UKHO;
 - All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic charts as distributed by the UKHO;
 - The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - The Applicant will ensure compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017);
 - A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB;
 - Ongoing liaison with fishing fleets will be maintained during maintenance operations via an appointed FLO; and
 - Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident.

18.2.7.3 Frequency of Occurrence

505. The frequency of occurrence in relation to vessel interaction with SKS or subsea cables during the O&M phase of the Bellrock WFDA is considered to be **Extremely Unlikely**.

18.2.7.4 Severity of Consequence

506. The severity of occurrence in relation to vessel interaction with SKS or subsea cables during the O&M phase of the Bellrock WFDA is considered to be **Moderate**.

18.2.7.5 Significance of Risk

507. Taking the frequency of occurrence as **Extremely Unlikely** and the severity of consequence as **Moderate**, the overall significance of risk in relation to vessel interaction with SKS or subsea cables during the O&M phase of the Bellrock WFDA is deemed to be **Broadly Acceptable**.

18.2.8 Reduction of Search and Rescue Capability due to Surface Infrastructure

508. *The presence of surface-piercing structures, project vessels, and increased personnel within the area may reduce emergency response capability by increasing the number of incident responses required and/or reducing access for responders.*

18.2.8.1 Qualification of Risk

509. The Bellrock WFDA covers an area of approximately 82 nm² which represents a small area to search relative to other UK OWFs. Additionally, a SAR operation may not require the entire Bellrock WFDA to be searched; it is more likely that, with potential drift of the casualty taken into account, a search could be restricted to a smaller area within which a casualty is known to be located.
510. The closest SAR helicopter service is located at Inverness, approximately 133 nm north-west of the Bellrock WFDA. Based on incident data analysed within **Section 9**, only one SAR tasking has occurred in proximity to and within the Bellrock WFDA during a nine-year period between 2015 and 2024. This was a 'rescue/recovery' tasking and was responded to by the Inverness base.
511. Up to 211 annual return trips by a maximum of 21 vessels made be made during the O&M phase of the Bellrock WFDA. It is assumed that multiple vessels will be on-site continuously throughout the majority of the O&M phase, with exceptions during extreme adverse weather or vessel maintenance. The presence of such vessels will increase the likelihood of an incident and subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability.
512. Marine coordination of project vessels will decrease the likelihood of an incident occurring within the Bellrock WFDA. Additionally, project vessel compliance with flag state and international regulations such as SOLAS (IMO, 1974) will ensure project vessels are equipped to assist any incidents or are capable of self-help, noting this would be undertaken in liaison with the MCA.
513. Should the use of an existing AtoN be inhibited by the presence of the Bellrock WFDA then the potential for an incident requiring emergency response may be

exacerbated. However, there are no nearby AtoN for which it is considered such an impact could apply.

514. The layout will be agreed with the MCA and NLB as part of the DSLP process, and will be in compliance with MGN 654 to ensure any SAR operations within the Bellrock WFDA are facilitated. This will include a safety justification for a single line of orientation if taken forward. An ERCoP will be submitted to the MCA, and a SAR Checklist will be completed and agreed with the MCA post-consent as per MGN 654 requirements.
515. The ERCoP will also give due consideration to the procedures applied in the event of a wreck (vessel or structure) associated with the Bellrock WFDA, noting that this was raised as a potential issue by NLB.
516. As an unlikely worst-case, the consequences of reduced emergency response capabilities could include a failure of emergency response to an incident, resulting in a PLL and pollution. Adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** will aid in managing environmental risks.

18.2.8.2 Embedded Mitigation Measures

517. The embedded mitigation measures identified as being relevant to reducing risk are as follows:
- The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA;
 - A DSLP will be developed post-consent to finalise the Bellrock WFDA layout in consultation with the MCA and NLB;
 - Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA via the development of and adherence to an LMP (an **Outline LMP** is provided in **Volume V**);
 - Marine coordination will be implemented to manage project vessels throughout maintenance periods including in liaison with relevant ports and harbours;
 - Development of and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident; and
 - Project vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974).

18.2.8.3 Frequency of Occurrence

518. The frequency of occurrence in relation to reduction of emergency response capability during the O&M phase of the Bellrock WFDA is considered to be **Remote**.

18.2.8.4 Severity of Consequence

519. The severity of consequence in relation to reduction of emergency response capability during the O&M phase of the Bellrock WFDA is considered to be **Serious**.

18.2.8.5 Significance of Risk

520. Taking the frequency of occurrence as **Remote** and the severity of consequence as **Serious**, the overall significance of risk in relation to reduction of emergency response capability during the O&M phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.3 Decommissioning Phase

18.3.1 Vessel Displacement Resulting in Increased Third-Party Collision Risk

521. *Vessel displacement as a result of decommissioning activities associated with the Bellrock WFDA may increase encounters and collision risk between third-party vessels operating in the area.*

18.3.1.1 Quantification and Qualification of Risk

522. Given that the methods used to remove structures and subsea cables are expected to be similar in nature to those used during installation, this hazard is expected to be similar to that of the construction phase (**Section 18.1.1**). In particular, a buoyed decommissioning area analogous to the buoyed construction area will be in place resulting in similar deviations during the decommissioning phase as are anticipated for the construction phase. As a result, it is expected that collision risk between third-party vessels is likely to be similar to that of the construction phase. However, deviations will be well established by the decommissioning phase, and vessels will likely be more familiar with navigation around the Bellrock WFDA compared to during the construction phase.

523. In the case of subsea cables, sections on the seabed may be left in situ but for the purposes of this assessment (as a worst-case) it has been assumed that all subsea cables will be removed during decommissioning with only cable protection left in situ.

18.3.1.2 Embedded Mitigation Measures

524. Relevant mitigation measures for this hazard are analogous to the equivalent construction phase hazard, with the addition of development and adherence to a Decommissioning Plan.

18.3.1.3 Frequency of Occurrence

525. The frequency of occurrence relating to collision risk between third-party vessels during the decommissioning phase of the Bellrock WFDA is considered to be **Remote**.

18.3.1.4 Severity of Consequence

526. The severity of consequence relating to collision risk between third-party vessels during the decommissioning phase of the Bellrock WFDA is considered to be **Moderate**.

18.3.1.5 Significance of Risk

527. Taking the frequency of occurrence as **Remote**, and the severity of consequence as **Moderate**, the overall significance of risk relating to collision risk between third-party vessels during the decommissioning phase of the Bellrock WFDA is deemed to be **Tolerable with Mitigation**.

18.3.2 Collision Risk Between Third-party and Project Vessels

528. *The presence of vessels associated with the decommissioning of the Bellrock WFDA may increase collision risk between project vessels and third-party vessels already operating in the area.*

18.3.2.1 Quantification and Qualification of Risk

529. Given that the numbers and types of vessels utilised during the decommissioning phase are likely to be similar to that of the construction phase, including number of return trips, this hazard is expected to be similar in nature to the equivalent construction phase hazard.

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

18.3.2.2 Embedded Mitigation Measures

531. Relevant mitigation measures for this hazard are analogous to the equivalent construction phase hazard, with the addition of development and adherence to a Decommissioning Plan.

18.3.2.3 Frequency of Occurrence

532. The frequency of occurrence relating to increased third-party to project vessel collision risk during the decommissioning phase of the Bellrock WFDA is considered to be **Extremely Unlikely**.

18.3.2.4 Severity of Consequence

533. The severity of consequence relating to increased third-party to project vessel collision risk during the decommissioning phase of the Bellrock WFDA is considered to be **Serious**.

18.3.2.5 Significance of Risk

534. Taking the frequency of occurrence as **Extremely Unlikely**, and the severity of consequence as **Serious**, the overall significance of risk relating to increased third-party to project vessel collision risk during the decommissioning phase of the Bellrock WFDA is deemed as **Tolerable with Mitigation**.

18.3.3 Reduced Access to Local Ports and Harbours

535. *The presence of project vessels may reduce third-party access to the decommissioning port(s) during the decommissioning phase.*

18.3.3.1 Qualification of Risk

536. Since the methods used to remove infrastructure are expected to be similar to those used for installation, inclusive of towage operations, this hazard is expected to be similar in nature to the equivalent construction phase hazard.

18.3.3.2 Embedded Mitigation Measures

537. Relevant mitigation measures for this hazard are analogous to the equivalent construction phase hazard, with the addition of development and adherence to a Decommissioning Plan.

18.3.3.3 Frequency of Occurrence

538. The frequency of occurrence in relation to reduced access to local ports, harbours, and facilities during the decommissioning phase of the Bellrock WFDA is considered to be **Remote**.

18.3.3.4 Severity of Consequence

539. The severity of consequence in relation to reduced access to local ports, harbours, and facilities during the decommissioning phase of the Bellrock WFDA is considered to be **Minor**.

18.3.3.5 Significance of Risk

540. Taking the frequency of occurrence as **Remote** and the severity of consequence as **Minor**, the overall significance of risk in relation to reduced access to local ports, harbours, and facilities during the decommissioning phase of the Bellrock WFDA is deemed to be **Broadly Acceptable**.

18.3.4 Loss of Station

541. *Loss of station of a FOU or mooring/metocean buoy may occur due to the failure of its SKS and/or mooring lines associated.*

18.3.4.1 Qualification of Risk

542. Since the methods used to remove infrastructure are expected to be similar to those used for installation, this hazard is expected to be similar in nature to the equivalent construction phase hazard.

18.3.4.2 Embedded Mitigation Measures

543. Relevant mitigation measures for this hazard are analogous to the equivalent construction phase hazard, with the addition of development and adherence to a Decommissioning Plan.

18.3.4.3 Frequency of Occurrence

544. The frequency of occurrence in relation to loss of station risk during the decommissioning phase of the Bellrock WFDA is considered to be **Negligible**.

18.3.4.4 Severity of Consequence

545. The severity of consequence in relation to loss of station risk during the decommissioning phase of the Bellrock WFDA is considered to be **Serious**.

18.3.4.5 Significance of Risk

546. Taking the frequency of occurrence as **Negligible** and the severity of consequence as **Serious**, the overall significance of risk in relation to loss of station risk during the decommissioning phase of the Bellrock WFDA is deemed **Broadly Acceptable**.

19 Cumulative Risk Assessment

19.1 Vessel Displacement Resulting in Increased Third-party Collision Risk

547. *Vessel displacement as a result of construction, maintenance, and decommissioning activities associated with the Bellrock WFDA and cumulative developments may increase encounters and collision risk between third-party vessels operating in the area.*
548. This hazard may arise due to buoyed construction and/or decommissioning areas, the presence of vessels associated with cumulative developments (including RAM vessels), and the presence of surface-piercing structures.
549. It is expected that six of the ten main commercial routes will require increased deviations (compared to the Bellrock WFDA in isolation scenario) due to the presence of the Bellrock WFDA and Tier 1 and 2 developments in combination.
550. These deviations may result in a funnelling effect of vessel traffic and create hotspots where vessel to vessel encounters between third-party vessels are more likely to occur. However, considering the international nature of shipping, it is possible that vessels will alter course in advance and choose to deviate closer to the coast or further offshore, particularly when routeing from the north-west or south-east, as illustrated in **Section 14.6.2**.
551. In terms of north-west/south-east routeing, it was indicated during previous consultation with key shipping and navigation stakeholders that vessels are unlikely to utilise the gap between Morven and Ossian given that it presents a long and narrow sea space to navigate (Anatec, 2025). Based on this, it has been estimated that vessel routeing may be displaced to the west of Morven and east of Ossian.
552. Vessels passing to the east of Ossian may choose to route between Ossian and the Bellrock WFDA. In line with MGN 654 (MCA, 2021), the width required between turbines on either side of a shipping corridor will be proportional to the corridor length based on a 20-degree course deviation. The width of the gap between Ossian and the Bellrock WFDA is 8.1 nm, thus a width no less than approximately 2.9 nm will be required to allow safe passage between the developments. The gap between Ossian and the Bellrock WFDA is 4.7 nm at its narrowest, therefore is compliant with MGN 654 (MCA, 2021) and deemed sufficiently safe for surface navigation. Furthermore, the MCA has expressed no concerns regarding the gap between the developments and as per the Shipping Route Template (MCA, 2021), the distance between Ossian and the Bellrock WFDA would fall under the ‘Broadly Acceptable’ category, though it should be considered that the Shipping Route Template is applied on a case-by-case basis.
553. Vessels routeing to the east of the Bellrock WFDA may choose to navigate west of the Catcher Area Development, Cedar, and ChampionWind. Again, there is in excess

of 10 nm of sea space between these developments and the Bellrock WFDA allows sufficient area to facilitate this deviation.

554. In terms of east/west and north-east/south-west routeing, vessels will likely be required to deviate north or south of the Cedar OWF, as well as north or south of the OWF Bellrock WFDA would contribute towards cumulative displacement leading to increased collision risk between third-party vessels in these instances.
555. In adverse weather, Fred Olsen Cruise have indicated that routeing options may be limited. Based on feedback from discussions with NLB regarding cumulative scenarios, it was considered that “*depending on weather conditions and vessel types some vessels may go further offshore east of Bellrock*” (Anatec, 2024) and this may be a suitable option for Fred Olsen Cruise operated vessels navigating between the UK and Norway.
556. Although Tier 3 developments (see **Table 13.1**) are a sufficient distance from the Bellrock WFDA such that no additional displacement due to the presence of surface-piercing structures, there remains potential for project vessel activities associated with any associated transmission assets to cause minor disruption.
557. Embedded mitigation measures will likely be similar to that of the in isolation scenario. In particular, promulgation of information to mariners will allow passage planning in advance. Additionally, appropriate marking on nautical charts and lighting and marking of structures will increase mariner awareness of the developments, with lighting and marking schemes across cumulative developments to be dictated by NLB. Development and adherence to the **MPCP (Volume V) of the Bellrock WFDA EIA Report** and an ERCoP will aid in managing effects to the environment and personnel.
558. The frequency of occurrence in relation to cumulative displacement of vessel traffic leading increased risk of collision between third-party vessels is considered **Remote** and the severity of consequence is considered **Serious**. Thus, the overall significance of risk is deemed to be **Tolerable with Mitigation**.

19.2 Collision Risk Between Third-party and Project Vessels

559. *The presence of vessels associated with the construction, maintenance, and decommissioning of the Bellrock WFDA and cumulative developments may increase collision risk between project vessels and third-party vessels already operating in the area.*
560. This hazard may be particularly relevant where the construction or decommissioning phases of the Bellrock WFDA and cumulative developments coincide, and especially where these are the Tier 1 developments, i.e. Ossian, Morven and ChampionWind OWFs. Given the proximity of these developments, there is potential for large increases in number of project vessels navigating in the local region, and disruption

to third-party vessels may be exacerbated where the developments share common port(s).

561. Embedded mitigations will likely be that of the in isolation scenario. All cumulative developments screened in in **Section 13** are expected to implement similar vessel management as in relation to the Bellrock WFDA, particularly marine coordination of project vessels and the use of Safety Zones. Marine coordination in particular will be critical, with effective coordination across the developments necessary to ensure disruption is minimised. Additionally, the production of a Vessel Management Plan (VMP) and NSP are standard conditions of consent, and all vessels associated with cumulative developments will be required to comply with COLREGS (IMO, 1972/77) and SOLAS (IMO, 1974). Furthermore, guard vessels may be utilised as required by risk assessment to further reduce encounters between third-party vessels and project vessels, particularly those that may be RAM. The promulgation of information, including liaison via an appointed FLO, will ensure mariners are kept informed of ongoing developments. Development and adherence to the **MPCP (Volume V)** of the **Bellrock WFDA EIA Report** and an ERCoP will aid in managing the effects to the environment and personnel.
562. The frequency of occurrence in relation to increased risk of collision between third-party vessels and cumulative project vessels is considered **Remote** and the severity of consequence is considered **Serious**. Thus, the overall significance of risk is deemed to be **Tolerable with Mitigation**.

19.3 Reduced Access to Local Ports and Harbours

563. *Given the location of cumulative developments, there is a possibility that the same ports are utilised across various projects. The presence of project vessels operating at these ports during construction, O&M, and decommissioning may reduce third-party access to local ports, harbours, and facilities at a cumulative level.*
564. Embedded mitigations are likely to be the same as per the in isolation scenario. In particular, marine coordination of project vessels will aid to ensure reduction in port access for third-party vessels is limited, and will involve liaison across cumulative developments where relevant. Additionally, the production of an NSP and VMP are standard conditions of consent which will manage project vessel movements across cumulative developments. The promulgation of information, including via an appointed FLO, will ensure that mariners are kept aware of project vessel movements.
565. The frequency of occurrence in relation to reduced access to local ports, harbours, and facilities due to the presence of cumulative project vessels is considered **Remote** and the severity of consequence is considered **Minor**. Thus, the overall significance of risk is deemed to be **Broadly Acceptable**.

19.4 Surface Structure Allision Risk

566. *The presence of surface-piercing structures, including buoys, within the Bellrock WFDA and nearby cumulative developments will increase the risk of allision to passing third-party vessels.*
567. As per **Section 14.6.2**, it is anticipated that vessels currently passing north-west/south-east within or in proximity to the Bellrock WFDA will choose to pass either between Ossian OWF and the Bellrock WFDA, or between the Bellrock WFDA and the Catcher Area Development and Cedar OWF to the east.
568. As noted in relation to the collision risk hazard between third-party vessels (see **Section 19.1**), the gap between the Bellrock WFDA and Ossian OWF is 4.7 nm at its narrowest, which presents sufficient sea space for vessels to safely navigate surface-piercing structures. Additionally, sea space exists in excess of 10 nm between the Bellrock WFDA and the Catcher Area Development, Cedar OWF, and CampionWind OWF. This is considered sufficient to manage any associated risks.
569. Embedded mitigations are likely to remain that of the in isolation scenario. In particular, lighting and marking of cumulative developments will be agreed with the NLB to ensure navigational safety in proximity to any surface piercing structure. Furthermore, each cumulative development will agree final layout configurations with the NLB and the MCA prior to construction in line with MGN 654 (MCA, 2021), which will aid to minimise the risk of allision. Appropriate charting on nautical charts will also ensure that mariners are kept aware of locations of any surface-piercing structures.
570. The frequency of occurrence in relation to creation of cumulative vessel to structure allision risk is considered **Remote** and the severity of consequence is considered **Serious**. Thus, the overall significance of risk is deemed to be **Tolerable with Mitigation**.

19.5 Reduction of Search and Rescue Capability due to Surface Infrastructure

571. *The presence of surface-piercing structures, project vessels, and increased personnel within the area associated with cumulative developments may reduce emergency response capability by increasing the number of incident responses required and/or reducing access for responders.*
572. However, given that baseline incident rates are low within and in proximity to the Bellrock WFDA (see **Section 9**), it is not anticipated that there will be notable effects on emergency response resources on a cumulative level, particularly when considering that additional resources will be available from cumulative project vessels through compliance with international regulations such as SOLAS (IMO, 1974)

and self-help capabilities. This will be most relevant for Tier 1 developments given their proximity to the Bellrock WFDA.

573. Additionally, all cumulative developments will be required to agree final layout configurations with the MCA to ensure they are suitable for SAR access in line with MGN 654 (MCA, 2021).
574. Embedded mitigation measures will likely be similar to that of the in isolation scenario, particularly the agreement of the final layout with the MCA, as well as appropriate marine and aviation lighting and marking of surface-piercing structures. Where appropriate, any marine coordination will include liaison across the relevant cumulative developments, with the Tier 1 developments again likely the most relevant.
575. The frequency of occurrence in relation to reduction of emergency response capability at a cumulative level is considered **Remote** and the severity of consequence is considered **Serious**. Thus, the overall significance of risk is deemed to be **Tolerable with Mitigation**.

20 Risk Control Log

576. **Table 20.1** presents a summary of the assessment of shipping and navigation hazards risk assessed. This includes the proposed embedded mitigation measures, frequency of occurrence, severity of consequence and significance of risk, per hazard.
577. Addition mitigation measures and subsequent residual significance of risk is considered in **Section 23**.

Table 20.1 Risk Control Log

Hazard	Phase	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Vessel displacement resulting in increased third-party collision risk	Construction/ decommissioning	<ul style="list-style-type: none"> ▪ Appropriate marking on charts; ▪ MGN 654 compliance; ▪ Fisheries liaison; ▪ Lighting and marking; ▪ MPCP (Volume V) of the Bellrock WFDA EIA Report; ▪ Promulgation of information; and ▪ Project vessel compliance with international marine regulations. 	Remote	Moderate	Tolerable with Mitigation
	O&M		Remote	Moderate	Tolerable with Mitigation
Collision risk between third-party vessel and project vessels	Construction/ decommissioning	<ul style="list-style-type: none"> ▪ Application for Safety Zones; ▪ Appropriate marking on charts; ▪ MGN 654 compliance; ▪ Fisheries liaison; ▪ Guard vessels; ▪ Lighting and marking; ▪ MPCP (Volume V) of the Bellrock WFDA EIA Report; ▪ NSP; ▪ Promulgation of information; ▪ VMNSP; ▪ Marine coordination for project vessels including liaison with relevant ports and harbours; and ▪ Project vessel compliance with international marine regulations. 	Extremely Unlikely	Serious	Tolerable with Mitigation
	O&M		Extremely Unlikely	Serious	Tolerable with Mitigation

Project A4900

Client Bellrock Offshore Wind Farm Limited

Title Bellrock Offshore Wind Farm – Wind Farm Development Area Navigational Risk Assessment

Hazard	Phase	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Reduced access to local ports and harbours	Construction/ decommissioning	<ul style="list-style-type: none"> ▪ MGN 654 compliance; ▪ Fisheries liaison; ▪ Marine coordination for project vessels including liaison with relevant ports and harbours; ▪ NSP; ▪ Project vessel compliance with international marine regulations; ▪ Promulgation of information; and ▪ VMNSP. 	Remote	Minor	Broadly Acceptable
	O&M		Extremely Unlikely	Minor	Broadly Acceptable
Loss of station	Construction/ decommissioning	<ul style="list-style-type: none"> ▪ MGN 654 compliance; ▪ Compliance with floating mooring guidance; ▪ Fisheries liaison; ▪ MPCP (Volume V) of the Bellrock WFDA EIA Report; ▪ Project vessel compliance with international marine regulations; and ▪ Promulgation of information. 	Negligible	Serious	Broadly Acceptable
	O&M		Negligible	Serious	Broadly Acceptable
Surface structure allision risk – powered	O&M	<ul style="list-style-type: none"> ▪ Appropriate marking on charts; ▪ MGN 654 compliance; ▪ DSLP; ▪ Lighting and marking; and ▪ MPCP (Volume V) of the Bellrock WFDA EIA Report. 	Remote	Serious	Tolerable with Mitigation
Surface structure allision risk – drifting	O&M	<ul style="list-style-type: none"> ▪ MGN 654 compliance; and ▪ MPCP (Volume V) of the Bellrock WFDA EIA Report. 	Extremely Unlikely	Serious	Tolerable with Mitigation

Project A4900

Client Bellrock Offshore Wind Farm Limited

Title Bellrock Offshore Wind Farm – Wind Farm Development Area Navigational Risk Assessment

Hazard	Phase	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Surface structure allision risk – Internally within the WFDA	O&M	<ul style="list-style-type: none">▪ Appropriate marking on charts;▪ MGN 654 compliance;▪ DSLP;▪ Lighting and marking;▪ MPCP (Volume V) of the Bellrock WFDA EIA Report;▪ Minimum blade clearance; and▪ Promulgation of information.	Extremely Unlikely	Serious	Tolerable with Mitigation
Reduction of under keel clearance due to presence of sub-surface infrastructure	O&M	<ul style="list-style-type: none">▪ CBRA;▪ Appropriate marking on charts;▪ MGN 654 compliance; and▪ MPCP (Volume V) of the Bellrock WFDA EIA Report.	Negligible	Moderate	Broadly Acceptable
Anchor interaction with sub-surface infrastructure	O&M	<ul style="list-style-type: none">▪ CBRA;▪ Appropriate marking on charts;▪ MGN 654 compliance;▪ Compliance with floating OWF mooring guidance;▪ DSLP;▪ Fisheries liaison; and▪ MPCP (Volume V) of the Bellrock WFDA EIA Report.	Extremely Unlikely	Moderate	Broadly Acceptable

Hazard	Phase	Embedded Mitigation Measures	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Reduction of SAR capability due to surface infrastructure	O&M	<ul style="list-style-type: none"> ▪ MGN 654 compliance; ▪ DSLP; ▪ Lighting and marking; ▪ Marine coordination for project vessels including liaison with relevant ports and harbours; ▪ MPCP (Volume V) of the Bellrock WFDA EIA Report; and ▪ Project vessel compliance with international marine regulations. 	Remote	Serious	Tolerable with Mitigation

21 Embedded Mitigation Measures

578. As part of the Bellrock WFDA design process, a number of embedded mitigation measures have been adopted to reduce the potential for risk to shipping and navigation.
579. These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing these measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Bellrock WFDA.
580. The embedded mitigation measures within the design relevant to shipping and navigation are outlined in **Table 21.1**. All mitigation measures for the Bellrock WFDA are summarised in **Appendix 5.1: Mitigation and Monitoring Register (Volume IV of the Bellrock WFDA EIA Report)**.

Table 21.1 Embedded Mitigation Measures Relevant to Shipping and Navigation

Subject Matter	Details	How the Embedded Mitigation Measures will be Secured
Application for Safety Zones	An application will be made post-consent for Safety Zones including up to 500 m around each FOU and OfSS during its construction and decommissioning, up to 50 m around each installed FOU and OfSS during its pre-commissioning, and up to 500 m around each FOU and OfSS during major maintenance during the O&M phase. Consideration will also be given to an application for up to 500 m operational Safety Zones throughout the O&M phase.	A Safety Zone application will be undertaken post-consent in line with Department for Energy Security and Net Zero (DESNZ) guidance before commencement of construction.
CBRA	A CBRA will be prepared where IACs are proposed to be buried to determine the target burial depth. The burial depths may vary and will be dependent on risk and ground conditions. The CBRA will also highlight instances where adequate burial cannot be achieved and alternative protection is needed. Any damage, destruction, or decay of cables will be notified to MCA, NLB, Kingfisher, and UKHO.	Secured in the Section 36 consent and Marine Licence, via the requirement for a Construction Method Statement (CMS) to be developed and submitted to Scottish Ministers for approval before commencement of construction.
Appropriate marking on charts	All relevant Wind Farm Infrastructure and OfSSs will be appropriately marked on all physical and electronic nautical charts as distributed by the UKHO.	Secured in the DSLP to be developed and submitted to Scottish Ministers for approval before commencement of construction.
MGN 654 Compliance	The Applicant will ensure compliance with MGN 654 and its annexes, where applicable, including the completion post-consent of an ERCoP and SAR Checklist in consultation with the MCA.	Secured in the Section 36 consent and Marine Licence.

Subject Matter	Details	How the Embedded Mitigation Measures will be Secured
Compliance with floating mooring guidance	The Applicant will ensure compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017).	Secured in the Section 36 consent and Marine Licence, noting that this document is referenced by MGN 654 (MCA, 2021).
Decommissioning Programme	A Decommissioning Programme will be developed prior to decommissioning.	Secured in the Section 36 consent and Marine Licence, via the requirement for a Decommissioning Programme, to be developed and submitted to Scottish Ministers for approval before commencement of construction.
DSLPL	A DSLP will be developed post-consent to finalise the WFDA layout in consultation with the MCA and NLB.	Secured in the Section 36 consent and Marine Licence, via the requirement for a DSLP to be developed and submitted to Scottish Ministers for approval before commencement of construction.
Fisheries liaison	Ongoing liaison with fishing fleets will be maintained during construction, maintenance, and decommissioning operations via an appointed FLO.	Secured in the Section 36 consent and Marine Licence via the requirement for a Fisheries Mitigation, Monitoring and Communication Plan (FMMCP) (Volume V) , which will be developed and submitted to Scottish Ministers for approval before commencement of construction. The FMMCP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside this Section 36 and Marine Licence application.
Guard vessels	Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, O&M, and decommissioning phases	Secured in the Section 36 Consent and Marine Licence, via the requirement for a NSP and VMP to be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline VMNSP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.

Subject Matter	Details	How the Embedded Mitigation Measures will be Secured
Lighting and marking	Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by NLB, MCA, and CAA including the buoyed construction/decommissioning areas.	Secured in the Section 36 consent and Marine Licence via the requirement for a LMP, which will be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline LMP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.
Marine coordination	Marine coordination will be implemented to manage project vessels throughout construction, O&M, and decommissioning periods including in liaison with relevant ports and harbours.	Secured in the Section 36 consent and Marine Licence via the requirement for a NSP and VMP, which will be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline VMNSP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.
MPCP (Volume V) of the Bellrock WFDA EIA Report	A MPCP (Volume V) of the Bellrock WFDA EIA Report will be developed outlining the approach for managing and reducing risk of pollution and procedures to protect personnel and to be followed in the event of a pollution incident.	Secured in the Section 36 consent and Marine Licence, via the requirement for a MPCP (Volume V) of the Bellrock WFDA EIA Report , which has been submitted alongside the Section 36 and Marine Licence Application.
NSP	Development of and adherence to a VMNSP. The VMNSP will describe measures put in place by the Bellrock WFDA related to navigational safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Bellrock WFDA activity to other sea users (e.g., via Notice to Mariners with Kingfisher Bulletins or other appropriate methods). Where appropriate, guard vessels will be used to ensure adherence with Safety Zones or advisory passing distances.	Secured in the Section 36 consent and Marine Licence, via the requirement for a NSP to be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline VMNSP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.

Subject Matter	Details	How the Embedded Mitigation Measures will be Secured
Minimum blade clearance	There will be a minimum blade tip clearance of at least 22 m above MHWS.	Secured in the Section 36 consent and Marine Licence, via the requirement for a CMS and DSLP developed and submitted to Scottish Ministers for approval before commencement of construction.
Compliance with international marine regulations	Bellrock WFDA vessels will ensure compliance with international marine regulations as adopted by the Flag State, including the COLREGs (IMO, 1972/77) and SOLAS (IMO, 1974).	Secured in the Section 36 consent and Marine Licence via the requirement for a VMP, to be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline VMNSP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.
Promulgation of information	Advance warning and accurate location details of construction, maintenance, and decommissioning operations, associated Safety Zones, and advisory passing distances will be given via notifications to mariners and Kingfisher Bulletins.	Secured in the Section 36 consent and Marine Licence, via the requirement for a VMP and NSP to be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline VMNSP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.
VMP	A VMNSP will be developed and implemented to confirm the types and numbers of vessels that will be engaged during the different phases of the Bellrock WFDA, including selection of preferred transit routes.	Secured in the Section 36 consent and Marine Licence, via the requirement for a VMP to be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline VMNSP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.

Subject Matter	Details	How the Embedded Mitigation Measures will be Secured
LMP	Development of and adherence to a LMP. The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting. Failures of the lighting and marking in the Bellrock WFDA will be appropriately reported and rectified as soon as practicable. Interim hazard warnings will be put in place as required.	Secured in the Section 36 consent and Marine Licence, via the requirement for a LMP to be developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline LMP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.
Dropped objects	Any objects dropped on the seabed during works associated with the Bellrock WFDA will be reported in line with MD-LOT dropped objects procedures and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.	Secured in the Section 36 consent and Marine Licence via the requirement for an Environmental Management Plan (EMP), which will be developed and submitted to Scottish Ministers for approval before commencement of construction.
ERCoP	Development of, and adherence to, an ERCoP.	Secured in the Section 36 consent and Marine Licence, noting that the requirement of an ERCoP is referenced in MGN 654 (MCA, 2021).
Towing of FOU	No more than two non-rotating turbines/FOUs will be towed together at once and will not exceed a velocity of 10 knots.	Secured in the Section 36 consent and Marine Licence, via the requirement for a VMP and NSP developed and submitted to Scottish Ministers for approval before commencement of construction. An Outline VMNSP (Volume V) of the Bellrock WFDA EIA Report is submitted alongside the Section 36 consent applicant and Marine Licence application for the Bellrock WFDA.
WTG layout	The layout of the WTGs and OfSSs in the Bellrock WFDA, will be finalised in discussion with the MCA and NLB in order to ensure the specific layout is compatible with potential SAR activity.	Secured in the Section 36 consent and Marine Licence, via the requirement for a DSLP to be developed and submitted to Scottish Ministers for approval before commencement of construction.

21.1 Marine Aids to Navigation

581. Throughout all phases, AtoNs will be provided in accordance with NLB and MCA requirements, with consideration being given to IALA Recommendation O-139 (IALA, 2021) and G1162 (IALA, 2022) and MGN 654 (MCA, 2021).

21.1.1 Construction and Decommissioning Phases

582. During the construction and decommissioning phases, buoyed construction and decommissioning areas will be established and marked, where required, in accordance with NLB requirements based on the IALA Maritime Buoyage System. In addition, where advised by NLB, additional marking on structures may also be applied. NLB have indicated that the buoyage will need to be in place when anchor and mooring systems are in situ, even with the absence of surface piercing structures.

21.1.2 O&M Phase

583. Marking during the O&M phase will be agreed in consultation with NLB once the final Bellrock WFDA layout has been selected post-consent; however, the following subsections summarise likely requirements.

21.1.2.1 Marking of Individual Structures

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

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

21.1.2.2 Marking of the Bellrock Wind Farm Development Area as a Whole

586. The marking of the Bellrock WFDA as a whole will be agreed with NLB once the final layout has been selected and will be in line with IALA Recommendation O-139 (IALA, 2021) and G1162 (IALA, 2022). As per the IALA guidance, and in consultation with NLB, it will be ensured that:

- All corner structures will be marked as a Significant Peripheral Structure (SPS) and where necessary, to satisfy the spacing requirements between SPSs, additional periphery structures may also be marked as SPSs;
 - Structures designated as an SPS will exhibit a flashing yellow five second (flash yellow every five seconds) light of at least 5 nm nominal range and omnidirectional fog signals as appropriate and where prescribed by NLB, and will be sounded at least when the visibility is 2 nm or less;
 - Further periphery structures may be marked as Intermediate Peripheral Structures (IPS) including a flashing yellow light with a distinctly different flash character from those displayed on the SPSs and at least 2 nm nominal range;
 - All lights will be visible to shipping through 360° and if more than one lantern is required on a structure to meet the all-round visibility requirement, then all the lanterns on that structure will be synchronised;
 - All lights will be exhibited at the same height at least 6 m above HAT and below the arc of the lowest WTG blades;
 - Remote monitoring sensors using Supervisory Control and Data Acquisition (SCADA) will be included as part of the lighting and marking scope to ensure a high level of availability for all aids to navigation;
 - Aviation lighting will be as per CAA requirements; however, will likely be synchronised Morse “W” at the request of NLB; and
 - All lighting will be considered cumulatively with existing aids to navigation to avoid the potential for light confusion to passing traffic.
587. Consideration will also be given to the use of marking via AIS, or other electronic means (such as Racon) to assist safe navigation particularly in reduced visibility. AIS transmitters or virtual buoys could also be considered internally to assist with safe navigation within the Bellrock WFDA. Mooring/metocean buoys will also be lit and marked in line with IALA guidelines, as noted during consultation by NLB.
588. As part of the lighting and marking discussions with NLB consideration will be given to the removal of FOU's for maintenance and the subsequent result for the lighting and marking scheme as a whole.

21.2 Design Specifications Noted in Marine Guidance Note 654

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

22 Through Life Safety Management

22.1 Quality, Health, Safety and Environment

590. QHSE documentation including a Safety Management System (SMS) will be in place for the Bellrock WFDA 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.

591. Monitoring, reviewing, and auditing will be carried out on all procedures and activities and feedback actively sought. Any designated person (identified in QHSE documentation), managers, and supervisors are to maintain continuous monitoring of all marine operations and determine if all required procedures and processes are being correctly implemented.

22.2 Incident Reporting

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

593. 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.

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

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

596. When appropriate, the designated person (noted within the ERCoP) should inform the MCA of any exercise or incidents including any implications on emergency response. If required, the MCA should be invited to take part in incident debriefs.

22.3 Review of Documentation

597. 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.
598. Reviews of the risk register should be made after any of the following occurrences:
- Changes to the development, conditions of operation and prior to decommissioning;
 - Planned reviews; and
 - Following an incident or exercise.
599. 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.

22.4 Inspection of Resources

600. All vessels, facilities, and equipment necessary for marine operations are to be subject to appropriate inspection and testing to determine fitness for purpose and availability in relation to their performance standards. This will include monitoring and inspection of all aids to navigation to determine compliance with the performance standards specified by NLB.

22.5 Audit Performance

601. Auditing and performance review are the final steps in QHSE management systems. The feedback loop enables an organisation to reinforce, maintain and develop its ability to reduce risks to the fullest extent, and to ensure the continued effectiveness of the system. The Applicant will carry out audits and periodically evaluate the efficiency of the marine safety documentation.
602. 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.

22.6 Safety Management System

603. The Applicant will manage the risk associated with the activities undertaken at the Bellrock WFDA. 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 a quick fix can be instigated, which will allow IALA availability requirements to be met.

22.7 Cable Monitoring

604. The subsea cable routes will be subject to periodic inspection post-construction to monitor the condition of the cable, any installed cable protection, and cable burial depths. Maintenance of the cable protection will be undertaken as necessary.
605. If exposed cables or ineffective cable protection measures are identified during post-construction monitoring, these would be communicated to relevant sea users including via Notifications to Mariners and Kingfisher Bulletins. Where immediate risk was observed, the Applicant would also employ additional temporary measures (such as a guard vessel or temporary buoyage) until such time as the risk was adequately mitigated.
606. Details will be included in full within the assessment of cable burial and protection document, to be produced post-consent.

22.8 Hydrographic Surveys

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

22.9 Decommissioning Programme

608. 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 Bellrock WFDA) which is considered to be a danger to navigation and which it has not proved possible to remove. Such an obstruction may result in a requirement for the Applicant or Operator of the Bellrock WFDA to implement marking until such time as it is either removed or no longer considered a danger to navigation.

23 Summary

23.1 Consultation

609. The NRA process has included consultation with stakeholders of relevance to shipping and navigation. This has included consideration of the outputs of the scoping process, direct liaison with key stakeholders (both statutory and non-statutory), outreach to Regular Operators of the area, and a Hazard Workshop (held in July 2025). Stakeholders which were consulted include the following:

- MCA;
- NLB;
- UK Chamber of Shipping;
- SWFPA;
- RYA Scotland;
- Montrose Port;
- Tidewater Marine; and
- Fred Olsen Cruise.

23.2 Existing Environment

23.2.1 Navigational Features

610. Key navigational features in the area include the Catcher Area Development located approximately 10.5 nm to the east of the Bellrock WFDA, which includes the FPSO vessel *BW Catcher*. The *Triton* FPSO within the Triton Oil Field is located approximately 22 nm from the Bellrock WFDA, and the *Anasuria* FPSO is located within the Teal & Guillemot Oil Fields at 28 nm from the Bellrock WFDA.

611. The closest existing OWF is the Seagreen OWF at 46 nm south-west of the Bellrock WFDA. Hywind OWF is located 51 nm from the Bellrock WFDA.

612. Peterhead Port is one of the closest ports to the Bellrock WFDA at approximately 64 nm to the north-west. Peterhead Port is the largest fishing port in Europe as well as being an important base for serving a range of commercial vessels (Peterhead Port Authority, 2024). The Port of Aberdeen is also located 64 nm from the Bellrock WFDA to the west, and Montrose Port is located 76 nm west of the Bellrock WFDA.

613. The closest subsea cable to the Bellrock WFDA is 25 nm to the east and is the North Sea Link interconnector between the UK and Norway. There are two charted subsea wrecks in proximity to the Bellrock WFDA; one located within the Bellrock WFDA itself at a depth of 73 m below CD and one located 0.8 nm south of the Bellrock WFDA at a depth of 71 m below CD.

23.2.2 Maritime Incidents

614. Only one SAR helicopter tasking was recorded within the study area across the 9-year period (April 2015 to March 2024), and was also recorded within the Bellrock WFDA itself. This tasking was a 'rescue/recovery' and was responded to by the Inverness base in 2020.
615. No other valid incidents were recorded within the RNLI or MAIB incident datasets.

23.2.3 Vessel Traffic Movements

616. Over the 14-day summer survey data period (16 to 30 August 2024), there was an average of nine unique vessels per day recorded within the study area. An average of three unique vessels per day were recorded intersecting the Bellrock WFDA or 36% of all vessel traffic recorded during the summer survey period.
617. Over the 14-day winter data period (4 to 17 December 2024), there was an average of three unique vessels per day recorded within the study area. An average of one unique vessels every two days was recorded intersecting the Bellrock WFDA or 18% of all vessel traffic recorded during the summer survey period.
618. Throughout the summer survey period, the main vessel type recorded within the study area was oil and gas vessels which accounted for 43% of all vessels recorded with cargo vessels (34%) also commonly recorded. Tankers (6%) and passenger vessels (6%) were the only other vessel types recorded greater than 5% of all vessels. Of vessels intersecting the Bellrock WFDA, cargo vessels were the greatest recorded with 52% of all intersecting vessels.
619. Throughout the winter data period, the main vessel type recorded within the study area was oil and gas vessels which accounted for 52% of all vessels recorded with cargo vessels (29%) also commonly recorded. Tankers (17%) and fishing vessels (2%) were the only other vessel types recorded during the winter data period. Of vessels intersecting the Bellrock WFDA, cargo vessels (50%) and tankers (38%) were the main vessel types intersecting.

23.3 Collision and Allision Risk Modelling

620. Of the ten main routes identified, it is anticipated that four will require a deviation as a result of the Bellrock WFDA. The largest increase was to Route 4, with a 1.6 nm increase – however, the percentage increase to this route was less than 1%, and so relatively small.
621. The NRA process included quantitative modelling of the change in allision and collision frequency as a result of the Bellrock WFDA, with consideration given to future cases in terms of potential future traffic increases. For allision modelling, an indicative layout including 138 locations was used, noting that this provides conservative results for quantifying allision risk.

