Bowdun Offshore Wind Farm Offshore EIA Report

Volume 3, Technical Appendix 14.1: Shipping and Navigation Navigational Risk Assessment

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Glossary

Defined term	Definition
Additional Mitigation	Also referred to as secondary mitigation which is defined by The Institute of Sustainability and Environmental Professionals (ISEP) (formerly Institute of Environmental Management and Assessment (IEMA)) as: Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the Environmental Impact Assessment (EIA) Report (sic).
Adverse Weather	Severe weather that creates potentially unsafe conditions for vessel transits.
Allision/Contact	Allision in shipping and navigation refers to the impact of a moving vessel with a stationary object, such as a Wind Turbine. It is distinct from a collision, which involves two moving vessels.
Anchorage	A designated area where ships lower their anchors to remain in position.
Applicant (the)	Bowdun Offshore Wind Farm Limited (BOWFL).
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
As Low as Reasonably Practicable (ALARP)	The principle that risk should be reduced as far as possible before further reduction is disproportionate to the costs of doing so.
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity and key statistics including location, destination, length, speed and current status. Most commercial vessels and European Union fishing vessels over 15 metres (m) in length are required to carry AIS.
Baseline	The status of the environment without the Proposed Development in place.
Collision (Shipping and Navigation)	Collision refers to the impact between two moving vessels, or a vessel and an object in motion. It differs from allision, which involves a moving vessel striking a stationary object.
Cumulative Effects	The effects of the Proposed Development assessed together with effects from the Onshore Infrastructure forming the Project as well as one or more different projects on the same receptor/resource.
Displacement/Deviation (Shipping and Navigation)	An impact that occurs when a vessel is forced away from their typical route due to activities associated with the construction, operation and maintenance, and/or decommissioning of the Proposed Development due to the Offshore Infrastructure.
Draught	The maximum depth of any floating body.
Effect	Term used to express the consequence of an impact (i.e. the result of change or changes on specific environmental resources or receptors). The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity of the receptor or resource in accordance with defined significance criteria.

Defined term	Definition
Embedded Mitigation	Measures that are adopted as part of the Proposed Development and therefore assessed within the EIA. The proposed approach for the EIA for the Proposed Development is that Embedded Mitigation includes both primary mitigation and tertiary mitigation. These are defined by the ISEP as follows: Primary: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken. Tertiary: Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
Environmental Impact Assessment (EIA)	Process for the assessment of likely significant environmental effects of a project on the physical, biological and human environment during construction, Operation and Maintenance (O&M) and decommissioning.
Environmental Impact Assessment Regulations (EIA Regulations)	Terminology used in this Offshore EIA Report to refer to three sets of regulations: • The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; • The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and • The Marine Works (Environmental Impact Assessment) Regulations 2007.
Export Cable Corridor	The area seaward of MHWS which connects the Array Area with the Landfall within which the Offshore Export Cables will be installed.
Flag State	A Flag State is the state chosen by merchant ships to be registered in, so that the vessel is bound to carry the flag of that state and comply with that state's rules and regulations.
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity.
Grounding	Vessel makes contact with the seabed/shoreline or underwater assets.
High Voltage Alternating Current (HVAC)	A system of power transmission and distribution that utilises alternating current at voltages typically exceeding 1000 volts, as defined by the International Electrotechnical Commission (2015). HVAC systems are designed to efficiently deliver electricity over long distances with minimal losses, leveraging transformers to modify voltage levels.
Impact	A change caused by an action that occurs during a project's lifetime.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the OSPs.
Interconnector Cables	Cables which will connect individual OSPs to each other to provide redundancy against cable failure elsewhere.
Intertidal Area	The area between MHWS and Mean Low Water Springs (MLWS).

Defined term	Definition
Landfall	The area in which the Offshore Export Cables make landfall and is also the transitional area between the Offshore Transmission Assets and the Onshore Transmission Assets. Located in the Intertidal Area at Benholm.
Marine Directorate (MD)	The Marine Directorate of the Scottish Government, formerly known as Marine Scotland. The planning and licensing authority for Scotland's seas and custodian of Scotland's National Marine Plan (NMP). The Marine Directorate - Licensing Operations Team (MD-LOT) are specifically responsible for managing Section 36 Consent and Marine Licence Applications seaward of MHWS.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping and of life at sea, and to prevent or minimise pollution from shipping.
Marine Licence	A Marine Licence permits the undertaking of different activities in the marine environment, including construction, the deposition or removal of substances or objects, and dredging. The Marine (Scotland) Act 2010 requires Marine Licences to be obtained for licensable activities taking place within Scottish Territorial Seas (MHWS to 12 nm). The Marine and Coastal Access Act (MCAA) 2009 requires a Marine Licence to be obtained for licensable marine activities within the Scottish offshore region (12 nm – 200 nm).
Master	The designated person in charge of a ship, its crew, passengers and cargo.
Maximum Design Scenario (MDS)	The scenario within the design envelope likely to result in the greatest impact on a particular topic receptor, and therefore the one that should be assessed for that topic receptor.
Mean High Water Springs (MHWS)	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mitigation	Measures to avoid, prevent, reduce or control effects on the environment. See also definitions for Embedded Mitigation and Additional Mitigation.
Offshore Application	Term used to refer to the applications associated with the Proposed Development. The Applicant will apply for: • A Section 36 Consent under the Electricity Act 1989; and • Marine Licence(s) under Marine Scotland Act 2010 and Marine and Coastal Access Act 2009.
Offshore Environmental Impact Assessment (EIA) Report (hereafter, 'Offshore EIA Report')	Document prepared to report the findings of the EIA for the Proposed Development and produced in accordance with the EIA Regulations. The Offshore EIA Report is submitted to support the Offshore Application for the Proposed Development, and to comply with EIA Regulations.
Offshore Export Cables	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cables terminate, and the onshore cabling begins.
Offshore Generation Assets	The infrastructure of the Proposed Development required to generate electricity comprising of the Wind Turbines, Wind Turbine foundations and associated infrastructure (e.g. IACs).

Defined term	Definition
Offshore Infrastructure	All of the Offshore Infrastructure associated with the Proposed Development that is located seaward of MHWS, comprising the Offshore Generation Assets and the Offshore Transmission Assets.
Offshore Scoping Report	The report that presents the findings of the EIA scoping process undertaken for the Proposed Development with the purpose of obtaining a Scoping Opinion. The Offshore Scoping Report defines what is intended to be assessed and reported as part of the EIA.
Offshore Substation Platform(s) (OSPs)	OSPs comprise the support structure, topside and electrical components used for collecting and/or converting electricity generated by the Wind Turbines for transmission by the Offshore Export Cables.
Offshore Transmission Assets	The infrastructure of the Proposed Development required to transmit the generated electricity comprising of the OSPs, Offshore Export Cables and associated infrastructure up to MHWS.
Operation and Maintenance (O&M)	The phase of the Proposed Development following completion of construction. This phase of development includes routine inspections, repairs and replacement of infrastructure and equipment (including Interconnector Cables and IACs), Scour Protection replenishment or replacement, major component replacement, painting and/or other coating works, removal of marine growth, and replacement of access ladders.
Passage Plan	A detailed description of a vessel's voyage from start to finish, including the route and hazards likely to be encountered along the way.
Piling	The action of installing piles: installation can use various methodologies, the most common of which are impact piling (in which the piles are struck by a "hammer") and drilling (during which a hole is drilled into the seafloor, the drilling tool is removed, and the pile is slotted into that hole).
Plan Option Area (POA)	A location identified in the SMP as a preferred area for commercial scale offshore wind development.
Port or Harbour	A maritime facility compromising of one or more wharves or loading areas where ships load and discharge cargo or passengers.
Practice and Exercise Area (PEXA)	Term used to describe an offshore area used by the military for practice and exercise drills, including submarine exercises and firing practice.
Project (the)	An overarching term for the Bowdun Offshore Wind Farm (Bowdun OWF) comprising the offshore and onshore infrastructure required to generate and transmit electricity from the Array Area to the onshore GCP. The Project includes the Offshore Generation Assets, the Offshore Transmission Assets and the Onshore Transmission Assets.
Project Design Envelope (PDE)	A description of the range of possible elements that make up the design options for the Proposed Development under consideration when the exact engineering parameters are not yet known.

Defined term	Definition
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Volume 1, Chapter 3: Project Description.
Safety Zones	An area extending a maximum of 500 m from the central point of a subsea installation in which other vessels are prohibited from entering, except in circumstances outlined within Section 96 of the Energy Act, 2004.
Scoping Opinion	A document produced by MD-LOT which is issued in response to submission and review of the Offshore Scoping Report. The Scoping Opinion is supported with feedback and advice from consultees, which details what is expected to be included in the Offshore EIA Report and what can be scoped out of the EIA process.
Scoping Workshop	A series of sessions preceding the finalisation of the Offshore Scoping Report to provide an opportunity for the Applicant to consult on the draft scope and for stakeholders to request additional information on key issues.
Scottish Ministers (the)	The decision makers with regard to Marine Licence(s) and Section 36 Consent applications in Scottish Offshore Waters and Scottish Marine Area.
Scottish Offshore Waters	The area of sea beyond 12 nm but within the Scottish Exclusive Economic Zone (EEZ) up to 200 nautical miles from the coast. .
Scottish Territorial Waters	The territorial waters of Scotland that extend out from MHWS to 12 nm.
Scour Protection	Protective materials installed to avoid sediment being eroded away from the base of the foundations and/or buried subsea cable due to the flow of water.
Section 36 Consent	Scottish Ministers' consent under Section 36 of the Electricity Act 1989 required to permit the generation and operation of an energy generation station.
Sectoral Marine Plan (SMP)	A plan developed by the Scottish Government which provide the strategically planned spatial footprint for offshore wind development in Scotland.
Significance	Effect factor that is determined by the magnitude of impact along with the sensitivity of the receptor.
Site Boundary	The boundary within which all elements of the Proposed Development will be located. The Site Boundary comprises the Array Area and Export Cable Corridor which ends at MHWS.
Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Thistle Wind Partners (TWP)	Company established for the development of the Project.
Vessel Traffic Services (VTS)	A marine traffic monitoring system established by port authorities to manage vessel movements and safety.

Defined term	Definition
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.

Acronyms

Acronym	Definition
AIS	Automatic Information System
ALARP	As Low as Reasonably Practicable
AtoN	Aid to Navigation
BWEA	British Wind Energy Association
CaP	Cable Plan
CBA	Cable Burial Assessment
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
CES	Crown Estate Scotland
COLREGS	The Convention on the International Regulations for Preventing Collisions at Sea
CTV	Crew Transfer Vessel
DSLP	Development Specification and Layout Plan
DfT	Department for Transport
EGL	Eastern Green Link
EIA	Environmental Impact Assessment
EMODNet	European Marine Observation and Data Network
ERCoP	Emergency Response Cooperation Plan
EU	European Union
FLO	Fisheries Liaison Officer
FSA	Formal Safety Assessment
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HAT	Highest Astronomical Tide
HAZID	Hazard Identification
HDD	Horizontal Directional Drilling
HM	His Majesty's
HMCG	His Majesty's Coastguard
IAC	Inter-Array Cable
IALA	International Association of marine aids to navigation and Lighthouse Authorities
ICW	In Collision With
IMO	International Maritime Organization

Acronym	Definition
IPS	Intermediate Peripheral Structure
IWRAP	The IALA Waterway Risk Assessment Program
LAT	Lowest Astronomical Tide
LMP	Lighting and Marking Plan
LOA	Length Overall
Lo-Lo	Lift On-Lift Off
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MCC	Marine Coordination Centre
MD-LOT	Marine Directorate - Licensing Operations Team
MDS	Maximum Design Scenario
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MoD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
MPS	Marine Policy Statement
MRCC	Maritime Rescue Coordination Centre
MS	Marine Scotland
NLB	Northern Lighthouse Board
NMP	National Marine Plans
NRA	Navigational Risk Assessment
NSTA	North Sea Transition Authority
NSVMP	Navigational Safety and Vessel Management Plan
NtM	Notice to Mariners
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
O&M	Operation and Maintenance
PDE	Project Design Envelope
PEXA	Practice and Exercise Area
PIANC	Permanent International Association of Navigation Congresses
RNLI	Royal National Lifeboat Institution
Ro-Ro	Roll-on roll-off
RYA	Royal Yachting Association
SAR	Search and Rescue
SFF	Scottish Fishermen's Federation
SOLAS	International Convention for the Safety of Life at Sea

Acronym	Definition
SPFA	Scottish Pelagic Fisherman's Association
SPS	Significant Peripheral Structure
SWFPA	Scottish White Fish Producers Association
TEU	Twenty-foot Equivalent Unit
TWP	Thistle Wind Partners Limited
UK	United Kingdom
UKC	Under Keel Clearance
UKCoS	United Kingdom Chamber of Shipping
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
VHF	Very High Frequency
VTS	Vessel Traffic Services

Table of Units

Units	Definition
km	Kilometre
km²	Square kilometre
kts	knots
kV	Kilovolt
m	Metre
m²	Square Metre
MW	MegaWatt
nm	Nautical mile
s	Second
°	Degree
£	GBP
‘	Minute
%	Percent

1 Introduction

1.1.1 This Shipping and Navigation Technical Report is the Navigation Risk Assessment (NRA) for the Offshore Infrastructure associated with the Bowdun Offshore Wind Farm (OWF) Project (hereafter referred to as the Proposed Development). The Proposed Development covers the Option Lease Area that is located in the E3 Plan Option Area, detailed in the Sectoral Marine Plan (SMP) for Offshore Wind Energy (Scottish Government, 2020), and the Export Cable Corridor. The Array Area is located 38 km offshore at its closest point, an area of 187 km^2 and will comprises the Wind Turbines (fixed foundation), Inter-Array Cables (IACs), Offshore Substation Platforms (OSPs), Interconnector Cables and any necessary scour/cable protection. The Offshore Export Cables will reach Landfall at Benholm, Aberdeenshire.

1.1.2 The Proposed Development has the potential to impact upon the safety and navigation of vessels transiting through or within the vicinity of the Site Boundary. The NRA is an important requirement for the consenting process for offshore renewable developments and identifies the potential impacts and effects of the Proposed Development on shipping and navigation receptors.

1.1.3 This NRA follows the requirements of the Maritime and Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 (MCA, 2021a) and accompanying methodology document (MGN 654 Annex 1) (MCA, 2021b).

1.1.4 The information from this technical report informs the assessment of the likely significant environmental effects of the Proposed Development on shipping and navigation receptors. This report accompanies Volume 2, Chapter 14: Shipping and Navigation of the Offshore Environmental Impact Assessment (EIA) Report to support the consent application for the Proposed Development.