622. Assuming commercial routes deviate in the presence of the Bellrock WFDA, it was estimated that the return period of a vessel being involved in a collision post Bellrock WFDA was one in 5,327 years assuming base case traffic levels. This represents a 83% increase in collision frequency compared to the pre Bellrock WFDA base case result.
623. The powered allision return period post Bellrock WFDA was estimated at one in 1,358 years assuming base case traffic levels. The corresponding drifting allision return period post Bellrock WFDA was estimated at 12,299 years. The fishing vessel allision return period was estimated at one in 212 years, noting that this conservatively assumes that there is no change in baseline fishing activity.

23.4 Risk Assessment

624. Based on the consultation feedback, baseline and quantitative modelling, the following hazards were taken forward to the risk assessment:
- Vessel displacement resulting in increased third-party collision risk;
 - Collision risk between third-party vessel and project vessels;
 - Reduced access to local ports and harbours;
 - Loss of station;
 - Reduction of under keel clearance due to presence of sub-surface infrastructure;
 - Surface structure allision risk;
 - Anchor interaction with sub-surface infrastructure;
 - Interference with navigation, communications, and position-fixing equipment; and
 - Reduction of SAR capability due to surface infrastructure.
625. These hazards have been assessed in line with the methodology outlined in Annex 1 of MGN 654 (MCA, 2021) and with consideration of embedded mitigation measures which have been adopted to reduce the potential for risk to relevant users.

23.5 Risk Statement

626. Overall, the risk assessment of both the Bellrock WFDA in isolation and cumulatively with other developments concluded that there will be no significant risks arising from the Bellrock WFDA with embedded mitigation measures in place during the construction, O&M, or decommissioning phases. The significance of risk for all hazards across the in isolation and cumulative risk assessments were predicted to be of **Broadly Acceptable** or **Tolerable with Mitigation** and ALARP assuming the implementation of the embedded mitigation measures identified.

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Client Bellrock Offshore Wind Farm Limited
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Annex A Marine Guidance Note 654 Checklist

627. 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.
628. 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 Marine Guidance Note 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. Metadata should facilitate the identification of the data creator, its date and purpose, and the geodetic datum used. For mariners’ use, appropriate data should also be provided with latitude and longitude coordinates in WGS84 (European Terrestrial Reference System 1989 (ETRS89)) datum.		
Traffic Survey. Includes:		
All vessel types.	✓	Section 10: Vessel Traffic Movements All vessel types are considered with specific breakdowns by vessel type given within the study area.
At least 28 days duration, within either 12 or 24 months prior to submission of the EIAR.	✓	Section 5: Data Sources A total of 28 full days of vessel traffic data from August and December 2024 has been assessed within the study area.
Multiple data sources.	✓	Section 5: Data Sources The summer vessel traffic survey data includes AIS, Radar and visual observations to maximise coverage of vessels not broadcasting on AIS. Long-term vessel traffic data recorded on AIS have also been considered.
Seasonal variations.	✓	Section 5: Data Sources A total of 28 full days of vessel traffic data from August and December 2024 has been assessed within the study area. Annex E: Long-Term Vessel Traffic Movements To assist with the assessment of seasonal variation a long-term AIS dataset covering 12 months in 2023 has also been assessed.
MCA consultation.	✓	Section 4: Consultation The MCA has been consulted as part of the NRA process including through the Hazard Workshop (July 2025).

Issue	Compliance	Comments
General Lighthouse Authority (GLA) consultation.	✓	Section 4: Consultation NLB has been consulted as part of the NRA process including through the Hazard Workshop (July 2025).
UK Chamber of Shipping consultation.	✓	Section 4: Consultation The UK Chamber of Shipping has been consulted as part of the NRA process including through a follow up meeting of the Hazard Workshop.
Recreational and fishing vessel organisations consultation.	✓	Section 4: Consultation RYA Scotland and SWFPA have been consulted as part of the NRA process including through the Hazard Workshop (July 2025).
Port and navigation authorities consultation, as appropriate.	✓	Section 4: Consultation Montrose Port Authority have been consulted as part of the NRA process including through the Hazard Workshop (July 2025).
Assessment of the cumulative and individual effects of (as appropriate):		
i. Proposed OREI site relative to areas used by any type of marine craft.	✓	Section 10: Vessel Traffic Movements Vessel traffic data in proximity to the Bellrock WFDA has been analysed. Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase. Section 19: Cumulative Risk Assessment The hazards due to the Bellrock WFDA and cumulative developments have been assessed for each phase.
ii. Numbers, types and sizes of vessels presently using such areas.	✓	Section 10: Vessel Traffic Movements Vessel traffic data in proximity to the Bellrock WFDA 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.	✓	Annex E: Long-Term Vessel Traffic Movements Non-transit users were identified in the long-term data and included fishing vessels engaged in fishing activities.
iv. Whether these areas contain transit routes used by coastal or deep-draught vessels on passage.	✓	Section 11: Base Case Vessel Routing Main commercial routes have been identified using the principles set out in MGN 654 in proximity to the Bellrock WFDA, with these routes taking into account coastal, deep-draught and internationally scheduled vessels.
v. Alignment and proximity of the site relative to adjacent shipping lanes.	✓	Section 7: Navigational Features No IMO routing measures were in proximity to the Bellrock WFDA.

Issue	Compliance	Comments
vi. Whether the nearby area contains prescribed routing schemes or precautionary areas.	✓	Section 7: Navigational Features No IMO routing measures or military PEXAs were in proximity to the Bellrock WFDA.
vii. Proximity of the site to areas used for anchorage (charted or uncharted), safe haven, port approaches and pilot boarding or landing areas.	✓	Section 7: Navigational Features Section 7.4 identifies port approaches and pilot boarding stations in proximity to the Bellrock WFDA. No anchorage areas are in proximity to the Bellrock WFDA.
viii. Whether the site lies within the jurisdiction of a port and/or navigation authority.	✓	Section 7: Navigational Features Section 7.4 identifies the locations of ports in proximity to the Bellrock WFDA.
ix. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	✓	Section 10: Vessel Traffic Movements Fishing vessel movements are considered within the study area. Detailed analysis of dedicated fishing vessel activities is undertaken in Chapter 11: Commercial Fisheries (Volume II) of the Bellrock WFDA EIA Report .
x. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.	✓	Section 7: Navigational Features There are no military PEXAs in proximity to the Bellrock WFDA.
xi. Proximity of the site to existing or proposed submarine cables or pipelines, offshore oil/gas platforms, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Areas or other exploration/exploitation sites.	✓	Section 7: Navigational Features There are no marine aggregate dredging areas in proximity to the Bellrock WFDA and Section 7.5 identifies the charted wrecks in proximity to the Bellrock WFDA.
xii. Proximity of the site to existing or proposed OREI developments, in cooperation with other relevant developers, within each round of lease awards.	✓	Section 7: Navigational Features Section 7.2 identifies other OWF developments in proximity to the Bellrock WFDA. Section 13: Cumulative Screening Considers other OREI sites in proximity to the Bellrock WFDA cumulatively.
xiii. Proximity of the site relative to any designated areas for the disposal of dredging spoil or other dumping ground.	✓	Section 7: Navigational Features There are no spoil or dumping grounds in proximity to the Bellrock WFDA.
xiv. Proximity of the site to AtoNs and/or VTS in or adjacent to the area and any impact thereon.	✓	Section 7: Navigational Features Section 7.4 identifies VTS areas in proximity to the Bellrock WFDA and Section 7.3 identifies AtoNs in proximity to the Bellrock WFDA.

Issue	Compliance	Comments
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.	✓	Section 16: Collision and Allision Risk Modelling Provides quantification of collision and allision risk resulting from the Bellrock WFDA including pinch (or choke) points in proximity to the Bellrock WFDA.
xvi. With reference to xv. above, the number and type of incidents to vessels which have taken place in or near to the proposed site of the OREI to assess the likelihood of such events in the future and the potential impact of such a situation.	✓	Section 9: Emergency Response and Incident Overview Historical vessel incident data published by DfT (Section 9.1), RNLI (Section 9.2) and MAIB (Section 9.4) in proximity to the Bellrock WFDA has been considered alongside historical OWF incident data throughout the UK (Section 9.5).
xvii. Proximity of the site to areas used for recreation which depend on specific features of the area.	✓	Section 10: Vessel Traffic Movements Non-transit users were identified in the vessel traffic data and included recreational activities.
Predicted effect of OREI on traffic and interactive boundaries. Where appropriate, the following should be determined:		
a. The safe distance between a shipping route and OREI boundaries.	✓	Section 14: Future Case Vessel Traffic A methodology for post Bellrock WFDA routeing is outlined and includes a minimum distance of 1 nm from offshore installations and existing OWF boundaries.
b. The width of a corridor between sites or OREIs to allow safe passage of shipping.	✓	Section 19: Cumulative Risk Assessment Consideration has been given to the sea room between the Bellrock WFDA and nearby cumulative developments.
OREI Structures. The following should be determined:		
a. Whether any feature of the OREI, including auxiliary platforms outside the main generator site, mooring and anchoring systems, inter-device and export cabling could pose any type of difficulty or danger to vessels underway, performing normal operations, including fishing, anchoring and emergency response.	✓	Section 16: Collision and Allision Risk Modelling Provides quantification of collision and allision risk resulting from the Bellrock WFDA. Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of users such as commercial vessels, commercial fishing vessels in transit, recreational vessels, anchored vessels and emergency responders.

Issue	Compliance	Comments
b. Clearances of fixed or floating WTG blades above the sea surface are not less than 22 m (above MHWS for fixed). Floating turbines allow for degrees of motion.	✓	Section 6: Project Description Relevant to Shipping and Navigation Section 6.2 outlines the shipping and navigation WCS for WTGs including the minimum air gap above MHWS.
c. Underwater devices: i. Changes to charted depth; ii. Maximum height above seabed; and iii. Under keel clearance.	✓	Section 6: Project Description Relevant to Shipping and Navigation Section 6.3 outlines the shipping and navigation WCS for subsea cables including the cable burial specifications.
d. Whether structures block or hinder the view of other vessels or other navigational features.	✓	Section 18: Risk Assessment The hazards due to the Bellrock WFDA 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 AtoNs.
The effect of tides, tidal streams and weather. It should be determined whether:		
a. Current maritime traffic flows and operations in the general area are affected by the depth of water in which the proposed installation is situated at various states of the tide, i.e. whether the installation could pose problems at high water which do not exist at low water conditions, and vice versa.	✓	Section 6: Project Description Relevant to Shipping and Navigation Outlines the shipping and navigation WCS for the Bellrock WFDA and includes the range of existing water depths. Section 8: Meteorological Ocean Data Section 8.4 provides meteorological data in proximity to the Bellrock WFDA relating to various states of the tide. Section 10: Vessel Traffic Movements Vessel traffic data in proximity to the Bellrock WFDA has been analysed including vessel draught. Section 16: Collision and Allision Risk Modelling Provides quantification of collision and allision risk resulting from the Bellrock WFDA including accounting for tidal conditions.
b. The set and rate of the tidal stream, at any state of the tide, has a significant effect on vessels in the area of the OREI site.	✓	Section 8: Meteorological Ocean Data Section 8.4 provides meteorological data in proximity to the Bellrock WFDA relating to various states of the tide.
c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.	✓	Section 16: Collision and Allision Risk Modelling Provides quantification of collision and allision risk resulting from the Bellrock WFDA including accounting for tidal conditions.
d. The set is across the major axis of the layout at any time, and, if so, at what rate.	✓	

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 Bellrock WFDA relating to various states of the tide.</p> <p>Section 16: Collision and Allision Risk Modelling Provides quantification of collision and allision risk resulting from the Bellrock WFDA including accounting for tidal conditions and assessment of whether machinery failure could cause vessels to be set into danger.</p>
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 Bellrock WFDA relating to various states of the tide and notes that no effects are anticipated.</p>
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 Bellrock WFDA relating to various states of the tide.</p> <p>Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of the potential for reduction in under keel clearance.</p>
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 Bellrock WFDA relating to weather and visibility.</p> <p>Section 10: Vessel Traffic Movements Vessel traffic data in proximity to the Bellrock WFDA has been analysed including recreational vessels.</p> <p>Section 12: Adverse Weather Routeing Section 12 identifies any alternative vessel routeing in proximity to the Bellrock WFDA in adverse weather.</p> <p>Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of adverse weather routeing.</p>
i. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	✓	<p>Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of internal allision risk for vessels under sail.</p>

Issue	Compliance	Comments
<p>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>	✓	<p>Section 8: Meteorological Ocean Data Provides meteorological data in proximity to the Bellrock WFDA relating to wind direction and various states of the tide.</p> <p>Section 16: Collision and Allision Risk Modelling Provides quantification of collision and allision risk resulting from the Bellrock WFDA including accounting for weather conditions and assessment of whether machinery failure could cause vessels to be set into danger.</p> <p>Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of drifting allision risk.</p>
<p>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:</p>		
<p>a. Navigation within or close to the site would be safe:</p>		
<p>i. For all vessels.</p>	✓	<p>Section 4: Consultation Section 4.2 outlines Regular Operator consultation undertaken following the vessel traffic surveys.</p>
<p>ii. For specified vessel types, operations and/or sizes.</p>		<p>Section 12: Adverse Weather Routeing Section 12.2 identifies any alternative vessel routeing in proximity to the Bellrock WFDA in adverse weather.</p>
<p>iii. In all directions or areas.</p>		<p>Section 16: Collision and Allision Risk Modelling Provides quantification of collision and allision risk resulting from the Bellrock WFDA including accounting for weather and tidal conditions.</p>
<p>iv. In specified directions or areas.</p>		<p>Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of internal allision risk.</p>
<p>v. In specified tidal, weather or other conditions.</p>		
<p>b. Navigation in and/or near the site should be prohibited or restricted:</p>		
<p>i. For specified vessel types, operations and/or sizes.</p>	✓	<p>Section 15: Navigation, Communication and Position Fixing Equipment Assesses potential hazards on navigation of the different communications and position fixing devices used in and around OWFs.</p>
<p>ii. In respect of specific activities.</p>	✓	
<p>iii. In all areas or directions.</p>	✓	
<p>iv. In specified areas or directions.</p>	✓	

Issue	Compliance	Comments
v. In specified tidal or weather conditions.	✓	<p>Section 14: Future Case Vessel Traffic A methodology for post Bellrock WFDA routeing is outlined and includes a minimum distance of 1 nm from offshore installations and existing OWF boundaries, i.e., it is assumed that commercial vessels will avoid the Bellrock WFDA.</p> <p>Section 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of vessel displacement.</p>
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 18: Risk Assessment The hazards due to the Bellrock WFDA have been assessed for each phase and include consideration of vessel displacement and emergency response capability.</p>
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 Bellrock WFDA routeing is outlined and includes consideration of the Shipping Route Template.</p>
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, O&M and decommissioning phases of the OREI.	✓	<p>Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which includes the provision of an ERCoP.</p>
b. The MCA's guidance document <i>Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for Search and Rescue and Emergency Response</i> (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.</p> <p>Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 and its annexes.</p>

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).	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which includes the completion of the SAR Checklist.
6. Hydrography. In order to establish a baseline, confirm the safe navigable depth, monitor seabed mobility and to identify underwater hazards, detailed and accurate hydrographic surveys are included or acknowledged for the following stages and to MCA specifications:		
i. Pre-construction: The proposed generating assets area and proposed cable route.	✓	Section 22: Through Life Safety Management Confirms that hydrographic surveys will be undertaken in agreement with the MCA.
ii. On a pre-established periodicity during the life of the development.	✓	
iii. Post construction: Cable route(s).	✓	
iv. Post decommissioning of all or part of the development: the installed generating assets area and cable route.	✓	
Communications, Radar and positioning systems. To provide researched opinion of a generic and, where appropriate, site specific nature concerning whether:		
a. The structures could produce radio interference such as shadowing, reflections or phase changes, and emissions with respect to any frequencies used for marine positioning, navigation and timing (PNT) or communications, including GMDSS and AIS, whether ship borne, ashore or fitted to any of the proposed structures, to:		
i. Vessels operating at a safe navigational distance.	✓	Section 15: Navigation, Communication and Position Fixing Equipment Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Bellrock WFDA including in relation to radio interference.
ii. Vessels by the nature of their work necessarily operating at less than the safe navigational distance to the OREI, e.g., support vessels, survey vessels, SAR assets.	✓	
iii. Vessels by the nature of their work necessarily operating within the OREI.	✓	
b. The structures could produce Radar reflections, blind spots, shadow areas or other adverse effects:		
i. Vessel to vessel.	✓	
ii. Vessel to shore.	✓	
iii. VTS Radar to vessel.	✓	

Issue	Compliance	Comments
iv. Racon to/from vessel.	✓	Section 15: Navigation, Communication and Position Fixing Equipment Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Bellrock WFDA 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.	✓	Section 15: Navigation, Communication and Position Fixing Equipment Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Bellrock WFDA including in relation to SONAR.
d. The site might produce acoustic noise which could mask prescribed sound signals.	✓	Section 15: Navigation, Communication and Position Fixing Equipment Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Bellrock WFDA including in relation to noise.
e. Generators and the seabed cabling within the site and onshore might produce EMFs affecting compasses and other navigation systems.	✓	Section 15: Navigation, Communication and Position Fixing Equipment Assesses the potential risks associated with the use of navigation, communication and position fixing equipment due to the Bellrock WFDA including in relation to electromagnetic interference.
Risk mitigation measures recommended for OREI during construction, O&M and decommissioning.		
Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the EIA. The specific measures to be employed will be selected in consultation with the MCA and will be listed in the Applicant's Environmental Statement. These will be consistent with international standards contained in, for example, SOLAS Chapter V (IMO, 1974), and could include any or all of the following:		
i. Promulgation of information and warnings through notices to mariners and other appropriate MSI dissemination methods.	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including promulgation of information.
ii. Continuous watch by multi-channel VHF, including DSC.	✓	Section 21: Embedded Mitigation Measures 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 ⁸ .	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the application for Safety Zones.
iv. Designation of the site as an area to be avoided (ATBA).	✓	There are no plans to designate the Bellrock WFDA as an ATBA.

⁸ 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.	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including lighting and marking in accordance with NLB and MCA requirements.
vi. Implementation of routeing measures within or near to the development.	✓	There are no plans to implement any new routeing measures in proximity to the Bellrock WFDA.
vii. Monitoring by Radar, AIS, closed circuit television (CCTV) or other agreed means.	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including traffic monitoring.
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of Safety Zones.	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the application for Safety Zones and use of guard vessels, which will be considered in further detail in the Safety Zone Application, submitted post-consent.
ix. Creation of an ERCoP with the MCA's SAR Branch for the construction phase onwards.	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including compliance with MGN 654 which include the provision of an ERCoP.
x. Use of guard vessels, where appropriate.	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards including the use of guard vessels.
xi. Update NRAs every two years, e.g. at testing sites.	✓	Not applicable to the Bellrock WFDA.
xii. Device-specific or array-specific NRAs.	✓	Section 6: Project Description Relevant to Shipping and Navigation All offshore elements of the Bellrock WFDA have been considered in this NRA including all infrastructure (surface and subsea) within the Bellrock WFDA.
xiii. Design of OREI structures to minimise risk to contacting vessels or craft.	✓	There is no additional risk posed to craft compared to previous OWFs and so no additional measures are identified.
xiv. Any other measures and procedures considered appropriate in consultation with other stakeholders.	✓	Section 21: Embedded Mitigation Measures Outlines the embedded mitigation measures to be implemented to reduce the significance of risk of shipping and navigation hazards. Section 22: Through Life Safety Management Outlines how QHSE documentation will be maintained and reviewed.

Table A-2 Marine Guidance Note (MGN) 654 Annex 1 Checklist

Item	Compliance	Comments
A risk claim is included that is supported by a reasoned argument and evidence.	✓	<p>Section 18: Risk Assessment The risk assessment provides a risk claim for a range of hazards based on a number of inputs including (but not limited to) baseline data, expert opinion, outputs of the Hazard Workshop, stakeholder concerns and lessons learnt from existing offshore developments.</p>
Description of the marine environment.	✓	<p>Section 7: Navigational Features Relevant navigational features in proximity to the Bellrock WFDA have been described including (but not limited to) other OWF developments, ports, harbours and related facilities, aids to navigation, oil and gas infrastructure, and charted wrecks.</p> <p>Section 13: Cumulative Screening Potential future developments have been screened into the cumulative risk assessment where a cumulative or in combination activity has been identified based upon the location and distance from the Bellrock WFDA, including consideration of other OWFs and oil and gas infrastructure.</p>
SAR overview and assessment.	✓	<p>Section 9: Emergency Response and Incident Overview Existing SAR resources in proximity to the Bellrock WFDA are summarised including the UK SAR operations contract, RNLI stations and assets and HM Coastguard stations.</p> <p>Section 18: Risk Assessment The risk assessment includes an assessment of how activities associated with the Bellrock WFDA may restrict emergency response capability of existing resources – Sections 18 and 19.</p>
Description of the OREI development and how it changes the marine environment.	✓	<p>Section 6: Project Description Relevant to Shipping and Navigation The maximum extent of the Bellrock WFDA for which any shipping and navigation hazards are assessed is provided including a description of the Bellrock WFDA, construction phase programme and indicative vessel and helicopter numbers during the construction and O&M phases.</p> <p>Section 14: Future Case Vessel Traffic Worst-case alternative routeing for commercial traffic has been considered.</p>

Annex B Hazard Log

Table B.1 Hazard Log

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
Displacement from Routing Including in Adverse Weather																					
Commercial vessels	C/D	<ul style="list-style-type: none"> Buoyed construction/ decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Development and adherence to a VMP Development and adherence to a NSP Appropriate marking on admiralty charts Lighting and marking Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels 	<ul style="list-style-type: none"> Presence of buoyed construction/ decommissioning area Construction/ decommissioning vessels which are RAM Presence of cumulative developments Adverse weather 	Displacement from normal weather preference with no effects on schedule and no safety risks	5	1	1	1	1	1.0	Tolerable with Mitigation	Displacement from adverse weather preference with effects on schedule and/or passing further offshore than preferred.	1	3	3	3	3	3.0	Broadly Acceptable	None	UK Chamber of Shipping does not accept a 1 nm passing distance from floating structures but rather a precautionary 1nm from the limits of the mooring arrangements.
	O	<ul style="list-style-type: none"> Compliance with MGN 654 Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Marine coordination of project vessels DSLPL 	<ul style="list-style-type: none"> Presence of surface structures Maintenance vessels which are RAM Presence of cumulative developments Adverse weather 		5	1	1	1	1	1.0	Tolerable with Mitigation		1	3	3	3	3	3.0	Broadly Acceptable		

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
Commercial fishing vessels in transit	C/D	<ul style="list-style-type: none"> Buoyed construction/ decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels Liaison via FLO Compliance with Regulatory Expectations on Moorings for Floating Wind and Marine Devices 	<ul style="list-style-type: none"> Presence of buoyed construction/ decommissioning area Construction/ decommissioning vessels which are RAM Presence of subsurface mooring lines and cables Presence of cumulative developments Adverse weather 	Displacement from normal weather preference with no safety risks	4	1	1	1	1	1.0	Broadly Acceptable	Displacement with effects on schedule and/or passing further offshore than preferred	1	3	2	3	3	2.8	Broadly Acceptable	None	
	O	<ul style="list-style-type: none"> Compliance with MGN 654 Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Marine coordination of project vessels DSLIP Liaison via FLO Compliance with Regulatory Expectations on Moorings for Floating Wind and Marine Devices 	<ul style="list-style-type: none"> Presence of surface structures Maintenance vessels which are RAM Presence of subsurface mooring lines and cables Presence of cumulative developments Adverse weather 		4	1	1	1	1	1.0	Broadly Acceptable		1	3	2	3	3	2.8	Broadly Acceptable		

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
Recreational vessels (2.5 to 24m length)	C/D	<ul style="list-style-type: none"> Buoyed construction/decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels 	<ul style="list-style-type: none"> Presence of buoyed construction/decommissioning area Construction/decommissioning vessels which are RAM Presence of cumulative developments Adverse weather 	Displacement from normal weather preference with no safety risks	1	1	1	1	1	1.0	Broadly Acceptable	Displacement with effects on schedule and/or passing further offshore than preferred	1	3	2	3	3	2.8	Broadly Acceptable	None	RYA Scotland raised during the Hazard Workshop that all electronic charts, not just admiralty, are included within the mitigation measures.
	O	<ul style="list-style-type: none"> Compliance with MGN 654 Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Marine coordination of project vessels DSLIP 	<ul style="list-style-type: none"> Presence of surface structures Maintenance vessels which are RAM Presence of cumulative developments Adverse weather 		1	1	1	1	1	1.0	Broadly Acceptable		1	3	2	3	3	2.8	Broadly Acceptable		

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences						Worst-Case Consequences	Realistic Worst-Case Consequences						Further Mitigation Required	Additional Comments		
					Frequency	Consequences						Risk	Frequency	Consequences						Risk	
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business				Average Consequence
Displacement from Routing Resulting in Third-Party Collision																					
Commercial vessels	C/D	<ul style="list-style-type: none"> Buoyed construction/decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones during construction and decommissioning Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels MPCP 	<ul style="list-style-type: none"> Presence of buoyed construction/decommissioning area Construction/decommissioning vessels which are RAM Presence of cumulative developments 	Displacement with effects on schedules and low impact collision event occurs involving minor vessel damage	2	2	2	3	2	2.3	Broadly Acceptable	Displacement with effects on schedule (including due to cumulative developments) and collision event occurs involving vessel damage, injury to person and/or pollution	1	4	4	4	4	4.0	Tolerable with Mitigation	None	<p>MCA raised the need to consider a collision event as the most likely scenario rather than a near miss.</p> <p>UK Chamber of Shipping does not accept a 1nm passing distance from floating structures but rather a precautionary 1nm from the limits of the mooring arrangements.</p>
	O	<ul style="list-style-type: none"> Compliance with MGN 654 Promulgation of information Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones during maintenance Marine coordination of project vessels DSLSP MPCP 	<ul style="list-style-type: none"> Presence of surface structures Maintenance vessels which are RAM Visual interference associated with a third-party vessel exiting the Wind Farm Development Area (WFDA) Presence of cumulative developments 		2	2	2	3	2	2.3			Broadly Acceptable	1	4	4	4	4			

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
Commercial fishing vessels in transit	C/D	<ul style="list-style-type: none"> Buoyed construction/decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones during construction and decommissioning Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels MPCP Liaison via FLO Compliance with Regulatory Expectations on Moorings for Floating Wind and Marine Devices 	<ul style="list-style-type: none"> Presence of buoyed construction/decommissioning area Construction/decommissioning vessels which are RAM Presence of subsurface mooring lines and cables Presence of cumulative developments 	Displacement with effects on routine and low impact collision event occurs involving minor vessel damage	2	2	2	3	2	2.3	Broadly Acceptable	Displacement with effects on schedule (including due to cumulative developments) and collision event occurs involving vessel damage, injury to person and/or pollution	1	4	3	4	4	3.8	Broadly Acceptable	None	MCA raised the need to consider a collision event as the most likely scenario rather than a near miss.
	O	<ul style="list-style-type: none"> Compliance with MGN 654 Promulgation of information Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones Marine coordination of project vessels DSLPL MPCP Fisheries liaison via FLO Compliance with Regulatory Expectations on Moorings for Floating Wind and Marine Devices 	<ul style="list-style-type: none"> Presence of surface structures Maintenance vessels which are RAM Visual interference associated with a third-party vessel exiting the Bellrock WFDA Presence of subsurface mooring lines and cables Presence of cumulative developments 		2	2	2	3	2	2.3	Broadly Acceptable		1	4	3	4	4	3.8	Broadly Acceptable		

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
Recreational vessels (2.5 to 24m length)	C/D	<ul style="list-style-type: none"> Buoyed construction/ decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones during construction and decommissioning Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels MPCP 	<ul style="list-style-type: none"> Presence of buoyed construction/ decommissioning area Construction/ decommissioning vessels which are RAM Presence of cumulative developments 	Displacement with effects on routine and low impact collision event occurs involving minor vessel damage	1	2	2	3	2	2.3	Broadly Acceptable	Displacement with effects on schedule (including due to cumulative developments) and collision event occurs involving vessel damage, injury to person and/or pollution	1	4	2	4	4	3.5	Broadly Acceptable	None	MCA raised the need to consider a collision event as the most likely scenario rather than a near miss. RYA Scotland raised during the Hazard Workshop that all electronic charts, not just admiralty, are included within the mitigation measures.
	O	<ul style="list-style-type: none"> Compliance with MGN 654 Promulgation of information Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones Marine coordination of project vessels DSLIP MPCP 	<ul style="list-style-type: none"> Presence of surface structures Maintenance vessels which are RAM Visual interference associated with a third-party vessel exiting the Bellrock WFDA Presence of cumulative developments 		1	2	2	3	2	2.3	Broadly Acceptable		1	4	2	4	4	3.5	Broadly Acceptable		
Third-Party with Project Vessel Collision																					
Commercial vessels	C/D	<ul style="list-style-type: none"> Project vessel compliance with international marine regulations (COLREGs) and G+ Guidelines Buoyed construction/ decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Development and adherence to a VMP 	<ul style="list-style-type: none"> Project vessels in transit including towing operations Project vessel loss of power Lack of third-party awareness of ongoing works Presence of cumulative project 	Low impact collision event occurs involving minor vessel damage	3	2	2	3	2	2.3	Broadly Acceptable	Collision event occurs involving vessel damage, injury to person and/or pollution	3	4	4	4	4	4.0	Tolerable with Mitigation	None	

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
	O	<ul style="list-style-type: none"> Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones during construction, maintenance and decommissioning Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels MPCP 	vessels • Reduction in navigable sea room		2	2	2	3	2	2.3	Broadly Acceptable		3	4	4	4	4	4.0	Tolerable with Mitigation		
Commercial fishing vessels in transit	C/D	<ul style="list-style-type: none"> Project vessel compliance with international marine regulations (COLREGs) and G+ Guidelines Buoyed construction/ decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Development and adherence to a VMP 	<ul style="list-style-type: none"> Project vessels in transit including towing operations Project vessel loss of power Lack of third-party awareness of ongoing works Presence of cumulative project vessels Reduction in navigable sea room 	Low impact collision event occurs involving minor vessel damage	2	2	2	3	2	2.3	Broadly Acceptable	Collision event occurs involving vessel damage, injury to person and/or pollution	1	4	3	4	4	3.8	Broadly Acceptable	None	
	O	<ul style="list-style-type: none"> Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones during construction, maintenance and decommissioning Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels MPCP Liaison via FLO 			1	2	2	3	2	2.3	Broadly Acceptable		1	4	3	4	4	3.8	Broadly Acceptable		

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
Recreational vessels (2.5 to 24m length)	C/D	<ul style="list-style-type: none"> Project vessel compliance with international marine regulations (COLREGs) and G+ Guidelines Buoyed construction/decommissioning area Compliance with MGN 654 and its annexes Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Appropriate marking on admiralty charts Lighting and marking Application for Safety Zones during construction, maintenance and decommissioning Guard vessels as defined by risk assessment Development and adherence to a Decommissioning Plan Marine coordination of project vessels MPCP 	<ul style="list-style-type: none"> Project vessels in transit including towing operations Project vessel loss of power Lack of third-party awareness of ongoing works Presence of cumulative project vessels Reduction in navigable sea room 	Low impact collision event occurs involving minor vessel damage	1	2	2	3	2	2.3	Broadly Acceptable		1	4	2	4	4	3.5	Broadly Acceptable		
	O				1	2	2	3	2	2.3	Broadly Acceptable	Collision event occurs involving vessel damage, injury to person and/or pollution	1	4	2	4	4	3.5	Broadly Acceptable	None	
Towage of Floating Substructures Resulting in Displacement of Port Related Activities																					
Commercial vessels	C/D	<ul style="list-style-type: none"> Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Marine coordination of project vessels 	<ul style="list-style-type: none"> Construction/decommissioning vessel undertaking towage of floating substructure from port or wet storage to Bellrock WFDA Failure of towage operation due to towing or damage to floating substructure Presence of cumulative developments and project vessels potentially also undertaking towage of floating 	Presence of project vessel undertaking towage of floating substructure temporarily restricts access but does not impact on schedules or berth times	3	1	1	1	2	1.3	Broadly Acceptable	Loss of tow or unknown issue with floating substructure results in floating substructure sinking within port limits impacting on vessel movements, schedules and berth times	3	1	4	2	5	3.0	Tolerable with Mitigation	None	MCA raised that towage operations in ports should be considered.

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments			
					Frequency	Consequences					Risk		Frequency	Consequences					Risk					
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence						
			substructures from the same ports																					
	O		<ul style="list-style-type: none"> Maintenance vessel undertaking towage of floating substructure from port or wet storage to Bellrock WFDA Failure of towage operation due to towing or damage to floating substructure Presence of cumulative developments and project vessels potentially also undertaking towage of floating substructures from the same ports 																					
Commercial fishing vessels in transit	C/D	<ul style="list-style-type: none"> Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Marine coordination of project vessels Liaison via FLO 	<ul style="list-style-type: none"> Construction/ decommissioning vessel undertaking towage of floating substructure from port or wet storage to Bellrock WFDA Failure of towage operation due to towing or damage to floating substructure Presence of cumulative developments and project vessels 	Presence of project vessel undertaking towage of floating substructure temporarily restricts access but does not impact on routines	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessel undertaking towage of floating substructure for installation or decommissioning temporarily restricts access and impacts on routines	2	1	4	2	5	3.0	Broadly Acceptable	None	MCA raised that towage operations in ports should be considered.			

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
			potentially also undertaking towage of floating substructures from the same ports																		
	O		<ul style="list-style-type: none"> Maintenance vessel undertaking towage of floating substructure from port or wet storage to Bellrock WFDA Failure of towage operation due to towing or damage to floating substructure Presence of cumulative developments and project vessels potentially also undertaking towage of floating substructures from the same ports 																		
Recreational vessels (2.5 to 24m length)	C/D	<ul style="list-style-type: none"> Promulgation of information Development and adherence to a VMP Development and adherence to an NSP Marine coordination of project vessels 	<ul style="list-style-type: none"> Construction/ decommissioning vessel undertaking towage of floating substructure from port or wet storage to Bellrock WFDA Failure of towage operation due to towing or damage to floating substructure Presence of cumulative developments and 	Presence of project vessel undertaking towage of floating substructure temporarily restricts access but does not impact on access to pontoons or marinas	2	1	1	1	2	1.3	Broadly Acceptable	Presence of project vessel undertaking towage of floating substructure for installation or decommissioning temporarily restricts access and impacts on access to pontoons or marinas	2	1	3	2	5	2.8	Broadly Acceptable	None	MCA raised that towage operations in ports should be considered.

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
			project vessels potentially also undertaking towage of floating substructures from the same ports																		
	O		<ul style="list-style-type: none"> Maintenance vessel undertaking towage of floating substructure from port or wet storage to Bellrock WFDA Failure of towage operation due to towing or damage to floating substructure Presence of cumulative developments and project vessels potentially also undertaking towage of floating substructures from the same ports 																		
Allision Risk (Powered, Drifting or Internal)																					
Commercial Vessels	C/D	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information Application for Safety Zones during construction, maintenance and decommissioning Appropriate marking on admiralty charts Lighting and marking Minimum blade tip clearance MPCP DSLPL 	<ul style="list-style-type: none"> Presence of surface structures (including buoys) Human/navigation error Mechanical/technical failure Adverse weather Aid to navigation failure Presence of cumulative developments 	<ul style="list-style-type: none"> Vessel passes in close proximity to a structure or buoy resulting in a need to make a late adjustment to course/speed. Vessel becomes adrift in proximity to a structure or buoy but regains power prior to an allision event. 	4	1	1	1	1	1.0	Broadly Acceptable	Allision event with a structure occurs involving vessel damage, injury to person and/or pollution	3	4	4	4	4	4.0	Tolerable with Mitigation	None	RYA Scotland raised that physical buoys located on-site introduce an additional allision risk.
	O				4	1	1	1	1	1.0	Broadly Acceptable		3	4	4	4	4	4.0	Tolerable with Mitigation		

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
Commercial fishing vessels in transit	C/D	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information Application for Safety Zones construction, maintenance and decommissioning 	<ul style="list-style-type: none"> Presence of surface structures (including buoys) Human/navigation error Mechanical/technical failure 	<ul style="list-style-type: none"> Vessel passes in close proximity to a structure or buoy resulting in a need to make a late adjustment to course/speed. 	4	1	1	1	1	1.0	Broadly Acceptable	Allision event with a structure or buoy occurs involving vessel damage, injury to person and/or pollution	3	4	3	4	4	4.0	Tolerable with Mitigation	None	RYA Scotland raised that physical buoys located on-site introduce an additional allision risk.
	O	<ul style="list-style-type: none"> Appropriate marking on admiralty charts Lighting and marking Minimum blade tip clearance MPCP DSLPL 	<ul style="list-style-type: none"> Adverse weather Aid to navigation failure Presence of cumulative developments 	<ul style="list-style-type: none"> Vessel becomes adrift in proximity to a structure or buoy but regains power prior to an allision event. 	4	1	1	1	1	1.0	Broadly Acceptable		3	4	3	4	4	3.8	Tolerable with Mitigation		
Recreational vessels (2.5 to 24m length)	C/D	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information Application for Safety Zones construction, maintenance and decommissioning Appropriate marking on admiralty charts Lighting and marking Minimum blade tip clearance MPCP DSLPL 	<ul style="list-style-type: none"> Presence of surface structures (including buoys) Human/navigation error Mechanical/technical failure Adverse weather Aid to navigation failure Presence of cumulative developments 	<ul style="list-style-type: none"> Vessel passes in close proximity to a structure or buoy resulting in a need to make a late adjustment to course/speed. Vessel becomes adrift in proximity to a structure or buoy but regains power prior to an allision event. 	4	1	1	1	1	1.0	Broadly Acceptable	Allision event with a structure or buoy occurs involving vessel damage, injury to person and/or pollution	3	4	2	4	4	4.0	Tolerable with Mitigation	None	RYA Scotland raised that physical buoys located on-site introduce an additional allision risk. RYA Scotland raised during the Hazard Workshop that all electronic charts, not just admiralty, are included within the mitigation measures.
	O				4	1	1	1	1	1.0	Broadly Acceptable		3	4	2	4	4	3.5	Tolerable with Mitigation		
Interference with Marine Navigation, Communication and Position Fixing Equipment																					
All vessels	C/D	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information 	<ul style="list-style-type: none"> Human error relating to adjustment of Radar controls Presence of surface structures 	Structures have no effect upon the Radar, communications and navigation equipment on a vessel	5	1	1	1	1	1.0	Tolerable with Mitigation	Radar interference due to the structures leading to large vessels being unaware of presence of a smaller vessel leading to collision	2	4	4	4	4	4.0	Tolerable with Mitigation	None	

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
	O			Structures have no effect upon the Radar, communications and navigation equipment on a vessel	5	1	1	1	1	1.0	Tolerable with Mitigation	Radar interference due to the structures leading to large vessels being unaware of presence of a smaller vessel leading to collision	3	4	4	4	4	4.0	Tolerable with Mitigation		
Loss of Station																					
All vessels	C/D	<ul style="list-style-type: none"> Compliance with MGN 654 Compliance with Regulatory Expectations Lighting and Marking Promulgation of information Development and adherence to an NSP Development and adherence to a VMP Liaison via FLO 	Damage to or failure of mooring line(s)	Failure of a single mooring line leads to temporary increase in the maximum excursion of the floating substructure but not full loss of station	3	2	2	2	2	2.0	Broadly Acceptable	Total failure of mooring/shared anchor system leads to drifting of multiple floating substructures with risk of collision with vessels	2	4	4	4	5	4.3	Tolerable with Mitigation	None	UK Chamber of Shipping consider shared anchors to represent a worst case and is not supportive.
	O	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information on admiralty charts Compliance with Regulatory Expectations DSLIP Cable Burial Risk Assessment (CBRA) Liaison via FLO 	Damage to or failure of mooring line(s)	Failure of a single mooring line leads to temporary increase in the maximum excursion of the floating substructure but not full loss of station	3	2	2	2	2	2.0	Broadly Acceptable	Total failure of mooring/shared anchor system leads to drifting of multiple floating substructures with risk of collision with vessels	1	4	4	4	5	4.3	Tolerable with Mitigation		
Vessel Interaction with Station Keeping Systems or IACs																					
All vessels	C/D	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information Appropriate marking on admiralty charts Compliance with Regulatory Expectations DSLIP Cable Burial Risk Assessment (CBRA) Liaison via FLO 	<ul style="list-style-type: none"> Presence of mooring lines and array cables Mooring line design Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather Insufficient burial/protection 	Vessel passes in close proximity to floating substructure resulting in a need to make a late adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable	Vessel passes in proximity to floating substructure and makes contact with mooring line or cable	3	4	3	4	4	3.8	Tolerable with Mitigation	None	
	O	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information on admiralty charts Compliance with Regulatory Expectations DSLIP Cable Burial Risk Assessment (CBRA) Liaison via FLO 	<ul style="list-style-type: none"> Presence of mooring lines and array cables Mooring line design Human error or navigational error Mechanical or technical failure resulting in a vessel drifting Adverse weather Insufficient burial/protection 	Vessel passes in close proximity to floating substructure resulting in a need to make a late adjustment to course/speed	4	1	1	1	1	1.0	Broadly Acceptable		3	4	3	4	4	3.8	Tolerable with Mitigation		
All vessels dropping anchor	C/D	<ul style="list-style-type: none"> Compliance with MGN 654 and its annexes Promulgation of information on admiralty charts Compliance with Regulatory Expectations 	<ul style="list-style-type: none"> Presence of subsea IACs or cable protection Human error or navigational error Mechanical or technical failure 	Vessel anchors on or drags anchor over an installed cable/protection but no interaction occurs dependent on anchor/burial depth	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	3	2	1	2	2	1.8	Broadly Acceptable	None	

User	Phase (C/O/D)	Embedded Mitigation Measures (Full Descriptions Provided in Separate Sheet)	Possible Causes	Most Likely Consequences	Realistic Most Likely Consequences							Worst-Case Consequences	Realistic Worst-Case Consequences							Further Mitigation Required	Additional Comments
					Frequency	Consequences					Risk		Frequency	Consequences					Risk		
						People	Environment	Property	Business	Average Consequence				People	Environment	Property	Business	Average Consequence			
	O	<ul style="list-style-type: none"> • DSLP • CBRA • Liaison via FLO 	<ul style="list-style-type: none"> • Adverse weather • Insufficient burial/protection 		2	1	1	1	1	1.0	Broadly Acceptable	and/or anchor Risks to vessel stability	2	2	1	2	2	1.8	Broadly Acceptable		
Reduction in Emergency Response Capability																					
Emergency responders	C/D	<ul style="list-style-type: none"> • Compliance with MGN 654 and its annexes • Lighting and marking for project vessels • MPCP • Project vessel compliance with international marine regulations (SOLAS) and G+ Guidelines 	<ul style="list-style-type: none"> • Array does not facilitate responder access • Limited resource capability including due to cumulative developments • Adverse weather • Increase of incident rate due to presence of project and associated vessels 	Delay to emergency response request	3	1	1	1	2	1.3	Broadly Acceptable	Delay to response request leading to vessel damage, injury to person or loss of life, and/or pollution including due to cumulative developments	2	5	5	5	5	5.0	Tolerable with Mitigation	None	
	O				3	1	1	1	2	1.3	Broadly Acceptable		2	5	5	5	5	5.0	Tolerable with Mitigation		

Annex C Consequences

C.1 Introduction

629. 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 Bellrock WFDA.
630. The significance of the risk due to the presence of the Bellrock WFDA is also assessed based on risk evaluation criteria and comparison with historical incident data in UK waters⁹.