1.1.5 The aim of this NRA is to:

- review relevant policy, guidance and legislation (Section 2);
- describe the assessment methodology (Section 3);
- describe the Project (Section 4);
- provide a description of the baseline environment (Section 5);
- describe the baseline vessel traffic and risk profile (Section 6);
- determine the likely future traffic profile (Section 7);
- identify and assess potential impacts of the Proposed Development on shipping and navigation (Section 8) and cumulative effects (Section 10);
- undertake an NRA that identifies and assesses hazards during construction, Operations and Maintenance (O&M) and decommissioning phases of the development (Section 9);
- identify risk controls in relation to the Proposed Development hazards to reduce the risk to As Low As Reasonably Practicable (ALARP) (Section 9.3 and Section 9.6); and

- provide recommendations in relation to the safety of the development and co-existence of users with regards to shipping and navigation (Section 11.2).

2 Policy, Guidance and Legislation

2.1 Legislation and National Policy

United Nations Convention on the Law of the Sea

2.1.1 The United Nations Convention on the Law of the Sea (UNCLOS) (United Nations, 1982) is an international agreement that establishes a legal framework for all marine and maritime activities. Article 60 concerns artificial islands, installations and structures in the exclusive economic zone. Article 60(7) states that *"Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation."* As per Article 22(4), *"The coastal state shall clearly indicate such sea lanes and traffic separation schemes on charts to which due publicity shall be given"*.

2.1.2 The United Kingdom (UK) is a signatory of UNCLOS and is written into law through Section 36B of the Electricity Act 1989. The requirement to not interfere with the use of recognised sea lanes essential to international navigation is also explicitly contained within that same section.

2.1.3 Any traffic routing schemes in the area have been considered in Section 5.

Convention on the International Regulations for Preventing Collisions at Sea

2.1.4 The Convention on the International Regulations for Preventing Collisions at Sea (COLREGS) (International Maritime Organization (IMO), 1972/77) is a set of regulations which establish the conduct of vessels in any condition of visibility, and the correct actions to take when a vessel is in close quarters with another vessel. Rule 8 Part (a) states that "*Any action taken to avoid collision shall be taken in accordance with the Rules of the Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.*"

2.1.5 Similarly, Rule 19 Part (b) states that "*Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre*".

2.1.6 Therefore, collision risks and avoidance provisions are considered and assessed in Section 8 and Section 9.

International Convention for the Safety of Life at Sea

2.1.7 The International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974) is an international maritime treaty that concerns the safety of merchant ships.

2.1.8 Regulation 33 states that "*The master of a ship at sea which is in a position to be able to provide assistance on receiving information from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance*".

2.1.9 This is followed by Regulation 34, which states that "*Prior to proceeding to sea, the master shall ensure that the intended voyage has been planned using the appropriate nautical charts and nautical publications for the area concerned.*"

UK Marine Policy Statement

2.1.10 The UK Marine Policy Statement (MPS) (His Majesty's (HM) Government, 2011) is the framework for preparing Marine Plans and taking decision affecting the marine environment. Paragraph 3.4.7 states that "*Increased competition for marine resources may affect the sea space available for the safe navigation of ships. Marine Plan authorities and decision makers should take into account and seek to minimise any negative impacts on shipping activity, freedom of navigation and navigational safety and ensure that their decisions are in compliance with international maritime law. Marine Plan development and individual decisions should also take account of environmental, social and economic effects and be in compliance with international maritime law. Marine Plan authorities will also need take account of the need to protect the efficiency and resilience of continuing port operations, as well as further port development.*"

2.1.11 Where relevant, the impacts to vessel traffic and routeing have been considered in Section 8.

Scotland's National Marine Plan

2.1.12 Scotland's National Marine Plan (NMP) (Scottish Government, 2015) covers the management of both Scottish Territorial Waters (out to 12 nm (22.2 km)) and Scottish Offshore Waters (12 nm to 200 nm (22.2 km to 370.4 km)) and details several policies relevant to shipping and navigation. Relevant updates will be accounted for at the appropriate point in time.

2.1.13 According to Transport 1: "*Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in UNCLOS. The following factors will be taken into account when reaching decisions regarding development and use:*

- *The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports.*
- *Where interference is likely, whether reasonable alternatives can be identified.*
- *Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the IMO can be achieved at no significant cost to the shipping or ports sector.*"

2.1.14 Moreover, within Transport 2, it states that "*Marine development and use should not be permitted where it will restrict access to, or future expansion of, major commercial ports or existing or proposed ports and harbours.*"

2.1.15 Transport 3 states "*Ferry routes and maritime transport to island and remote mainland areas provide essential connections and should be safeguarded from*

inappropriate marine development. Developments will not be consented where they will unacceptably interfere with lifeline ferry services."

2.1.16 Finally, relevant instruction is also given in Transport 6, which states that "*Developers should ensure displacement of shipping is avoided where possible to mitigate against potential increased journey lengths (and associated fuel costs, emissions and impact on journey frequency).*"

2.1.17 Similar to the UK MPS, the impacts to vessel traffic and routeing have been considered in Section 8. Where route displacement would be necessary, the most likely reroutes were considered based on these policies.

2.1.18 It is noted that Scotland's NMP is currently being reviewed and will be updated to form NMP2. However, it is not anticipated that this will have any material impact on the findings and outcomes of this NRA.

2.2 Primary Guidance

MGN 654

2.2.1 The principal guidance for assessing impacts to shipping and navigation is described in MGN 654 (MCA, 2021a). Annex 1 of MGN 654 describes the methodology by which an NRA should be undertaken, including data collection and consultation requirements.

2.2.2 To provide the data required to inform the NRA and Offshore EIA Report, vessel traffic surveys have been undertaken to the standard of MGN 654. These consisted of two 14-day seasonally representative surveys of the Array Area within a validity period of two years. The vessel-based surveys collect Automatic Identification System (AIS), radar and visual observation data on all vessel movements. A summer and winter survey were undertaken in 2023 in line with MGN 654 requirements. To ensure data validity at time of application, a summer and winter top-up survey were undertaken in 2025. The initial surveys in 2023 consisted of a summer and winter survey, undertaken in July 2023 (15 July 2023 to 29 July 2023) and December 2023 (06 December 2023 to 21 December 2023), respectively. The top-up surveys in 2025 consisted of the summer survey undertaken in July 2025 (30 June 2025 to 13 July 2025) and the winter survey in December 2025 (02 December 2025 to 16 December 2025). A recent 12-month AIS dataset covering the Shipping and Navigation Study Area (Section 3.1) was also acquired from third-party AIS data providers and considered with other datasets where appropriate.

2.2.3 The MGN 654 checklist has been completed as part of this NRA and is presented in Annex B.

Formal Safety Assessment Process

2.2.4 The IMO Formal Safety Assessment (FSA) process has been applied within this NRA. The guidelines for FSA were approved in 2002 and most recently amended in 2018 by MSC-MEPC.2/Circ.12/Rev.2 (IMO, 2018).

2.2.5 The FSA is a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and, if appropriate, cost-benefit assessment. The IMO FSA guidance defines a hazard as "*a potential to threaten human life, health, property or the environment*", the realisation of which results in an incident or accident. The potential for a hazard to be realised (i.e. likelihood) can be combined with an estimated or known consequence of outcome and this combination is termed 'risk'. There are five steps within the FSA process.

- Step 1: Identification of hazards;
- Step 2: Risk analysis;
- Step 3: Risk control options;
- Step 4: Cost-benefit assessment (if applicable); and
- Step 5: Recommendations for decision making.

2.3 Additional Guidance and Lessons Learnt

2.3.1 Table 2.1 and Table 2.2 provide a summary of additional relevant guidance for assessing impacts to shipping and navigation, and lessons learnt from previous shipping and navigation studies, respectively.

Table 2.1: Summary of Additional Relevant Guidance

Guidance	Description
MGN372 Amendment 1 Safety of Navigation: Guidance to Mariners Operating in Vicinity of UK Offshore Renewable Energy Installations (OREIs) (MCA, 2022)	Guidance to support passage planning near OREIs off the UK coast.
International Association of Marine Aids to Navigation (AtoN) and International Association Lighthouse Authorities (IALA) G1162 The Marking of Offshore Man-Made Structures (IALA, 2021)	Guidance on the lighting and marking arrangements for OWFs.
Royal Yachting Association (RYA) Position of Offshore Renewable Energy Developments: Wind Energy (RYA, 2019a)	Describes key impacts of OWFs on recreational activities.
Permanent International Association of Navigation Congresses (PIANC) [World Association for Waterborne Transport Infrastructure] WG161 Interaction Between Offshore Wind Farms and Maritime Navigation (PIANC, 2018)	Provides guidelines and recommendations on impacts on mitigations for shipping routes near OWFs.
Nautical Institute The Shipping Industry and Marine Spatial Planning (Nautical Institute, 2013)	Guidance on benefits and risks of marine spatial planning for shipping and navigation.
G+ IOER Good Practice Guidelines for Offshore Renewable Energy Developments (G+ IOER, 2019)	Guidance on emergency response for OWFs.

Guidance	Description
IALA G1185 Enhancing the Safety and Efficiency of Navigation Around OREIs (IALA, 2024)	Guidance for maritime authorities, OREI developers and stakeholders when planning OREIs to ensure navigational safety issues in and around OREI using best current practice and knowledge.

Table 2.2: Lessons Learnt and Supporting Studies

Study	Lessons Learnt
MCA and QinetiQ Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle wind farm by QinetiQ and the MCA and QinetiQ, 2004)	Reporting of trial on impacts of OWF on shipboard equipment.
MCA OWF Helicopter Search and Rescue Trials Undertaken at the North Hoyle Wind Farm (MCA, 2005)	Reporting of trial on impacts of OWF on Search and Rescue (SAR) equipment and activities.
British Wind Energy Association (BWEA) Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats OWF (BWEA, 2007)	Reporting of trial on impacts of OWF on shipboard equipment.
MCA report following aviation trials and exercises in relation to OWFs (MCA, 2019)	Reporting of trial on impacts of OWF SAR equipment and activities and the implications on OWF design.
Rawson and Brito (2022) Assessing the validity of navigation risk assessments: a study of offshore wind farms in the UK (Rawson and Brito, 2022)	Analysis of historical incidents in UK OWFs.
Ocean Studies Board's Division on Earth and Life Studies (2022). Wind Turbine Generator Impacts to Marine Vessel Radar.	Review of impacts of OWFs on marine radar.

3 NRA Methodology

3.1.1 The NRA has been produced in accordance with MGN 654 and follows the IMO's FSA approach (see Section 2.2). This assessment considers all identified impacts of the Proposed Development on shipping and navigation receptors.

3.1.2 Figure 3.1 provides a workflow of the FSA approach as is applied within this NRA. The FSA defines a risk as "*the combination of frequency and the severity of the consequence*" (IMO, 2018). Therefore, the likelihood and consequence of these impacts are assessed through the collection and analysis of relevant datasets and through consultation. Details on the risk criteria and matrix methodology are contained within Section 9.2.

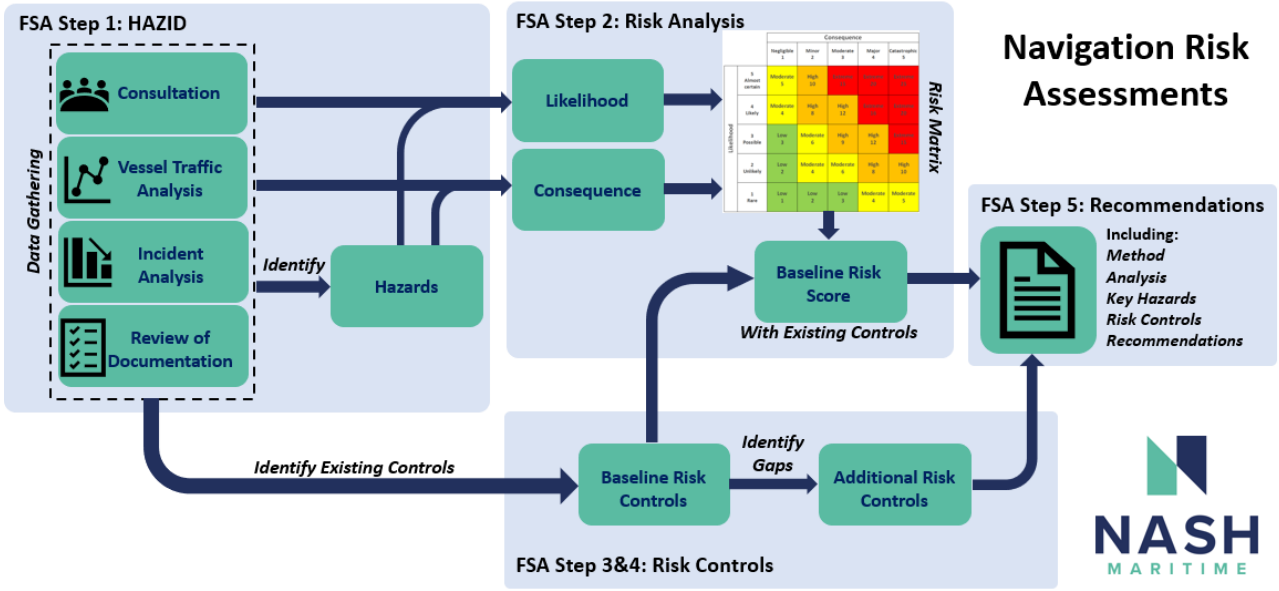

Figure 3.1: NRA Methodology

3.1 Shipping and Navigation Study Area

3.1.1 The Shipping and Navigation Study Area (as shown in Figure 3.2), comprises two key areas:

- the Array Area, and its 10 nm (18.5 km) buffer; and
- the Export Cable Corridor, and its 3 nm (5.6 km) buffer.

3.1.2 The Array Area is situated 20.5 nm (38 km) from the Aberdeenshire coastline, in water of -55 m to -75 m depth, and the Export Cable Corridor connects the western edge of the Array Area with the cable Landfall at Benholm and has maximum length of 37.8 nm (70 km).

3.1.3 The 3 nm (5.6 km) buffer is considered an adequate study area when assessing the shipping and navigation risks associated with subsea cables; whilst a 10 nm (18.5 km) buffer has been selected for the Array Area, to reflect that the Array Area poses a greater hazard to navigation, and to better assess the vessel routes in proximity to the surface piercing structures. The Shipping and Navigation Study Area is consistent with industry best practice (MCA, 2021a) as applied to

previous consented and ongoing offshore renewable shipping and navigation studies (Buchan OWL, 2023; SSE Renewables, 2022; Mona Offshore Wind Limited, 2023; Morgan Offshore Wind Limited, 2023; Morecambe Offshore Wind Limited, 2023; Ayre Offshore Wind Farm Limited, 2025). This Shipping and Navigation Study Area provides further context to vessel traffic and routeing in proximity to the Proposed Development and allows for identification of key navigational features affecting vessel traffic. This was agreed at the Scoping Workshop as part of early stakeholder consultation.

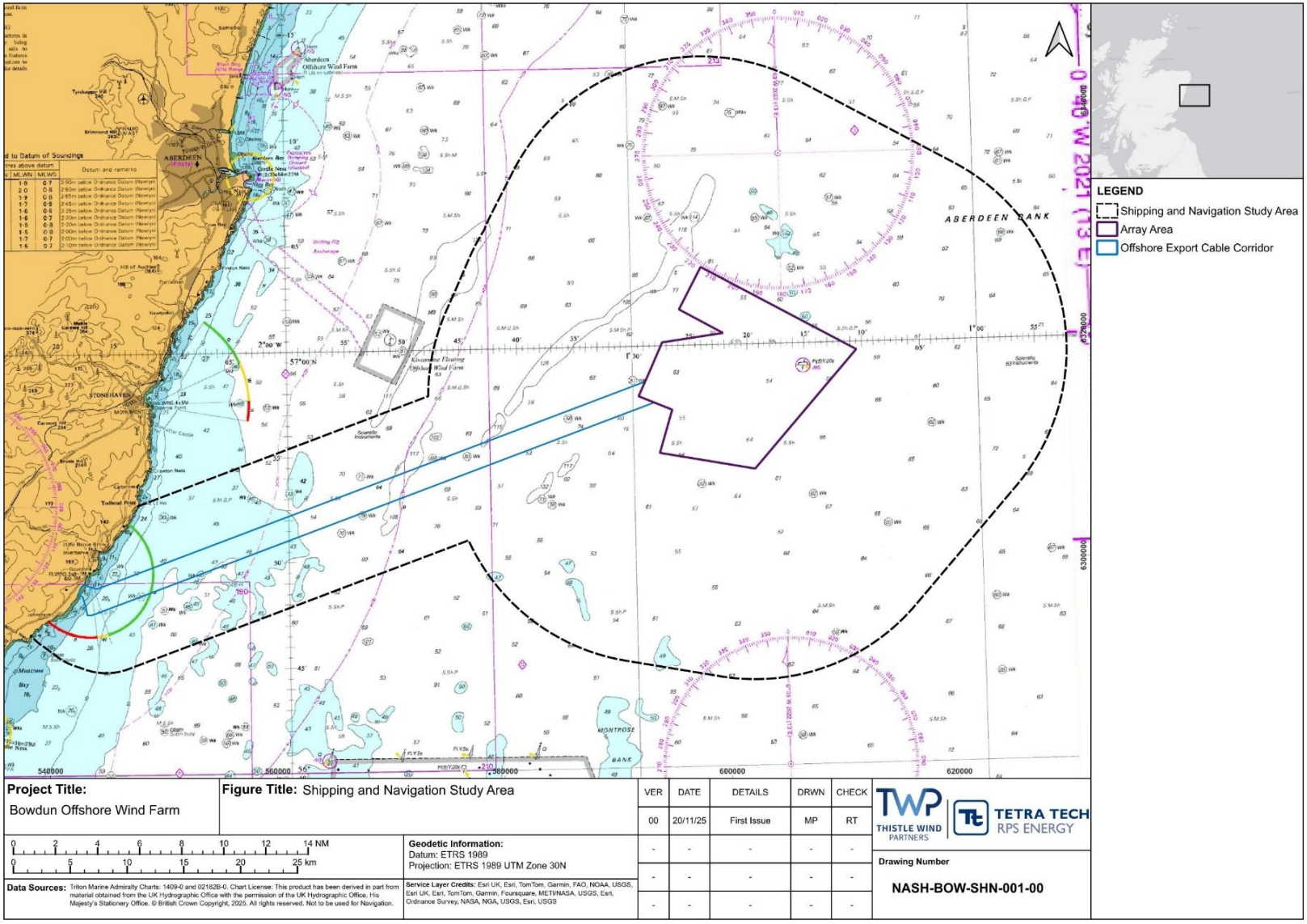

Figure 3.2: Shipping and Navigation Study Area

3.2 Data Sources and Information

Consultation and Engagement

3.2.1 Consultation letters were sent to relevant shipping and navigational stakeholders to provide information on the Proposed Development and request input into the NRA process. In addition to the letters, dedicated consultation meetings were held with the MCA, Northern Lighthouse Board (NLB), UK Chamber of Shipping (UKCoS), RYA Scotland, and a representative for the fisheries organisations listed below.

3.2.2 The following organisations were sent a copy of the consultation letter:

- MCA;
- NLB;
- UKCoS;
- RYA Scotland;
- Defence Infrastructure Organisation (DIO) as part of the Ministry of Defence (MoD);
- Royal National Lifeboat Institution (RNLI);
- Cruising Association;
- Aberdeen and Stonehaven Yacht Club;
- Montrose Sailing Club;
- Fisheries Liaison Officer (FLO);
- Scottish Fishermen's Federation (SFF);
- Scottish White Fish Producers Association (SWFPA);
- Scottish Pelagic Fisherman's Association (SPFA);
- North and East Coast Regional Inshore Fisheries Group;
- NorthLink Ferries;
- Port of Aberdeen;
- Aberdeenshire Harbours;
- Peterhead Port Authority;
- Kincardine OWF; and
- Seagreen OWF.

3.2.3 Table 3.1 summarises consultation responses that have been received and meetings the that have been held to inform the NRA. Full minutes from the individual NRA consultation meetings and the Hazard Identification (HAZID) Workshop are provided in Annex C.

Table 3.1: Consultation Responses Summary

Date	Consultee	Source	Purpose and Issues Raised with respect to Shipping and Navigation	Response to Issues Within This NRA
Scoping Workshop				
25/04/2024	MCA	Scoping workshop	The MCA highlighted concern over the cumulative impacts with Morven North, Morven South and Ossian OWF projects.	This NRA follows the MCA's MGN654 guidance and IMO FSA methodology. Cumulative considerations are made within Section 10, including cumulative impact assessment with Morven North, Morven South and Ossian OWFs, together with other offshore developments.
	NLB	Scoping workshop	The NLB raised the need for marking array edges if turbines are removed for maintenance. The NLB also highlighted the statutory duty to mark wrecks accordingly and the risks of vessel entanglement if floating turbine moorings were to be used. The NLB were also interested in cumulative maintenance impacts.	The final Lighting and Marking Plan (LMP) developed post-consent will include contingency planning for marking Array Area boundaries during major maintenance works. Floating Wind Turbines and vessel wreck entanglement risks on mooring lines are no longer a concern as the Project will have fixed Wind Turbines only. Cumulative effects have been assessed within Section 10.
	SFF	Scoping workshop	It was noted that European Marine Observation and Data Network (EMODnet) data underrepresents fishing activity; and that seasonal activity is not captured by 14-day surveys. Requested inclusion of SFF data (screenshots only). Queried implications of base port selection on Study Area.	The limitations of EMODnet and short term surveys were acknowledged. This NRA has also incorporated analysis of 12-month AIS dataset, together with 4 vessel traffic surveys and stakeholder consultation to capture information on non-AIS seasonal fishing patterns. Confidential information of plotter screenshots provided by SFF were also considered when undertaking relevant risk and impact assessments. Base ports are not yet defined and will be determined post-consent.
	UKCoS	Scoping workshop	Rig movements and navigational constraints should be considered in NRA due to proximity to Port of Aberdeen.	Rig movements and their supporting vessels were considered within the 12-month AIS dataset and assessed in this NRA for navigational constraints (Section 6.3). Consideration and consultation with Kincardine OWF was also considered for towage of their floating Wind Turbine assets and is described below on 27/08/2025.
15/08/2024	MCA	MGN Guidance Discussion	Presentation of potential Wind Turbine locations and discussion regarding lines of orientation	Final Array Area layout will be confirmed through consultation with MCA and NLB post-consent via the Development Specification and Layout Plan (DSLP), as per the Embedded Mitigation
Scoping Opinion				
16/09/2024	MCA	Letter Response	The MCA emphasised the need to consider the impact on commercial and recreational craft specifically, and to also consider routing deviations, particularly in adverse weather, and the cumulative effects on shipping routes. MCA noted that the implications of the site size and location on SAR resources and Emergency Response Cooperation Plan (ERCoP) should be considered. MCA highlighted that attention should be paid to cabling routes and, where appropriate, burial depth for which a Burial Protection Index study should be completed.	Routing impacts in both a Project-alone scenario and a cumulative scenario have been considered in Section 8.2 and Section 10, respectively. Adverse weather routeing is presented in Section 6.3. The impact of the Proposed Development on commercial and recreational vessels has been considered is Section 8.2 and 8.10, respectively. The impact of the Proposed Development on SAR has been considered in Section 8.6, and an ERCoP will be developed in consultation with the MCA post-consent as per Table 9.7. Impacts related to the Offshore Export Cables are considered in Section 8.2, Section 8.5, Section 8.8 and Section 8.10. Potential hazards within the Export Cable Corridor are presented in Paragraph 9.5.9.
20/09/2024	NLB	Letter Response	NLB requested that consideration is given within the EIA to the potential impact that a wreck (either that of a vessel or Wind Turbine) could have upon navigation, both within the Array Area and the immediate vicinity.	Floating and hybrid Wind Turbines have been ruled out following refinement of the Project Design Envelope (PDE). However, a vessel wrecking within the Array Area is considered within the 'worst credible' scenario for Wind Turbine allision outlined in Section 9 of this NRA.
02/10/2024	RYA Scotland	Letter Response	RYA Scotland noted that the failure or loss of AtoN could pose an additional risk and should be considered.	Failure of AtoNs is considered as a potential contributor to an allision event in Section 8.4
15/10/2024	UKCoS	Letter Response	The Chamber recommended that the NRA should provide a detailed analysis of shipping traffic, accounting for seasonal variations in commercial and recreational vessel activity within the project area.	A detailed analysis of shipping traffic is provided in Section 6.3.

Date	Consultee	Source	Purpose and Issues Raised with respect to Shipping and Navigation	Response to Issues Within This NRA
			The Chamber noted that the EIA should assess the potential risks posed to vessels during both the construction and operational phases, particularly those using nearby shipping lanes. The UKCoS noted that a cumulative impact assessment should be carried out. The UKCoS commented that the EIA should fully consider emergency response preparedness, including how emergency anchoring or vessel refuge procedures will be managed within the vicinity of the wind farm.	Potential impacts are considered for both the construction and O&M phase of the Project in Section 4.3 and 4.4, respectively, of Volume 2, Chapter 14: Shipping and Navigation. The cumulative effect assessment has been undertaken for a 50 nm (92.6 km) buffer of the Proposed Development (Section 10). Embedded mitigations, including an ERCoP to be developed post-consent, are listed in Table 9.7
25/10/2024	SFF (on behalf of the Anglo Scottish Fishermen's Association, Fife Fishermen's Association, Fishing Vessel Agents and Owners Association, Mallaig and North West Fishermen's Association, Orkney Fisheries Association, SPFA, the SWFPA and Shetland Fishermen's Association).	Letter Response	SFF objected to use of floating foundation Wind Turbines as these can create 'no fish' zones. SFF noted that if floating Wind Turbines are necessary, their preferred Wind Turbine floating foundation option is Tension Leg Platform (with Vertical Tendon vs Tilted Tendon mooring systems), since they have lesser spatial footprint on the seabed and reduces the potential snagging hazard. SFF proposed that the siting of wet storage must be consulted with the fishing industry to ensure its impact on fishers is avoided at the outset SFF highlighted their opposition to using concrete mattresses and rock bags as cable protection in open water since they create severe snagging hazards for bottom trawl fishing vessels and static gears.	Floating and hybrid Wind Turbines have been ruled out following refinement of the PDE. Only fixed Wind Turbines are now considered, thus removing potential impacts related to floating Wind Turbines and wet storage. Volume 1, Chapter 3: Project Description outlines the parameters of the Proposed Development. Further information on commercial fisheries is discussed in the Commercial Fisheries chapter of the Offshore EIA Report (Volume 2, Chapter 13: Commercial Fisheries).
November 2024 (day not listed)	Marine Directorate - Licensing Operations Team (MD-LOT) Scoping Opinion	Letter Response	MD-LOT emphasised compliance with MCA's MGN 654 guidance was required, including a minimum 28-day vessel traffic surveys. MD-LOT also requested a detailed NRA and consultation with stakeholders. MD-LOT reiterated points of note raised by other stakeholders such as the MCA, RYA Scotland, UKCoS and the NLB. MD-LOT emphasised that the cumulative effects of the Proposed Development in combination with other projects was assessed.	In alignment with the MD-LOT scoping opinion, a detailed NRA was (this technical report) including over 28 days of recent vessel traffic surveys. Dedicated stakeholder consultation was undertaken including a HAZID workshop and feedback used in consideration of risks within the Section 9. Issues raised by other referenced stakeholders within MD-LOT's response have also been addressed as detailed in the consultation summary from their respective Scoping Opinion or Scoping Workshop responses (rows above this entry). The cumulative impact of the Proposed Development in combination with other project is detailed in Section 10.
NRA Consultation				
14/01/2025	MCA	Consultation meeting	The MCA highlighted that vessel traffic surveys undertaken would be older than 24 months at the time the application is submitted. Therefore, to meet MGN654 validity requirements, the project would be required to run a summer and winter top-up survey.	Summer and winter top-up surveys were completed throughout 2025 and are presented within the NRA (Volume 3, Technical Appendix 14.2: Shipping and Navigation Vessel Traffic Survey Report 2024 and 14.3: Shipping and Navigation Vessel Traffic Survey Report 2025).
01/09/2025	RYA Scotland	Email	No significant issues raised, providing that the normal mitigations are applied. Concern regarding buoys breaking loose or losing AtoNs, as experience has shown that this is not an unlikely scenario and that there can be a significant time lapse between this being noticed and repairs being made.	Embedded Mitigation measures are detailed in Section 9.3.
04/08/2025	MCA	Email	No specific comments raised, other than what was included in their Scoping Opinion response.	See Scoping Opinion Response received on 16/09/2024.