C.2 Risk Evaluation Criteria

C.2.1 Risk to People

631. Regarding the assessment of risk to people two measures are considered, namely:
- Individual risk; and
 - Societal risk.

C.2.2 Individual Risk

632. Individual risk considers whether the risk from an incident to a particular individual changes significantly due to the presence of the Bellrock WFDA. 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.
633. The purpose of estimating the individual risk is to ensure that individuals who may be affected by the presence of the Bellrock WFDA 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 Bellrock WFDA relative to the UK background individual risk levels.
634. Annual risk levels to crew (the annual risk to an average crew member) for different vessel types are presented in **Figure C.1**, which also includes the upper and lower bounds for risk acceptance criteria as suggested in IMO Maritime Safety Committee 72/16 (IMO, 2001). The annual individual risk level to crew falls within the ALARP region for each of the vessel types presented.

⁹ For the purposes of this assessment, UK waters is defined as the UK Exclusive Economic Zone and UK territorial waters refers to the 12 nm limit from the British Isles, excluding the Republic of Ireland.

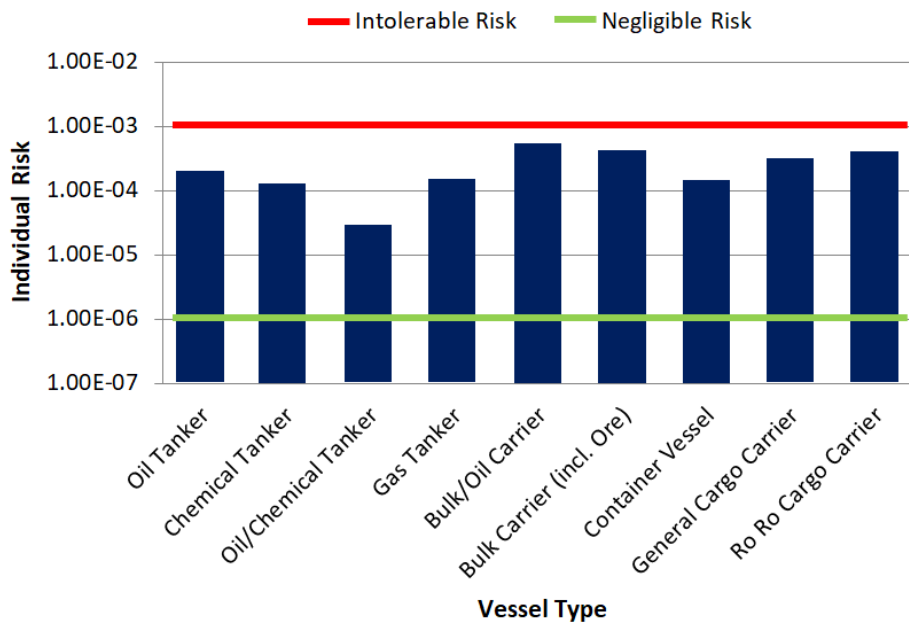


Figure C.1 Individual Risk Levels and Acceptance Criteria per Vessel Type

635. 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

636. 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**.

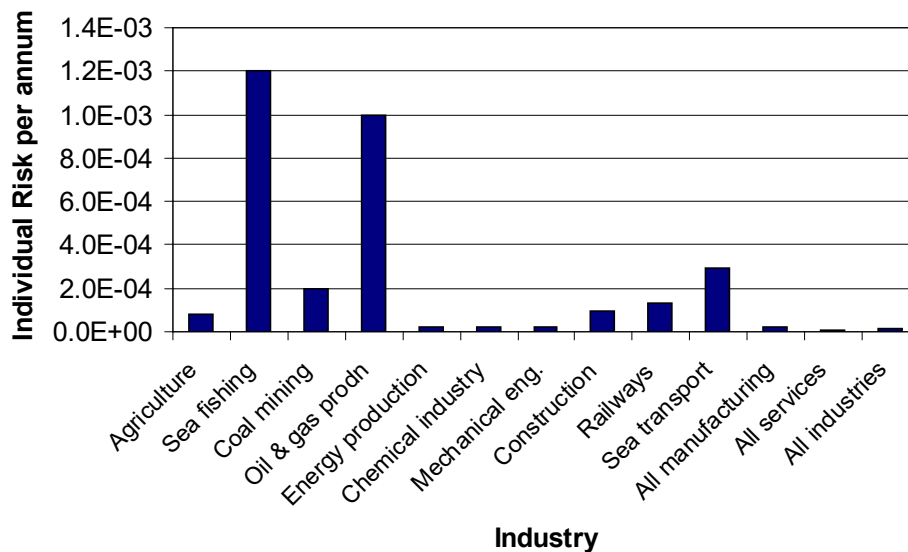


Figure C.2 Individual Risk per Year for Various United Kingdom Industries

637. The individual risk for sea transport of 2.9×10^{-4} per year is consistent with the worldwide data presented in **Figure C.2**, whilst the individual risk for sea fishing of 1.2×10^{-3} per year is the highest across all of the industries included.

C.2.3 Societal Risk

638. 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.

639. Within this assessment, societal (navigation based) risk can be assessed for the Bellrock WFDA, giving account to the change in risk associated with each incident scenario cause by the introduction of the structures in the Bellrock WFDA. Societal risk may be expressed as:

- Annual fatality rate where frequency and fatality are combined into a convenient one-dimensional measure of societal risk (also known as PLL); and
- F-N diagrams showing explicitly the relationship between the cumulative frequency of an accident and the number of fatalities in a multi-dimensional diagram.

640. When assessing societal risk this study focuses on PLL, which accounts for the number of people likely to be involved in an incident (which is higher for certain vessel types) and assesses the significance of the change in risk compared to the UK background risk levels.

C.2.4 Risk to Environment

641. For risk to the environment the key criteria considered in terms of the risk due to the Bellrock WFDA is the potential quantity of oil spilled from a vessel involved in an incident.
642. 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 Bellrock WFDA compared to UK background pollution risk levels.

C.3 Marine Accident Investigation Branch Incident Data

C.3.1 All Incidents in UK Waters

643. All UK flagged commercial vessels are required to report incidents to the MAIB. Non-UK flagged vessels do not have to report an incident to the MAIB unless located at a UK port or within 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.
644. 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.
645. 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 Bellrock WFDA.
646. 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).
647. The location of all incidents in proximity to the UK are presented in **Figure C.3** (2002 to 2021). The majority of incidents occur in coastal waters.

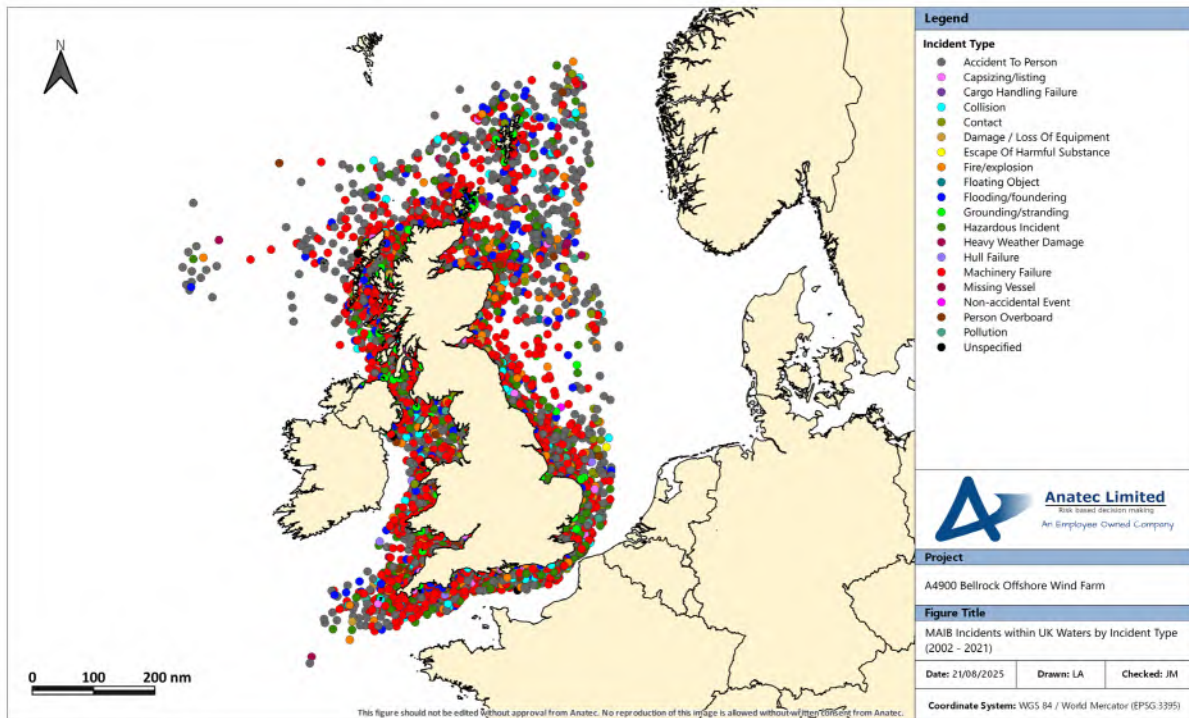


Figure C.3 Marine Accident Investigation Branch Incident Locations within United Kingdom Waters

648. The distribution of incidents by year in UK waters is presented in **Figure C.4** (2002 to 2021).

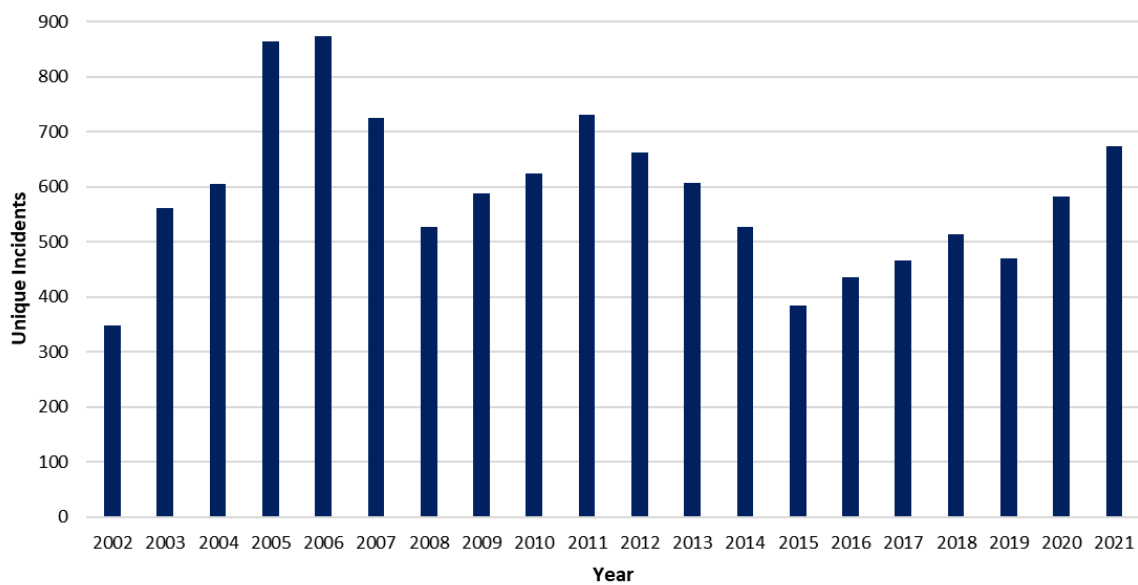


Figure C.4 Marine Accident Investigation Branch Unique Incidents per Year within United Kingdom Waters

649. The average number of unique incidents per year was 589. There has generally been a fluctuating trend in incidents over the 20-year period.
650. The distribution of incidents in UK waters by incident type is presented in **Figure C.5** (2002 to 2021).

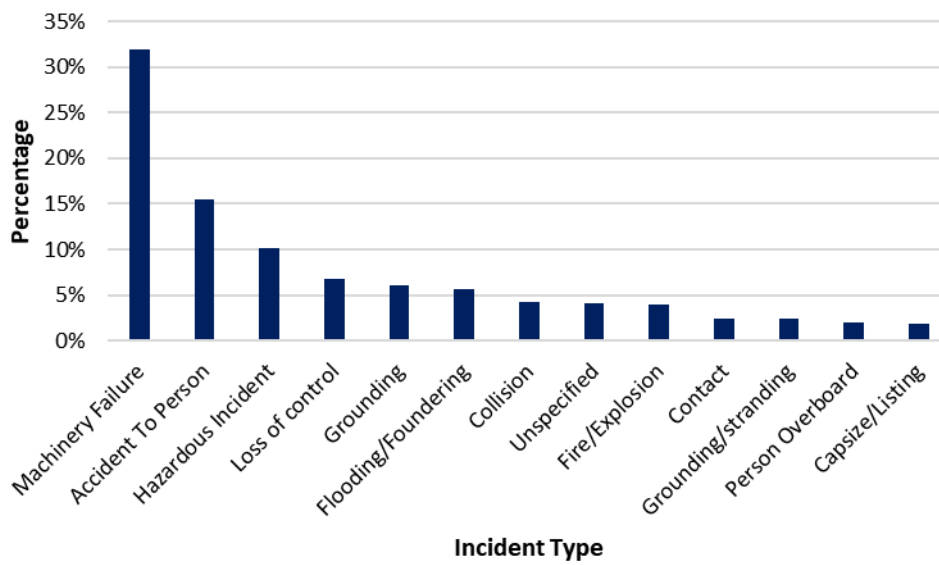


Figure C.5 Marine Accident Investigation Branch Incident Types Breakdown within United Kingdom Waters

651. 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.
652. The distribution of incidents in UK waters by vessel type is presented in **Figure C.6** (2002 to 2021).

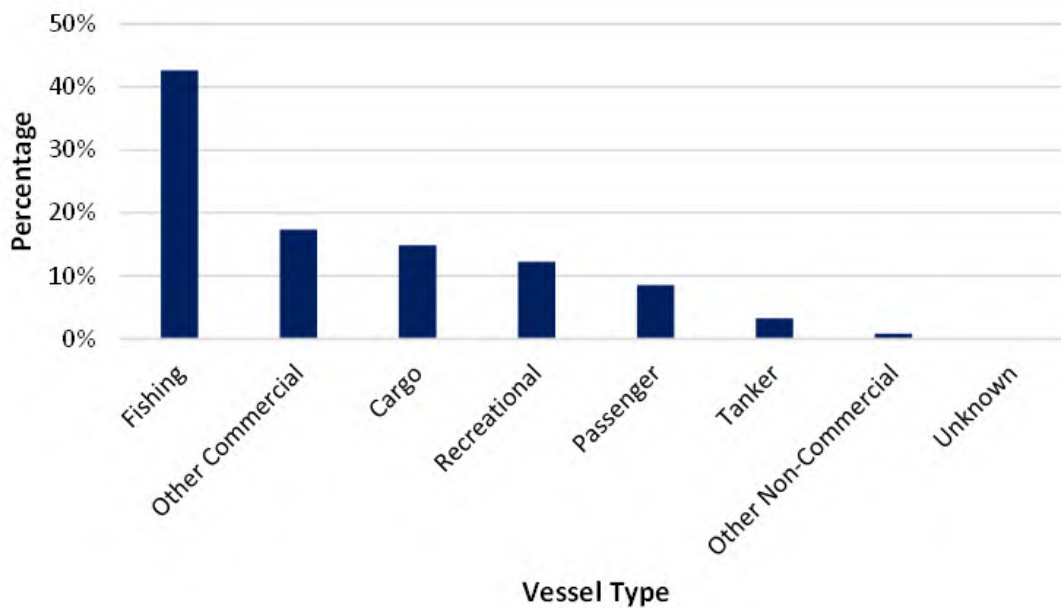


Figure C.6 Marine Accident Investigation Branch Incident Types Breakdown within United Kingdom Waters

653. 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%).
654. 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.
655. The distribution of fatalities in UK waters by vessel type and person category (crew, passenger and other) is presented in **Figure C.7** (2002 to 2021).

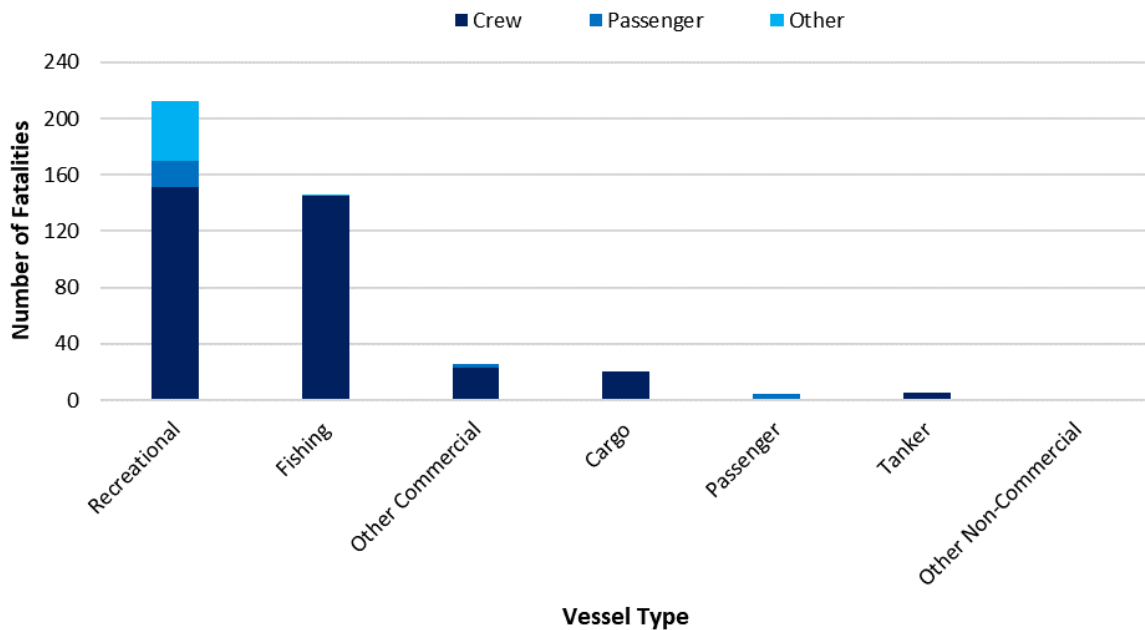


Figure C.7 Marine Accident Investigation Branch Fatalities by Vessel Type within United Kingdom Waters

656. 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

657. 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).

658. A total of 481 collision incidents were reported to the MAIB in UK waters between 2002 and 2021 involving 1,068 vessels (in a small number of cases the other vessel involved was not logged).

659. The locations of collision incidents reported in proximity to the UK are presented in **Figure C.8** (2002 to 2021).

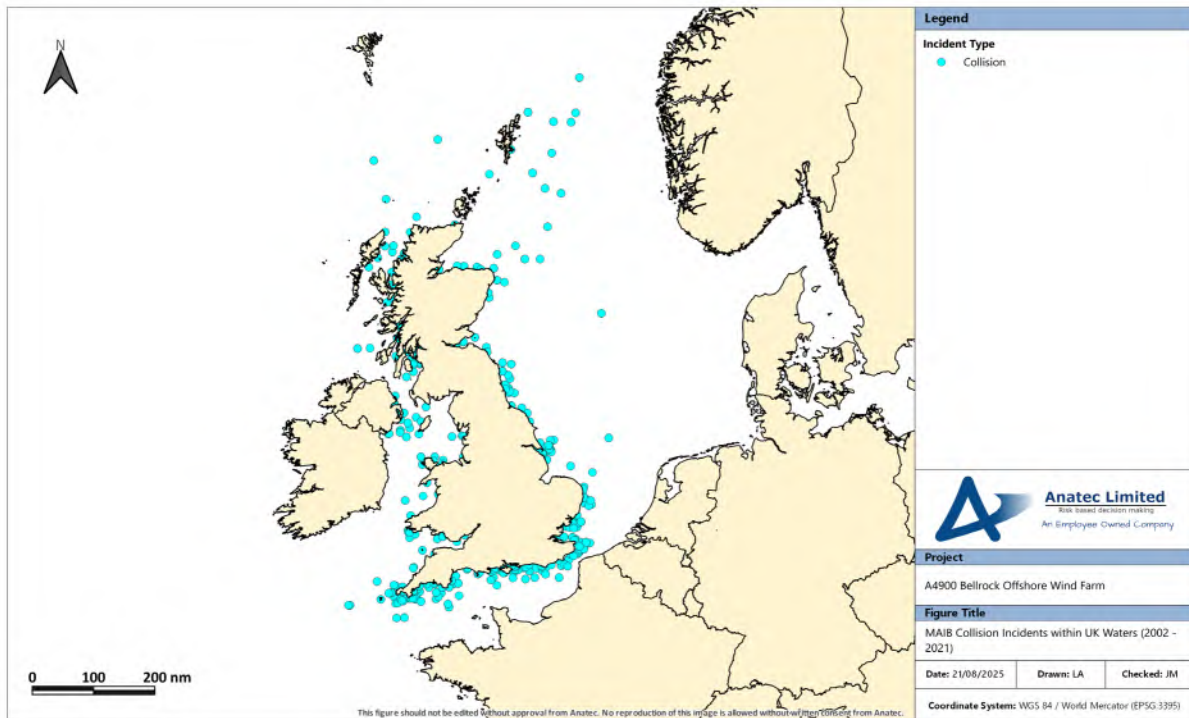


Figure C.8 Marine Accident Investigation Branch Collision Incident Locations within United Kingdom Waters

660. The distribution of collision incidents per year is presented in **Figure C.9** (2002 to 2021).

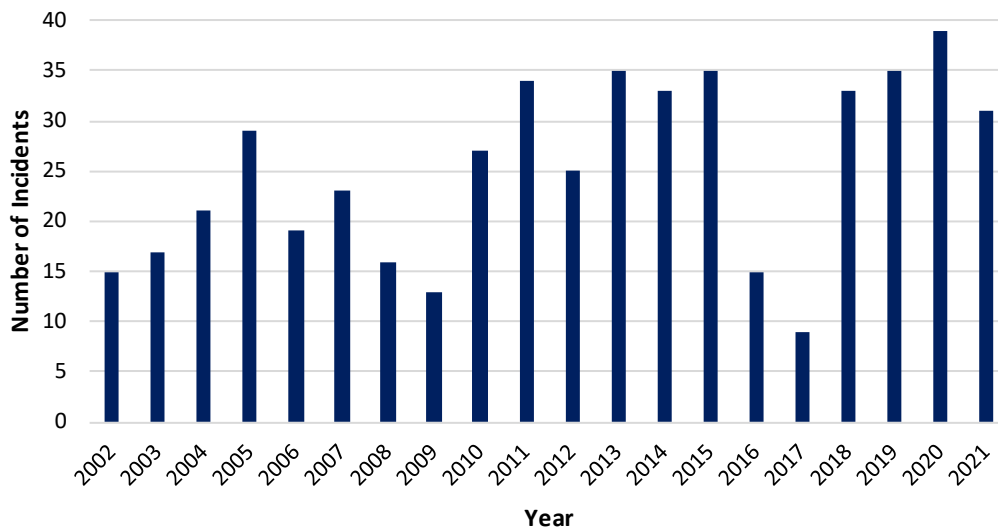


Figure C.9 Marine Accident Investigation Branch Annual Collision Incidents within United Kingdom Water

661. 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.
662. The distribution of vessel types involved in collision incidents is presented in **Figure C.10** (2002 to 2021).

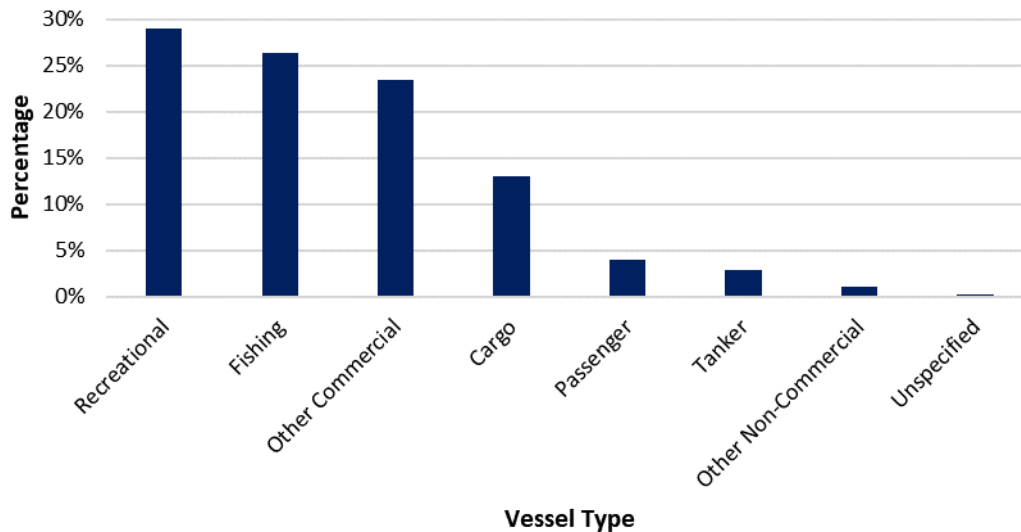


Figure C.10 Marine Accident Investigation Branch Collision Incidents by Incident Type within United Kingdom Water

663. The most frequent vessel types involved in collision incidents were recreational vessels (29%), fishing vessels (26%), other commercial vessels (24%) and cargo vessels (13%).
664. 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** (2002 to 2021).

Table C.2 Description of Fatal Marine Accident Investigation Branch Collision Incidents

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

Date	Description	Fatalities
August 2010	Collision between passenger ferry and fishing vessel. Fishing vessel sank with one of the two crew members recovered from the sea, but the other member was not recovered despite an extensive search.	1
June 2015	Collision between 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

665. 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.
666. A total of 119 allision incidents were reported to the MAIB within UK waters between 2002 and 2021 involving 119 vessels.
667. The locations of allision incidents reported in proximity to the UK are presented in **Figure C.11** (2002 to 2021).

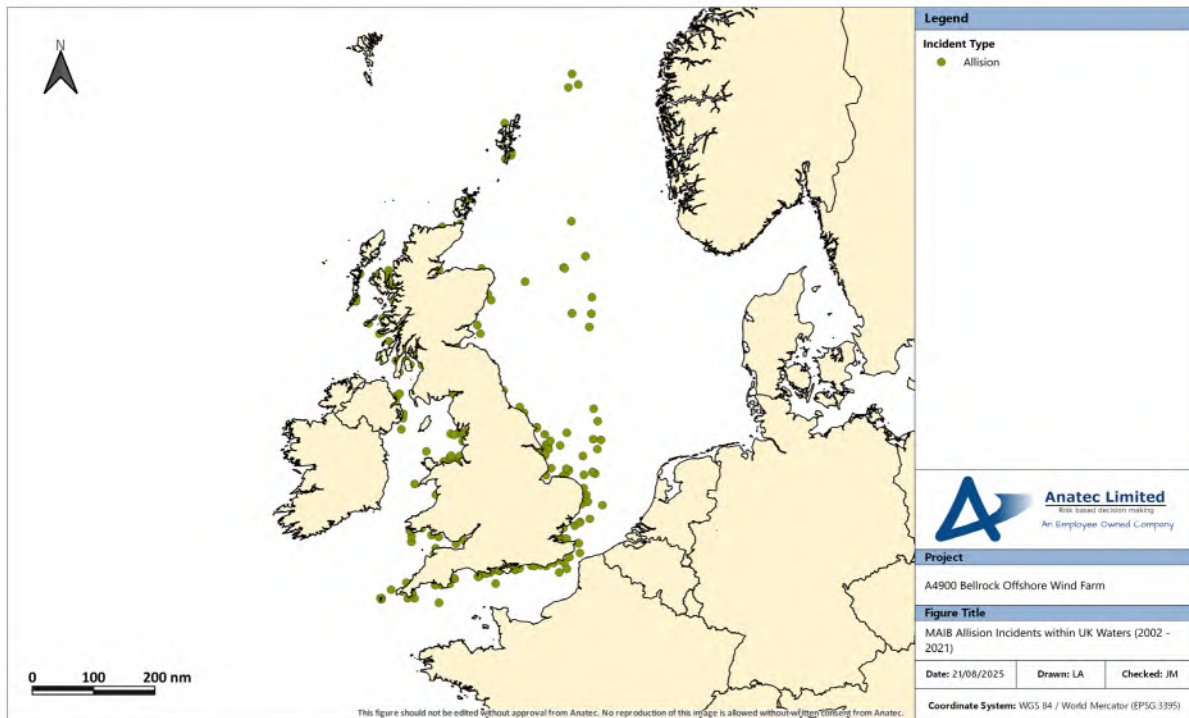


Figure C.11 Marine Accident Investigation Branch Allision Incident Locations within United Kingdom waters

668. The distribution of allision Incidents per year is presented in **Figure C.12** (2000 to 2019).

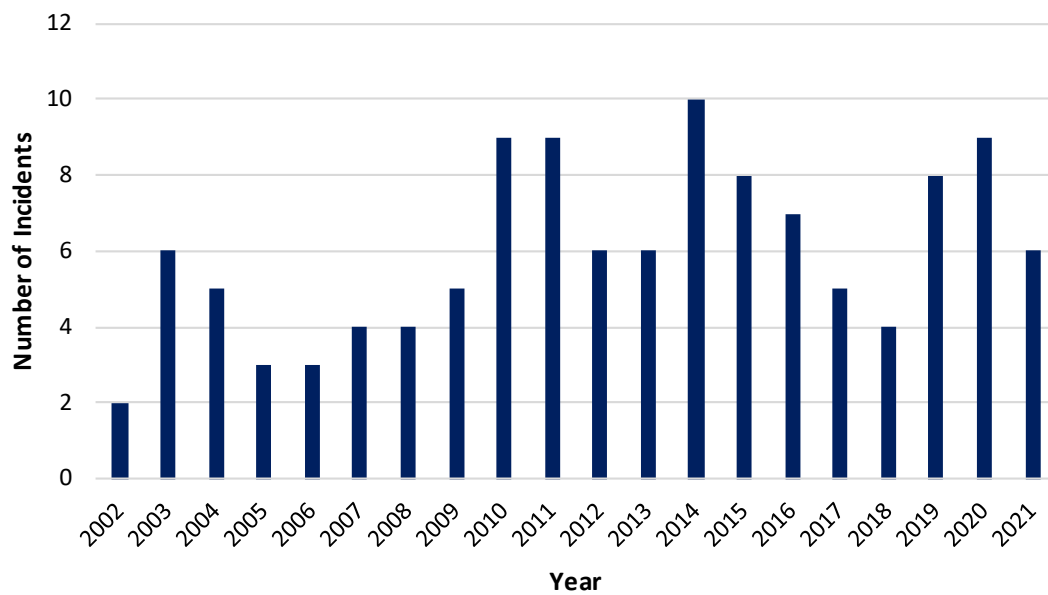


Figure C.12 Marine Accident Investigation Branch Contact Incidents per Year within United Kingdom Waters

669. 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.
670. The distribution of vessel types involved in allision incidents is presented in **Figure C.13** (2002 to 2021).

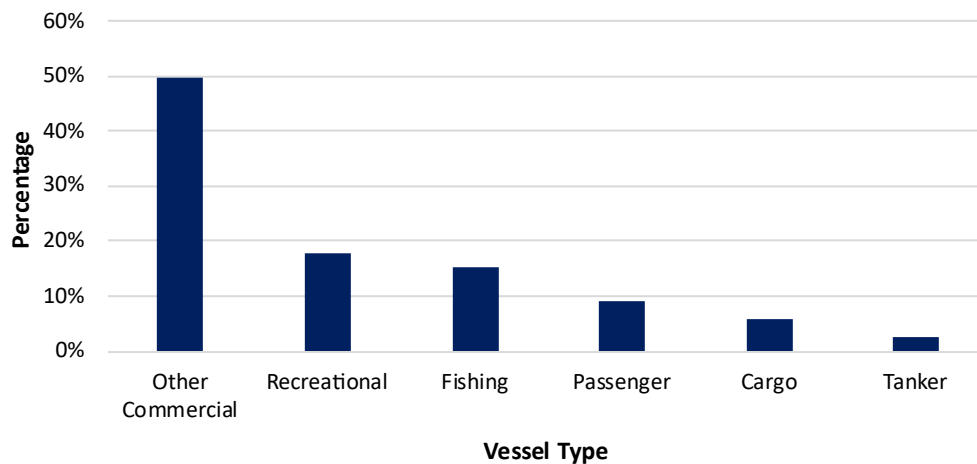


Figure C.13 Marine Accident Investigation Branch Allision Incidents by Vessel Type within United Kingdom Waters

671. The most frequent vessel types involved in allision incidents were other commercial vessels (50%), recreational vessels (18%) and fishing vessels (15%).
672. 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

673. 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 Bellrock WFDA.
674. The Bellrock WFDA 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.

675. Of these incident types, only vessel to vessel collisions match the MAIB definition of collisions and hence the fatality analysis presented in **Section C.4.2** is considered directly applicable to these types of incidents.
676. 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 9.4**). Additionally, none of the allision incidents reported by the MAIB between 2002 and 2021 resulted in a fatality.
677. Therefore, the MAIB collision fatality risk rate has also been conservatively applied for the allision incident types.

C.4.2 Fatality Probability

678. 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.
679. 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 persons on board (POB) estimated for each category of vessel navigating in proximity to the Bellrock WFDA. 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 Person on Board 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	RoPax, cruise liner, etc.	Vessel traffic survey data/online information	2,808
Fishing	Trawler, potter, dredger, etc.	MAIB incident data	3.3

680. 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.

681. Using the average POB, along with the vessel type information involved in collision incidents reported by the MAIB there was an estimated 122,666 POB the vessels involved in the collision incidents.
682. Based upon five fatalities during the period 2002 to 2021, the overall fatality probability in a collision for any individual onboard is approximately 4.08×10^{-5} per collision.
683. 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	120,716	8.28×10^{-6}	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 Bellrock Wind Farm Development Area

684. The base case and future case annual collision frequency levels pre and post Bellrock WFDA for the Bellrock WFDA are summarised in **Table C.5**.

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

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Bellrock WFDA	Post Bellrock WFDA	Change
Vessel to vessel collision	Base case	1.03×10^{-4} (1 in 9,729 years)	1.88×10^{-4} (1 in 5,327 years)	8.49×10^{-5} (1 in 11,773 years)
	Future case (10%)	1.42×10^{-4} (1 in 7,066 years)	2.57×10^{-4} (1 in 3,893 years)	1.15×10^{-4} (1 in 8,669 years)
	Future case (20%)	1.63×10^{-4} (1 in 6,125 years)	2.97×10^{-4} (1 in 3,368 years)	1.34×10^{-4} (1 in 7,485 years)
	Base case	-	7.36×10^{-4}	7.36×10^{-4}

Risk	Scenario	Annual Frequency (Return Period)		
		Pre Bellrock WFDA	Post Bellrock WFDA	Change
Powered vessel to structure allision			(1 in 1,358 years)	(1 in 1,358 years)
	Future case (10%)	-	8.87×10^{-4} (1 in 1,127 years)	8.87×10^{-4} (1 in 1,127 years)
	Future case (20%)	-	9.46×10^{-4} (1 in 1,057 years)	9.46×10^{-4} (1 in 1,057 years)
Drifting vessel to structure allision	Base case	-	8.13×10^{-5} (1 in 12,299 years)	8.13×10^{-5} (1 in 12,299 years)
	Future case (10%)	-	8.94×10^{-5} (1 in 11,181 years)	8.94×10^{-5} (1 in 11,181 years)
	Future case (20%)	-	9.76×10^{-5} (1 in 10,249 years)	9.76×10^{-5} (1 in 10,249 years)
Fishing vessel to structure allision	Base case	-	4.71×10^{-3} (1 in 212 years)	4.71×10^{-3} (1 in 212 years)
	Future case (10%)	-	5.18×10^{-3} (1 in 193 years)	5.18×10^{-3} (1 in 193 years)
	Future case (20%)	-	5.65×10^{-3} (1 in 176 years)	5.65×10^{-3} (1 in 176 years)
Total	Base case	1.03×10^{-4} (1 in 9,729 years)	5.71×10^{-3} (1 in 174 years)	5.61×10^{-3} (1 in 178 years)
	Future case (10%)	1.42×10^{-4} (1 in 7,066 years)	6.41×10^{-3} (1 in 155 years)	6.27×10^{-3} (1 in 159 years)
	Future case (20%)	1.63×10^{-4} (1 in 6,125 years)	6.99×10^{-3} (1 in 143 years)	6.83×10^{-3} (1 in 146 years)

685. 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 Bellrock WFDA for the base case and future case are presented in **Figure C.14**.

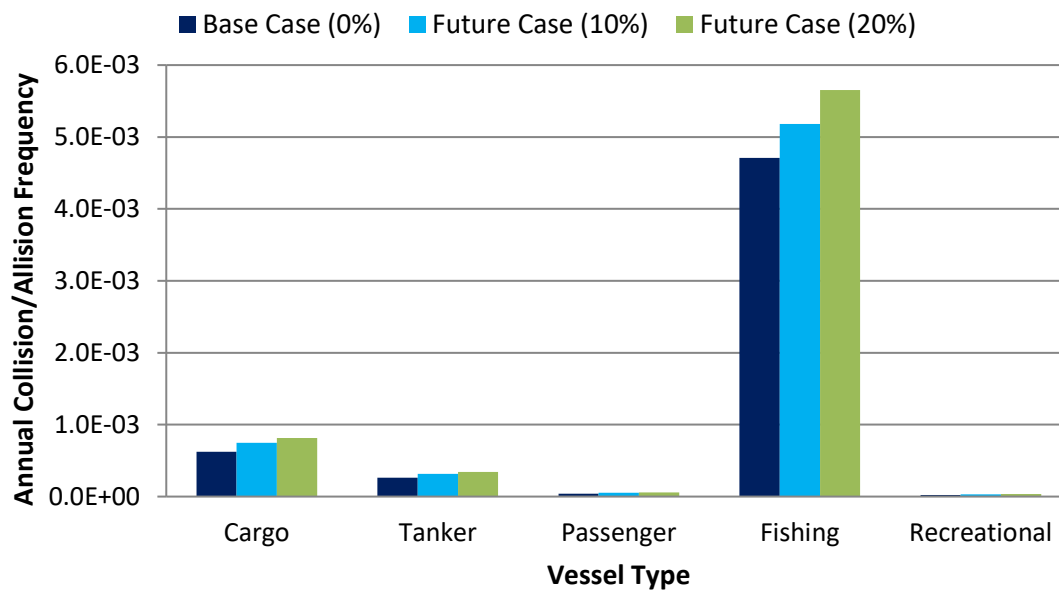


Figure C.14 Estimated Change in Annual Collision and Allision Frequency by Vessel Type

686. The change in collision and allision frequency is dominated by fishing vessels due to their active presence within and in proximity to the Bellrock WFDA and the conservative nature of Anatec’s COLLRISK model for fishing vessel allisions.
687. The second greatest collision and allision frequency change was associated with cargo vessels but was significantly lower than fishing vessels.
688. Combining the annual collision and allision frequency (**Table C.5**), estimated number of POB for each vessel type (**Table C.3**) and the estimated fatality probability for each vessel type category (**Table C.4**), the annual increase in PLL due to the presence of the Bellrock WFDA for the base case is estimated to be 3.31×10^{-5} , equating to one additional fatality every 30,214 years. The estimated incremental increases in PLL due to the Bellrock WFDA, distributed by vessel type and for the base case and future case, are presented in **Figure C.15**.

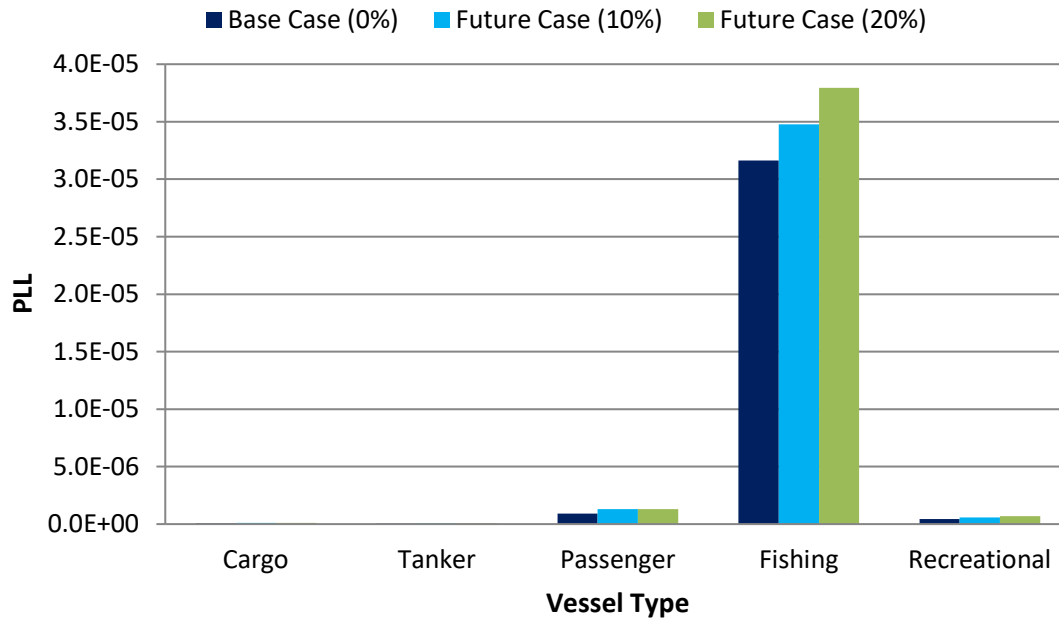


Figure C.15 Estimated Change in Annual Potential Loss of Life by Vessel Type

- 689. As with the change in collision and allision frequency, the change in annual PLL is dominated by fishing vessels which historically have a higher fatality probability than commercial vessels.
- 690. The second greatest annual PLL change was associated with passenger vessels due to much greater numbers of POB associated with this vessel type compared to others.
- 691. 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**.

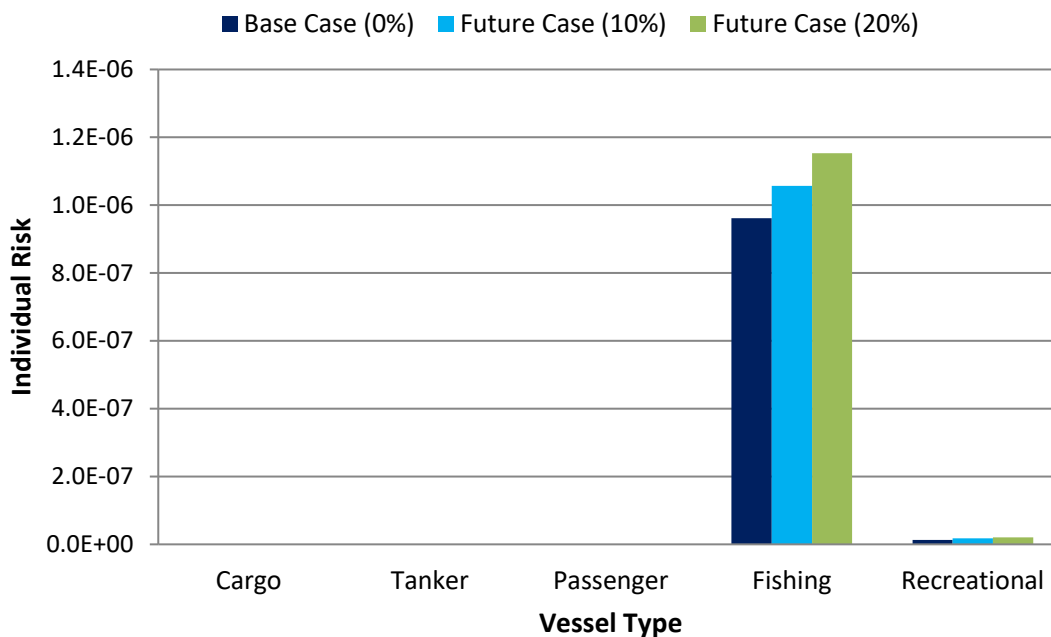


Figure C.16 Estimated Change in Individual Risk by Vessel Type

692. The change in individual risk to people is dominated by fishing vessels, again reflecting the higher probability of a fatality occurring in the event of an incident involving a fishing vessel compared to other vessel types.

C.4.4 Significance of Increase in Fatality Risk

693. In comparison to MAIB statistics, which indicate an average of 18 to 19 fatalities per year in UK territorial waters during the 20-year period between 2002 and 2021, the overall increase for the base case in PLL of one additional fatality per 30,214 years represents a very small change.

694. In terms of individual risk to people, the change for commercial vessels attributed to the Bellrock WFDA (approximately 8.53×10^{-10} for the base case) is very low compared to the background risk level for the UK sea transport industry of 2.9×10^{-4} per year.

695. For fishing vessels, the change in individual risk attributed to the Bellrock WFDA (approximately 9.61×10^{-7} for the base case) is very 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

696. 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).

697. Two types of oil spill are considered in this assessment:

- Fuel oil spills from bunkers (all vessel types);
- Cargo oil spills (laden tankers).

698. 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**.

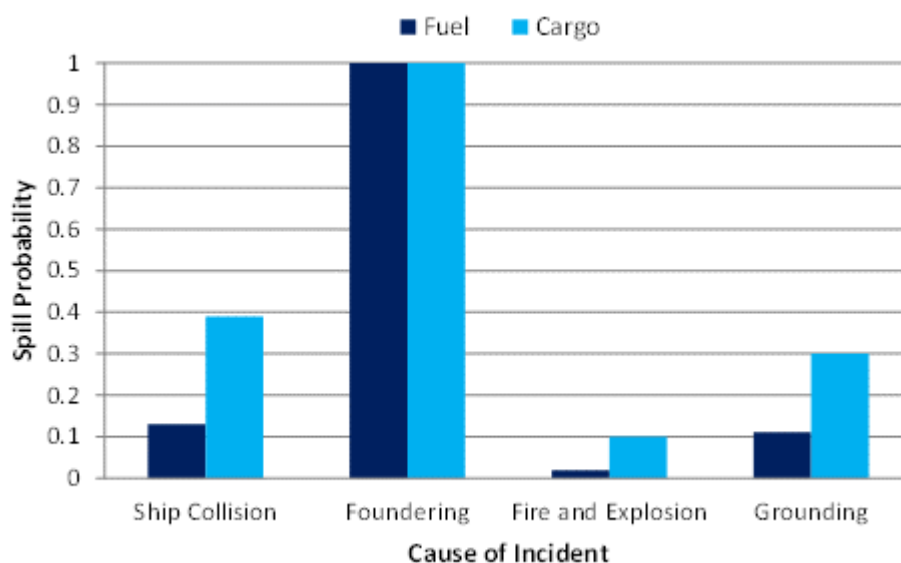


Figure C.17 Probability of an Oil Spill Resulting from an Accident

699. 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.

700. 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.

701. For the types and sizes of vessels exposed to the Bellrock WFDA, an average spill size of 100 tonnes of fuel oil is considered a conservative assumption.
702. For cargo spills from laden tankers, the spill size can vary significantly. The ITOFF 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.
703. Based upon this data and the tankers transiting in proximity to the Bellrock WFDA, an average spill size of 400 tonnes is considered a conservative assumption.
704. 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 Bellrock Wind Farm Development Area

705. 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 Bellrock WFDA is estimated to be 0.06 tonnes for the base case, rising to 0.08 tonnes per year for the 20% future case.
706. The estimated increase in tonnes of oil spilled, distributed by vessel type, for the base case and future case are presented in **Figure C.18**.

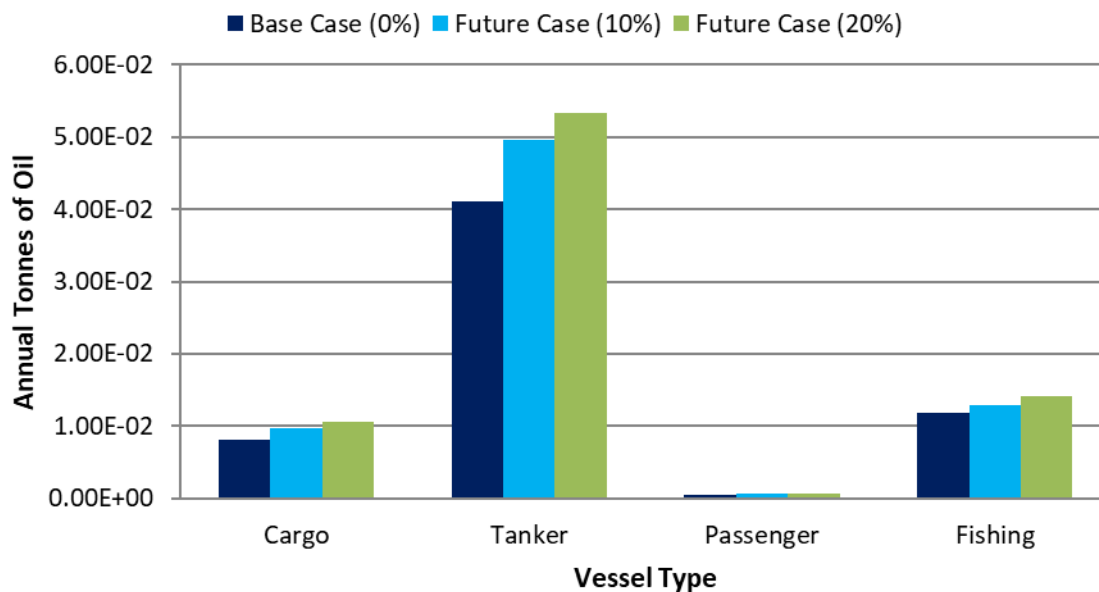


Figure C.18 Estimated Change in Pollution by Vessel Type

707. The annual oil spill results are dominated by tankers due to their high oil spill volume per incident. The second greatest contributor was fishing vessels, reflecting the higher allision and collision frequency.

C.5.3 Significant of Increase in Pollution Risk

708. To assess the significance of the increased pollution risk from vessels caused by the Bellrock WFDA, historical oil spill data for the UK has been used as a benchmark.

709. 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%.

710. The overall increase in pollution estimated due to the Bellrock WFDA of 0.06 tonnes per year for the base case represents a 0.00038% increase compared to the historical average pollution quantities from maritime incidents in UK waters.

C.6 Conclusion

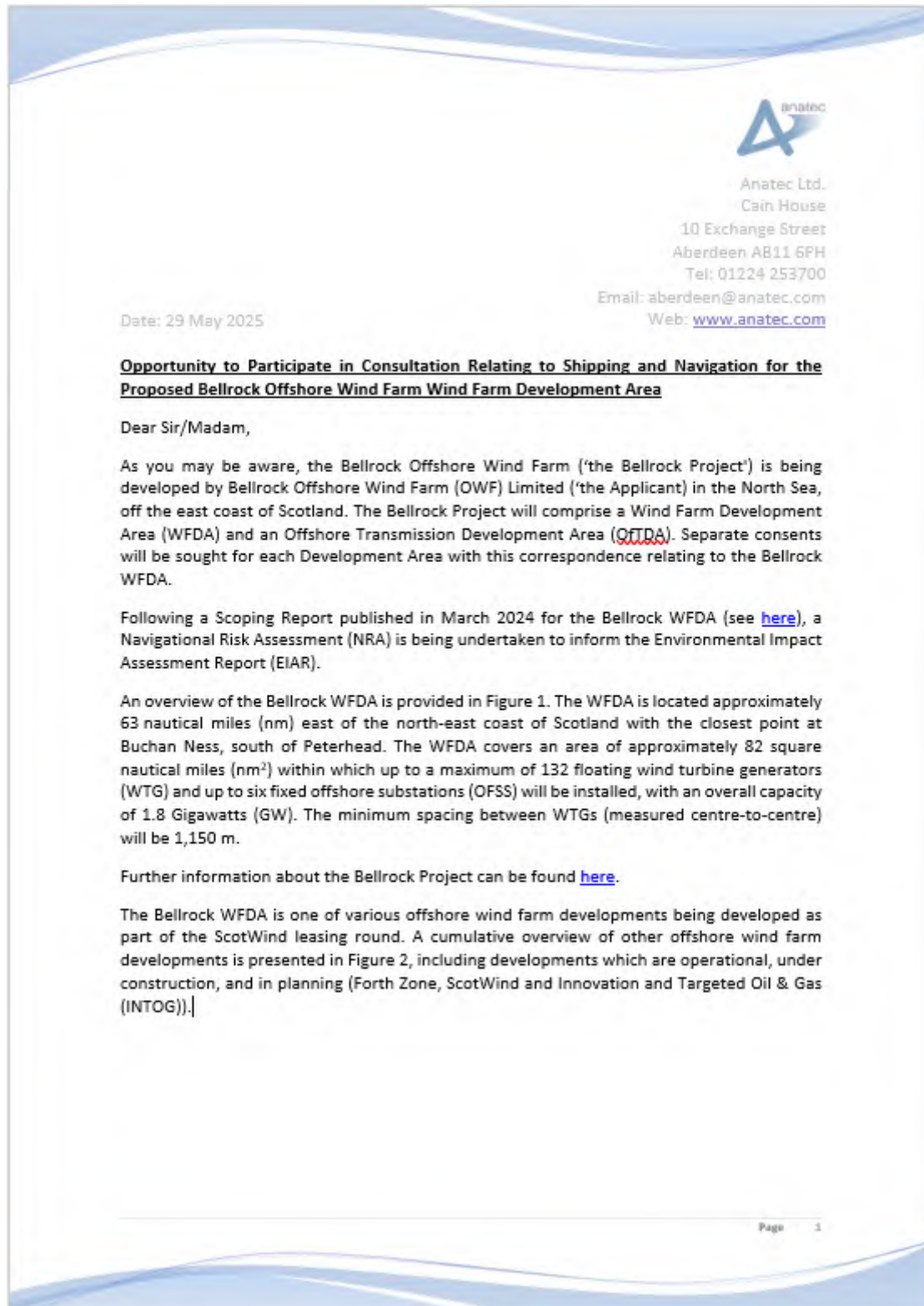
711. This appendix has quantitatively assessed the fatality and pollution risk associated with the Bellrock WFDA in the event of a collision or allision incident occurring. The

assessment indicates that the fatality risk associated with fishing vessels and pollution risk associated with tankers is greatest.

712. Overall, the impact of the Bellrock WFDA 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 OWF development and there will be additional maritime risks associated with other OWF developments in the North Sea and the UK as a whole.
713. Discussion of relevant mitigation measures and monitoring is provided in **Section 21** of the NRA.

Annex D Regular Operator Consultation

714. As part of the consultation process for the Bellrock WFDA, Regular Operators identified (from the vessel traffic survey data) in proximity to the Bellrock WFDA were consulted via email. An example of the correspondence sent to the Regular Operators is presented below.



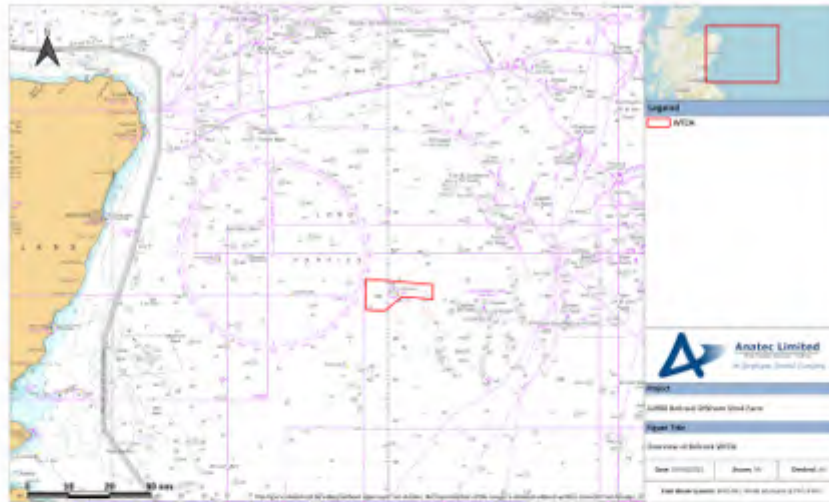


Figure 1 Overview of the Bellrock WFDA

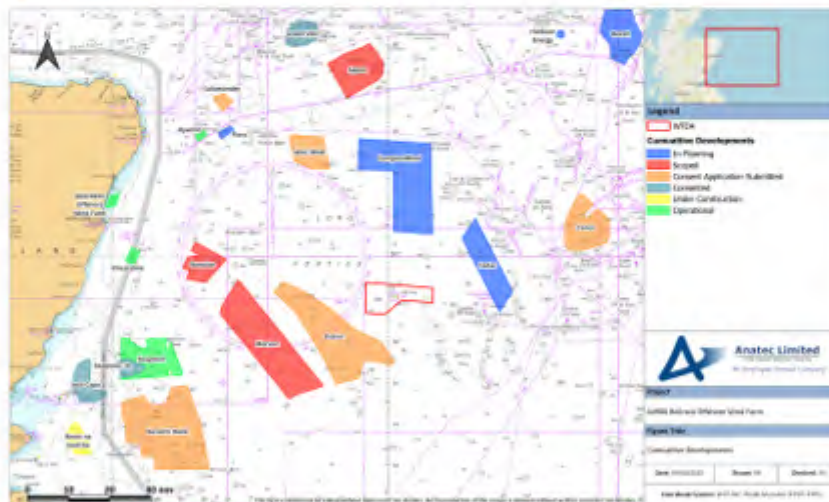


Figure 2 Overview of Cumulative Developments

Anatec has been contracted by the Applicant to provide technical support on shipping and navigation during the EIA process, and to coordinate consultation with relevant stakeholders. As part of this support, Anatec will undertake an assessment of 28 days of vessel traffic data in compliance with the Maritime and Coastguard Agency's (MCA) Marine Guidance Note (MGN) 654, with the methodology agreed with the MCA and Northern Lighthouse Board. To date, a 14-day survey was carried out in summer 2024, 14 days of desk based Automatic Identification System (AIS) only data has been gathered for winter 2024 and

a long-term AIS assessment for the entirety of 2023 has been undertaken. Combined, this allowed the identification of regular commercial operators up to 10 nautical miles (nm) from the Bellrock WFDA. This exercise has identified your organisation as a regular operator within or in proximity to the Bellrock WFDA.

We therefore invite your feedback on the Bellrock WFDA, including any impact it may have upon the navigation of vessels. Whilst we welcome all feedback we are particularly interested in any comments or feedback relating to the following:

1. Whether the presence of the Bellrock WFDA is likely to impact the routing of any specific vessels and/or routes, including the nature of any change in regular passage.
2. Whether the presence of the Bellrock WFDA poses any safety concerns to your vessels, including in relation to adverse weather routing.
3. Whether your responses to the previous questions are affected by the additional presence of cumulative offshore wind farm developments.
4. Whether you would choose to make passage internally through the WFDA containing floating WTGs and fixed OFSSs.
5. Whether you wish to be retained on our list of marine stakeholders and consulted throughout the NRA process.

Additionally, we wish to invite you to attend a Hazard Workshop which is anticipated to take place in July 2025 (further details will follow).

We would appreciate that any responses are provided via email to [REDACTED] by **Friday 20th June**, as well as an indication of whether you are interested in attending the Hazard Workshop noted above.

If you require any further information please reach out. If necessary, we can share precise location of the WFDA if it will assist in your feedback.

Yours sincerely,

[REDACTED]
Lead Risk Analyst
Anatec Ltd.

Annex E Long-term Vessel Traffic Movements

715. This appendix assesses additional long-term vessel traffic data for the Bellrock WFDA. As required under MGN 654 (MCA, 2021), the NRA considers 28 days of AIS, Radar and visual observation data as the primary vessel traffic data source. However, it should be considered that studying a 28-day period in isolation may exclude certain activities or periods of pertinence to shipping and navigation. Therefore, in line with good practice assessment procedures, this NRA has also considered a longer term dataset covering all of 2023 to ensure a comprehensive characterisation of vessel traffic movements can be established, including the capture of any seasonal variation.
716. The key aims of this appendix are to identify seasonal variations and any other movements or activities not represented by the vessel traffic survey data.

E.1 Methodology

E.1.1 Study Area

717. This appendix has assessed the long-term vessel traffic data within the same 10 nm buffer study area as introduced in **Section 3.5**.

E.1.2 Data Period and Temporary Vessel Traffic

718. AIS data was recorded for the entirety of 2023 (1 January to 31 December 2023) from onshore, offshore and satellite sources. The subsections below outline the traffic excluded from this data as well as the limitations of this data.
719. Similar to the approach for the vessel traffic survey data (see **Section 10**), any traffic deemed to be temporary and/or non-routine in nature, based on clear evidence, has been excluded from the dataset to ensure the data is representative of routine traffic. These included vessels involved in the works associated with the Devil's Hole Horst well, vessels supporting works with other surrounding projects, and temporary survey and research vessels.

E.1.3 AIS Carriage

720. General limitations associated with the use of AIS data (for example, carriage requirements) are discussed in full within **Section 5.4.1**.

E.2 Long-term Vessel Traffic Movements

721. An overview of all vessels recorded within the study area during 12 months of 2023, colour-coded by vessel type, is presented in **Figure E.1**. Following this, **Figure E.2** presents a density heatmap of the oil and gas vessel traffic and **Figure E.3** presents a density heatmap of the remainder of the traffic.

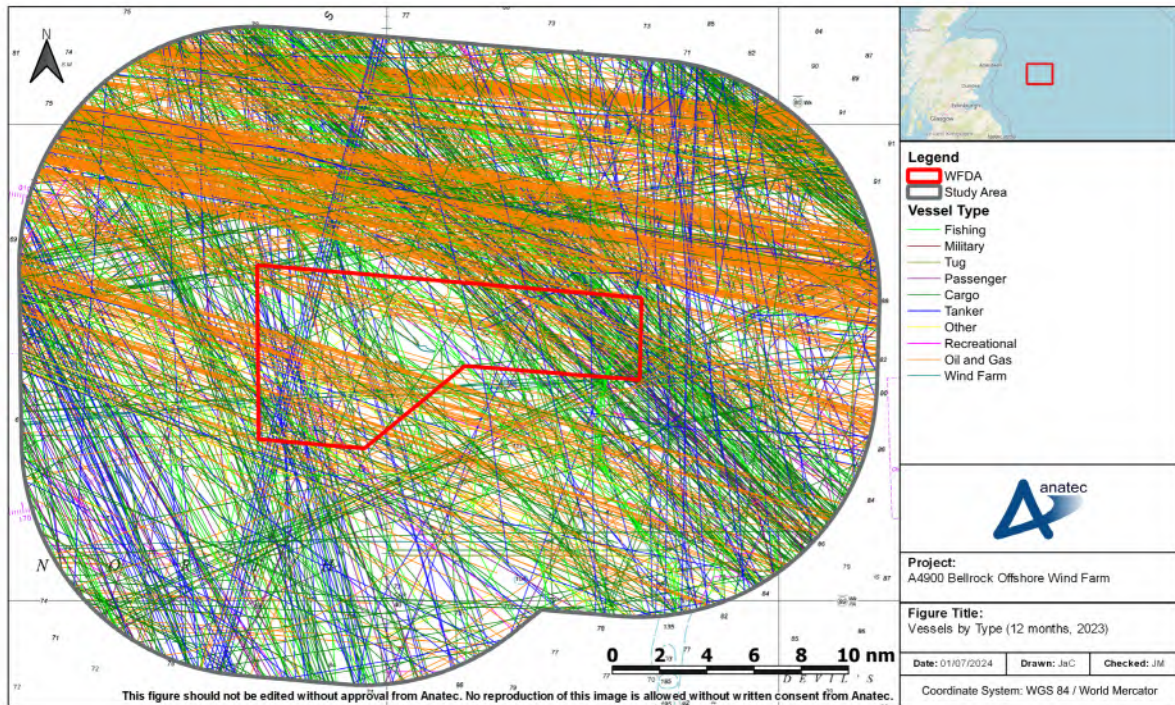


Figure E.1 Vessels by Type

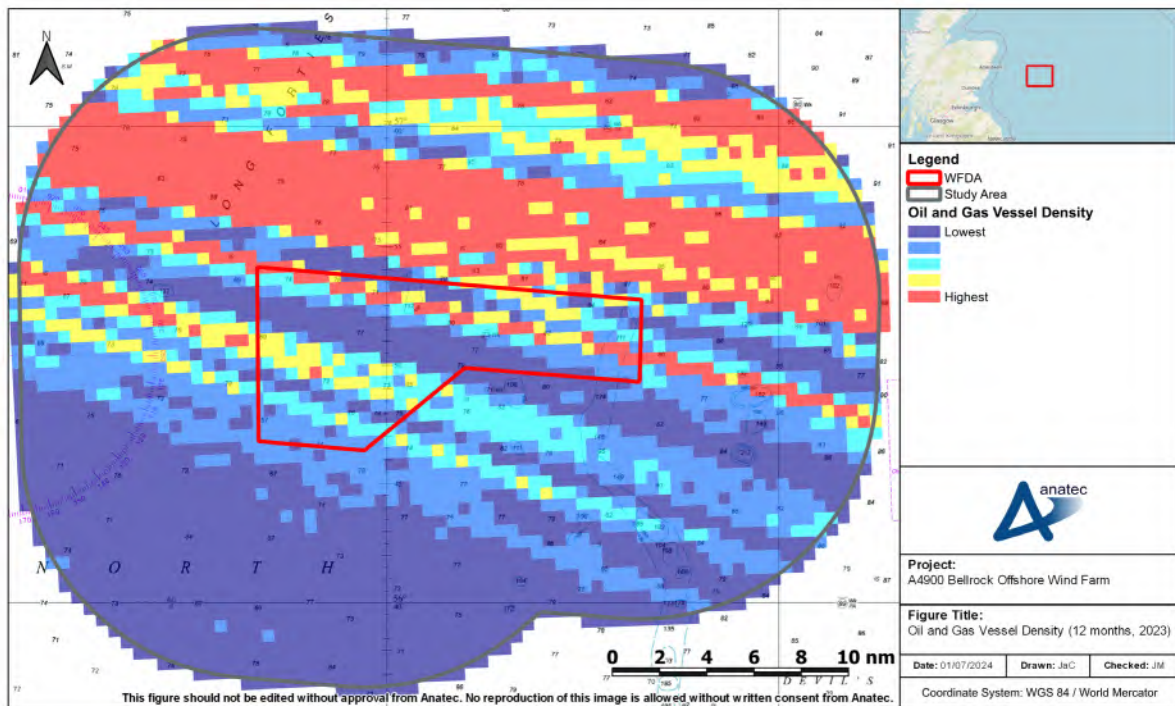


Figure E.2 Oil and Gas Vessel Density

722. Oil and gas vessel density was at its highest to the north of the Bellrock WFDA, corresponding to east/west routeing. East/west routeing through the Bellrock WFDA itself can also be seen, although with notably lower density. Further information on oil and gas vessels can be found in **Section E.6.2**.

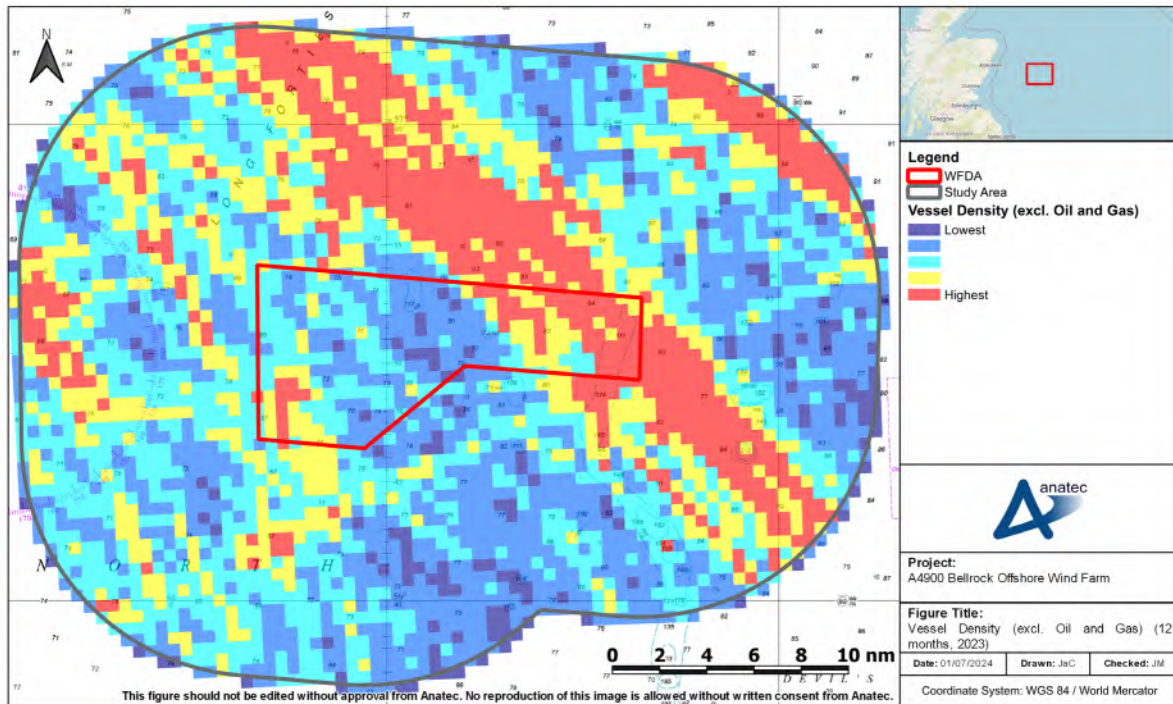


Figure E.3 Vessel Density (Excluding Oil and Gas)

723. Relatively high density traffic (when excluding oil and gas vessels) can mainly be seen within a north-west/south-east route through the eastern portion of the Bellrock WFDA. This route is mainly comprised of cargo vessels and passenger vessels. A north-west/south-east cargo vessel route with relatively high density can also be seen at the north-eastern extent of the study area. See **Sections E.6.3** and **E.6.6** for further information about cargo vessels and passenger vessels, respectively.

E.3 Vessel Counts

724. **Figure E.4** presents a breakdown of the average daily number of vessels recorded within the study area per month and per vessel type.

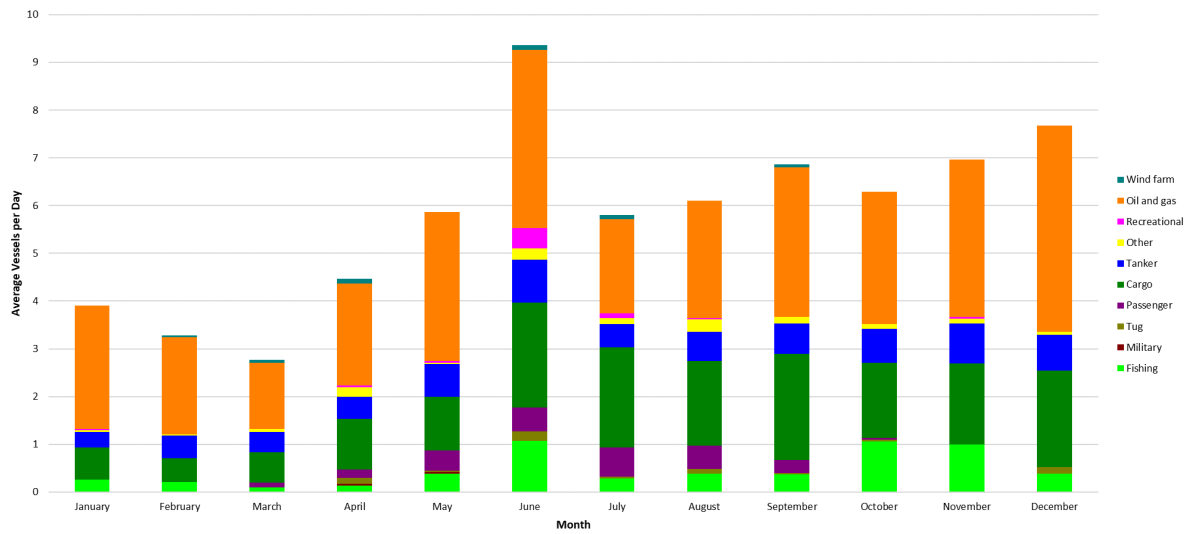


Figure E.4 Average Daily Vessel Counts per Month per Type

725. Overall, there was an average of six vessels per day recorded within the study area during 2023 with some notable fluctuation around this average. The busiest month was June, with an average of nine to ten vessels being recorded per day. The quietest month was March, with an average of three vessels being recorded per day. Further individual analysis on each main vessel type is presented in **Section E.6**.
726. The busiest month (June, 2023) is presented in **Figure E.5**.

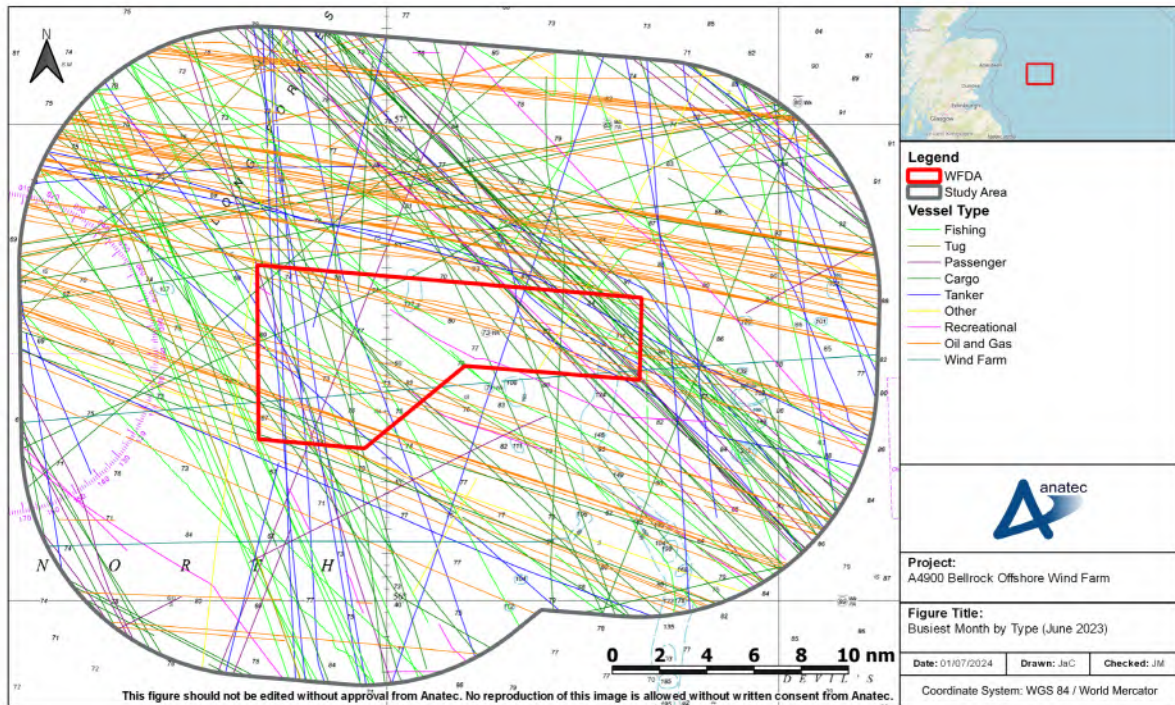


Figure E.5 Busiest Month by Type

E.4 Vessel Lengths

727. **Figure E.6** presents the vessels recorded within the study area during the 12 months of 2023, colour-coded by vessel length. All vessels were assigned a known length except for two, accounting for less than 1% of the data. Following this, **Figure E.7** presents the distribution of vessel lengths (excluding the two vessels of unspecified length) during 12 months of 2023.

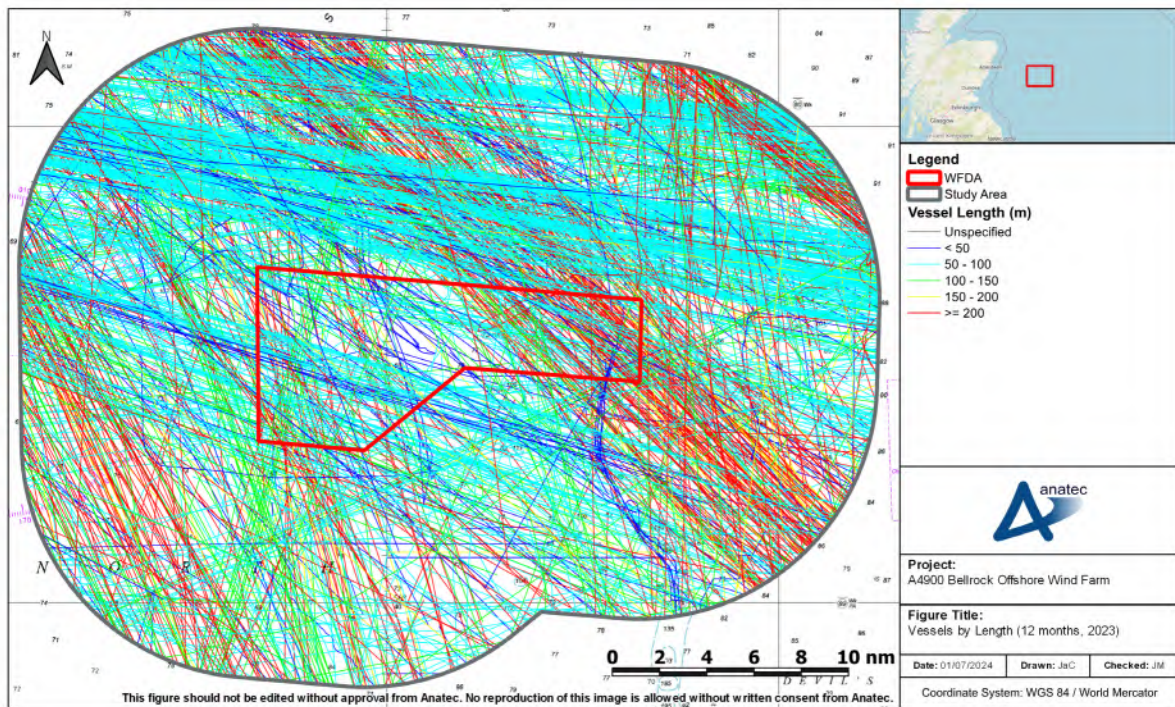


Figure E.6 Vessels by Length

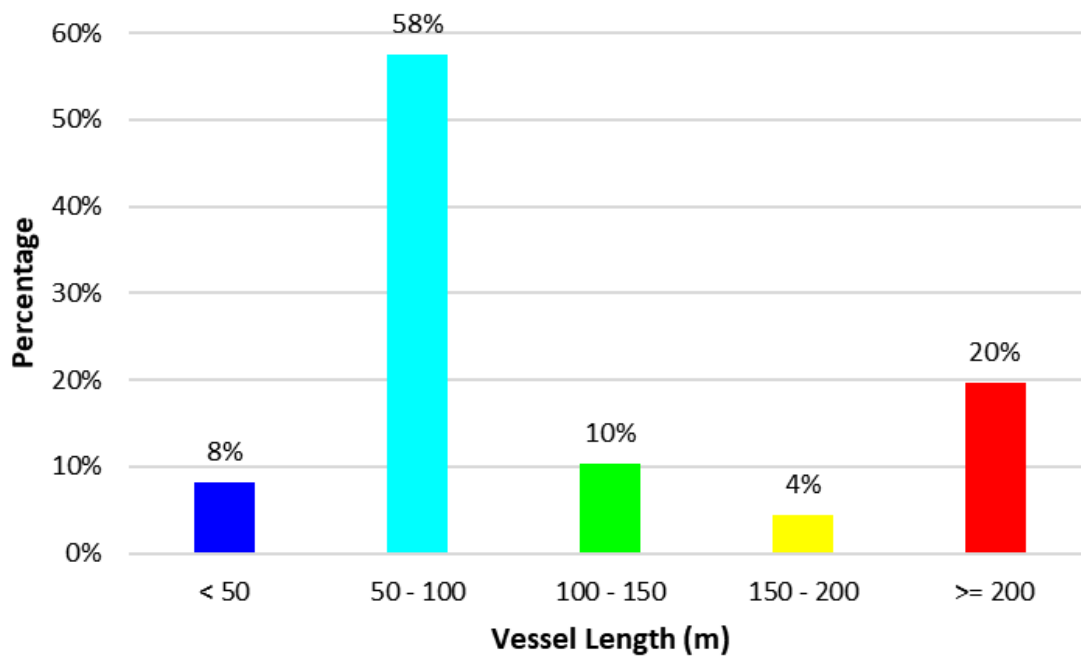


Figure E.7 Distribution of Vessel Lengths

728. The smallest vessels (less than 50 m) were mainly fishing vessels, recreational vessels and standby safety oil and gas vessels. The longest vessels (at least 200 m) comprised passenger vessels, cargo vessels and tankers; among this traffic was a north-west/south-east route (mainly used by cargo vessels) intersecting the eastern portion of the Bellrock WFDA. The majority of vessels were between 50 m and 100 m in length with this traffic mainly consisting of oil and gas vessels routeing north-west/south-east.
729. The average length recorded was 120 m. The longest recorded vessel was a 333 m long cruise liner recorded six times, transiting to either Hamburg (Germany) or Kirkwall/Invergordon (UK), each time intersecting the north-eastern portion of the Bellrock WFDA.

E.5 Vessel Draughts

730. **Figure E.8** presents the vessels recorded within the study area for 12 months of 2023, colour-coded by vessel draught. Following this, **Figure E.9** presents the distribution of vessel draughts (excluding 14% unspecified values).