Date	Consultee	Source	Purpose and Issues Raised with respect to Shipping and Navigation	Response to Issues Within This NRA
05/08/2025	Kincardine OWF	Email	Recommendation to contact their FLO given existing relationship. Note that communication and advanced notice of construction activity would be essential, and our concession area would need to be avoided. Note that liaison on emergency response will be necessary.	Embedded Mitigation measures that have been adopted include the inclusion of FLO, advanced Notice to Mariners (NtM) and development of an ERCoP. These are outlined in greater detail in Section 9.3.
07/08/2025	UKCoS	Joint consultation meeting	UKCoS raised concerns about layout clarity, particularly regarding the exclusion of a triangular area on the western boundary and the visibility of lines of orientation. In addition, the UKCoS noted that consistent shapes and clear grid orientation are important for surface navigation and safety. UKCoS also highlighted that while the likelihood of allision may be similar between Wind Turbines and OSPs, the consequence of an allision with an OSP is greater due to the potential for more serious damage. UKCoS asked whether cumulative modelling was being undertaken and recommended a wider cumulative assessment. UKCoS advised they would not be able to attend the HAZID date and requested to be updated following this.	Lines of orientation and layout are under review; feedback will be provided post-consent. OSP allision risk is acknowledged as having greater consequence and will be considered in hazard profiling. Cumulative impacts have been qualitatively assessed in Section 10. The Eastern Developers Group also coordinated efforts to assess cumulative impacts across their respective projects. The cumulative future case scenario was also discussed in the HAZID and stakeholders commented that modelling this was a borderer strategic matter better considered at a national level than through more limited coverage of individual projects. Therefore, the cumulative scenario has been considered only qualitatively for the area of Cumulative Effects Assessment (CEA) coverage (50 nm (92.5 km)) within Section 10 of this NRA. UKCoS chose to review the HAZID minutes and Hazard Log following the HAZID and minor corrections were made accordingly.
07/08/2025	NLB	Joint consultation meeting	NLB emphasised the importance of consistent spacing of lighting and marking on the perimeter of the Array Aea, especially if spare Wind Turbine locations are used. NLB stressed the need for a Monitoring Programme for AtoNs to ensure timely response to failures. NLB reiterated the importance of preparedness for maritime incidents, including wreck management, environmental consequences, and emergency response planning. NLB recommended exercises and drills to ensure readiness. NLB emphasised the need for robust emergency response planning, particularly in the event of a vessel sinking within the array. They highlighted the importance of wreck management, pollution control, and timely information distribution. NLB recommended that policies and procedures be in place and that exercises and drills be conducted to ensure readiness for worst credible scenarios.	Consistent perimeter spacing and lighting/marking will be considered in layout refinement. AtoN status monitoring will be incorporated into the Outline AtoN Management Plan (Section 4.7). Points raised on maritime incident preparedness will be addressed in the ERCoP post-consent, including wreck management, pollution response, and stakeholder communication. Exercises and drills will be considered to ensure operational readiness (Section 9.3).
07/08/2025	UKCoS and NLB	Joint consultation meeting	Both consultees raised concerns about the lack of cumulative assessment in the NRA, noting that recently consented wind farms may already be influencing vessel traffic patterns from the baseline data. UKCoS recommended that cumulative modelling be undertaken to assess wider impacts on shipping and navigation. NLB and UKCoS agreed that cumulative effects would significantly alter the risk landscape compared to the Bowdun in isolation scenario. UKCoS expressed general comfort with the preliminary hazard and risk scoring but noted that additional mitigations may be required during the full HAZID phase. NLB reiterated the importance of asset protection and incident response during both operational and maintenance phases.	Navigation Risk Assessment focuses on the Proposed Development in isolation. However, effects of cumulative projects have been qualitatively considered in Section 10 of this NRA. . Cumulative impacts have been qualitatively assessed in Section 10. The Eastern Developers Group also coordinated efforts to assess cumulative impacts across their respective projects. The cumulative future case scenario was also discussed in the HAZID and stakeholders commented that modelling this was a borderer strategic matter better considered at a national level than through more limited coverage of individual projects. Therefore, the cumulative scenario has been considered only qualitatively for the area of CEA coverage (50 nm (92.5km)) within Section 10. Newly consented wind farms will be acknowledged in the NRA report as part of the broader context.

Date	Consultee	Source	Purpose and Issues Raised with respect to Shipping and Navigation	Response to Issues Within This NRA
			NLB raised concerns about the Eastern Green link 2 (EGL2) subsea cable intersecting the Bowdun site and the risk of simultaneous operations leading to allision or collision.	The HAZID and findings is detailed in Section 9.5. Additional mitigations as explored during the full HAZID phase in Section 9.6. Coordination with EGL2 is ongoing, and construction timelines are being actively discussed between developers. EGL2 is currently ahead of Bowdun OWF in its programme and planned to be operational prior to construction of the Proposed Development.
08/08/2025	MoD	Email	No specific comments raised, other than what was included in their Scoping Opinion response, noting sections titled "*Military Practice and Exercise Areas and Danger Areas & Unexploded Ordnance*" would be most relevant.	See Scoping Opinion response received on 25/10/2024.
12/08/2025	Seagreen OWF	Email	No perceived impact and no plans to submit a response.	Acknowledged
HAZID Workshop				
19/08/2025	SFF	HAZID Workshop	SFF queried why the fishing industry was not consulted earlier on the Array Area layouts. They suggested that future consultations should be streamlined by involving all stakeholders at the same time. SFF also raised concerns about the impact of the wind farm on fishing activity, noting that some fishing methods may not be able to continue due to displacement and stock migration, particularly in light of climate change.	The layout design presented is indicative and subject to refinement post-consent. Early layout development was driven by SAR coordination requirements with MCA. Stakeholder input, including from the fishing industry, will be considered in final layout decisions. These will be refined and supported by the DSLP developed post-consent. Impacts on commercial fisheries, including displacement and changes to fishing methods, are assessed in Volume 2, Chapter 13: Commercial Fisheries. The EIA also considers cumulative effects and layout refinements based on ongoing surveys and stakeholder feedback.
19/08/2025	MCA	HAZID Workshop	MCA noted that the layouts used in the NRA were not agreed or approved and asked whether the project intends to adopt design commitments at the post-consent stage, such as single- or double-line orientation. MCA also raised concerns about the cumulative impact of routing changes due to multiple OWFs in the area and asked whether these would be considered in future modelling.	Design commitments regarding layout orientation and spacing will be made in consultation with MCA during the post-consent phase, such as the DSLP (see Embedded Mitigation in Table 9.7). The layouts used in the NRA reflect the developer's preferred maximum and minimum options and are subject to change following geotechnical surveys and stakeholder input. Cumulative routing impacts are addressed in Volume 2, Chapter 14: Shipping and Navigation through the CEA, which qualitatively and quantitatively assesses the combined impact of Bowdun and other nearby OWFs.
19/08/2025	RYA Scotland	HAZID Workshop	RYA Scotland asked whether the layouts used in the NRA represented the Maximum Design Scenario (MDS) scenario, noting that layouts used for risk assessment may not resemble the final design. They also highlighted the importance of understanding what was scoped out of the basecase scenario to assess where vessel displacement may occur.	The layout considered in the NRA represents the MDS, including the maximum number of Wind Turbines for allision risk. This approach ensures conservative risk modelling. Displacement impacts and vessel routing changes are considered in the CEA within the Volume 2, Chapter 14: Shipping and Navigation. Stakeholder feedback on layout and vessel activity will inform post-consent planning and mitigation strategies, including the DSLP (see Table 9.7).
19/08/2025	NLB	HAZID Workshop	NLB recommended implementing a Supervisory Control and Data Acquisition monitoring programme for AtoNs throughout the operational phase to detect and respond to outages. They advised that Marine Coordination Centre (MCC) technicians should be trained to manage AtoN outages, not just Wind Turbines. NLB also suggested internal audits of monitoring systems and raised concerns about wreck management, including emergency response planning for new or existing wrecks within the site. The NLB highlighted the need for timely response to buoyage breakout and clarified that responsibility lies with the asset owner.	AtoN status monitoring, technician training, and internal audits for AtoNs will be considered in post-consent plans, LMP and AtoN Management Plan and has been incorporated into the Embedded Mitigation (Table 9.7). Wreck management and emergency response planning are recognised as key components of the ERCoP, which forms part of the Embedded Mitigations (see Table 9.7). Buoyage breakout is included as a hazard in the NRA presented in Section 9, and mitigation responsibilities have been clarified. The design of buoyage systems will be fit for purpose, and timely notification and response protocols will be developed in coordination with NLB. These measures will be further detailed in post-consent documentation, such as LMP, and operational planning, such as the Navigational Safety And Vessel Management Plan (NSVMP) (see Table 9.7).

Date	Consultee	Source	Purpose and Issues Raised with respect to Shipping and Navigation	Response to Issues Within This NRA
19/08/2025	RYA Scotland	HAZID workshop	RYA Scotland noted that guard vessels would presumably only be needed during the construction phase and not the operational phase. In agreement with the hazard scoring for recreational vessel allision, stating that the frequency is very low	Guard vessels are primarily intended for the construction phase or during significant maintenance activities in the O&M phase. This approach is consistent with industry practice and stakeholder expectations. The low frequency of recreational vessel allision is acknowledged and reflected in the NRA scoring. These assumptions will be reviewed and updated as necessary during post-consent planning and operational risk assessments.
19/08/2025	MCA	HAZID Workshop	MCA noted that Risk ID 10 had a property consequence score of 4 under the realistic most credible scenario and suggested that a large commercial vessel should have the same or higher scoring. MCA also highlighted increasing reports of allision with fishing vessels and recommended increasing the likelihood score for Risk ID 19.	Property consequence score for Risk ID 1 (Large Commercial In Collision With (ICW) Large Commercial) was increased from 3 to 4 under the realistic most credible scenario (see Section 9.5). Frequency of occurrence for Risk ID 19 (Allision: Fishing and Recreational) was increased from 3 to 4. These updates reflect stakeholder concerns and recent incident data. The revised scores are documented in the NRA and will inform future risk mitigation strategies and post-consent planning (see Section 9.5).
19/08/2025	SWFPA	HAZID Workshop	SWFPA agreed with increasing the allision likelihood score for fishing vessels, noting that for every incident reported, there is likely one that isn't. They also expressed difficulty in visualising cumulative effects due to the mix of fixed and floating OWFs, large OSPs, and limited space between other projects, especially under adverse conditions.	The frequency score for Risk ID 19 was updated to reflect stakeholder concerns. Cumulative impacts have been qualitatively assessed in Section 10. The Eastern Developers Group is also coordinating efforts to assess cumulative impacts across their respective projects. The cumulative future case scenario was also discussed in the HAZID and stakeholders commented that modelling this was a borderer strategic matter better considered at a national level than through more limited coverage of individual projects. Therefore, the cumulative scenario has been considered only qualitatively for the area of CEA coverage (50 nm (92.5 km)) within Section 10.
19/08/2025	RYA Scotland	HAZID Workshop	RYA Scotland suggested that instead of attempting a full cumulative assessment, the project could assess how sensitive the risk matrix is to changes, such as doubling vessel traffic, to determine whether risks remain tolerable (i.e. ALARP).	Stakeholder suggestions have informed the development of adaptive risk management strategies and scenario testing in Volume 2, Chapter 14: Shipping and Navigation. The consideration of the wider cumulative impacts has been included qualitatively within this NRA (Section 10 and Table 10.3).
27/08/2025	Kincardine OWF	Individual consultation meeting	Kincardine OWF noted that fishing areas can be fished intensely, particularly by nomadic scallop trawlers operating in packs. Emphasising the need for cables to be buried to specification to avoid incidents. Kincardine OWF raised the issue of maintenance towage between Kincardine OWF and the Netherlands, noting that the route passes near Bowdun. Kincardine OWF recommended that a specific towage route be identified and communicated between the 2 projects. Adding that towage is on an as-needed basis. It was noted that towage is infrequent, with only one occurrence in the past year. Kincardine OWF supported the suggestion from NLB regarding remote monitoring capability for AtoNs to identify outages and respond promptly. It was recommended that Bowdun consider electronic monitoring. Kincardine OWF agreed with the updated hazard scorings from the HAZID Workshop. Also acknowledging concerns raised by RYA Scotland and fisheries representatives regarding buoy breakout hazards (IDs 38 and 39). Kincardine OWF raised concerns about cumulative impacts from multiple OWFs, noting displacement of fishing vessels and changing patterns already observed at Kincardine. Kincardine OWF referenced the Forth and Tay Commercial Fisheries Working Groups as actively considering cumulative impacts.	Cable burial specifications are acknowledged and will be addressed in the project's design and construction planning (Section 4.3). Towage route coordination is recognised as a specific concern and coordination planning will be continued post-consent through sharing of towage routes and notifications The LMP will be developed for Bowdun OWF in coordination with NLB post-consent, including details on AtoN availability, remote monitoring, and procedures for responding to outages (Section 9.6). Hazard scoring updates have been incorporated into the NRA. Buoy breakout risks are acknowledged and will be considered in mitigation planning and post-consent documentation, including ERCoP and NSVMP (Section 4.8 and Embedded Mitigations Table 9.7). Cumulative impacts have been qualitatively assessed in Section 10. The Eastern Developers Group also coordinated efforts to assess cumulative impacts across their respective projects. The cumulative future case scenario was also discussed in the HAZID and stakeholders commented that modelling this was a borderer strategic matter better considered at a national level than through more limited coverage of individual projects. Therefore, the cumulative scenario has been considered only qualitatively for the area of CEA coverage (50 nm (92.5 km)) within Section 10 of this NRA. Impacts to Commercial Fisheries through displacement and changing patterns have been addressed in the EIA (Volume 2, Chapter 13: Commercial Fisheries).

Desktop Study

3.2.4 Information within the Shipping and Navigation Study Area collected through a detailed desktop review of existing studies and datasets and used to inform the NRA is summarised in Table 3.2.

Table 3.2: Summary of Key Desktop Datasets and Reports for Shipping and Navigation

Title	Source	Extent	Year	Author
High fidelity AIS data for May 2024 to April 2025	MadeSmart Group (2025)	Entirety of the Shipping and Navigation Study Area	2025	MadeSmart Group
European Marine Observation and Data Network (EMODnet) 2024 vessel density grids	EMODnet (2024)	North Coast of Scotland	2024	EMODnet
Admiralty Charts (1409-0, 02182B-0)	Triton Software Limited and United Kingdom Hydrographic Office (UKHO), (2025)	Entirety of Shipping and Navigation Study Area	2025	UKHO
NP52 - Admiralty Sailing Directions: North Coast of Scotland Pilot	UKHO (Admiralty, 2022)	North Coast of Scotland	2022	UKHO Admiralty
Locations and details of maritime accidents reported to the Marine Accident Investigation Branch (MAIB).	MAIB (Obtained through freedom of information request) (MAIB, 2025)	Entirety of Shipping and Navigation Study Area	1992 to 2024	MAIB
Locations and details of maritime accidents reported to the RNLI.	RNLI Incident Data (RNLI, 2025)	Entirety of Shipping and Navigation Study Area	2008 to 2024	RNLI
Locations and details of Department for Transport (DfT) SAR Helicopter Taskings	DfT (2025)	Entirety of Shipping and Navigation Study Area	2025 dataset	DfT
Port Freight Annual Statistics 2024	DfT (2024a)	UK wide	2000-2024	DfT
UK Port Freight Traffic 2024 Forecasts	DfT (2024b)	UK wide	2024-2050	DfT

Title	Source	Extent	Year	Author
OWF sites and Offshore Transmission Owners in planning, construction and operational phases	Crown Estate Scotland (CES) (CES, 2025a)	Entirety of Shipping and Navigation Study Area	2025	CES
Tidal agreements in planning, construction and operational phases	CES (CES, 2025b)	Entirety of Shipping and Navigation Study Area	2025	CES
Oil and Gas fields, wells, pipeline infrastructure and surface infrastructure	North Sea Transition Authority (NSTA) (2025)	Entirety of Shipping and Navigation Study Area	2025	NSTA
Disposal Sites in Scotland	Marine Scotland (MS) (MS, 2024)	Entirety of Shipping and Navigation Study Area	2024	MS
UK harbour areas and military and exercises areas	Digitised from Admiralty Charts (UKHO, 2025)	Entirety of Shipping and Navigation Study Area	2023	UKHO
Copernicus MetOcean Data	Copernicus Marine Data Store (2025)	Entirety of Shipping and Navigation Study Area	2025	Copernicus

Site-Specific Surveys

3.2.5 A summary of the surveys undertaken to inform shipping and navigation is outlined in Table 3.3 below. Details of the surveys, including methodology and data findings is shown in Section 6.1. Vessel Traffic Survey summary reports are included in Volume 3, Technical Appendix 14.2: Shipping and Navigation Vessel Traffic Survey Report 2024 and 14.3: Shipping and Navigation Vessel Traffic Survey Report 2025.

Table 3.3: Summary of Site-Specific Surveys Undertaken for Shipping and Navigation

Title	Date	Extent of Survey	Overview of Survey	Survey Contractor	Reference to Further Information
14-Day Summer Vessel Traffic Survey	30/06/2023 to 14/07/2023	Array Area + 10 nm (18.5 km)	14-Day Vessel Traffic Survey to capture recreational and fishing vessel activity that do not broadcast AIS, by radar and visual observations.	Survey Vessel: Karelle	Details of the surveys, including methodology and data findings are shown in Section 6.2. Vessel traffic survey summary
14-Day Winter Vessel Traffic Survey	05/01/2024 to 19/01/2024				

Title	Date	Extent of Survey	Overview of Survey	Survey Contractor	Reference to Further Information
14-Day Summer Top-Up Vessel Traffic Survey	16/07/2025 to 30/07/2025				reports are shown in Volume 3, Technical Appendix 14.2: Shipping and Navigation Vessel Traffic Survey Report 2024 and 14.3: Shipping and Navigation Vessel Traffic Survey Report 2025.
14-Day Winter Top-Up Vessel Traffic Survey	02/12/2025 to 16/12/2025				

3.3 IALA Risk Management Tool and Quantitative Risk Modelling

3.3.1 The IALA Waterway Risk Assessment Program (IWRAP Mk II) is a quantitative tool for calculating the frequency of collisions, groundings and allisions for vessels navigating a given waterway. The tool was developed by IALA to support coastal states in conducting risk assessments to address obligations under International Convention on the SOLAS Chapter V. The tool has been presented at the IMO (e.g. NAV 52/17/2 and SN.1/Circ.296) and used by Denmark and Sweden to support the assessment of new routeing measures (NCSR 5/INF.3). IALA (2017) Guideline G1123 contains guidance on implementing the tool and the underlying mechanics are presented in Friis-Hansen (2008).

3.3.2 IWRAP modelling has a number of stages:

- Data preparation:
  - vessel traffic legs are created that represent existing and future case deviated shipping routes and AIS data is used to determine the volume and types of traffic, and lateral distribution of traffic across those legs (see Figure 3.3);
  - these legs are connected into a network, with waypoints added where legs cross, merge or join together; and
  - other hazards, such as bathymetry and fixed installations are inputted into the model.
- Risk calculation:
  - where these legs intersect with one another or physical hazards, the proportion of traffic on that leg at risk is calculated; and
  - to account for the ability of the crew to avoid these hazards, a causation factor is used (in the order of one in 10,000) to represent the probability of human error or mechanical failure leading to an incident.

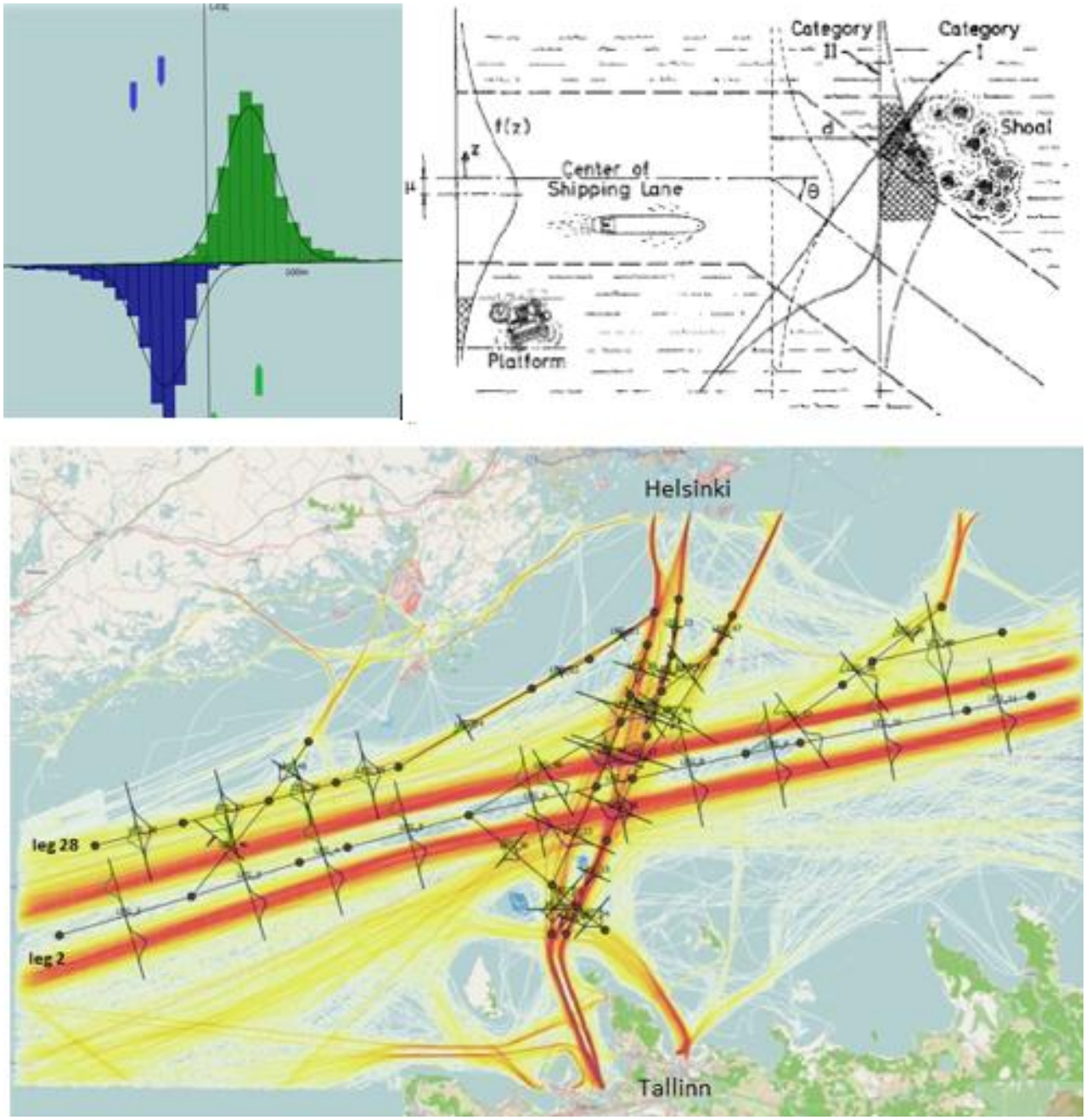

Figure 3.3: IWRAP MKII Model Example, Gulf of Finland (IALA, 2017)

4 Project Description

4.1 Overview

4.1.1 This section provides an overview of the Proposed Development by setting out its main components. It also gives an overview of the main activities that will be undertaken during construction, O&M and decommissioning.

4.1.2 A full description of the Proposed Development is contained in Volume 1, Chapter 3: Project Description.

4.2 Site Description

Layout

4.2.1 At present, two indicative layout options for Wind Turbines within the Array Area have been assessed, as presented in Figure 4.1. A Wind Turbine layout plan is to be further consulted on with MCA and NLB prior to construction and will be finalised through the design process. For the analysis conducted during this NRA, the MDS Wind Turbine layout of maximum site build-out has been assumed. It is noted that each layout under consideration includes spare Wind Turbine locations. The maximum number of Wind Turbines for the 15 MW scenario is 67 and the maximum number of Wind Turbines for the 25 MW scenario is 40 It is further noted that OSPs would also be located at up to three of the locations shown in Figure 4.1 including the potential to be on a perimeter location.

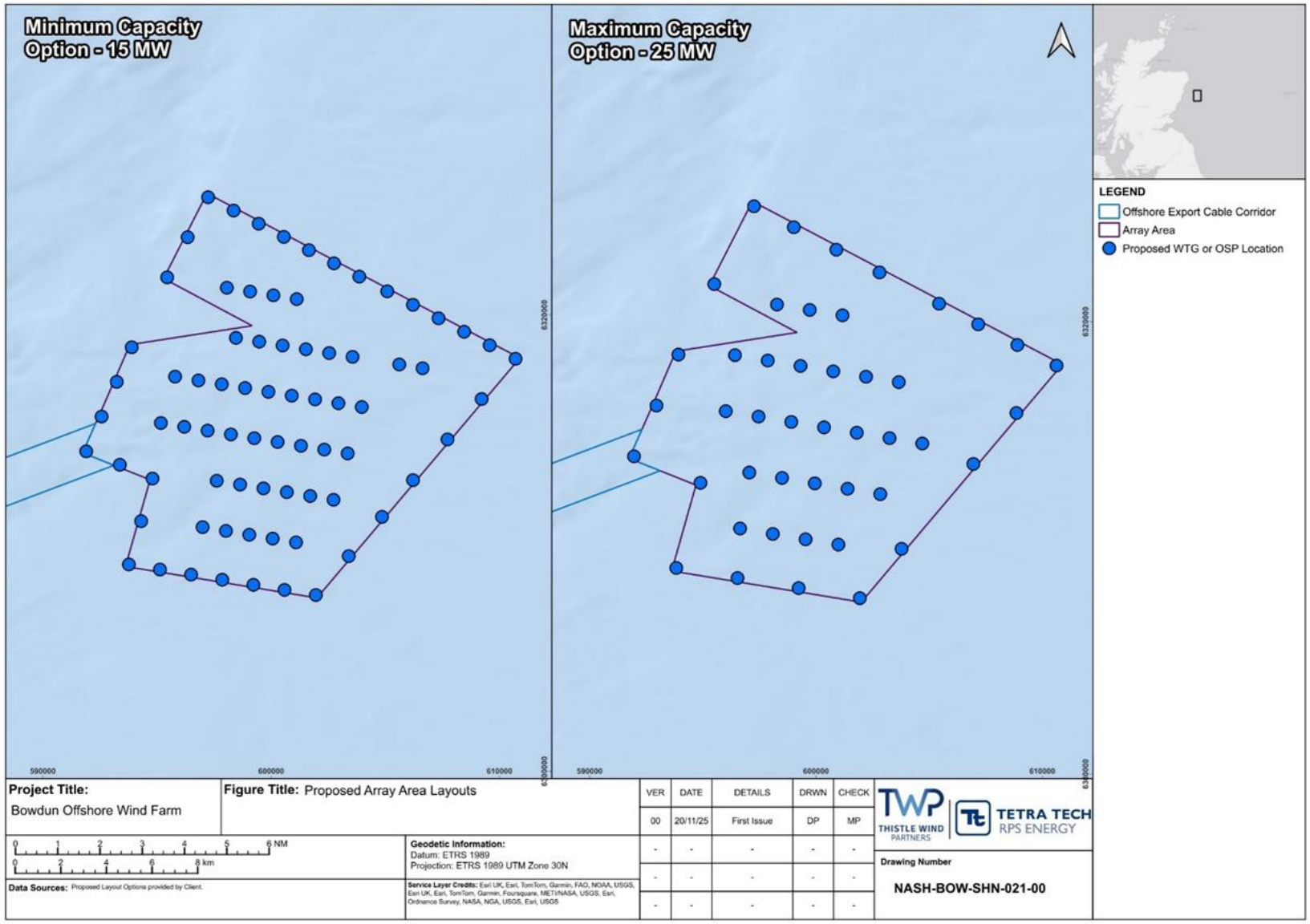

Figure 4.1: Proposed Array Area Layouts

Wind Turbines

4.2.2 The final size and capacity of the Wind Turbines will be determined at a later stage in the development of the Project, prior to final investment decision. The current PDE for Wind Turbines is outlined in Table 4.1.

Table 4.1: Wind Turbine Project Design Envelope

Wind Turbine Parameter	Range to be considered	
Wind Turbine capacity (MW)	15	25
Wind Turbine Rotor Diameter (m)	236	326
Maximum Number of Wind Turbines	67	40
Minimum clearance above Lowest Astronomical Tide (LAT) (m)	33.12	33.12
Minimum Separation Distance Between Wind Turbines perpendicular to prevailing wind direction (m)	1,038	1,467

4.2.3 The foundation type will also be determined at a later stage, prior to final investment decision. The current Wind Turbine foundation type options being considered for the Proposed Development are:

- Fixed - monopile with transition piece; or
- Fixed - piled jacket (either 3-leg or 4-leg jacket structure); or
- Fixed - 3-leg suction bucket jacket.

4.2.4 It is anticipated that any foundations will be fabricated onshore before specialist vessels are used to transport and install the foundations within the Array Area.

4.2.5 The MDS associated with each fixed foundation type being considered for the Wind Turbines as part of the Proposed Development is provided in Table 4.2 and illustrated in Figure 4.2.