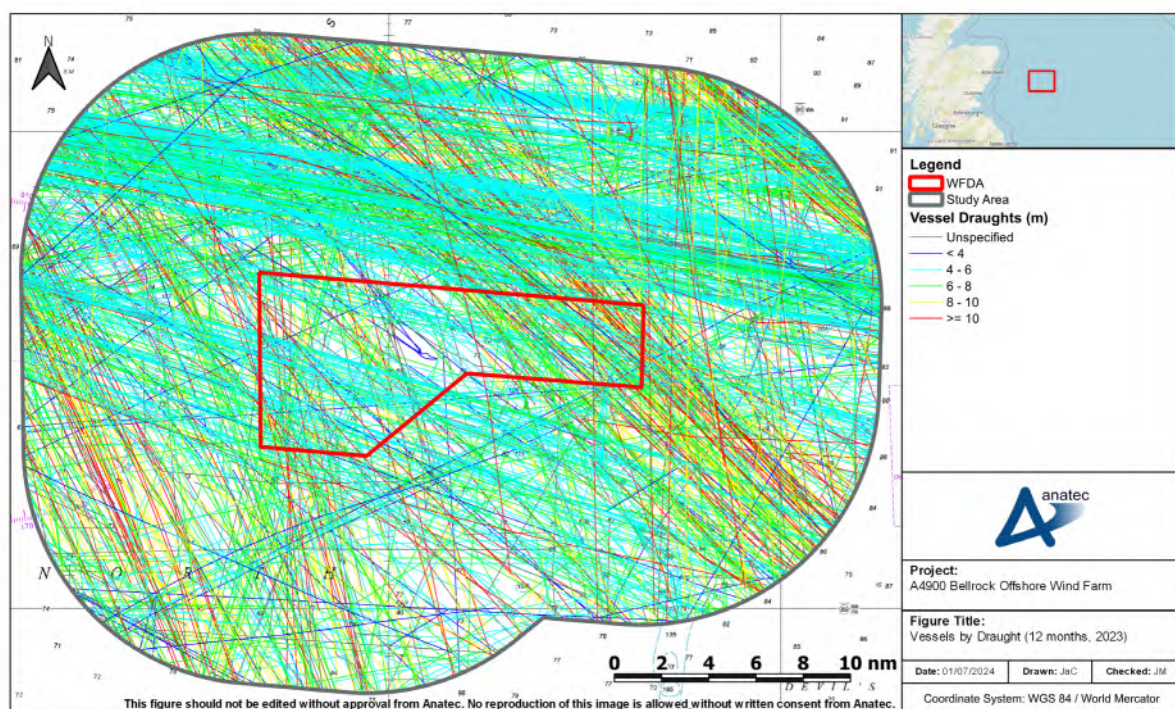


Figure E.8 Vessels by Draught

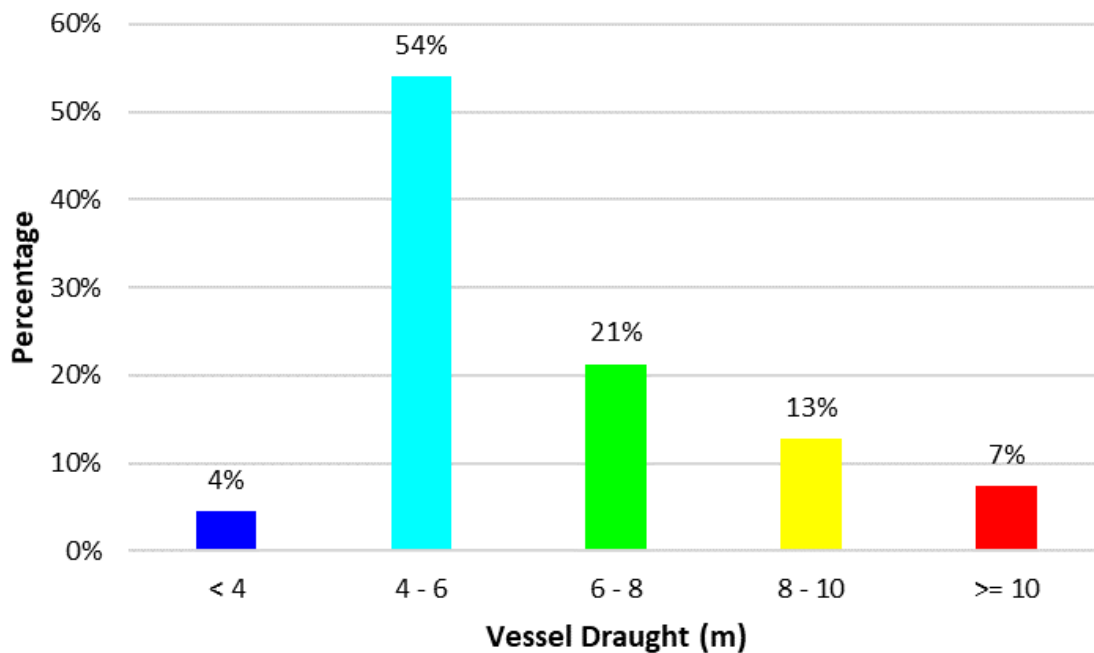


Figure E.9 Distribution of Vessel Draughts

731. The shallowest draughts (less than 4 m) were generally displayed by fishing vessels, cargo vessels and wind farm vessels. The deepest draughts (at least 10 m) were generally displayed by cargo vessels and tankers routeing north-west/south-east; among this traffic was a north-west/south-east route (mainly used by cargo vessels) intersecting the eastern portion of the Bellrock WFDA. The majority of draughts were between 4 m and 6 m, with this traffic mainly consisting of oil and gas vessels routeing north-west/south-east.
732. The average draught was 6.4 m. The deepest draught was 16.9 m, north of the Bellrock WFDA, broadcast from a crane vessel in north-west transit towards Aberdeen (UK).

E.6 Vessel Type

733. **Figure E.10** presents the distribution of the main vessel types recorded within the study area for 12 months of 2023. All vessels were associated with a known type.

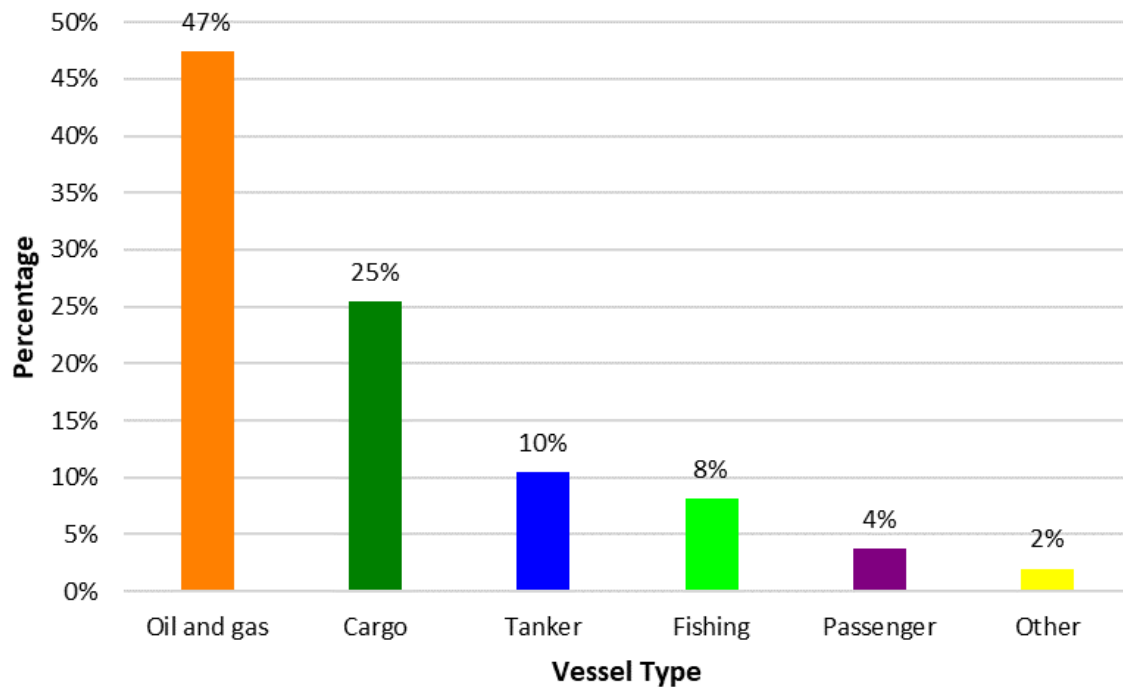


Figure E.10 Distribution of Main Vessel Types

734. Additional vessels recorded in small numbers (each accounting for less than 1% of the data) include tugs, recreational vessels, wind farm vessels and military vessels. Each main vessel type is analysed in more detail in the following subsections.

E.6.2 Oil and Gas Vessels

735. **Figure E.13** presents the oil and gas vessels recorded within the study area for 12 months of 2023.

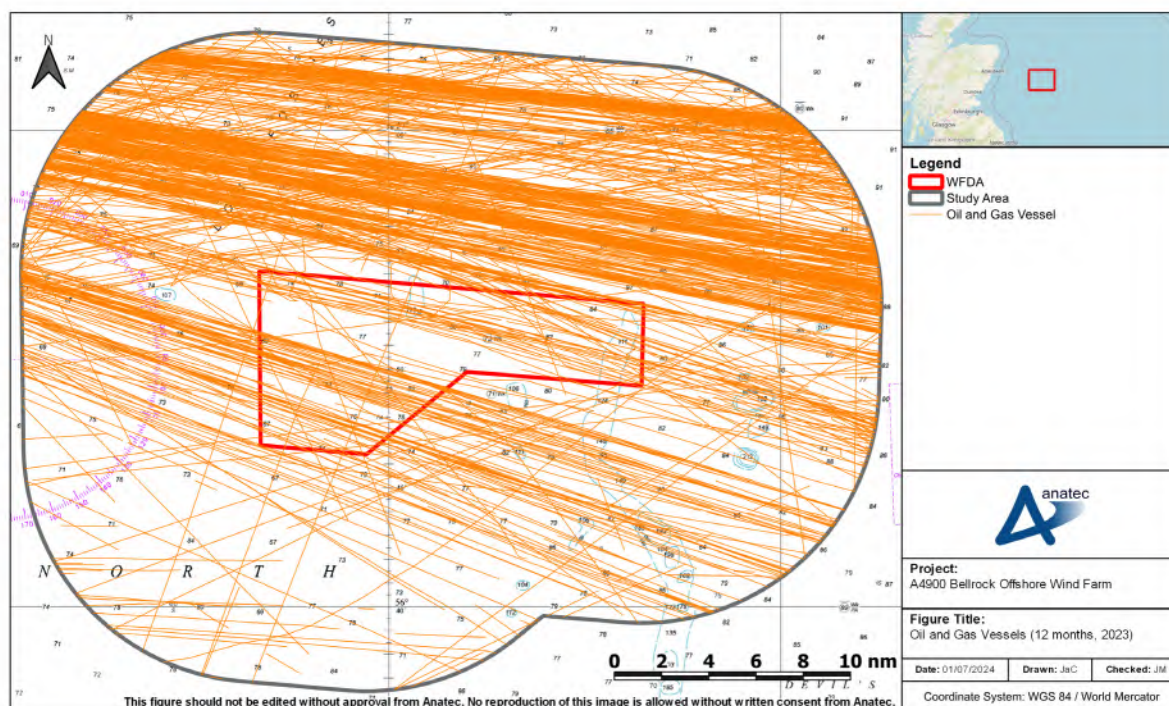


Figure E.11 Oil and Gas Vessels

736. An average of two to three oil and gas vessels per day was recorded within the study area during 2023, with one every two to three days within the Bellrock WFDA itself. The majority of oil and gas vessels were observed to be routing east/west, north of the Bellrock WFDA, between Aberdeen (UK) and various oil and gas infrastructure in the North Sea.

E.6.3 Cargo Vessels

737. **Figure E.12** presents the cargo vessels recorded within the study area for 12 months of 2023.

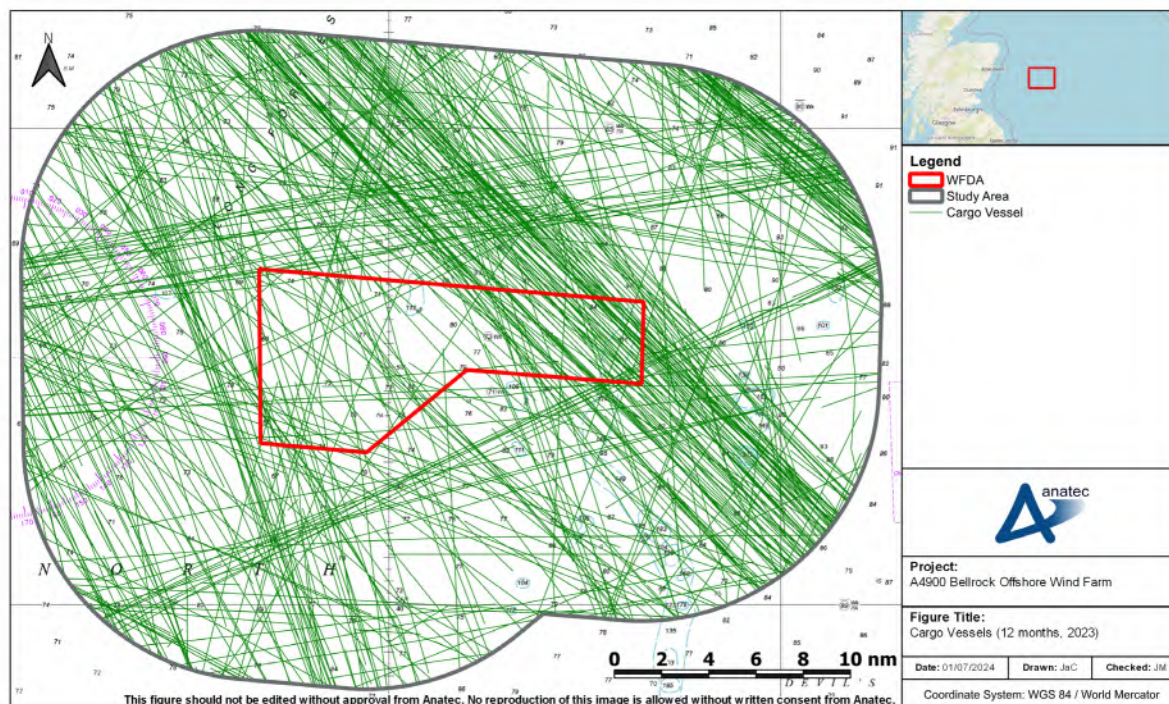


Figure E.12 Cargo Vessels

738. An average of one to two cargo vessels per day was recorded within the study area during 2023, with one every two days within the Bellrock WFDA itself. A north-west/south-east route intersecting the eastern portion of the Bellrock WFDA was observed, with a variety of destinations broadcast such as Canada, Germany, the Netherlands and the United States.

E.6.4 Tankers

739. **Figure E.13** presents the tankers recorded within the study area during 12 months of 2023.

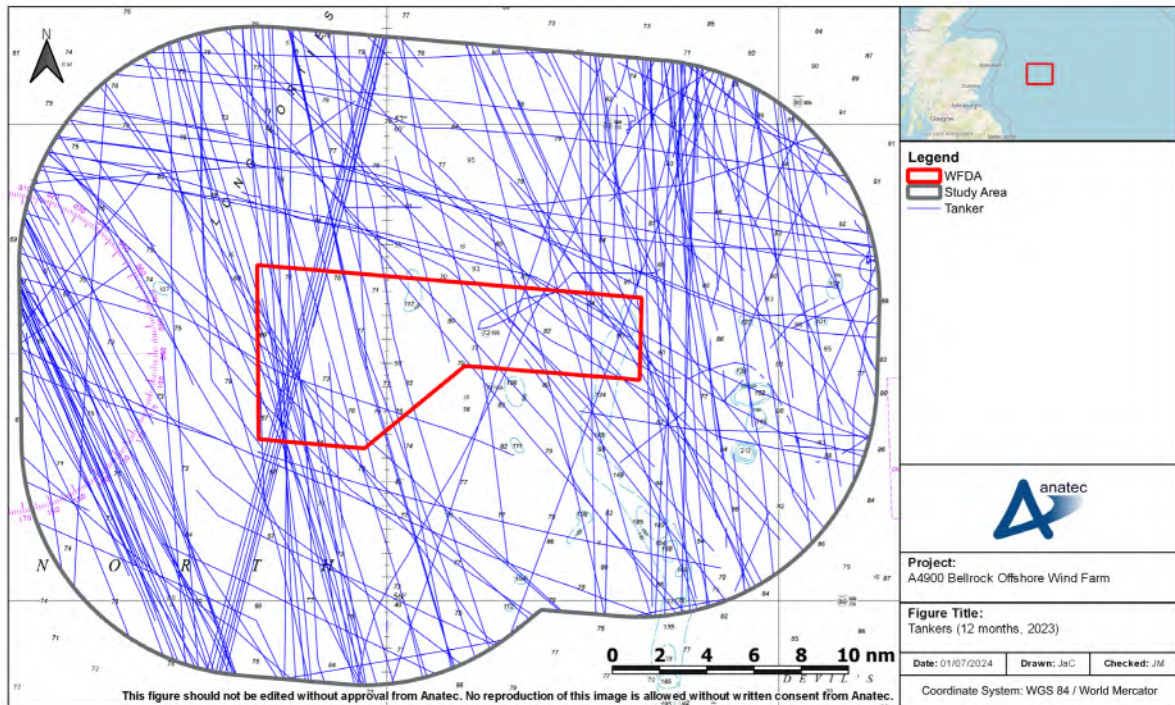


Figure E.13 Tankers

740. An average of one tanker every one to two days was recorded within the study area during 2023, with one every five to six days within the Bellrock WFDA itself. Tankers were most commonly seen transiting north/south with common destinations including the Catcher oil field, Rotterdam (the Netherlands) and ports in the UK.

E.6.5 Fishing Vessels

741. **Figure E.14** presents the fishing vessels recorded within the study area for 12 months of 2023, colour-coded by average speed. Average speeds of below six knots are considered a helpful indication of possible active fishing. As AIS carriage is only mandatory for fishing vessels of 15 m length and over, it is possible that fishing vessel activity is underrepresented due to this assessment being AIS only (see **Section 5.4**).

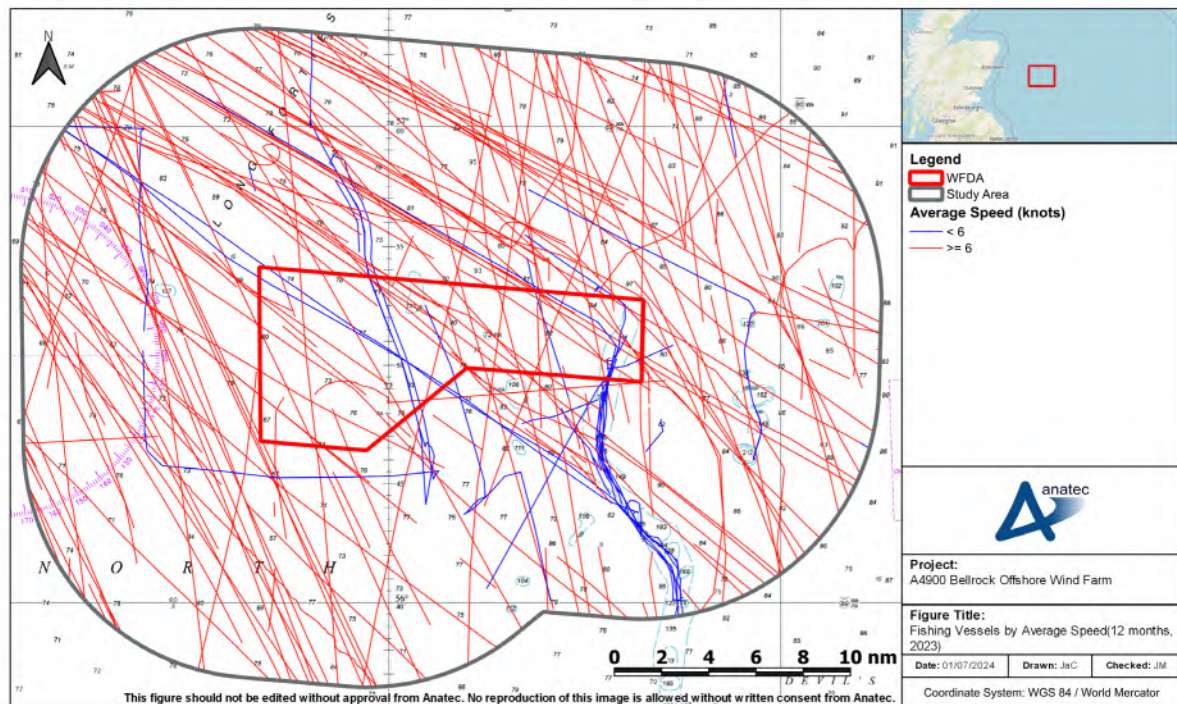


Figure E.14 Fishing Vessels by Average Speed

742. An average of one fishing vessel every two days was recorded within the study area during 2023, with one every six days within the Bellrock WFDA itself. The majority of fishing vessels were observed transiting in a north-west/south-east direction; however, a proportion were also seen exhibiting potential active fishing behaviour. In particular, five fishing vessels were seen potentially fishing in an area of relatively higher water depths (at least 100 m below CD) to the south-east, and within the eastern portion of the Bellrock WFDA. An otter twin trawler was also observed potentially engaged in active fishing within the centre of the Bellrock WFDA.

E.6.6 Passenger Vessels

743. **Figure E.15** presents the passenger vessels recorded within the study area for 12 months of 2023.

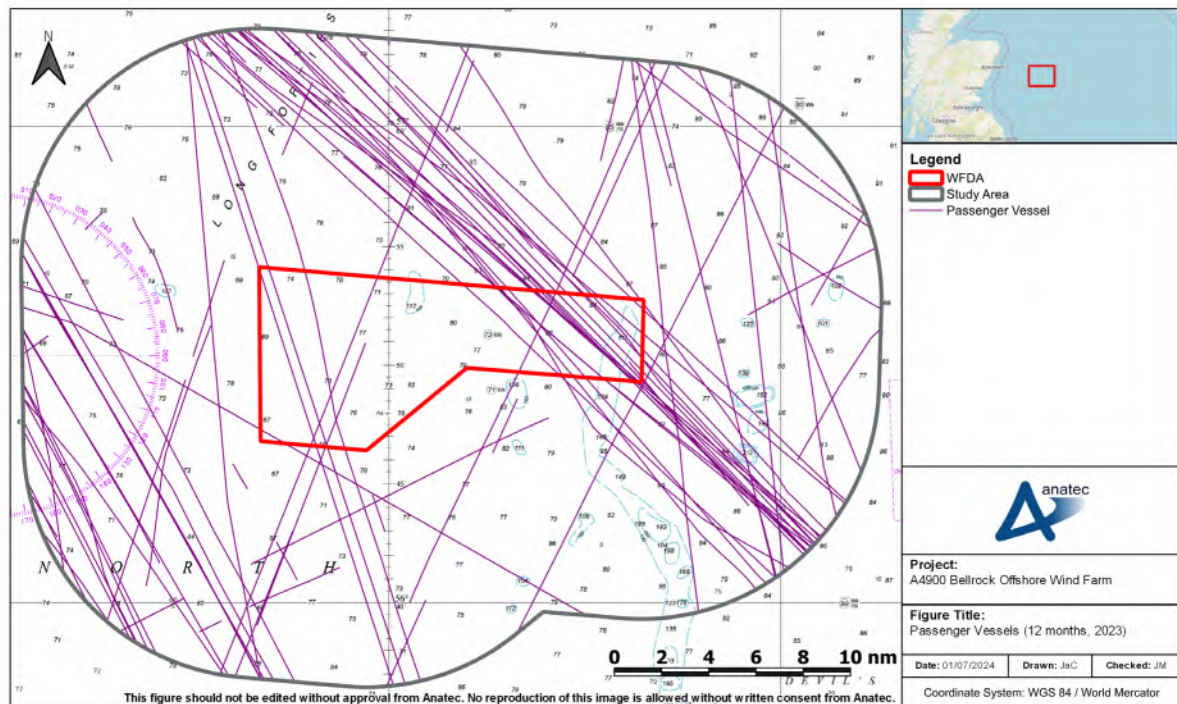


Figure E.15 Passenger Vessels

744. An average of one passenger vessel every four to five days was recorded within the study area for 12 months of 2023, with one every 12 days within the Bellrock WFDA itself. Passenger vessel traffic displayed seasonality, with the highest counts during June, July and August and with no passenger vessels recorded during January, February, November or December.
745. The majority of passenger vessels were cruise liners. Passenger vessel traffic was most commonly seen within a north-west/south-east route that intersects the eastern portion of the Bellrock WFDA, with these vessels most commonly transiting between Invergordon (UK) and Hamburg/Bremerhaven (Germany).

E.6.7 Recreational Vessels

746. **Figure E.16** presents the recreational vessels recorded within the study area for 12 months of 2023. Recreational vessels accounted for less than 1% of the data; however, are notable for their seasonality.

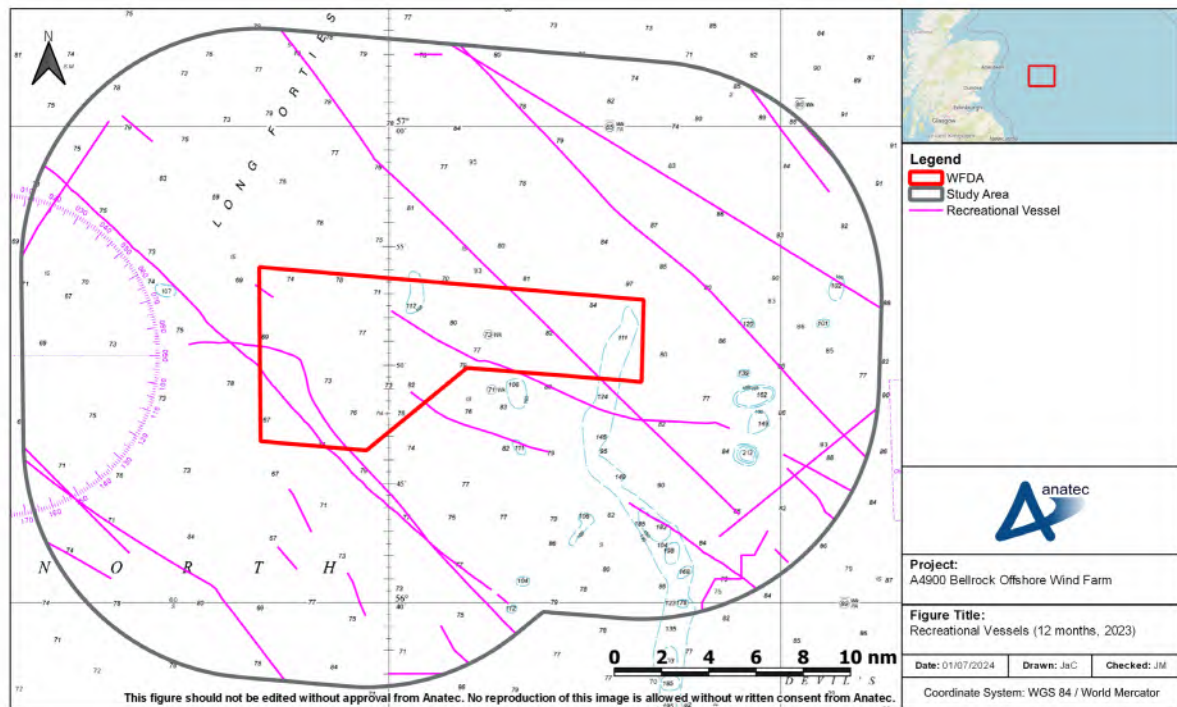


Figure E.16 Recreational Vessels

747. Recreational vessels were most commonly recorded during June, displaying an average of one every two to three days. However, June accounted for the majority (61%) of recreational traffic with the average over the course of the entire year being one every 17 to 18 days. A total of six intersections through the Bellrock WFDA was recorded, each from vessels transiting north-west.

E.7 Intersections Through Bellrock Wind Farm Development Area

748. **Figure E.17** presents the vessels recorded intersecting the Bellrock WFDA for 12 months of 2023, colour-coded by type.

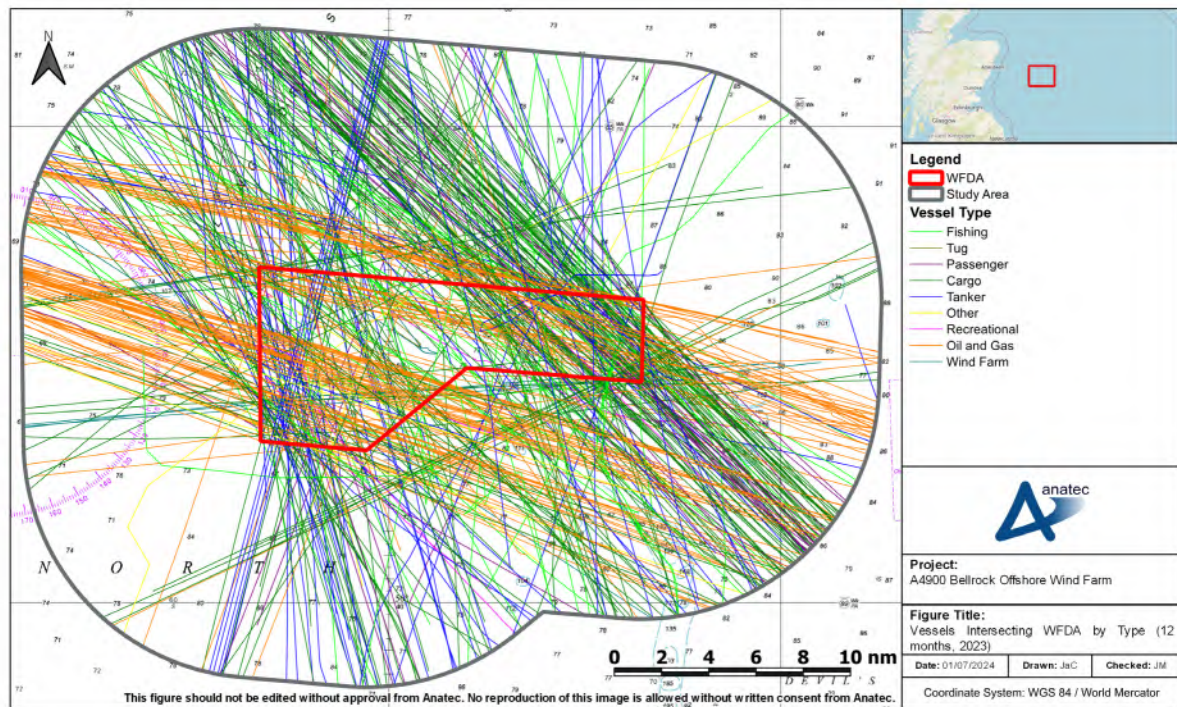


Figure E.17 Vessels Intersecting Bellrock Wind Farm Development Area by Type

749. An average of one to two vessels per day was recorded intersecting the Bellrock WFDA during 2023. The busiest month for intersections was June, with 106 intersections corresponding to an average of three to four per day. The quietest month for intersections was January, with five intersections corresponding to one every six days.
750. The distribution of vessel types recorded intersecting the Bellrock WFDA for 12 months of 2023 is presented in **Figure E.18**.

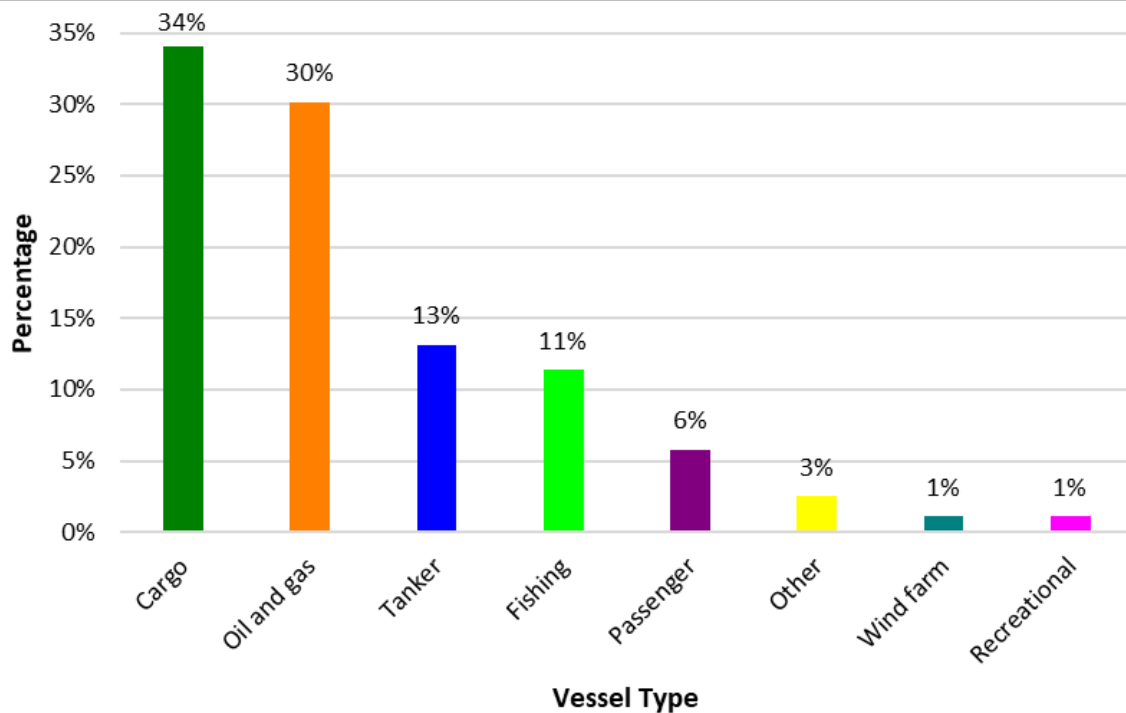


Figure E.18 Distribution of Vessel Types Intersecting Bellrock Wind Farm Development Area

751. Cargo vessels were the most common vessel type to intersect the Bellrock WFDA, accounting for 34% of intersections; these intersections were most commonly from routing through the eastern portion of the Bellrock WFDA in a north-west/south-east direction (see **Section E.6.3**). This was followed by oil and gas vessels, accounting for 30%; these vessels were observed routing north-west/south-east between Aberdeen (UK) and various oil and gas infrastructure in the North Sea.

E.8 Vessel Traffic Survey Data Comparison

752. The daily averages within the study area and Bellrock WFDA for each of the main vessel types recorded during the 12 months during 2023 are compared to those recorded during the 14 days during August 2024 and 14 days in December in **Table E.1**.

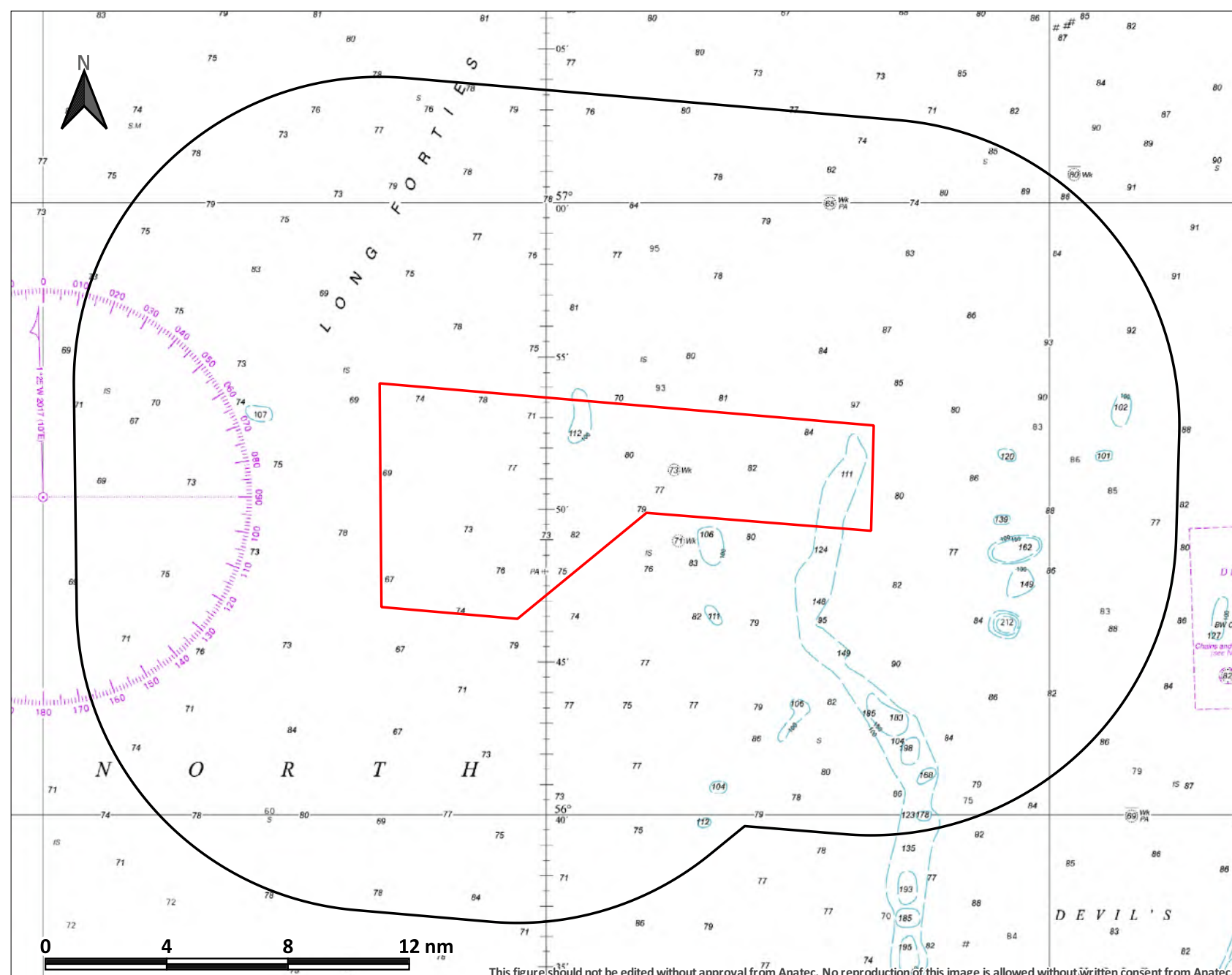
Table E.1 Comparison of Vessel Type Counts Between Long-term Vessel Traffic Data and Vessel Traffic Survey Data

Vessel Type	Average Unique Vessels Per Day					
	Long-term Period (12 Months, AIS)		Winter Period (14 Days, AIS)		Summer Survey Period (14 Days, AIS & Radar)	
	Study Area	WFDA	Study Area	WFDA	Study Area	WFDA
Oil and gas	2-3	< 1	1-2	<1	4-5	1
Cargo	1-2	< 1	<1	<1	3	1-2
Tanker	< 1	< 1	<1	<1	< 1	< 1
Fishing	< 1	< 1	<1	<1	< 1	< 1
Passenger	< 1	< 1	<1	<1	< 1	< 1
All Vessels	6	1-2	3	<1	9-10	3-4

753. Traffic levels were slightly higher during the 28-day period compared to the long-term data period, but displayed broad similarities e.g. oil and gas vessels being the most prominent vessel type.