Table 4.2: Wind Turbine Foundations Project Design Envelope

Foundation Parameter	MDS – Parameter Value			
	Monopile	**Piled Jacket (3-Leg)**	**Piled Jacket (4-Leg)**	**Suction Bucket Jacket**
Maximum number of foundations	67			
Seabed Footprint (per foundation) (m^2)	176.7	58.9	78.5	850.6
Scour Protection material	Rock placement, rock bags and/or concrete mattressing			

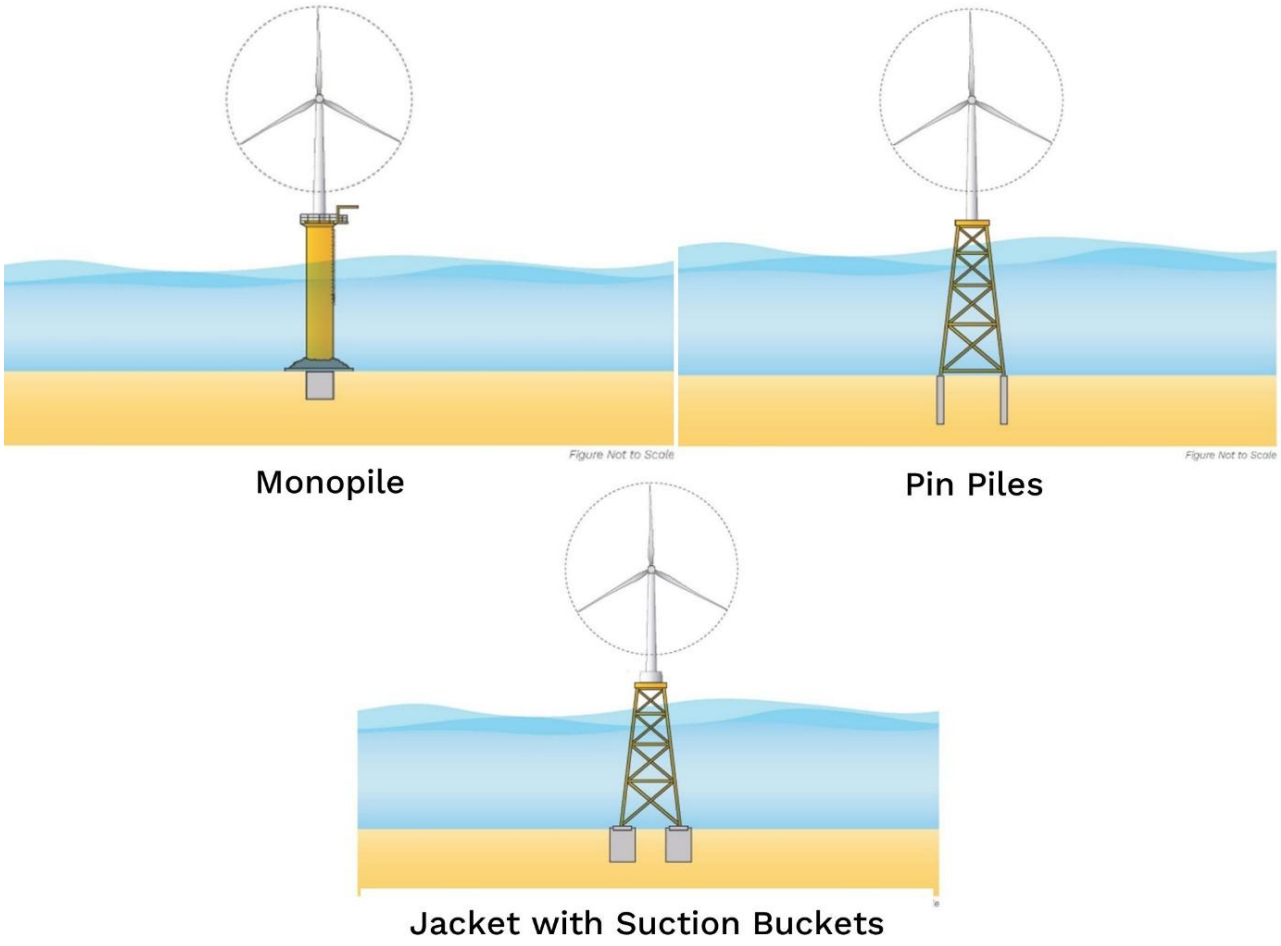

Figure 4.2: Wind Turbine Foundation Design Options

Offshore Substation Platforms

4.2.6 IACs from Wind Turbines will be brought to up to three OSPs depending on the electrical system voltage and final layout. A High Voltage Alternating Current (HVAC) transmission option is assumed at this stage and the OSP(s) will be situated on jacket foundations within the Array Area. The MDS of the OSPs is provided in Table 4.3.

Table 4.3: OSP MDS Parameters

OSP Parameters	MDS – Parameter Value
Maximum number of OSPs	Up to 3
Structure type	Fixed jacket
Maximum height of main OSP structure (m)	60
Maximum topside length (m)	100
Maximum topside width (m)	80

Subsea Cables

Inter-Array Cables

4.2.7 IACs connect the Wind Turbines to each other and to the OSP(s). Each Wind Turbine will be connected via an Alternating Current static IAC which will lie directly on the seafloor between the Wind Turbines and the OSPs. The length of each IAC will depend on the final layout and be a total maximum of 167 km (of which a maximum of 151 km located on the seabed).

4.2.8 Where practicable, the IACs will be buried to an appropriate target burial depth. Cable burial depths will be informed by a Cable Burial Risk Assessment (CBRA) but based on current information the current target burial depth is 1.5 m (subject to further design), with a target burial depth of 1.5 m and greater burial depths in specific areas as informed by the CBRA. In cases where such burial is not feasible (e.g. the foundation entry points, or where the cable is expected to cross areas of bedrock, pipelines, or other existing cables), alternative protection methods will be employed.

4.2.9 The MDS for the key parameters associated with IACs within the Proposed Development is shown in Table 4.4.

Table 4.4: IAC MDS Parameters

IAC Parameters	MDS – Parameter Value
Total IAC Length (km)	167 (151 on seabed)
Maximum number of crossings	9
Cable burial depth (m)	Target 1.5 m, minimum 0.5 m, maximum informed by CBRA
Maximum cable protection height (m)	2

Interconnector Cables

4.2.10 Should the Array Area require more than one OSP, Interconnector Cables will be required to connect the OSPs to enable transfer of generated power from one part of the Array Area to the other, and to ensure that electricity transmission can continue in the event of one cable failing. Cable crossings will be required where IACs and Interconnector Cables pass over other cables and/or pipelines.

4.2.11 The Interconnector Cables will be installed by the same methodologies proposed for IACs, with final methodology determined during the Proposed Development's final design phase. The MDS for Interconnector Cables is provided in Table 4.5.

Table 4.5: Interconnector Cable MDS Parameters

Interconnector Cable Parameters	MDS – Parameter Value
Maximum number of Interconnector Cables within Array Area	3
Total length of Interconnector Cables (km)	36
Maximum number of crossings	3
Cable burial depth (m)	Target 1.5 m, minimum 0.5m, maximum informed by CBRA
Maximum cable protection height (m)	2

Offshore Export Cables

4.2.12 Offshore Export Cables allow the transfer of electricity from the Array Area to the Onshore Infrastructure. Up to three 220/275 kV Offshore Export Cables will be installed within three adjacent trenches between the OSP(s) and the Landfall area, connecting to the Onshore Infrastructure. There is a strong preference that the Offshore Export Cables are buried to protect the assets, to limit interaction with other sea users, and reduce the amount of cable protection required. However, sediment types and ground conditions largely determine the ability to bury cables, and cable burial depths will be informed by a CBRA. Based upon current design information and industry best standard, a target burial depth of 1.5 m is being considered.

4.2.13 Cables are anticipated to be installed using several possible techniques given the length of the Offshore Export Cables. Depending on the seabed and sediment conditions, the Offshore Export Cables could be installed by dredging or ploughing. Otherwise, the cables will be surface laid and protected by means of rock berm, or installation of concrete mattresses. Protection will also be needed at cable and pipeline crossings, the number of which will be dependent on the final Export Cable Corridor route. The current MDS for Offshore Export Cables is summarised in Table 4.6 below.

4.2.14 The Landfall is planned to be installed via a trenchless technique (e.g. Horizontal Directional Drilling (HDD)) or pipe-jacking.

Table 4.6: Offshore Export Cables MDS Parameters

Offshore Export Cable Parameters	MDS – Parameter Value
Maximum number of Offshore Export Cables	3
Total length of Offshore Export Cables (per cable) (km)	70
Maximum number of crossings	6
Cable burial depth (m)	Target 1.5 m, minimum 0.5m, maximum informed by CBRA
Maximum cable protection height (m)	2

4.3 Construction

Seabed Preparation

4.3.1 Seabed preparation is likely to be required. Seabed preparation includes seabed levelling, ground reinforcement, and removing surface and subsurface debris such as boulders, fishing nets, lost anchors etc. If debris are present below the seabed, then excavation may be required for access and removal. Any unexploded ordnances found with live ammunition will follow the assessment and mitigations set out in Volume 3, Technical Appendix 19.2: Unexploded Ordnance Technical Report.

Marine Operations

4.3.2 Offshore site preparation works are anticipated to start Q1 2031, with offshore construction anticipated to start from Q4 2031, with first power anticipated in Q4 2035. The Project aims to be fully commissioned by Q1 2036.

4.3.3 Throughout construction, it is expected that there will be up to 25 vessels within the Array Area at any one time, with ~1,671 return transits during construction, including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, Crew Transfer Vessels (CTVs), Scour Protection installation vessels and cable protection installation vessels. Throughout construction of the Offshore Export Cables, it is expected that there will be up to 16 vessels on site at any one time within the Export Cable Corridor, with ~449 return transits during construction.

4.4 Operations and Maintenance

4.4.1 Across the operational life of the Project, O&M activities can be split into three main categories as follows:

- scheduled maintenance;
- unscheduled maintenance; and
- emergency/special maintenance (in the event of major equipment breakdown and repairs).

4.4.2 The strategy for O&M will be finalised based on the location of a suitable port/harbour, yet to be defined. In choosing a suitable port/harbour there will be requirements to ensure sufficient access to a fleet of vessels with the capabilities to complete any required O&M activities. The overall O&M strategy will also reflect the technical specification (once known) including Wind Turbine type, electrical transmission design and final Proposed Development layout.

4.4.3 At this stage, the high-level offshore activities will include but not be limited to the following:

- wide ranging inspections of foundations, transition pieces, blades, safety equipment, OSP equipment etc;
- system performance assessments and fault-finding;
- replacement of lubricants, oils, filters, etc.;

- painting and coating application of Wind Turbines, etc;
- replacement of Wind Turbine parts including bearings, gearboxes, generators, nacelles, transformers and blades;
- minor repair and replacements including access ladders, corrosion protection system including anodes and protective coatings, secondary steel, boat landings, cable penetrations and ducting, AtoNs;
- removal of marine growth and guano;
- structural surveys;
- periodic cable burial surveys, including any crossings and at interfaces at subsurface structures;
- reburial or other remedial actions of IACs, Offshore Export Cables and crossings;
- repair or replacement of Offshore Export Cables and IACs; and
- replenishment of rock protection as additional cable and scour protection.

4.4.4 Throughout the O&M phase, a maximum of 12 O&M vessels (Array Area) and eight vessels (Export Cable Corridor) are expected on site at any one time, with 588 (Array Area) and 125 (Export Cable Corridor) return vessel transits, including CTVs/workboats, cable repair vessels, anchor handling vessels or similar and guard vessels. In addition to this, a further number of vessels will undertake another 146 (Array Area) and 114 (Export Cable Corridor) return trips spread over the 30 year O&M phase.

4.5 Decommissioning

4.5.1 At the end of the operational lifetime of the Project, anticipated to be up to 30 years, the decommissioning sequence will be undertaken in reverse of the construction sequence, involving similar types and numbers of vessels and equipment.

4.5.2 At this stage, the full detail of the required decommissioning activities is unknown. A Decommissioning Programme will be prepared (in line with section 105 and 106 of the Energy Act 2004) during detailed design and developed and refined during the Project's lifetime and as decommissioning approaches. To reflect future best practice and new technologies, the approach and methodologies of the decommissioning activities will be compliant with the relevant legislation, guidance and policy requirements at the time of decommissioning.

4.5.3 The approach for decommissioning is yet to be determined, however, for the purpose of this MDS it is assumed that all electrical cables are anticipated to be left *in situ* to reduce environmental impacts associated with their removal. The possibility of removing the subsea cables and leaving structures above the seabed *in situ* with appropriate navigation markers will also be assessed.

4.6 Maximum Design Scenario

4.6.1 Based on a review of the Project Description (Volume 1, Chapter 3: Project Description) and Offshore EIA Scoping Report (Bowdun Offshore Wind Farm Limited (BOWFL), 2024), the MDS for each key parameter for shipping and navigation is summarised in Table 4.7.

Table 4.7: Maximum Design Scenario (MDS)

Parameter	Justification	Value	Scenario /Option
Maximum Number of Wind Turbines	Greatest impacts (all) from greatest number of structures.	67	15 MW Wind Turbine option
Maximum Wind Turbine Rotor Diameter	Greatest impact on SAR access from minimum corridor width.	236 m	15 MW Wind Turbine option
Minimum Separation Distance Between Wind Turbines	Greatest impact on SAR access from minimum corridor width.	1,038 m	15 MW Wind Turbine option
Maximum Number of OSPs	Greatest impact from greatest number of structures.	3	15 MW Wind Turbine option
Location of OSPs	Greatest impact for allision consequence.	Boundary position	All options
Maximum Length of Cables on Seabed	Greatest impact on grounding and snagging for greatest reduction in water depth.	137 km IAC 36 km Interconnector 210 km export?	All options
Maximum Cable Protection Height	Greatest impact on grounding and snagging for greatest reduction in water depth.	2 m	All options
Maximum Amount of Cable Protection	Greatest impact on grounding and snagging for greatest reduction in water depth.	50% of cable length	All options
Maximum number of cable crossings	Greatest impact on grounding and snagging for greatest reduction in water depth.	9 IAC 3 Interconnector Cable 6 Offshore Export Cables	All options
Maximum Cable Protection Height	Greatest impact on grounding and snagging for greatest reduction in water depth.	2.0 m	All options
Maximum Operational Duration	Greatest duration of Project has greatest exposure to risk.	30 years	All options
Maximum Construction/ Decommissioning Duration	Greatest disruption and vessel activities across longest construction duration.	5 years	All options
Maximum Number of Construction/Decommissioning Vessel	Greatest disruption as a result of the largest number of vessel movements.	Array Area: 1,671 Offshore Export Cables: 449	All options

Parameter	Justification	Value	Scenario /Option
Return Trips over entire phase			
Maximum Number of O&M Vessel Return Trips per year	Greatest disruption as a result of the largest number of vessel movements.	Array Area: 588 Offshore Export Cables: 125	All options

4.7 Navigational Markers, Lighting and Charting

4.7.1 Marking and lighting requirements for man-made offshore devices are described in IALA Recommendation G1162 2021 (previously O-139 2013). An AtoN Management Plan should be developed and agreed post-consent with the NLB and MCA (an outline AtoN plan can be found Volume 4, Appendix 32: Outline Aid to Navigation Management Plan).