Annex F Figures

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Legend

- WFDA
- Study Area



Project

A4900 Bellrock Offshore Wind Farm

Figure Title

Overview of Study Area

Date: 20/03/2026	Drawn: RR	Checked: JM
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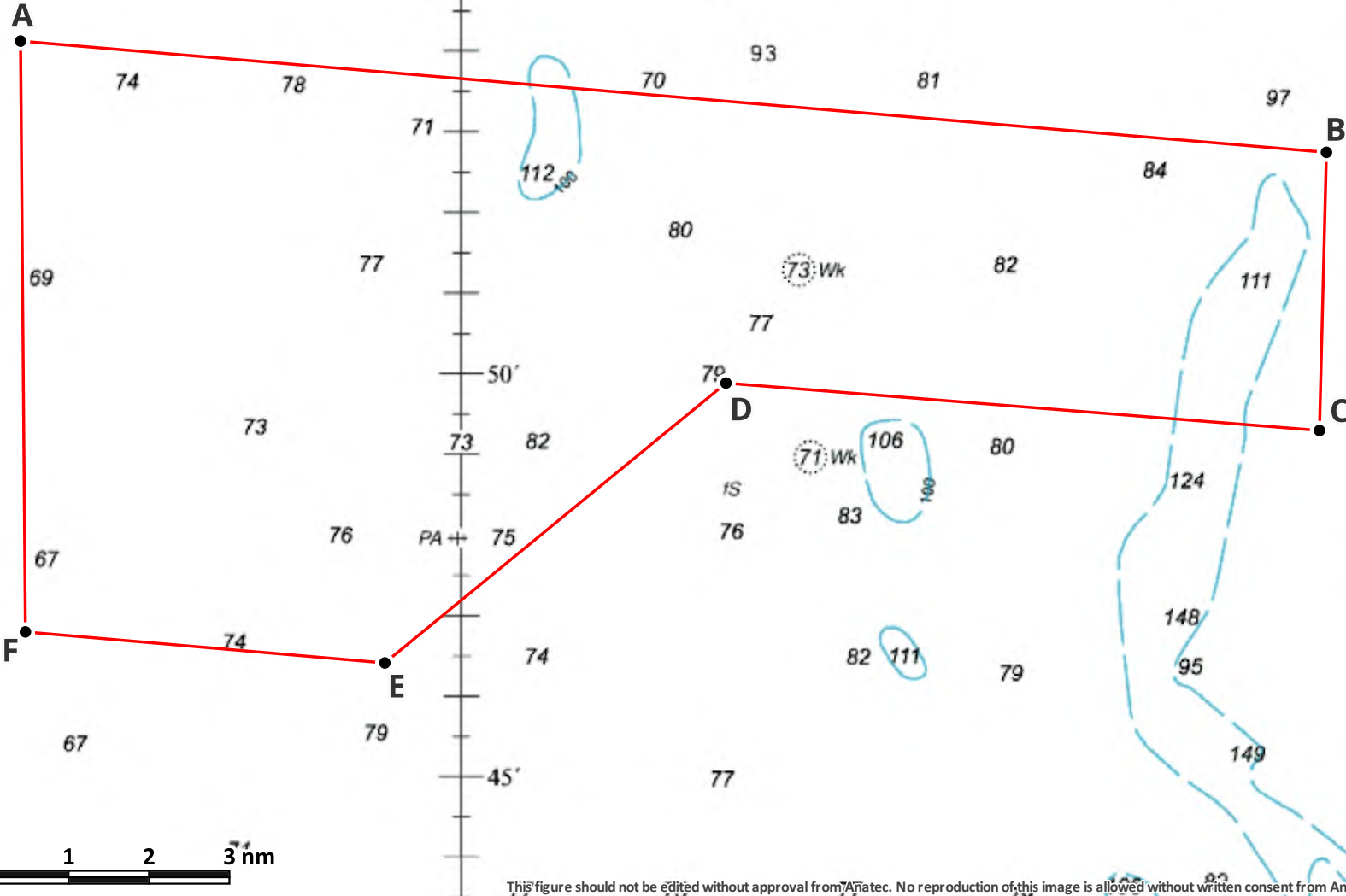
Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

-  WFDA
-  Key Coordinate Location




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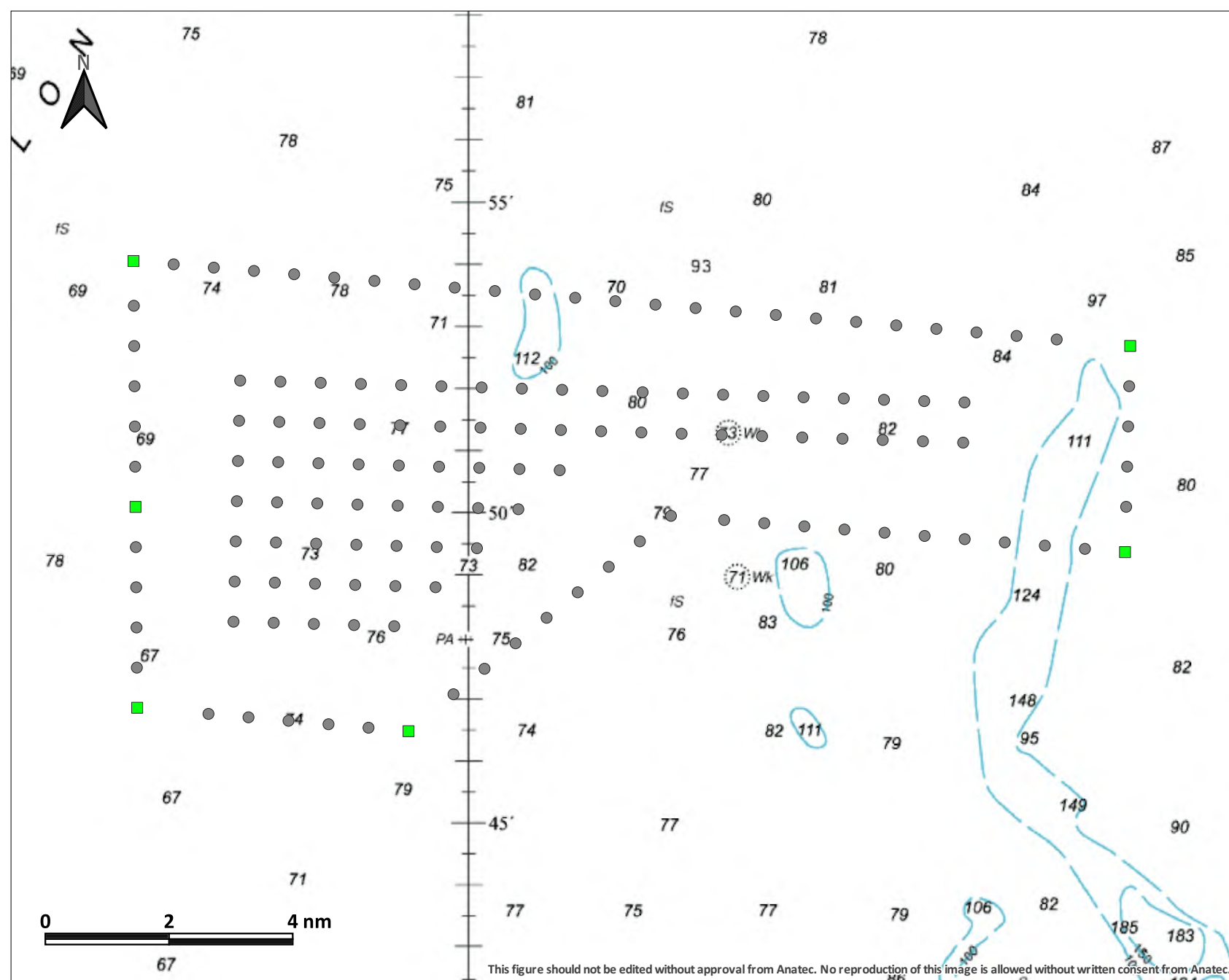
A4900 Bellrock Offshore Wind Farm

Figure Title

Key Coordinates of the WFDA

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)



Legend

- Surface Infrastructure**
- WTG
 - OFSS



Project

A4900 Bellrock Offshore Wind Farm

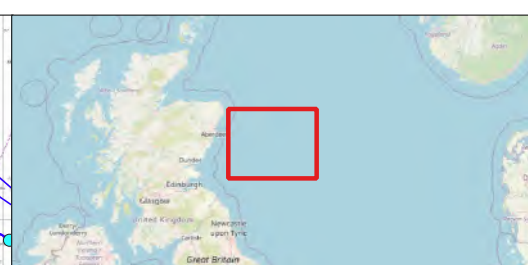
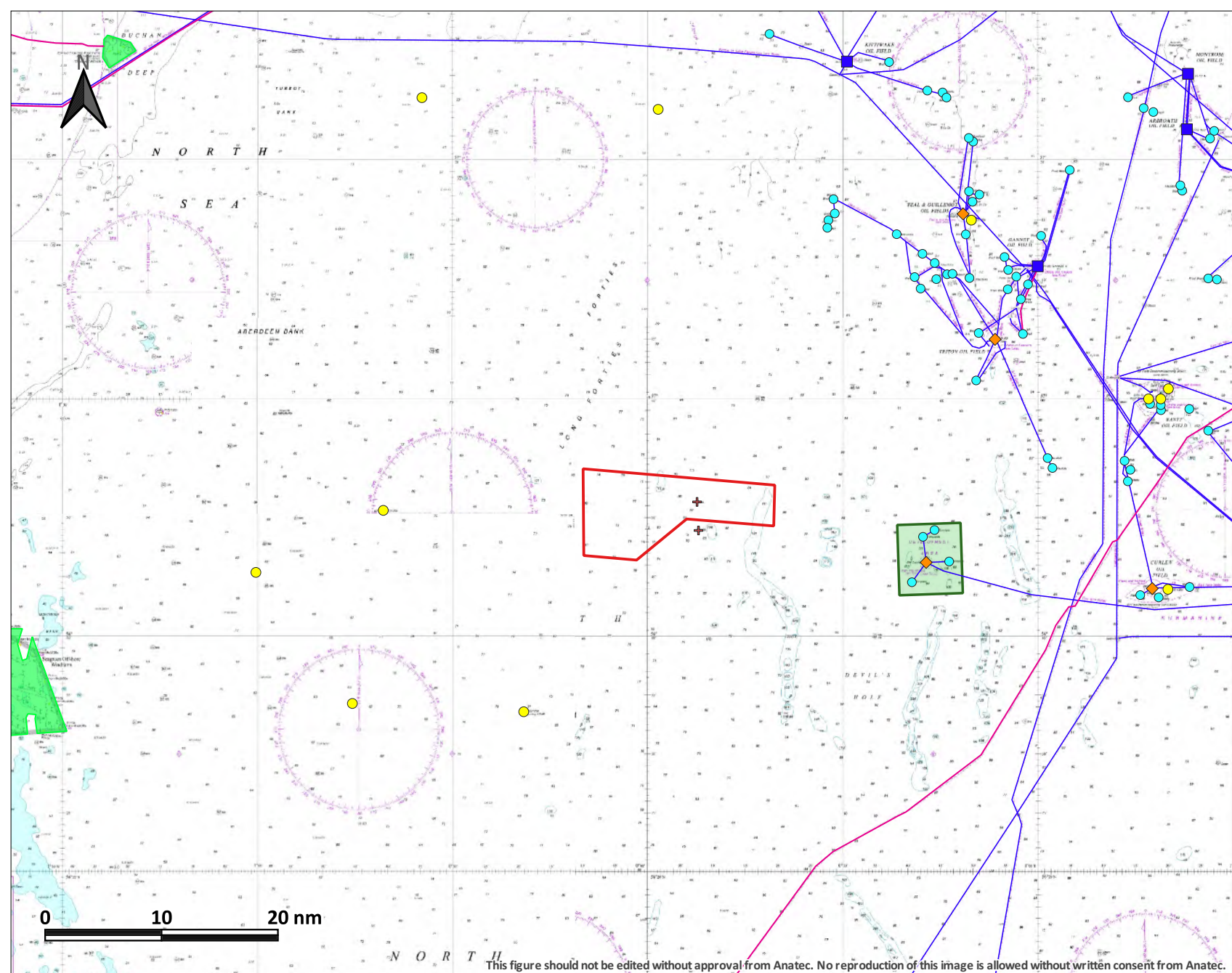
Figure Title

Worst Case Scenario Layout for Shipping and Navigation

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Legend

- WFDA
- Key Navigational Features**
- Operational Wind Farm
- Development Area
- Aid to Navigation
- ◆ FPSO
- Surface Platform
- Subsea Infrastructure
- + Key Wreck or Obstruction
- Subsea Pipeline
- Subsea Cable



Project

A4900 Bellrock Offshore Wind Farm

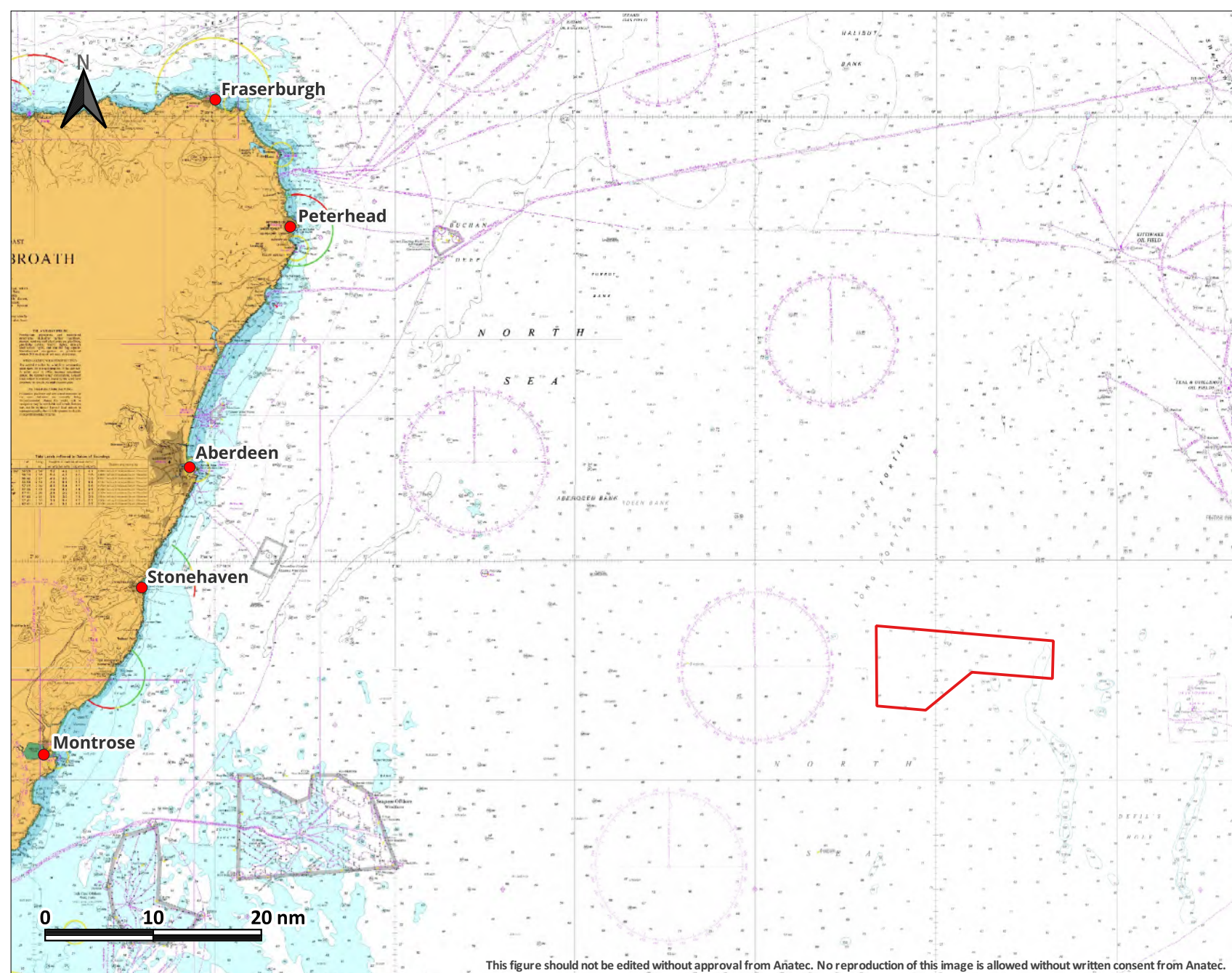
Figure Title

Overview of Key Navigational Features

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Legend

- WFDA
- Port or Harbour



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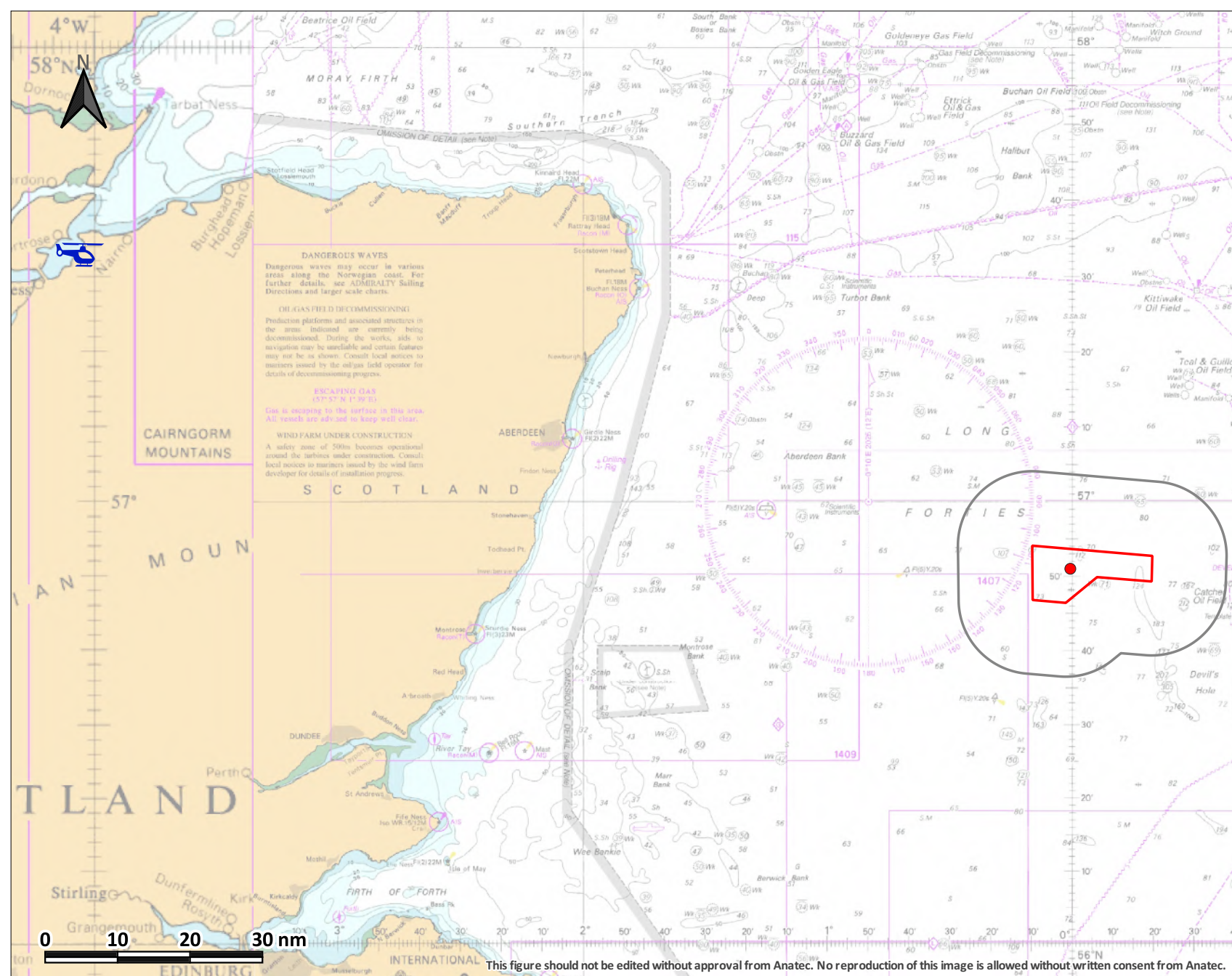
Figure Title

Key Ports and Harbours in Proximity to Bellrock WFDA





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Legend

-  WFDA
-  Study Area
-  Inverness SAR Heli Base
- SAR Heli Tasking Type**
-  Rescue/recovery



Project

A4900 Bellrock Offshore Wind Farm

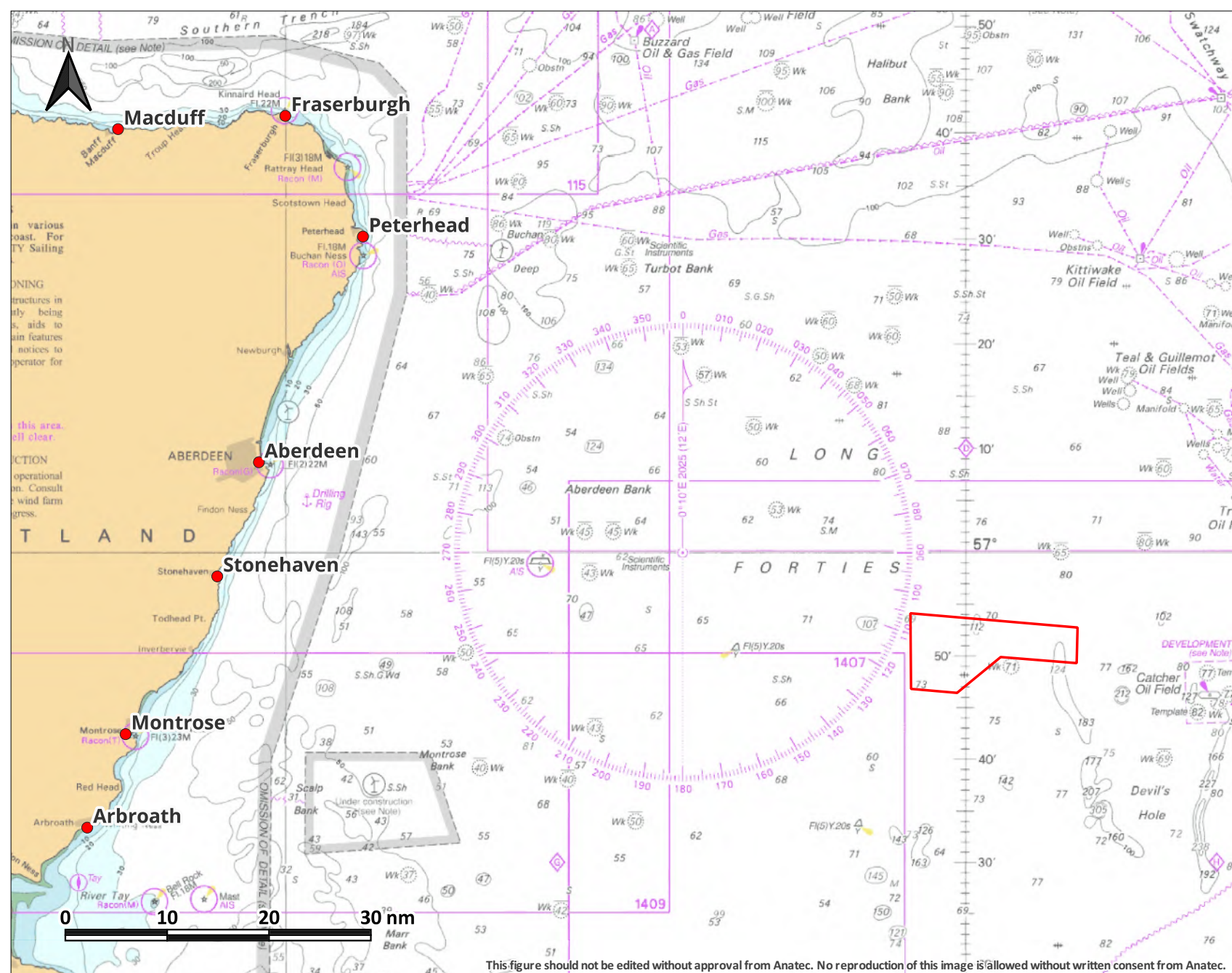
Figure Title

DFT SAR Heli Taskings by Tasking Type (2015-2024)

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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- RNLI Stations



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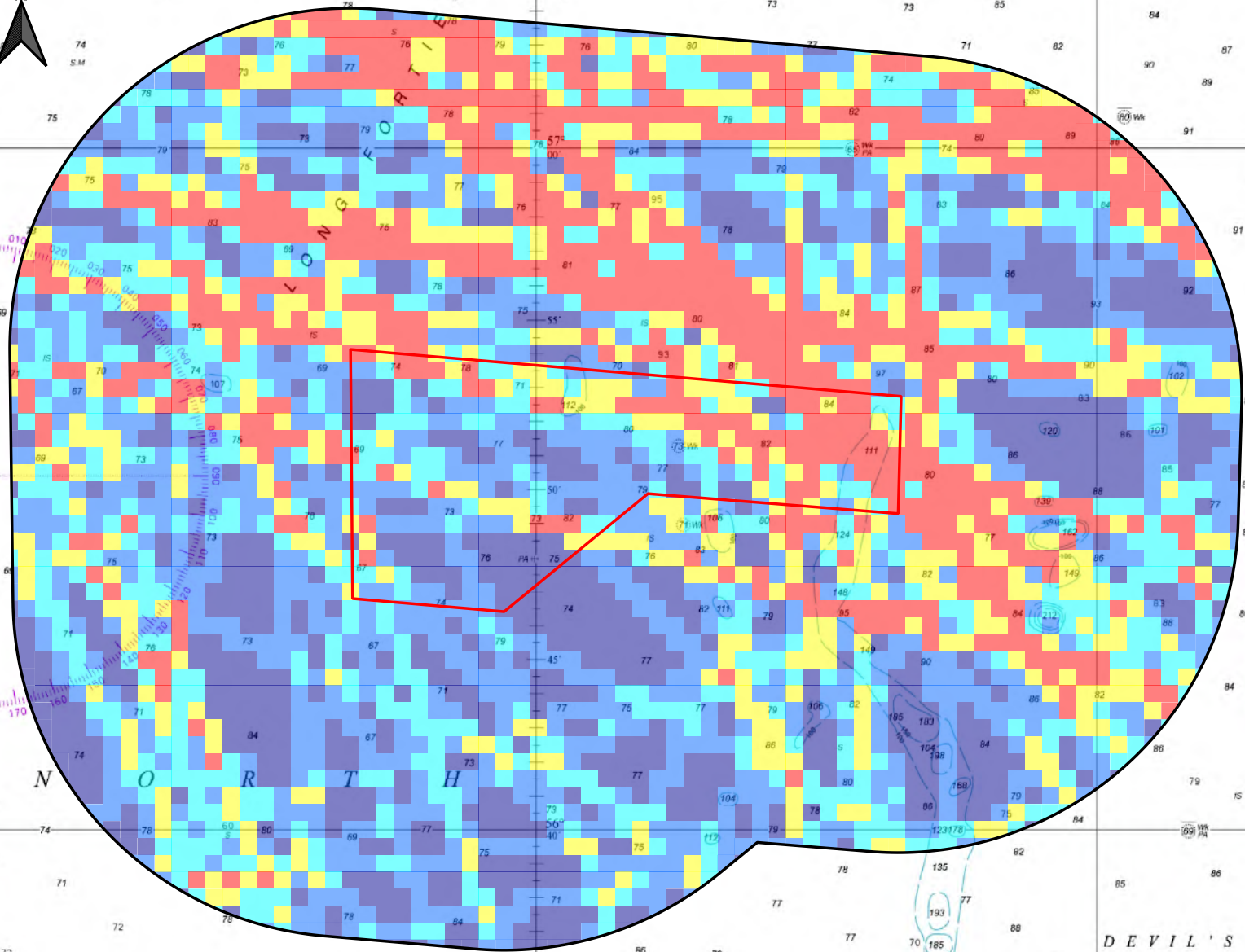
Figure Title

RNLI Stations in Proximity to Bellrock WFDA

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Study Area
- Vessel Density**
- Highest
-
-
- Lowest



Project

A4900 Bellrock Offshore Wind Farm

Figure Title

14-Day Vessel Traffic Survey Data Density Heat Map (Summer, 2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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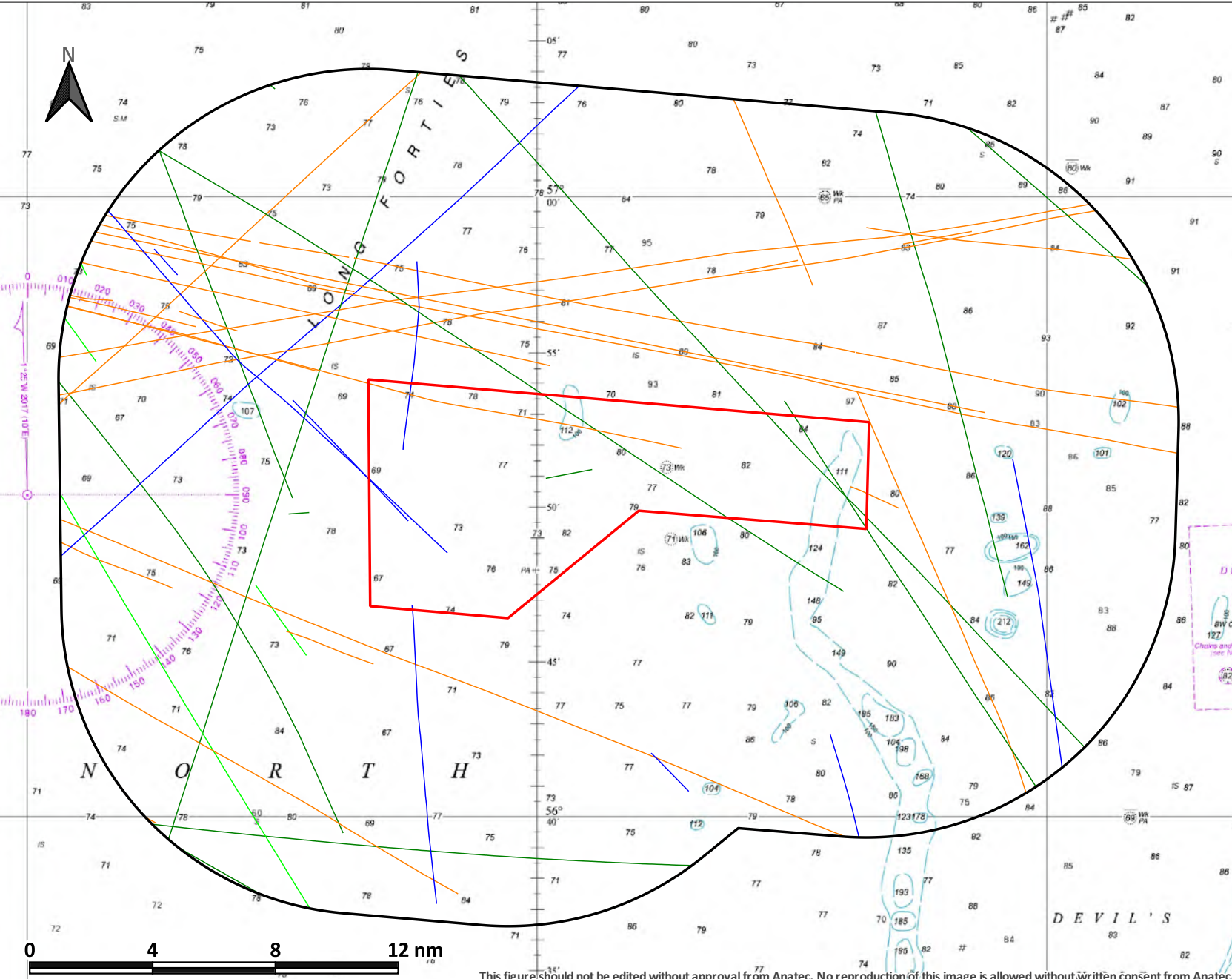
Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Study Area
- Vessel Type**
- Fishing
- Cargo
- Tanker
- Oil and Gas



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Project

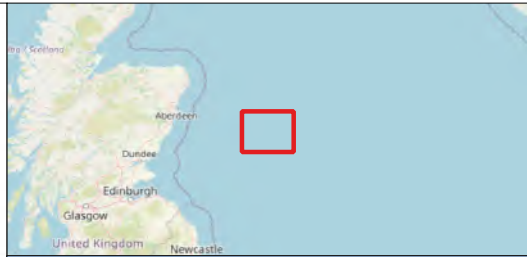
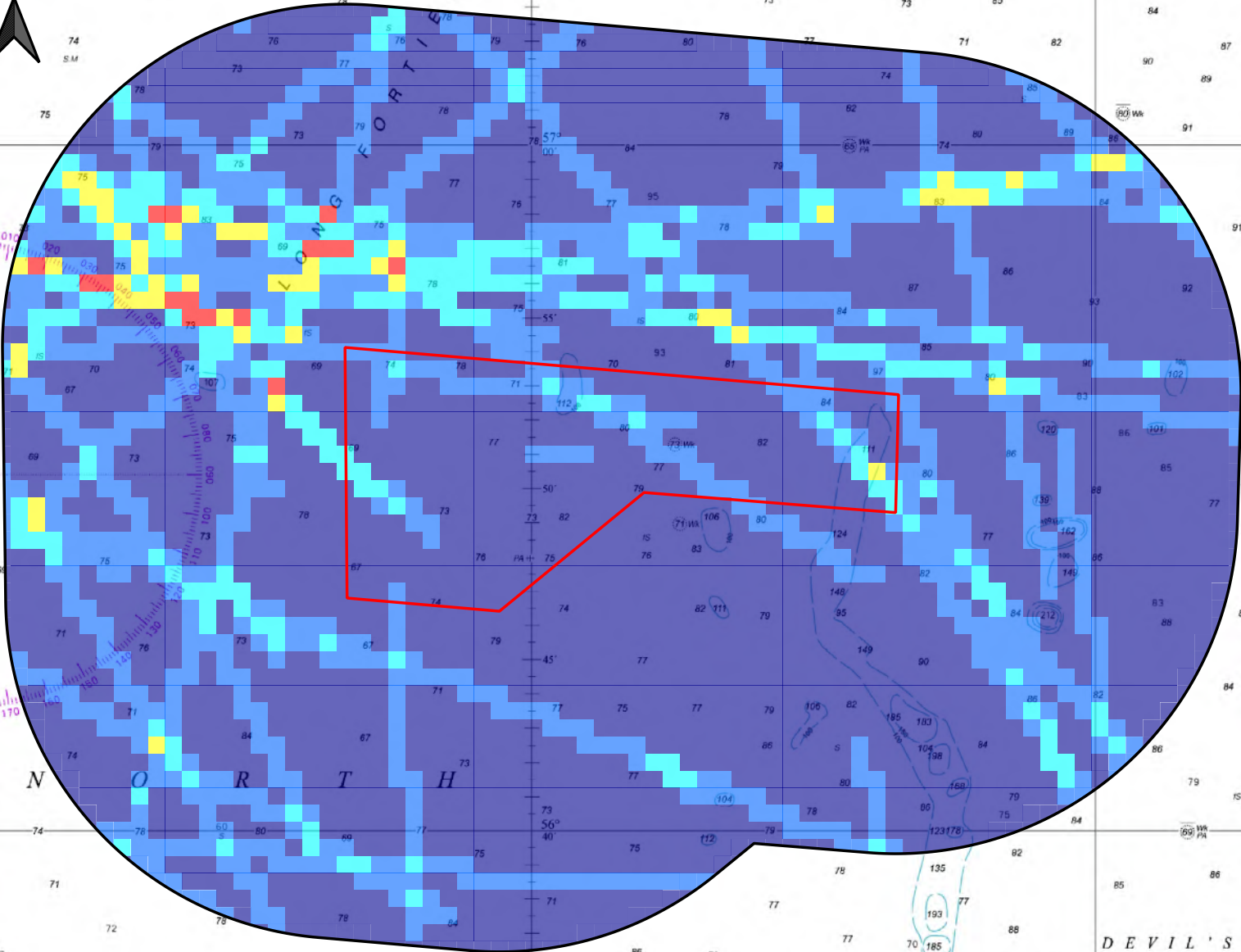
A4900 Bellrock Offshore Wind Farm

Figure Title

14-Day AIS Vessel Traffic Data by Vessel Type (Winter, 2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)



Legend

- WFDA
- Study Area
- Vessel Density**
- Highest
-
-
- Lowest



Project

A4900 Bellrock Offshore Wind Farm

Figure Title

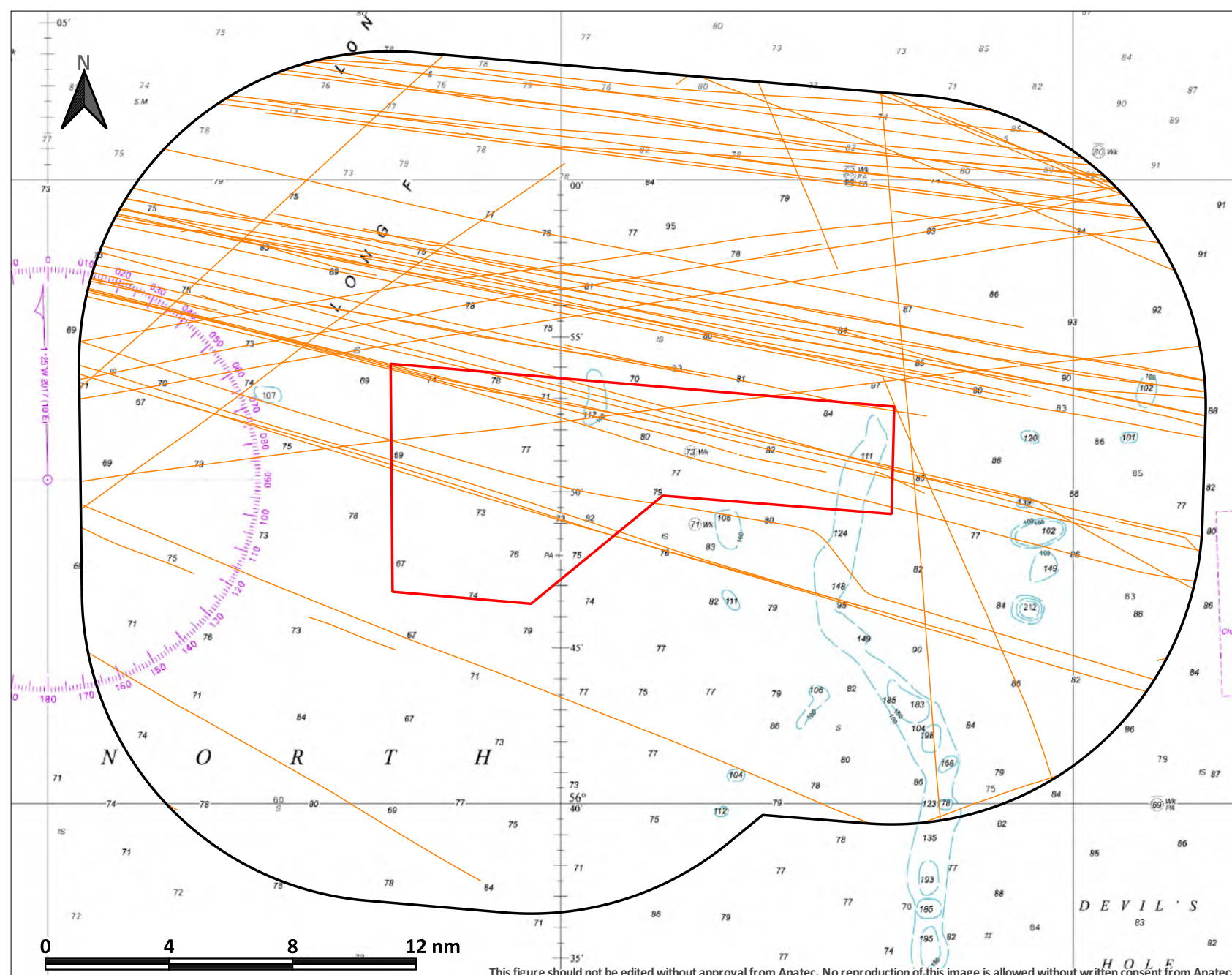
14-Day AIS Vessel Traffic Data Density Heat Map (Winter, 2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)



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Legend

- WFDA
- Study Area
- Vessel Type**
- Oil and Gas



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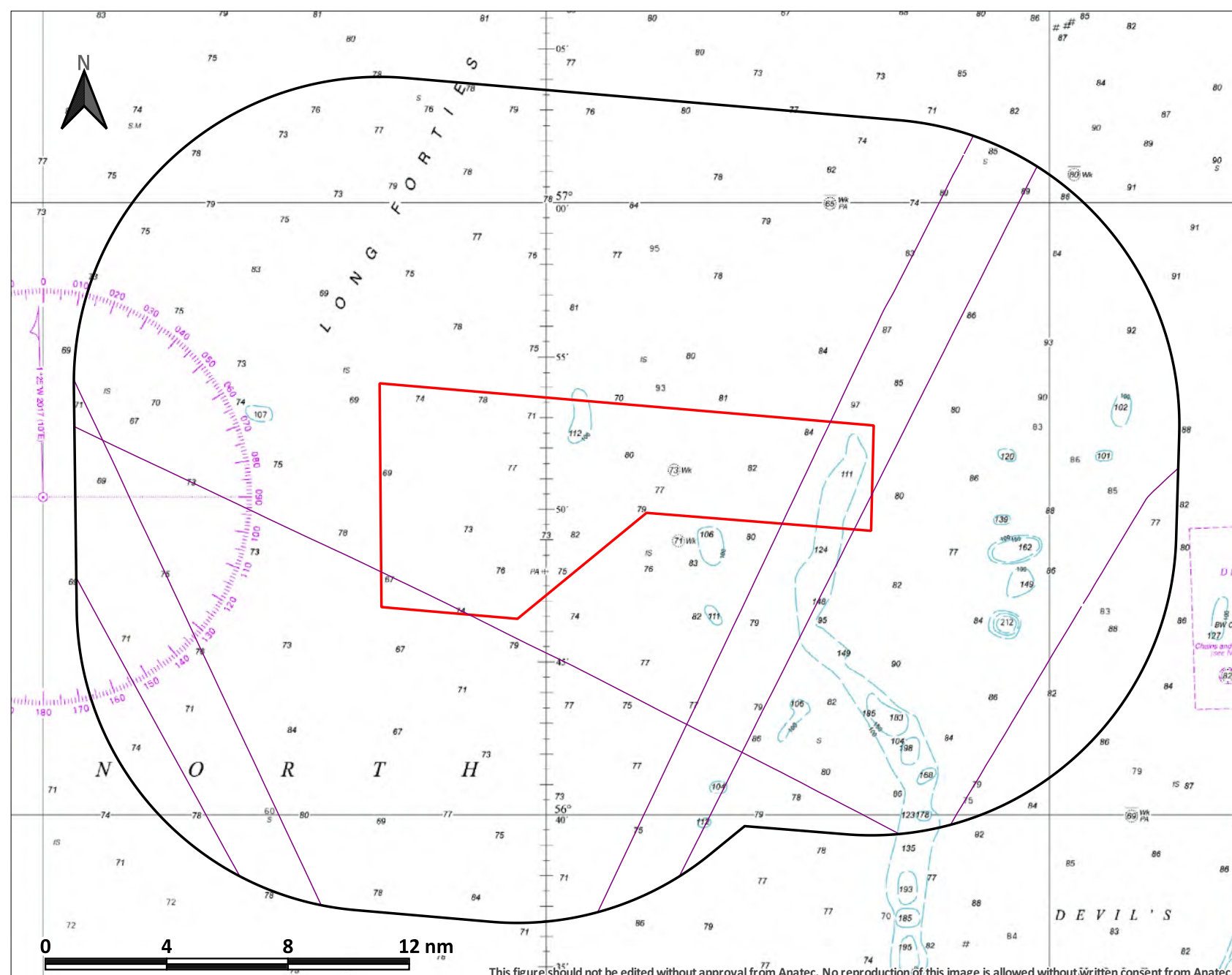
Figure Title

28-Day Oil and Gas Vessel Traffic Data (2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Study Area
- Vessel Type**
- Passenger