4.7.2 G1162 outlines the following specific recommendations made for offshore Wind Turbines (see Figure 4.3):

- Isolated Wind Turbines, meteorological masts and other structures are recommended to:
  - be marked with a white light flashing Mo (U) ≤15 s, and with a nominal range of 10 nm (18.5 km);
  - have AtoN mounted below the lowest point of the arc of any rotor blades. They shall ideally be located at a height of at least 6 m above Highest Astronomical Tide (HAT); and
  - have AtoN that comply with IALA recommendations and have an availability of not less than 99.0% (IALA Category 2).
- Lettering: It is recommended that each structure, displays identification panels with black letters or numbers 1 m high on a yellow background visible in all directions.
- Hazard Warning Signals: Consideration may also be given to the provision of hazard warning signals where appropriate, taking into account the prevailing visibility and vessel traffic conditions. The range of such hazard warning signals should not be less than 2 nm (3.7 km).
- AIS/Racons: Where there is a requirement to remotely identify a particular structure a radar beacon (racon) and/or an AIS AtoN may be fitted.
- A Significant Peripheral Structure (SPS) will include the structures on the corners/periphery of an OWF as determined by the competent authority. It is recommended that:
  - These lights display a special mark characteristic, flashing yellow, with a minimal nominal range of 5 nm (9.3 km);
  - The competent authority (MCA) may consider the synchronisation of all SPS of the same light characteristic;

- In the case of a large or extended OWF, the distance between SPS should not normally exceed 3 nm (5.6 km);
- On large OWF consideration should be given to using different light characteristics for marking SPS on corners of OWF to those marking structures along the periphery of the OWF; and
- SPS - lights visible from all directions in the horizontal plane. It is recommended to synchronise these lights in order to display a special mark characteristic, flashing yellow, with a range of not less than 5 nm (9.3 km).

- Intermediate Peripheral Structures (IPS) may be considered, dependent on the wind farm layout, and these are also located on the periphery of an OWF:
  - Are marked with flashing yellow lights;
  - The flash character of these lights shall be distinctly different from those displayed on the SPS, with a nominal range of 2 nm (3.7 km);
  - Have a lateral distance between IPS or the nearest SPS which will not normally exceed 2 nm (3.7 km); and
  - Intermediate structures on the periphery of an OWF other than the SPS - marked with flashing yellow lights which are visible to the mariner from all directions in the horizontal plane with a flash character distinctly different from those displayed on the SPS and with a range of not less than 2 nm (3.7 km).
- Promulgation: NtMs and the relevant Hydrographic Office must be informed of the marking, location and extent of any man-made structure, to permit the appropriate marking.

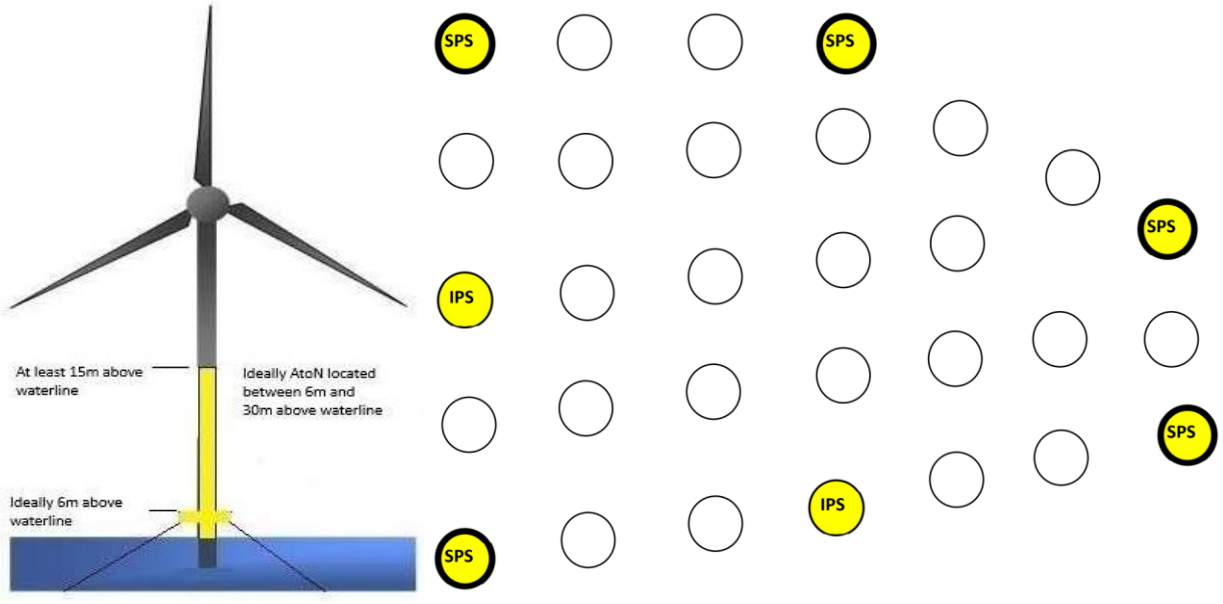

Figure 4.3: IALA G1162 OWF Marking Recommendations

4.8 Embedded Mitigation

4.8.1 A list of Embedded Mitigation for the Proposed Development relevant to shipping and navigation is contained within Section 9.3. The requirement for and feasibility of any mitigation has been reviewed throughout the EIA process.

4.8.2 The list represents a mix of national requirements and industry best practice to reduce the potential impact on shipping and navigation. These measures will be reviewed throughout the assessment and development process.

5 Overview of the Baseline Environment

5.1.1 This section provides a description of the shipping and navigation baseline environment, following a desk-based review, including the key navigational features and a review of historic incidents within the Shipping and Navigation Study Area.

5.1.2 The Proposed Development area is well charted and covered by the following Admiralty nautical charts:

- Admiralty Chart 2182B-0 – North Sea Central Sheet;
- Admiralty Chart 0210 - Newburgh to Montrose; and
- Admiralty Chart 1409-0 – Buckie to Arbroath.

5.1.3 The key navigational features identified in the vicinity of the Shipping and Navigation Study Area are presented in Figure 5.1. These features are currently in place and may affect vessel routeing and operations in the future. To provide full context, other offshore renewables projects in the planning phase are also shown.

5.2 Ports and Harbours

5.2.1 The closest ports/harbours are Aberdeen, Montrose, and Peterhead. These are all located to the west of the Shipping and Navigation Study Area.

5.2.2 Montrose: Montrose is 5 nm (9.2 km) south-west and sees cargo vessels, cruise vessels, and offshore supply ships. The area also serves as the O&M base for Seagreen OWF. At time of this NRA construction is underway for Inch Cape OWF O&M base.

5.2.3 Aberdeen: Aberdeen is located 12 nm (22.2 km) west of the Shipping and Navigation Study Area. The port features deepwater berths, is a hub for vessels associated with the oil and gas sector and decommissioning works, as well as renewable Offshore Infrastructure works. The port also welcomes cruise calls at Aberdeen and is a key destination for NorthLink ferry services to the Northern Isles.

5.2.4 Peterhead: Peterhead is located 19 nm (35.2 km) north-west of the Shipping and Navigation Study Area. As well as being Europe's largest fishing port for whitefish and pelagic species, the port contains a marina for recreational users, deepwater berths, and areas for tanker vessels and oil and gas related vessels. There are some cruise calls to Peterhead.

5.3 Offshore Renewable Projects

5.3.1 There are no operational offshore renewable projects located within the Shipping and Navigation Study Area. The closest operational offshore renewable project to the Shipping and Navigation Study Area is the Kincardine OWF, located 0.8 nm (1.5 km) north-west of the Shipping and Navigation Study Area. This is a floating OWF on semi-submersible foundations with a 47.5 MW capacity.

5.3.2 Other nearby operational offshore renewable projects include: Seagreen OWF located 4.8 nm (8.9 km) south of the Shipping and Navigation Study Area, Aberdeen OWF located 11 nm (20.4 km) west of the Shipping and Navigation Study Area, and Buchan Deep Demo at 13.9 nm (25.7 km) north of the Shipping and Navigation Study Area.

5.3.3 Recently consented but not yet operational OWFs include Berwick Bank OWF and Inch Cape OWF. Neither project is located within the Shipping and Navigation Study Area. Berwick Bank OWF is located approximately 22 nm (46.5 km) south-east of the Array Area with construction planned between 2025 and 2032, overlapping the construction phase of the Proposed Development. Inch Cape OWF is located 32.9 nm (52 km) south-east of the Array Area (next to Berwick Bank OWF) and is currently under construction due for completion in 2026 with operations commencing 2027, therefore will be fully operational during the construction phase of the Proposed Development. As these wind farms were not in place during the data period of the baseline, they are considered in Section 10 as part of the coverage of the cumulative scenario for offshore energy infrastructure development.

5.3.4 There are other offshore renewable projects that are currently still in the planning phase, adjacent to the Shipping and Navigation Study Area. Section 10 provides the cumulative scenario for offshore energy infrastructure development. The only other offshore renewable project which is the planning phase that intersects the Shipping and Navigation Study Area is Morven North OWF, located 5.4 nm (10 km) east of the Array Area.

5.4 Military Practice and Exercise Areas

5.4.1 The Proposed Development is not within any UK Military Practice and Exercise Areas (PEXAs). The nearest PEXA is D604 located in the immediate coastal region near Carnoustie, approximately 22 km south-west of the Shipping and Navigation Study Area.

5.5 Oil and Gas Infrastructure

5.5.1 There are no oil and gas fields within the Shipping and Navigation Study Area. The closest producing oil fields are the Kittiwake, and Teal and Guillemot oil fields located 48 nm (88 km) and 47 nm (86 km) to the north-east of the Shipping and Navigation Study Area, respectively.

5.5.2 There are no oil and gas pipelines intersecting the Shipping and Navigation Study Area. The nearest oil and gas pipeline is located 11.2 nm (20.7 km) north of the Shipping and Navigation Study Area.

5.5.3 One NSTA well is located within the Array Area, however this is decommissioned.

5.6 Subsea Cables

5.6.1 There are no existing subsea cables running through the Shipping and Navigation Study Area. However, the EGL2 subsea cable between Drax in North Yorkshire and Peterhead in Aberdeenshire is currently in construction phase and planned for operation in 2029. This cable passes through the Shipping and Navigation Study Area and the Array Area and scheduled to be installed prior to the Proposed Development construction commencing.

5.7 Other Navigational Features

5.7.1 Charted within the east of the Array Area is a cluster of buoys associated with Metocean monitoring undertaken for the Project. These include a guard buoy, wave buoy, floating Light Detection and Ranging, and a subsurface mooring. A 500 m exclusion zone is defined within a NtM which considers these buoys and the vessel conducting maintenance activities between February 2024 and November 2025. This timescale does not overlap with the timing of the construction phase for the Proposed Development and therefore the equipment was not included in the risk modelling.

5.7.2 Where locations are known to the UKHO, wrecks described as live, or dead are presented on Admiralty charts with the recorded shallowest depth of the wreckage. There are no wrecks located within the Array Area. There are eight wrecks shown in the navigation charts located within the Export Cable Corridor, of which two are considered dangerous. One dangerous wreck, the tanker BAKU STANDARD, has a known shallowest depth of -31 m. The other dangerous wreck is the steam ship TAURUS and the shallowest depth is unknown, but it is noted as being safe to clear at -28 m. The shallowest wreck intersecting the Export Cable Corridor is the remains of a vessel located at a depth of -17 m and distance of 0.7 nm (1.3km) from land. None of the wrecks located in the Shipping and Navigation Study Area are considered by the UKHO to have an impact on shipping and navigation; however, wrecks in general have been considered within the NRA in relation to the Proposed Development.

5.7.3 There are no active aggregate extraction licence areas, dredge disposal sites, anchorages, or IMO traffic schemes within the Shipping and Navigation Study Area.

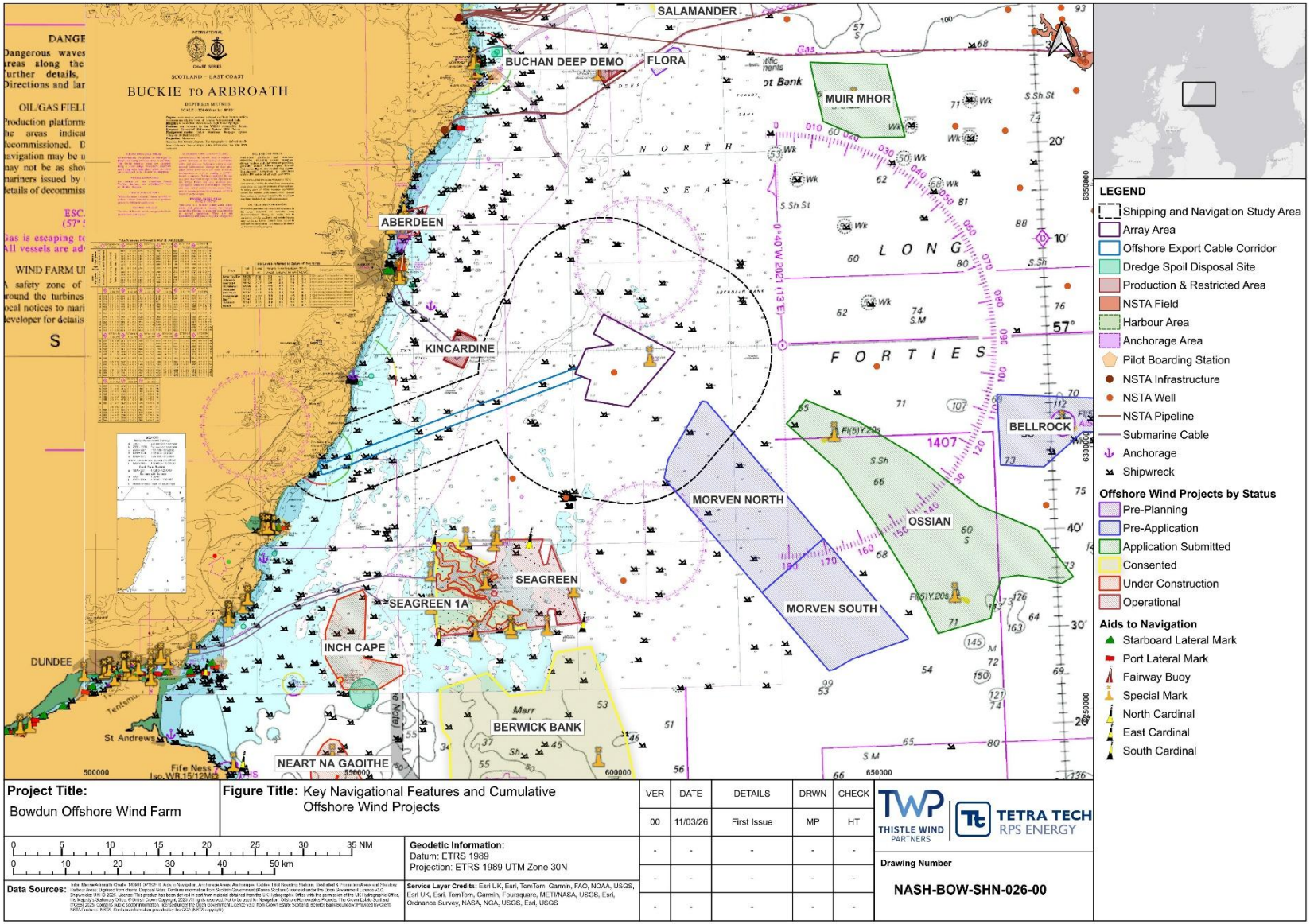

Figure 5.1: Key Navigational Features with Present and Proposed Cumulative Offshore Wind Projects

5.8 Wind and Wave

5.8.1 Metocean information for the area has been obtained from Copernicus Marine Data Store, at central location using the extents of the Export Cable Corridor and Array Area (56°58.026' N, 1°21.3' W).