Project

A4900 Bellrock Offshore Wind Farm

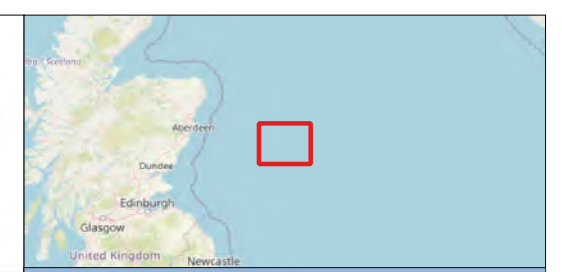
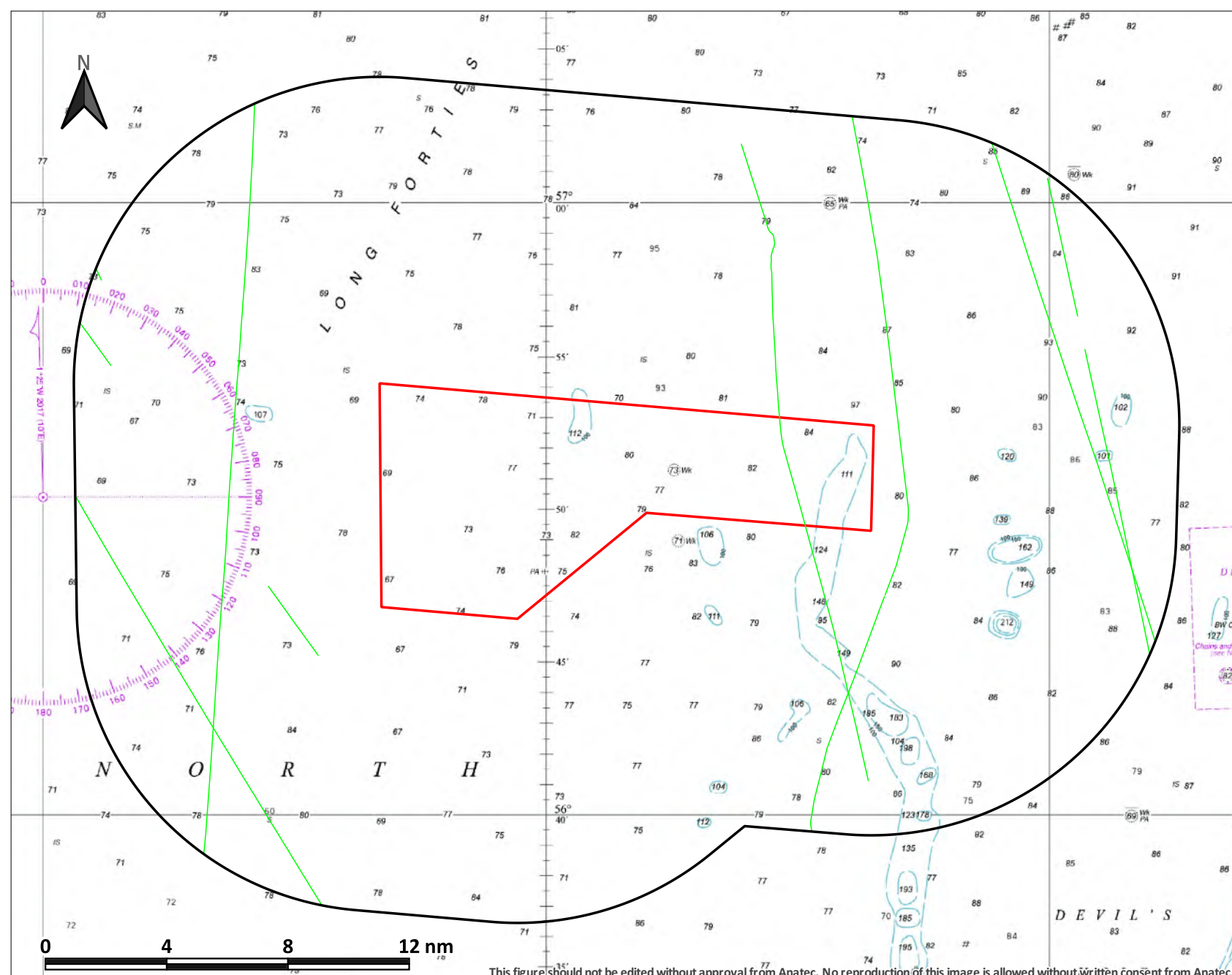
Figure Title

28-Day Passenger Vessel Traffic Data (2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Study Area
- Fishing



Project

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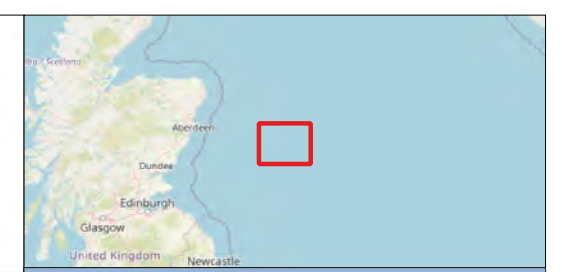
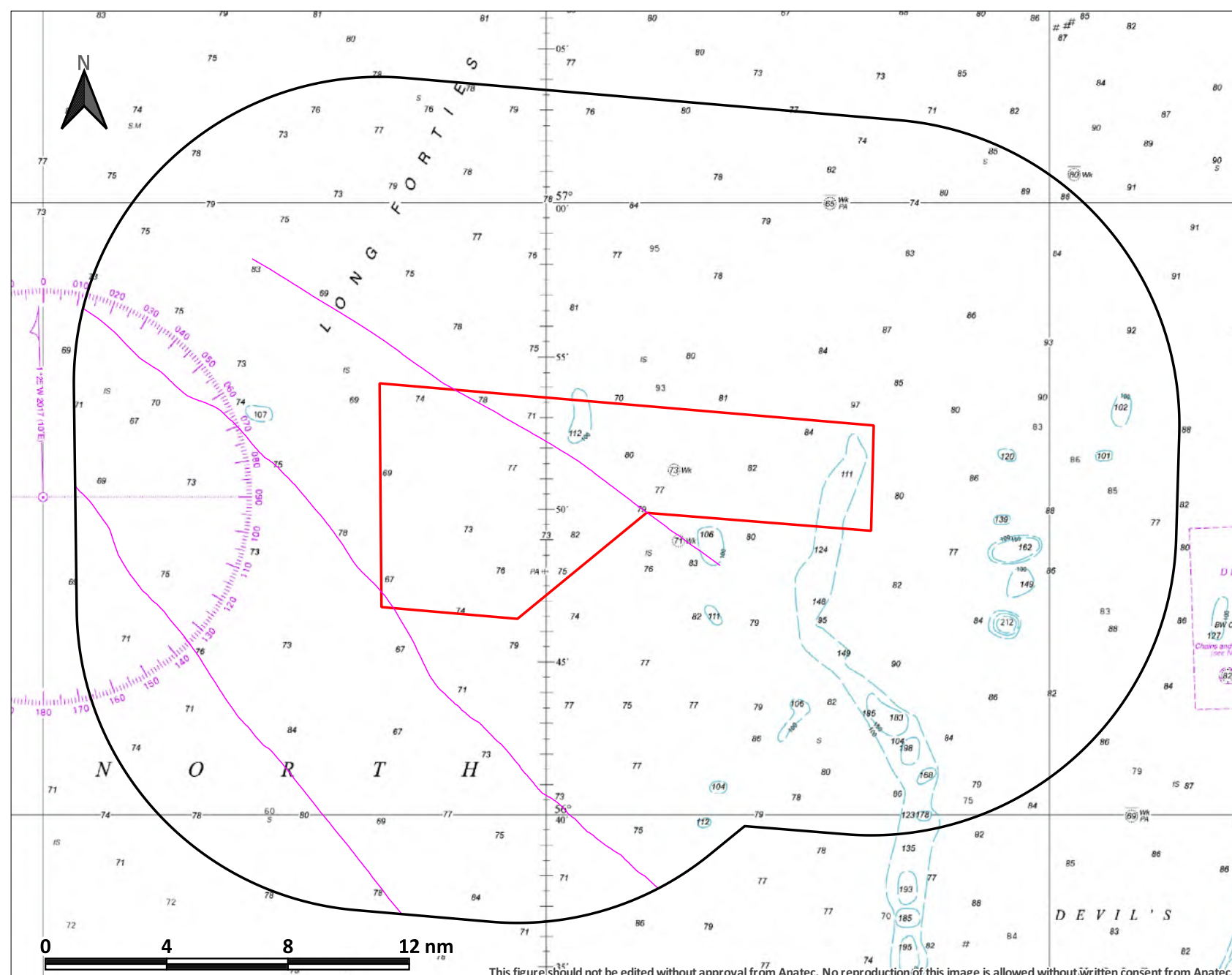
Figure Title

28-Day Fishing Vessel Traffic Data (2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Study Area
- Recreational



Project

A4900 Bellrock Offshore Wind Farm

Figure Title

28-Day Recreational Vessel Traffic Data (2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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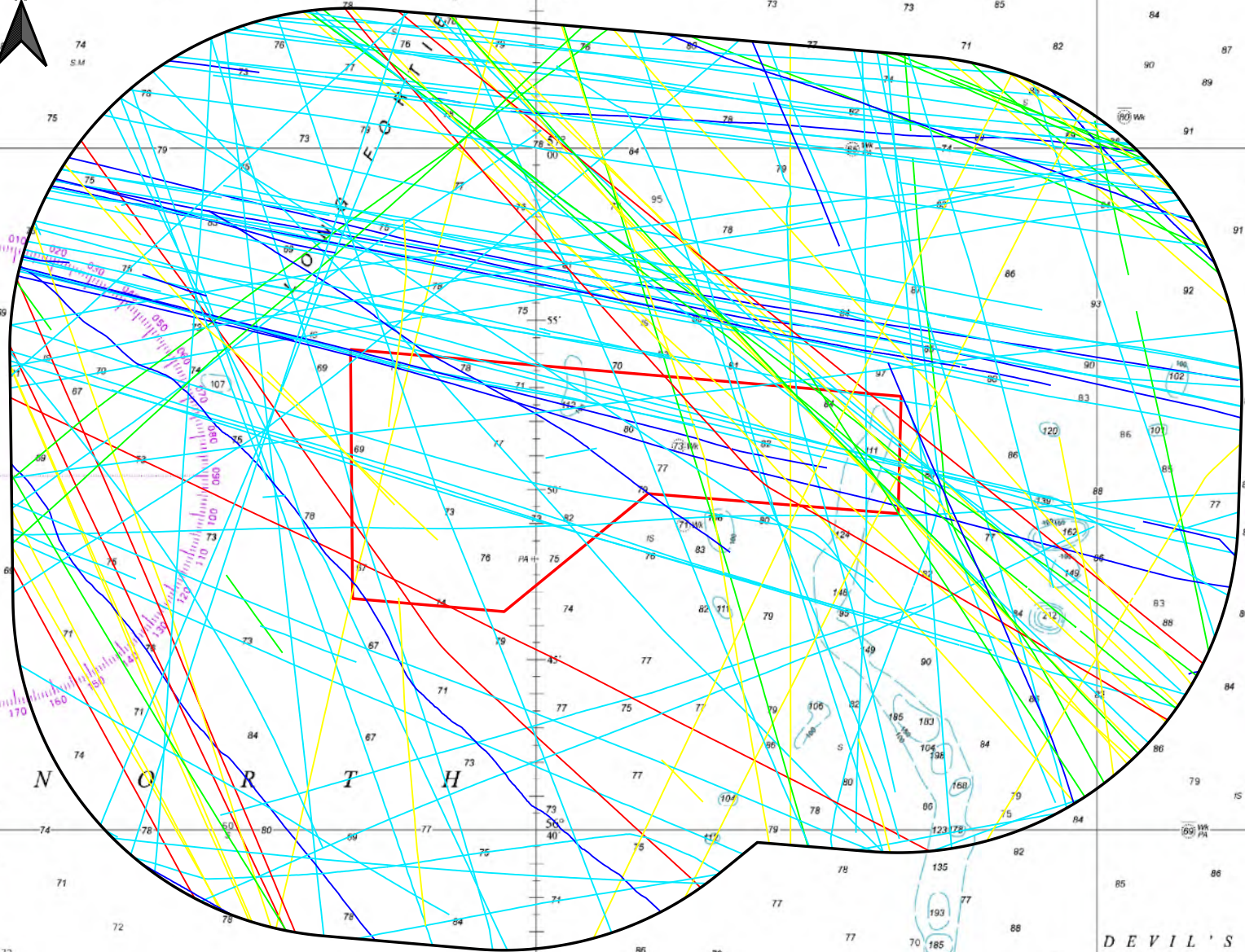
Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Study Area
- Vessel LOA (m)**
- < 70
- 70 - 140
- 140 - 210
- 210 - 280
- >= 280



Project

A4900 Bellrock Offshore Wind Farm

Figure Title

28-Day Vessel Traffic Data by LOA (2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

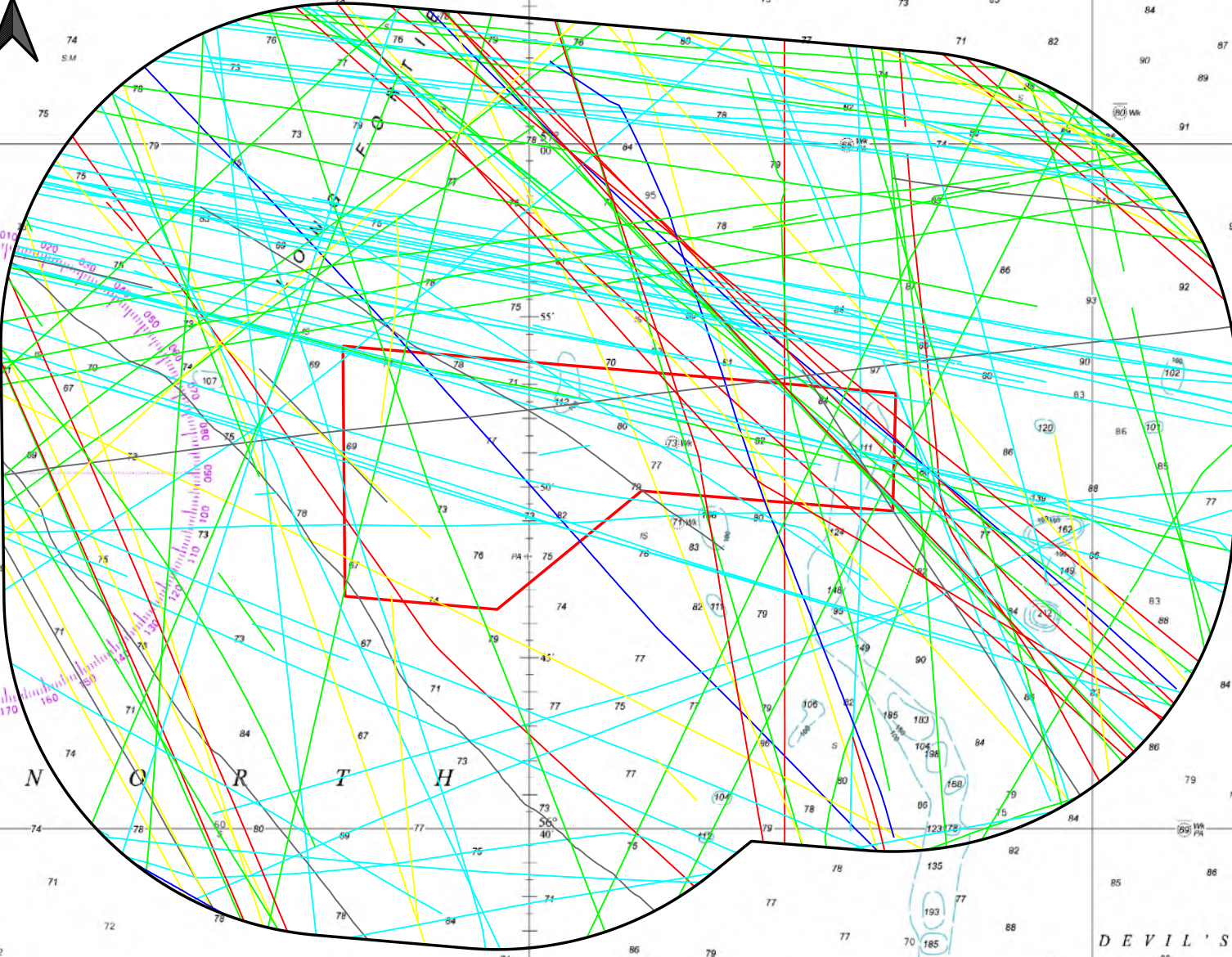


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Legend

- WFDA
- Study Area
- Vessel Draught (m)**
- Unspecified
- < 4
- 4 - 6
- 6 - 8
- 8 - 10
- >= 10



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Project

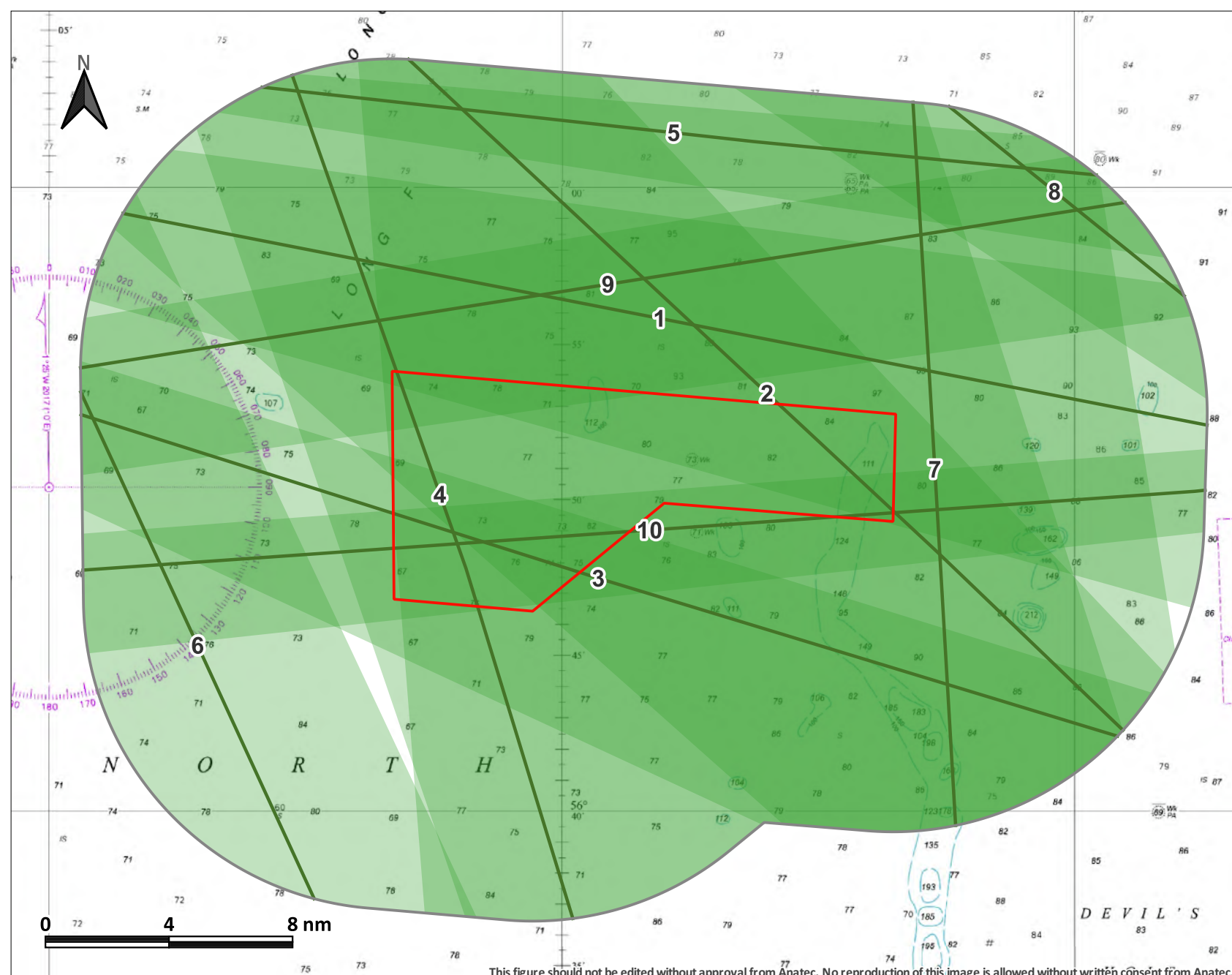
A4900 Bellrock Offshore Wind Farm

Figure Title

28-Day Vessel Traffic Data by Vessel Draught (2024)

Date: 20/03/2026	Drawn: RR	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)



Legend

- WFDA
- Study Area
- Main Commercial Route Mean Position
- 90th Percentile



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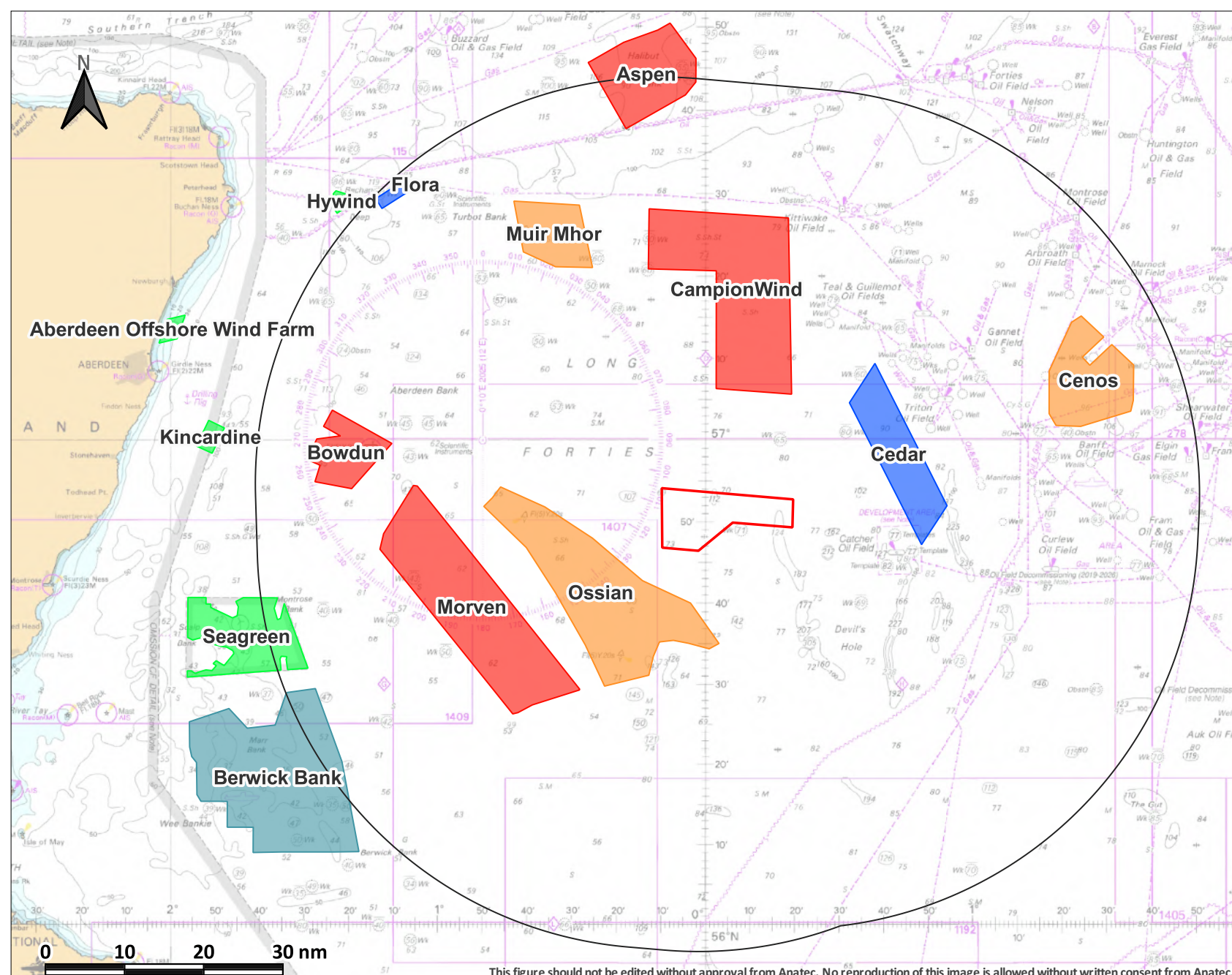
Figure Title

Main Commercial Routes – Mean Route Positions and 90th Percentiles

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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- 50nm Buffer
- Development Phase**
- Pre-scoping
- Scoped
- Consent Application Submitted
- Consented
- Operational



Project

A4900 Bellrock Offshore Wind Farm

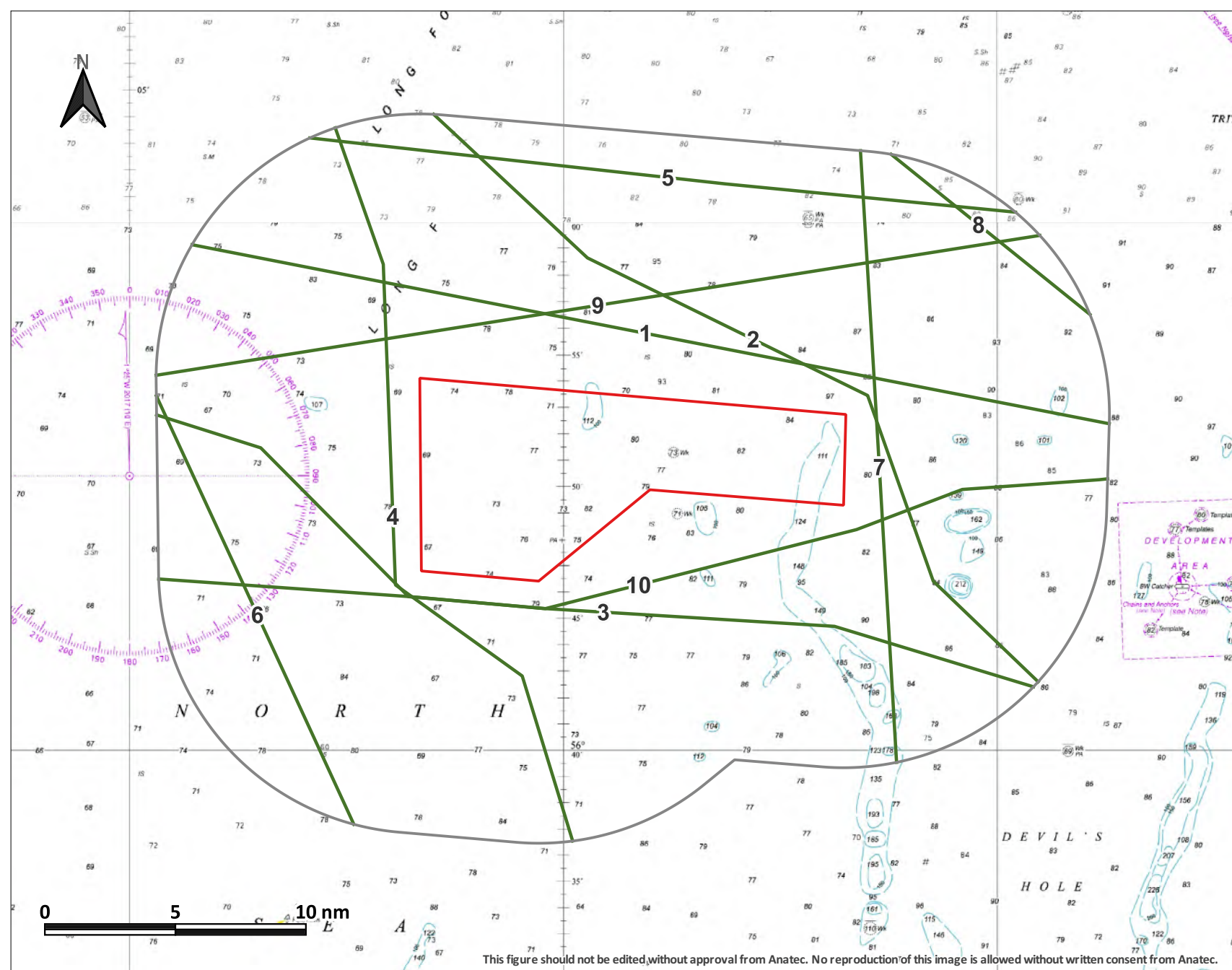
Figure Title

Cumulative Developments within 50nm of Bellrock WFDA

Date: 20/03/2026	Drawn: LA	Checked: JM
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Legend

- WFDA
- Study Area
- Main Commercial Route Mean Position



Project

A4900 Bellrock Offshore Wind Farm

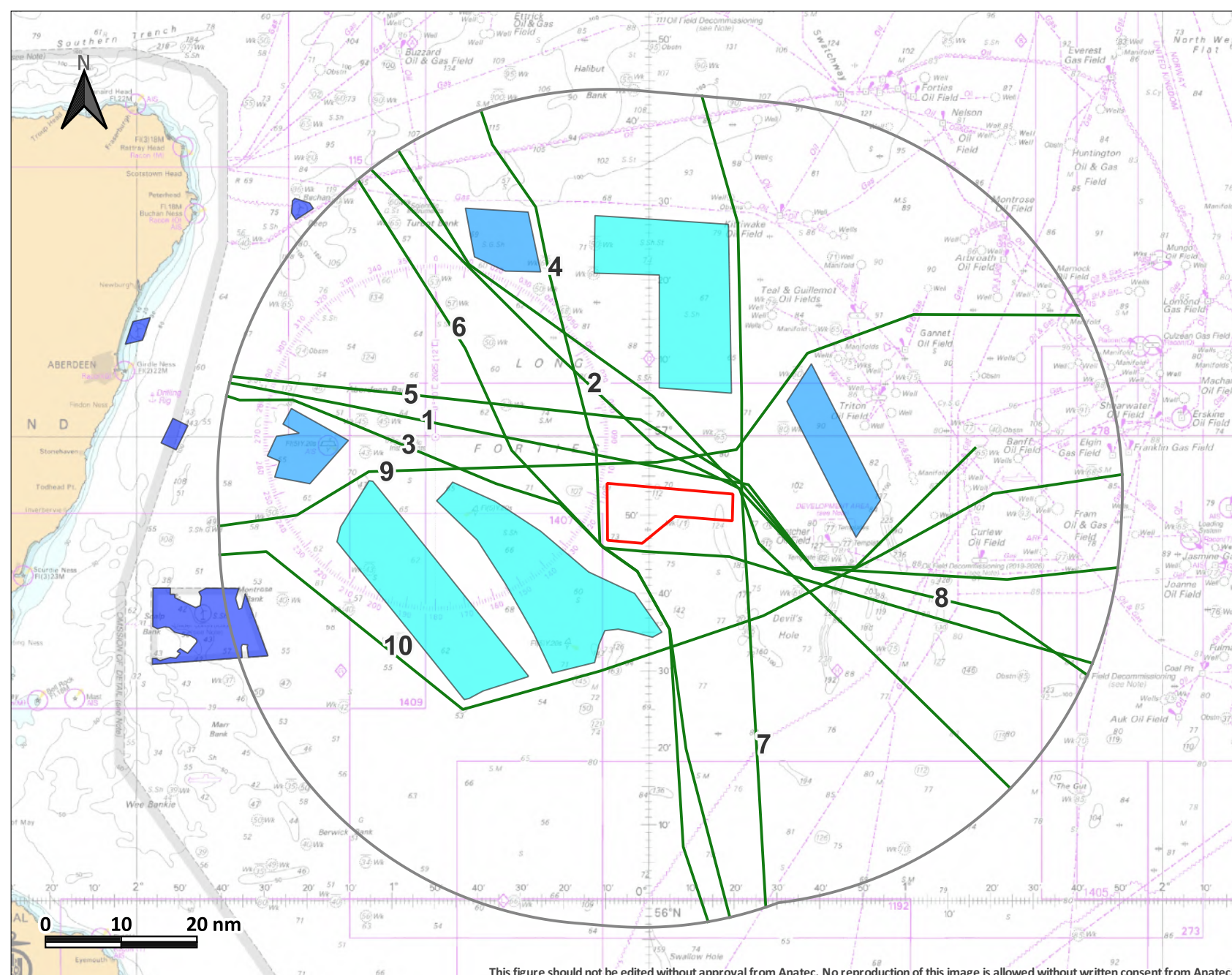
Figure Title

Main Commercial Routes Post Wind Farm – Mean Route Positions

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- 50 nm Buffer
- Cumulative Main Commercial Route
- Mean Position Post Wind Farm

Cumulative Development

- Tier 1
- Tier 2
- Baseline



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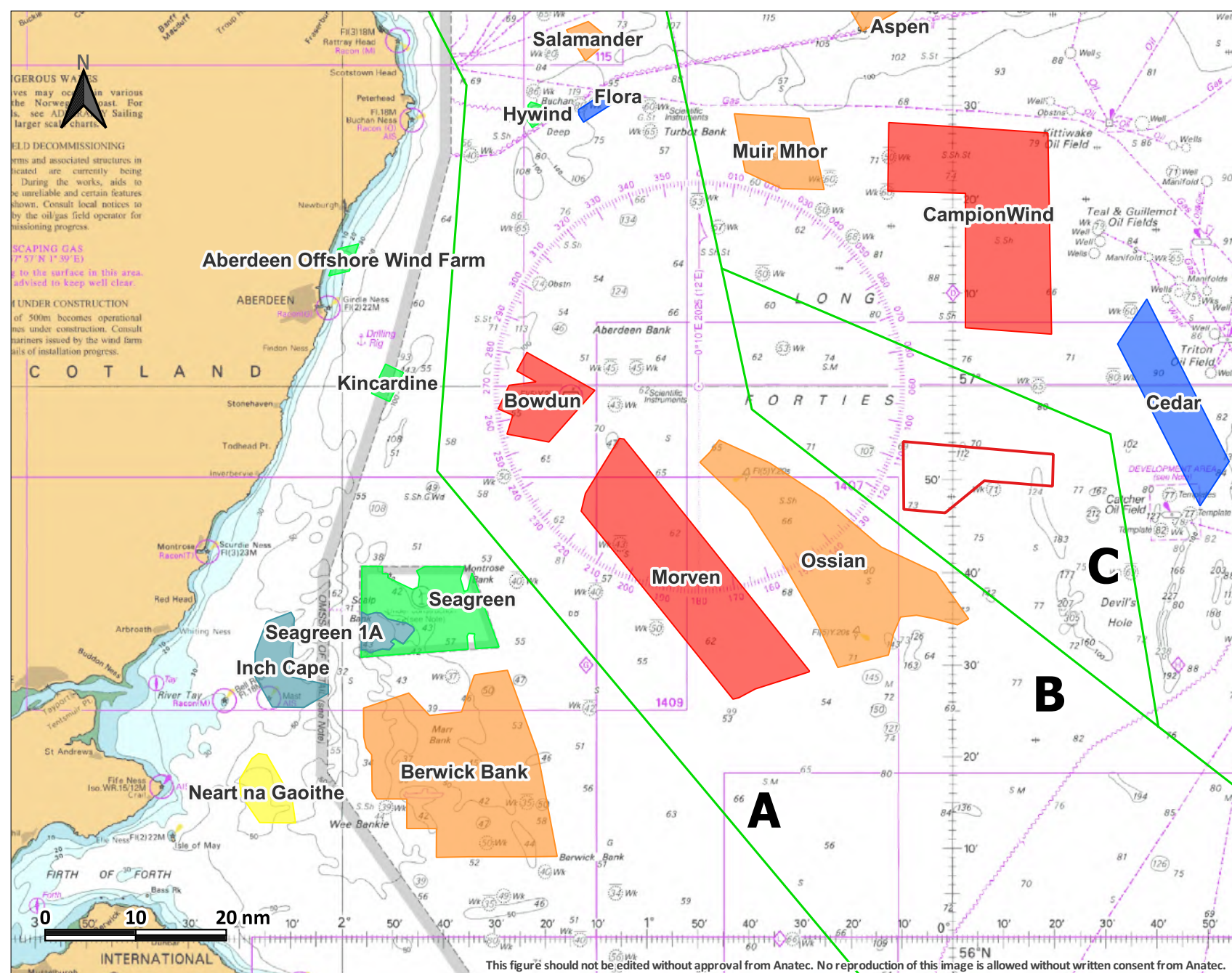
Figure Title

Cumulative Main Commercial Routes Post Wind Farm – Mean Route Position

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
 - Future Case Cumulative Routing Option
- Wind Farm Phase**
- Pre-scoping
 - Scoped
 - Consent Application Submitted
 - Consented
 - Under Construction
 - Operational



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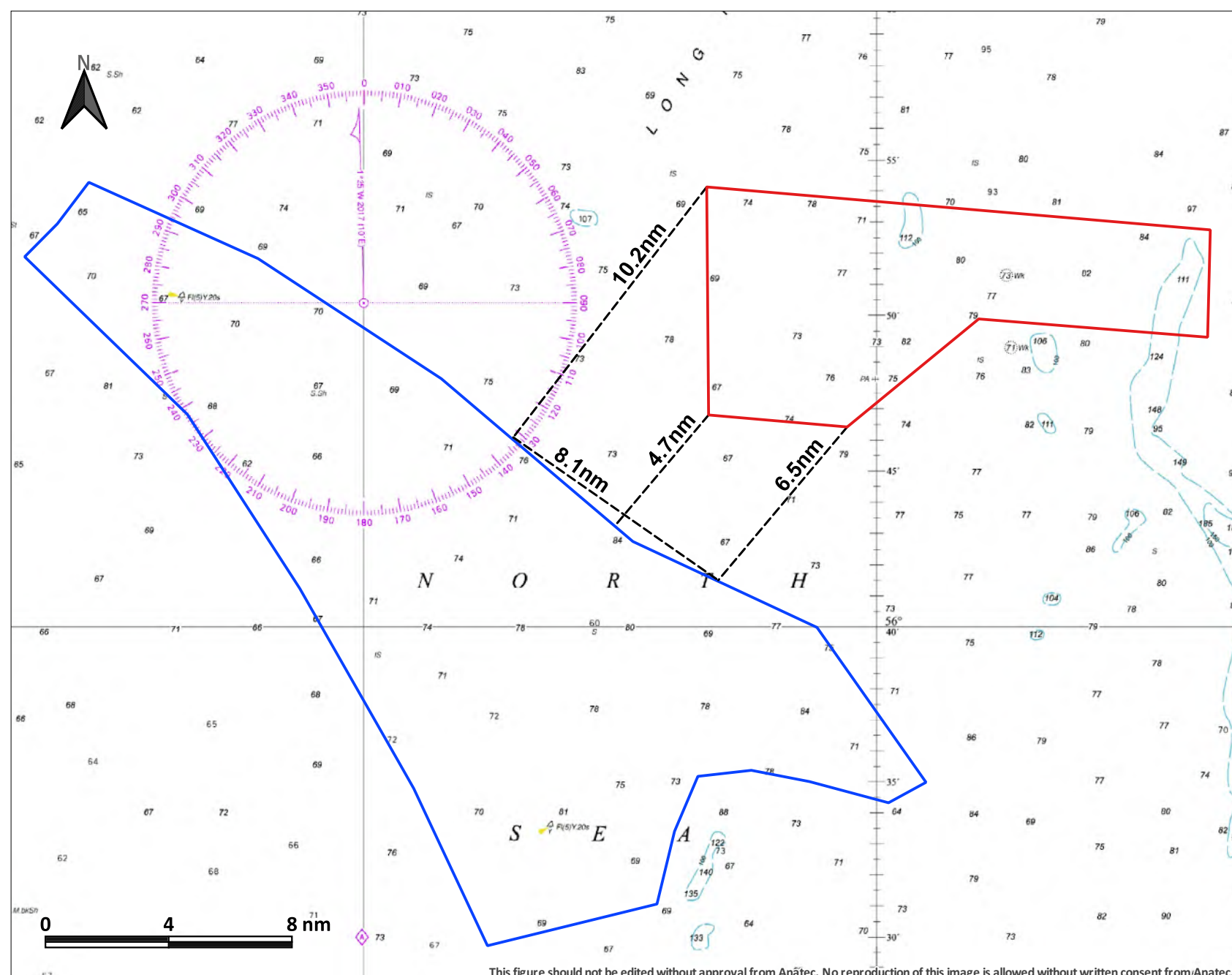
Figure Title

Future Case Cumulative Routing Options

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Ossia OWF



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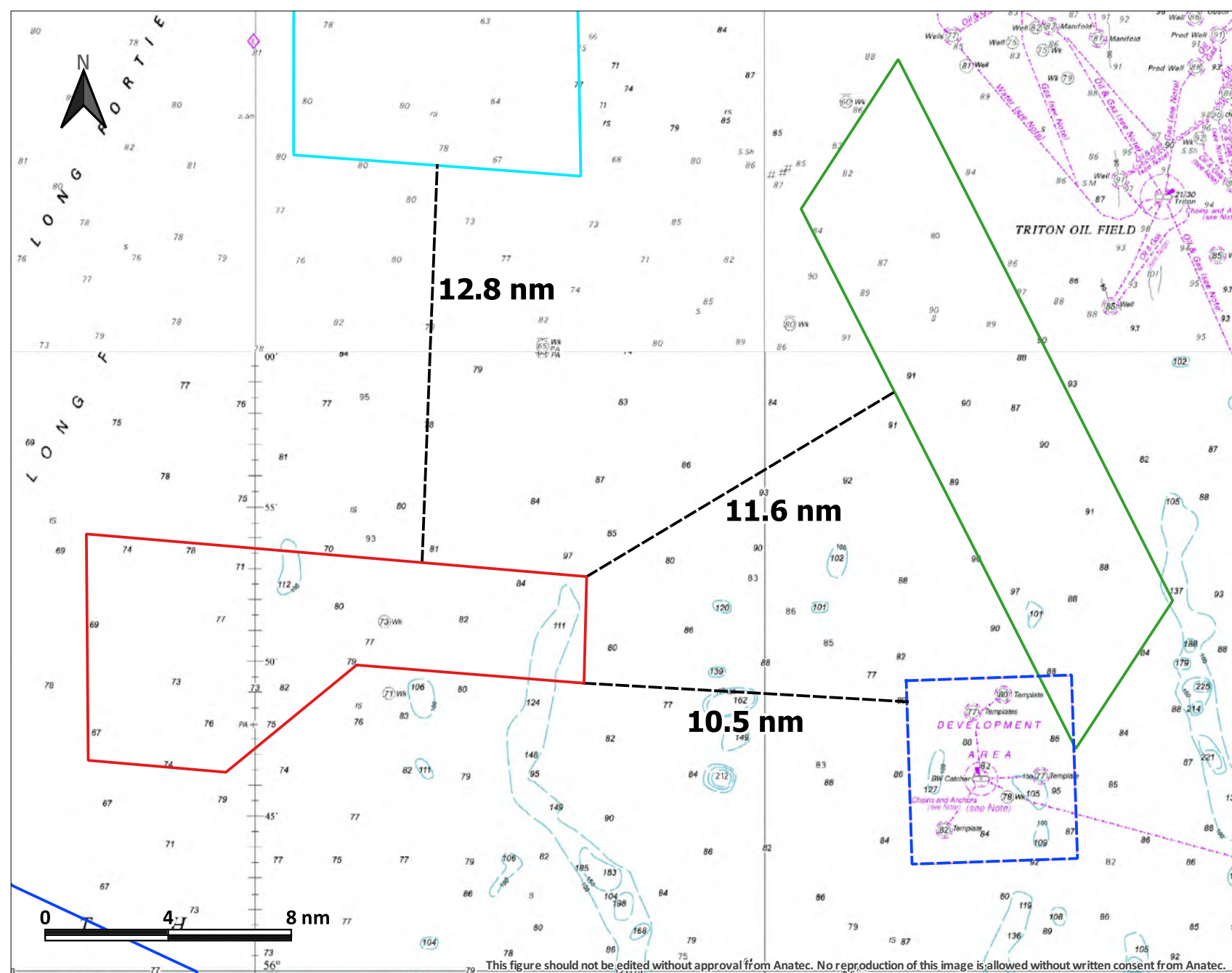
Figure Title

Ossia and Bellrock Gap

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Campion Wind OWF
- Cedar OWF
- Catcher Development Area



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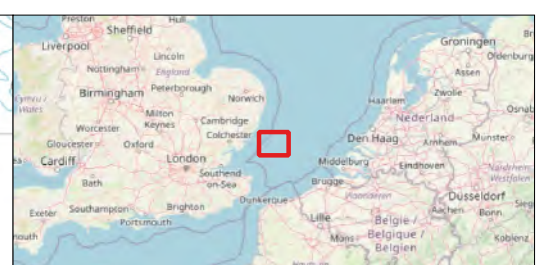
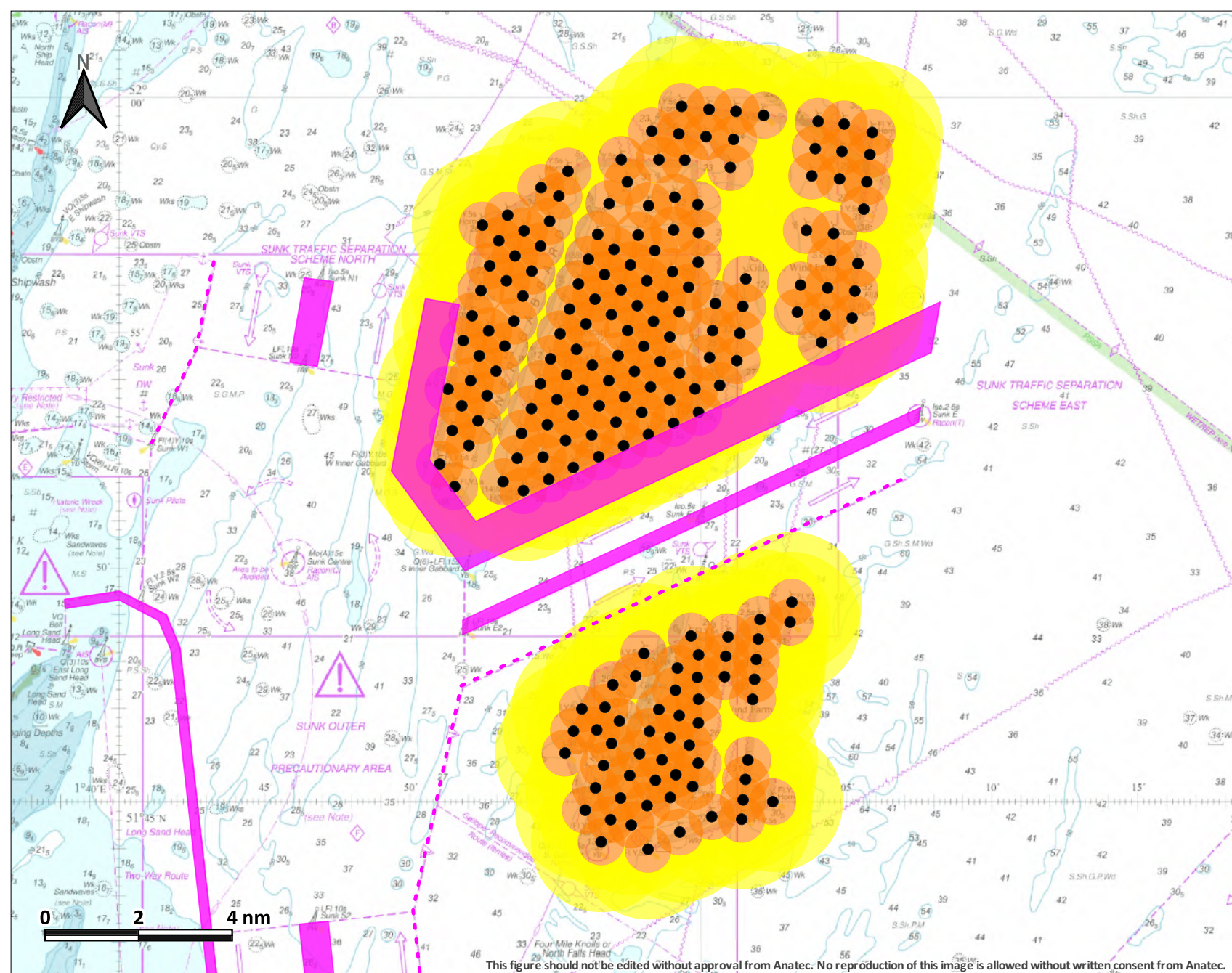
Figure Title

Bellrock Gap with Other Cumulative Developments

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Legend

- Galloper and Greater Gabbard WTG Location

IMO Routing Measures

- TSS Separation Zones
- - - TSS Boundary Lines

Radar Interference

- 0.5 nm
- 1.5 nm



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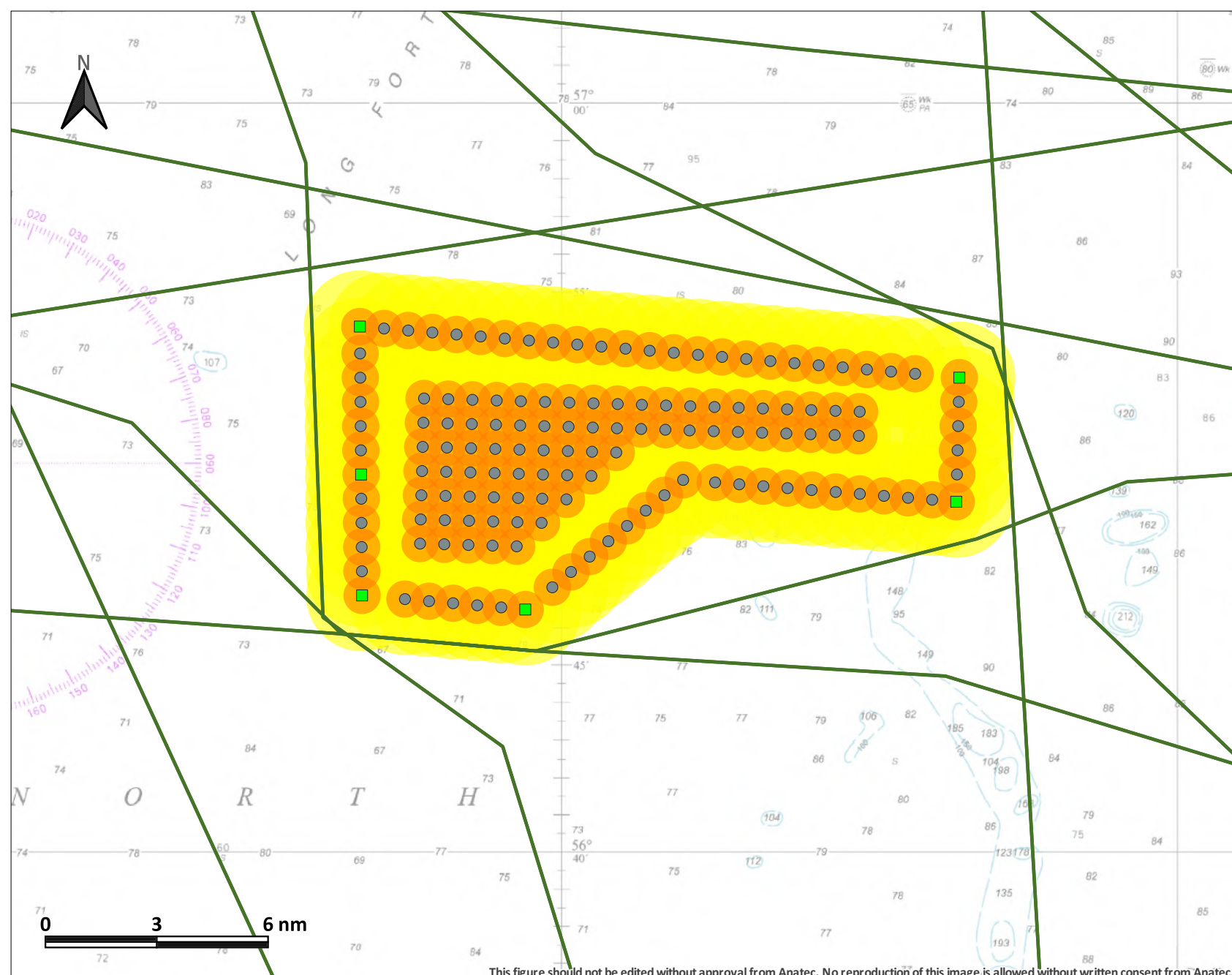
Figure Title

Illustration of Potential Radar Interference at Galloper and Greater Gabbard Offshore Wind Farms

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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- Post Wind Farm Main Commercial Route Mean Position
- Surface Infrastructure**
- WTG
- OFSS
- Radar Interference**
- 0.5 nm
- 1.5 nm



Project

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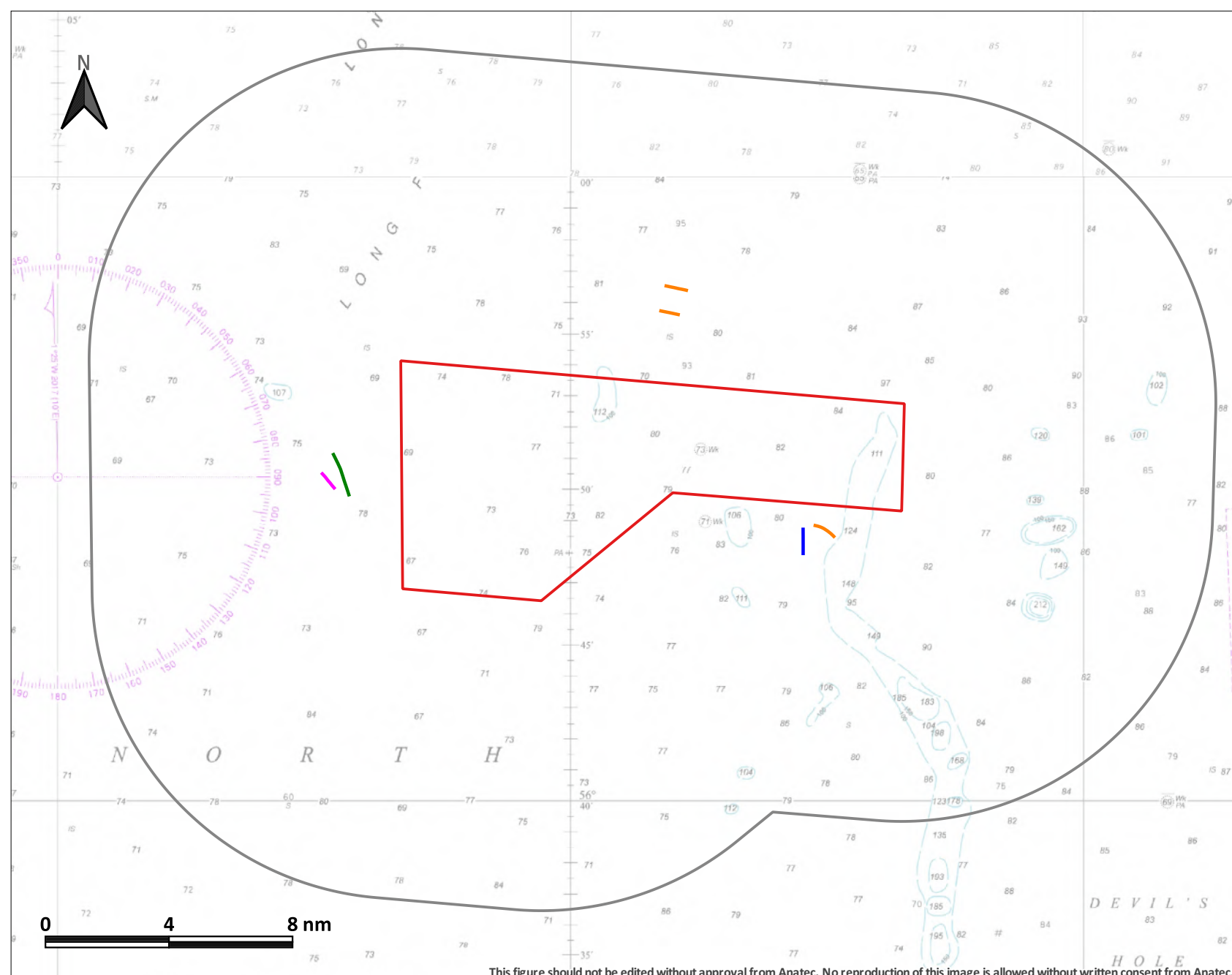
Figure Title

Illustration of Potential Radar Interference at Bellrock Offshore Wind Farm

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)





Legend

- WFDA
- Study Area
- Vessel Type**
- Cargo
- Tanker
- Recreational
- Oil and Gas



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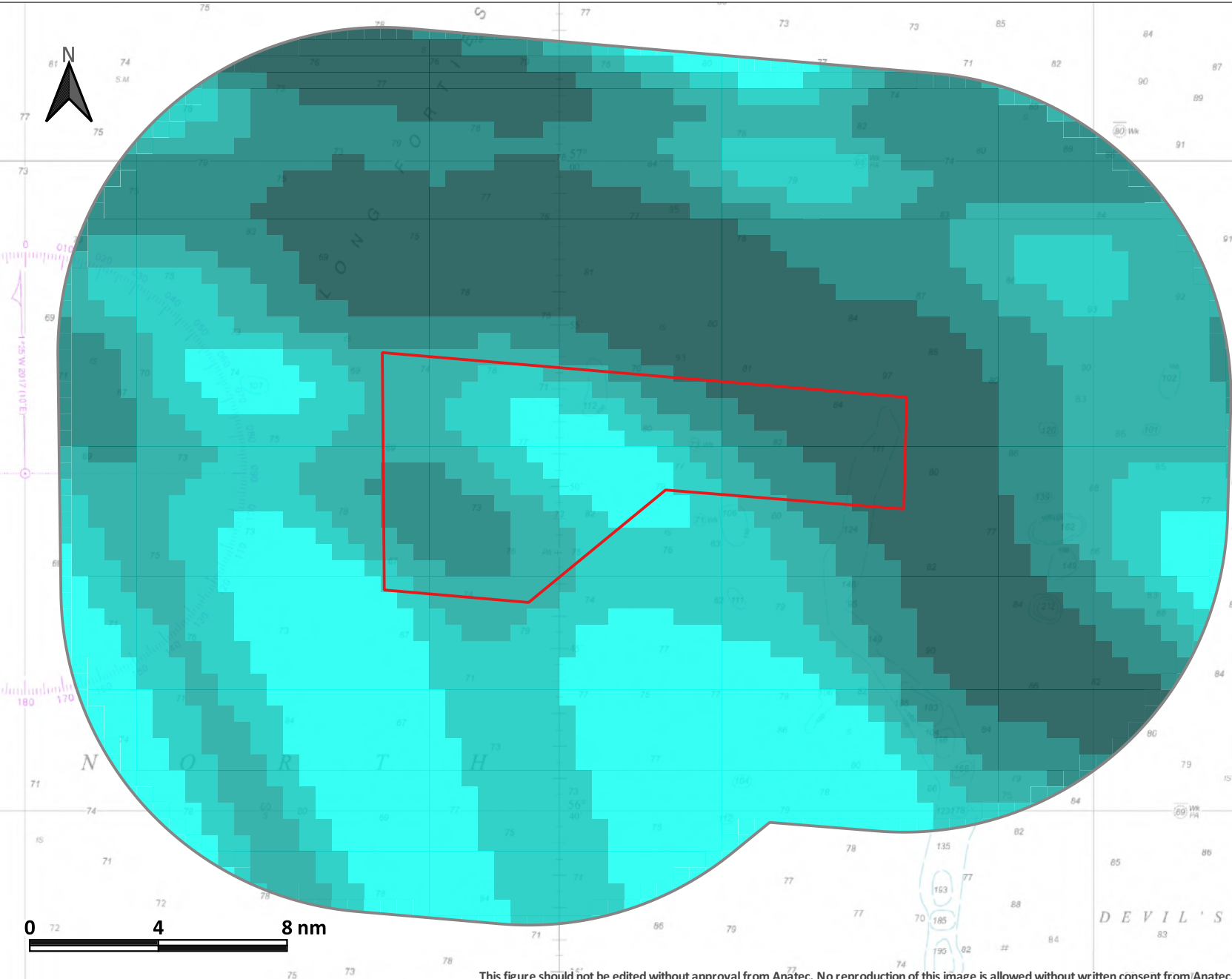
Figure Title

28-Day Vessel Traffic Survey Data Vessel Encounters by Vessel Type

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend

- WFDA
- Study Area
- Collision Risk**
- Lowest
-
-
- Highest



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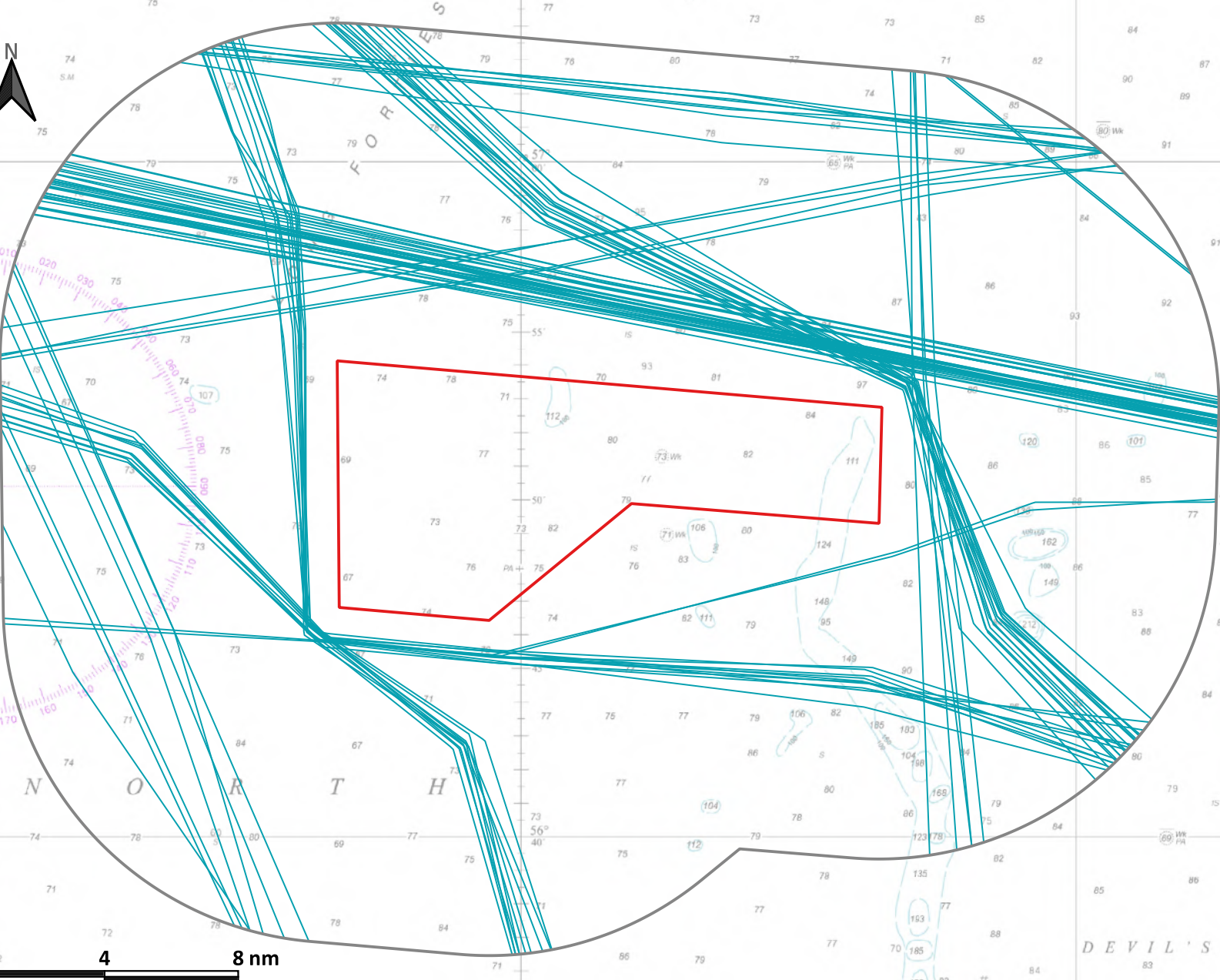
Figure Title

Pre Wind Farm Base Case Vessel to Vessel Collision Risk Heat Map

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)




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Legend

-  WFDA
-  Study Area
-  Simulated AIS Track



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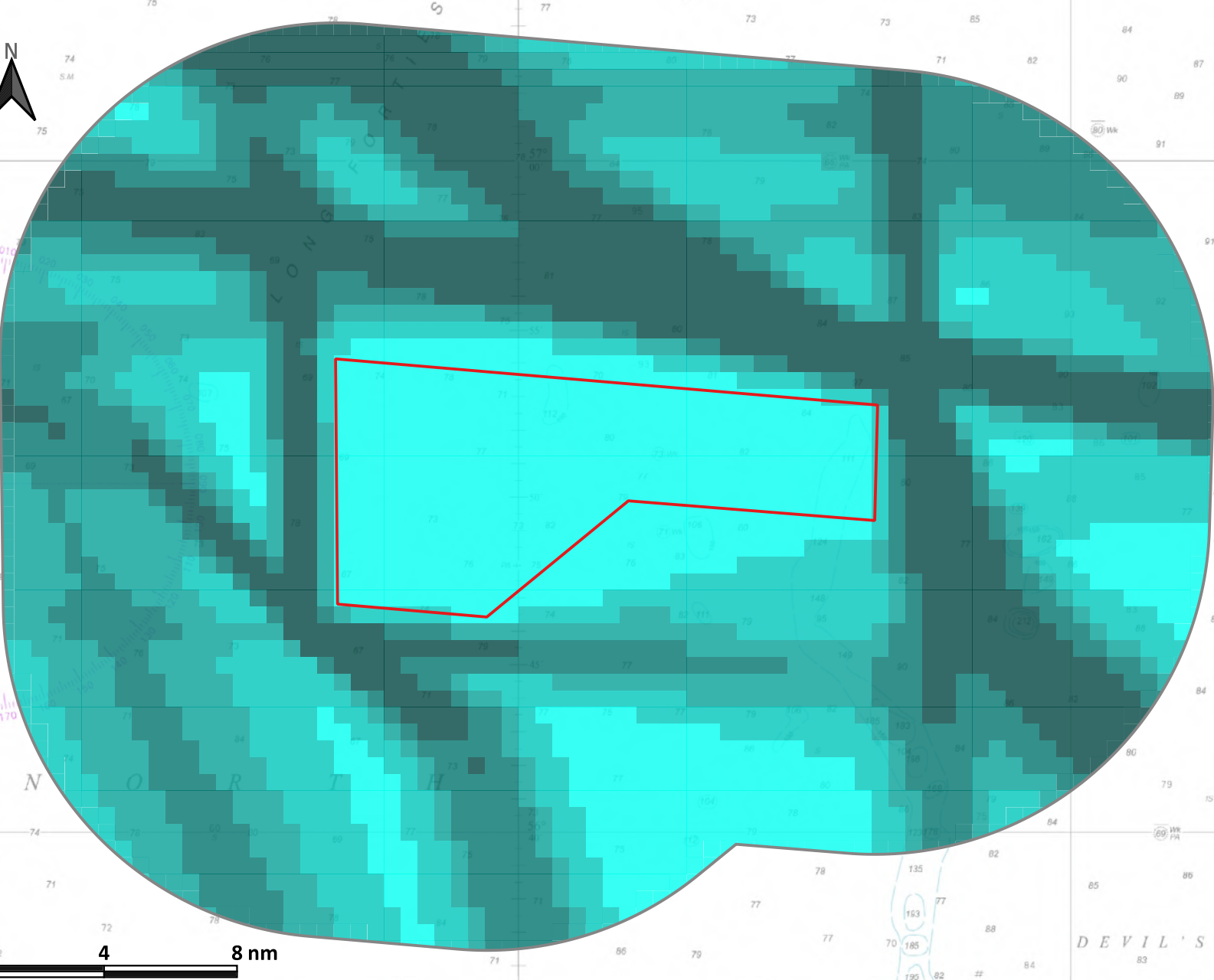
A4900 Bellrock Offshore Wind Farm

Figure Title

Post Wind Farm Base Case Simulated AIS (28 Days)

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)



Legend

-  WFDA
-  Study Area
- Collision Risk**
-  Lowest
- 
- 
-  Highest



Project

A4900 Bellrock Offshore Wind Farm

Figure Title

Post Wind Farm Base Case Vessel to Vessel Collision Risk Heat Map

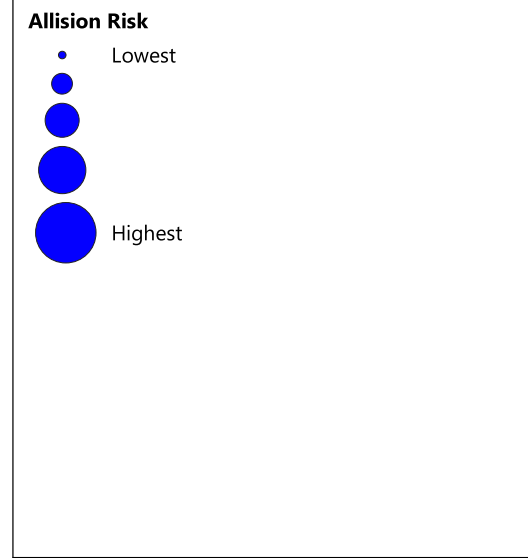
Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)

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Legend



Project

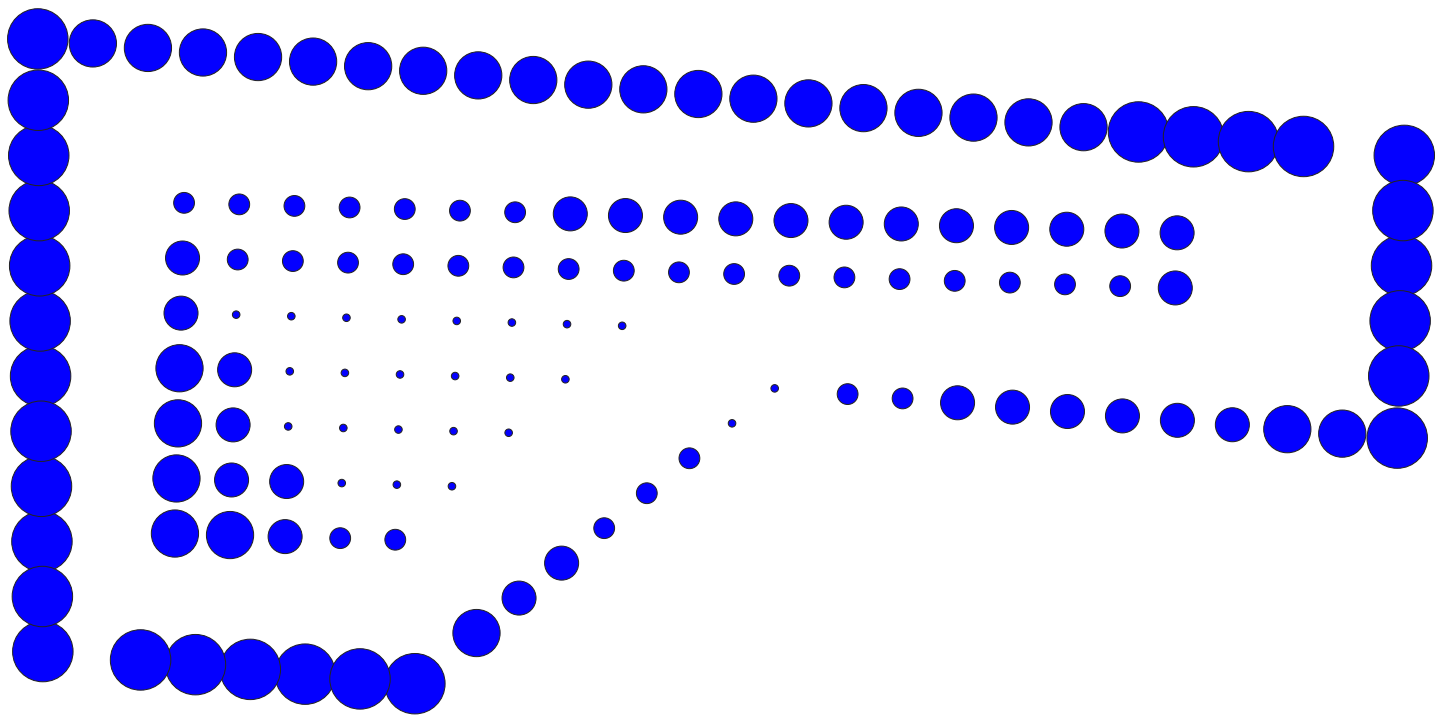
A4900 Bellrock Offshore Wind Farm

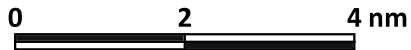
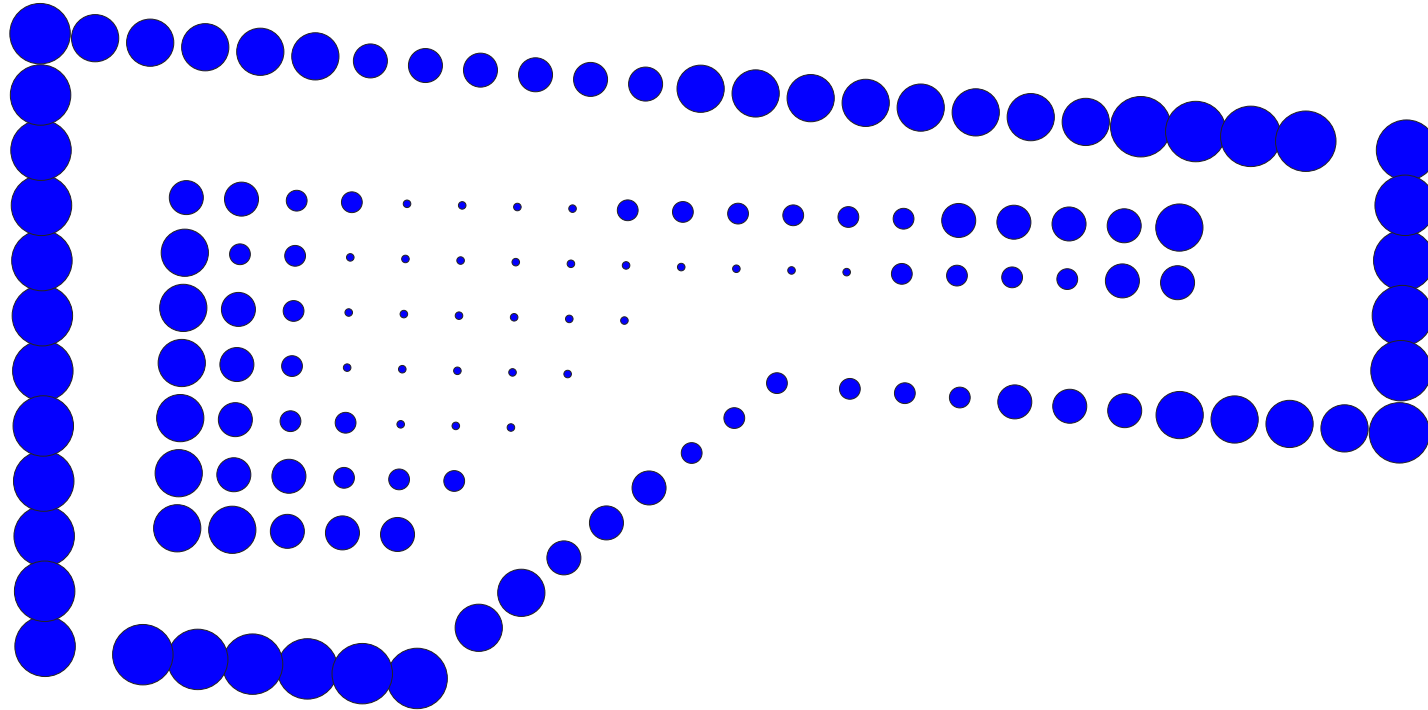
Figure Title

Post Wind Farm Base Case Powered Allision Risk per Structure

Date: 20/03/2026	Drawn: LA	Checked: JM
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Coordinate System: WGS 84 / World Mercator (EPSG:3395)



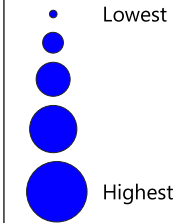


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Legend

Allision Risk



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Figure Title

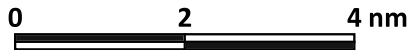
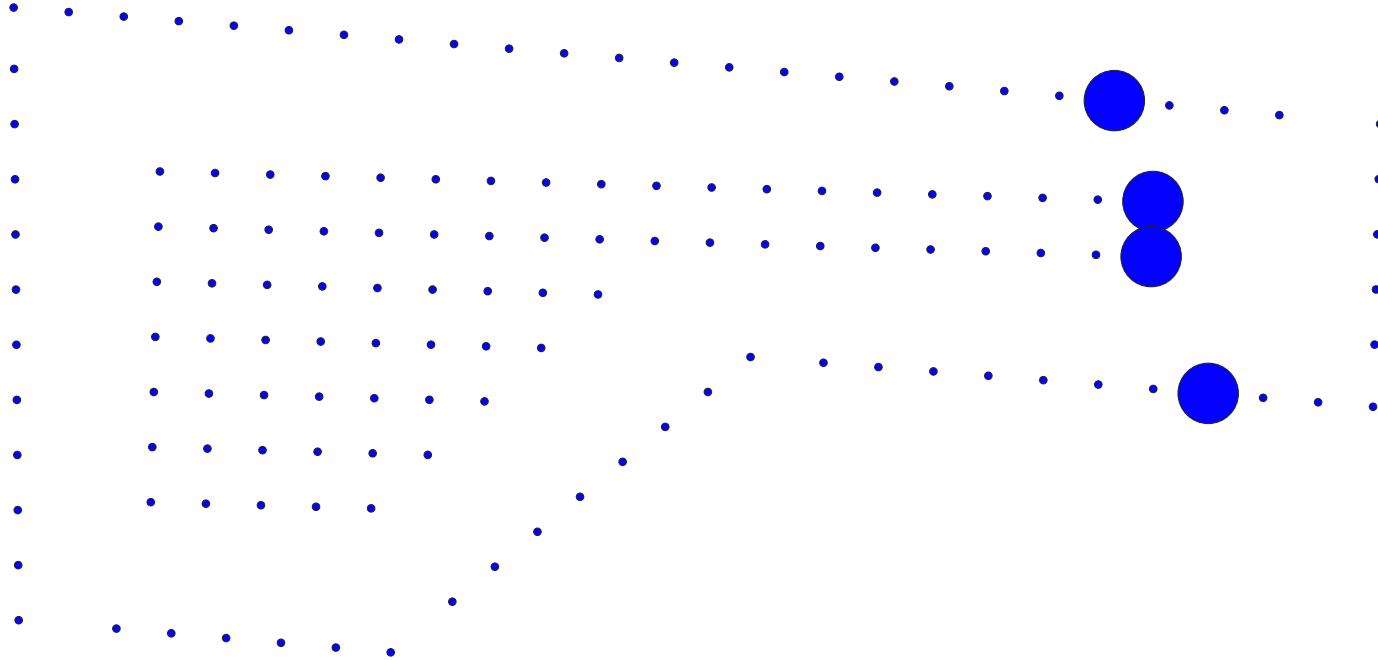
Post Wind Farm Base Case Drifting Allision Risk per Structure

Date: 20/03/2026

Drawn: LA

Checked: JM

Coordinate System: WGS 84 / World Mercator (EPSG:3395)

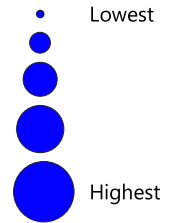


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Legend

Allision Risk



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Figure Title

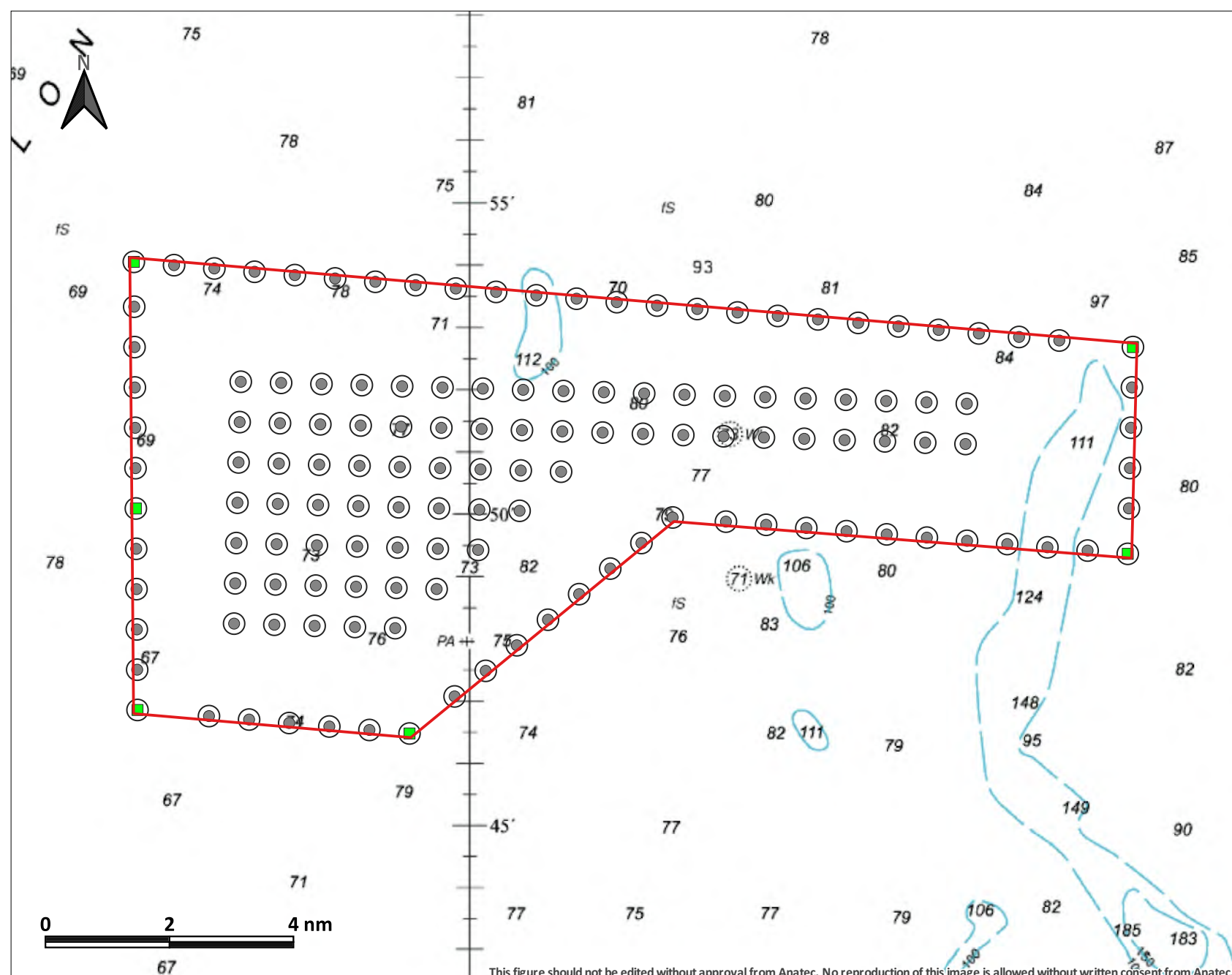
Post Wind Farm Base Case Fishing Vessel Allision Risk per Structure

Date: 20/03/2026

Drawn: LA

Checked: JM

Coordinate System: WGS 84 / World Mercator (EPSG:3395)



Legend

- WFDA
- Surface Infrastructure**
- WTG
- OFSS
- Potential Fishing Vessel Interaction Area



Project

A4900 Bellrock Offshore Wind Farm

Figure Title

Worst Case Scenario Layout and Potential Fishing Vessel Interaction Areas

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