5.8.2 The wind rose and wind speed by month are presented in Figure 5.2 and Figure 5.3, respectively. These figures demonstrate that wind conditions are predominantly south-westerly and account for the majority of wind conditions. Wind speeds are higher during the winter with an average wind speed above 15 kts between October and February.

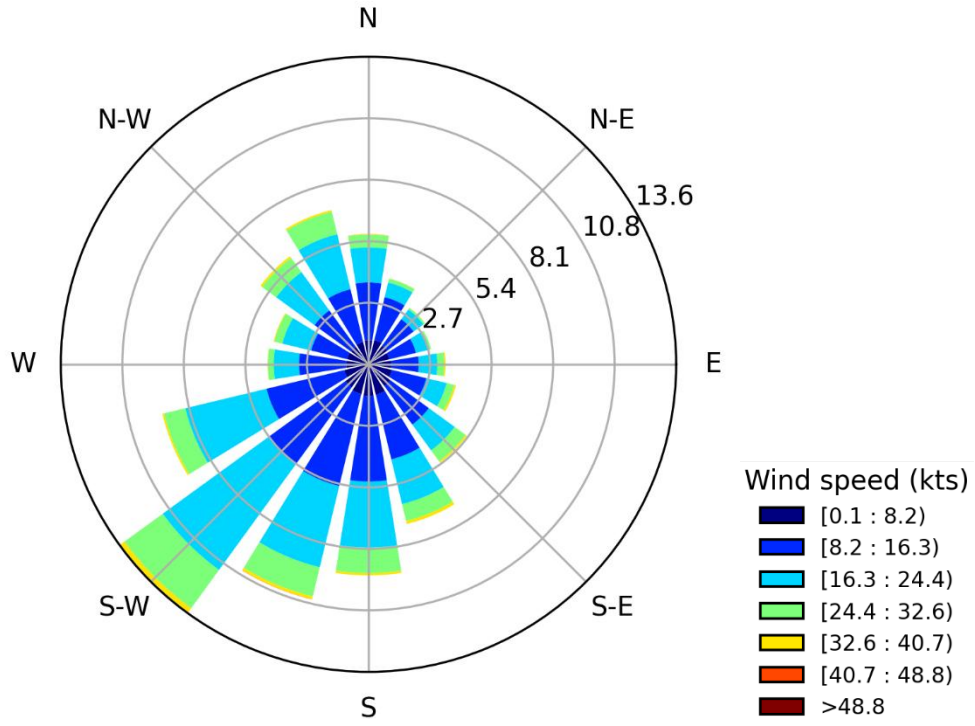

Figure 5.2: Annual Average Wind Rose

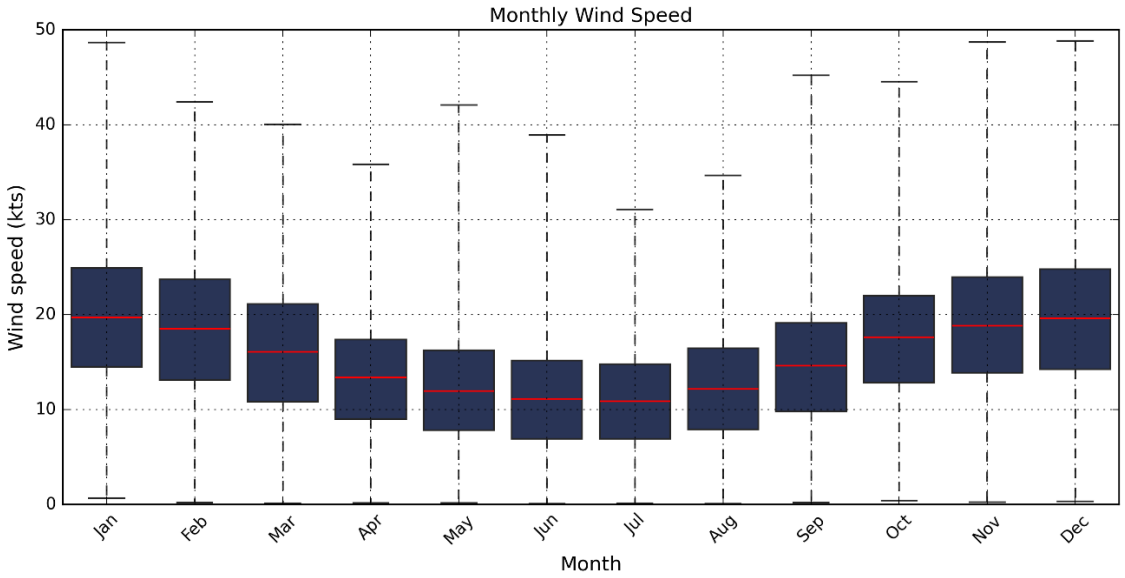

Figure 5.3: Monthly Wind Speed

5.8.3 The wave rose and significant wave heights by month are presented in Figure 5.4 and Figure 5.5, respectively. Wave conditions are predominantly northerly and north-north-easterly. Wave height averages between 1 m to 1.5 m, with winter months being nearer 2 m.

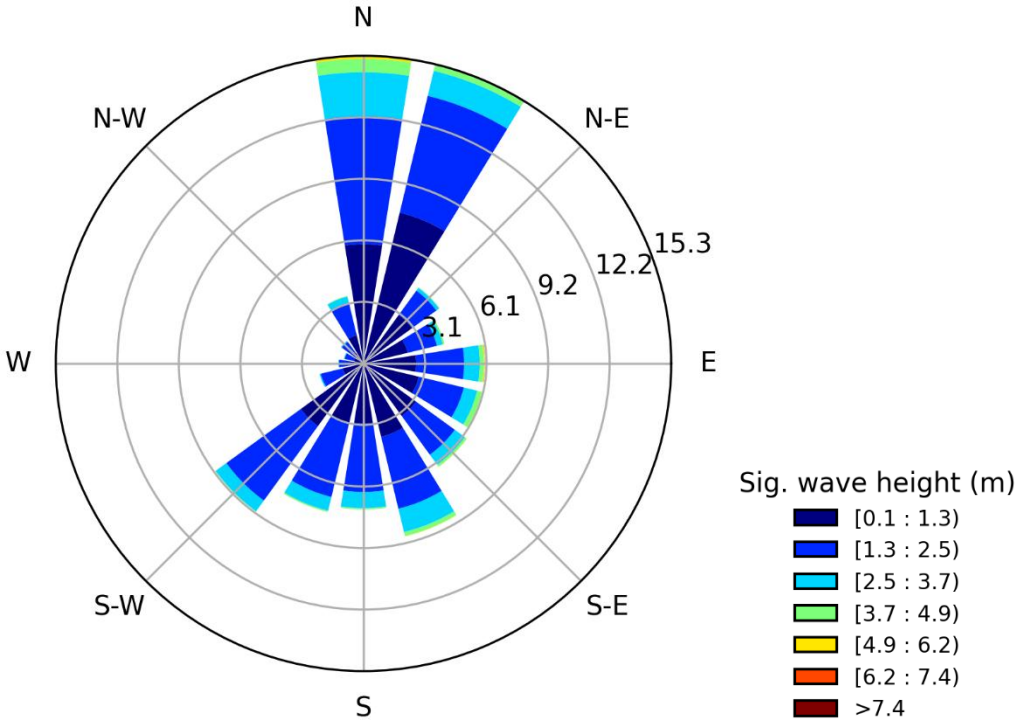

Figure 5.4: Annual Average Wave Rose

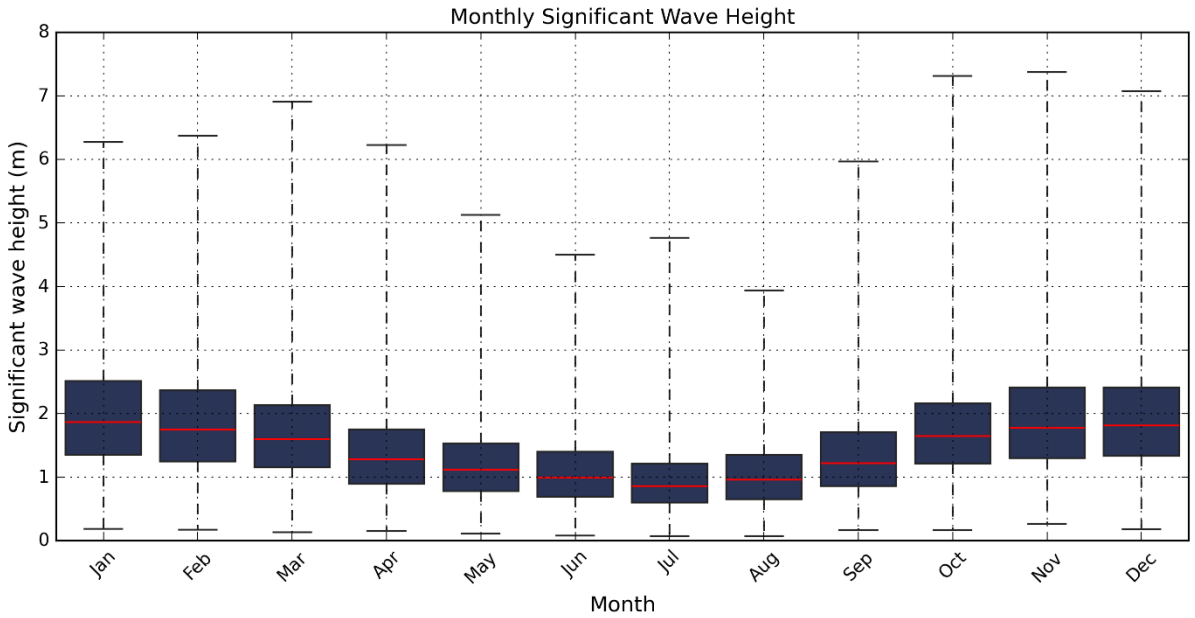

Figure 5.5: Monthly Significant Wave Height

5.9 Tide and Current

5.9.1 Tidal diamond “G” (56°45.0' N, 1°40.0' W) from Admiralty Chart 1409-0, located 12.0 nm (22.2 km) south-east of the Array Area, is presented in Table 5.1. providing context of tidal current rates and directions in spring and neap tidal cycle conditions. There are no tidal limitations at the Array Area or on the Export Cable Corridor. The Admiralty Chart includes no statements indicative of hazardous tidal streams or recommended precautions.

Table 5.1: Details for Tidal Diamond "G" on Admiralty Chart 1409-0: Buckie to Arbroath

Hours		Tidal Stream	Rate at Spring Tide (kts)	Rate at Neap Tide (kts)
Before high water	**6**	016°	1.1	0.6
	5	014°	0.9	0.5
	4	005°	0.5	0.3
	3	160°	0.9	0.6
	2	172°	0.9	0.5
	1	185°	1.4	0.7
High Water		193°	1.5	0.8
After high water	**1**	198°	1.1	0.6
	2	207°	0.5	0.3
	3	349°	0.3	0.2
	4	005°	0.9	0.5
	5	007°	1.3	0.7
	6	017°	1.3	0.7

5.10 Search and Rescue

His Majesty's Coast Guard

5.10.1 His Majesty's Coastguard (HMCG) is responsible for requesting and coordinating SAR activities within the UK's SAR region. SAR near to the Proposed Development is coordinated from Aberdeen Maritime Rescue Coordination Centre (MRCC).

5.10.2 There are 11 RNLI lifeboat stations within 50 nm (92.6 km) of the Shipping and Navigation Study Area, as detailed in Table 5.2 and shown in Figure 5.6. The Inverness HMCG helicopter base provides aerial capability for the area, and the closest RNLI all-weather lifeboats are located in Montrose, Aberdeen, and Peterhead.

Table 5.2: SAR Capabilities within 50 nm (92.6 km) of the Shipping and Navigation Study Area

Name	Type	Closest distance to the Array Area and/or Export Cable Corridor (nm)
Stonehaven Lifeboat Station	2x B Class Lifeboats	7.6
Montrose Lifeboat Station	Shannon Class Lifeboat D Class Lifeboat	8.5
Aberdeen Lifeboat Station	Severn Class Lifeboat D Class Lifeboat	17.3
Aberdeen MRCC	Maritime Rescue Coordination Centre	17.6
Arbroath Lifeboat Station	B Class Lifeboat D Class Lifeboat	18.2
Peterhead Lifeboat Station	Tamar Class Lifeboat	29.3
Broughty Ferry Lifeboat Station	Trent Class Lifeboat D Class Lifeboat	31.3
Anstruther Lifeboat Station	Shannon Class Lifeboat D Class Lifeboat	38.3
Fraserburgh Lifeboat Station	Trent Class Lifeboat	45.5
North Berwick Lifeboat Station	D Class Lifeboat	46.9
Dunbar Lifeboat Station	Trent Class Lifeboat D Class Lifeboat	48.7

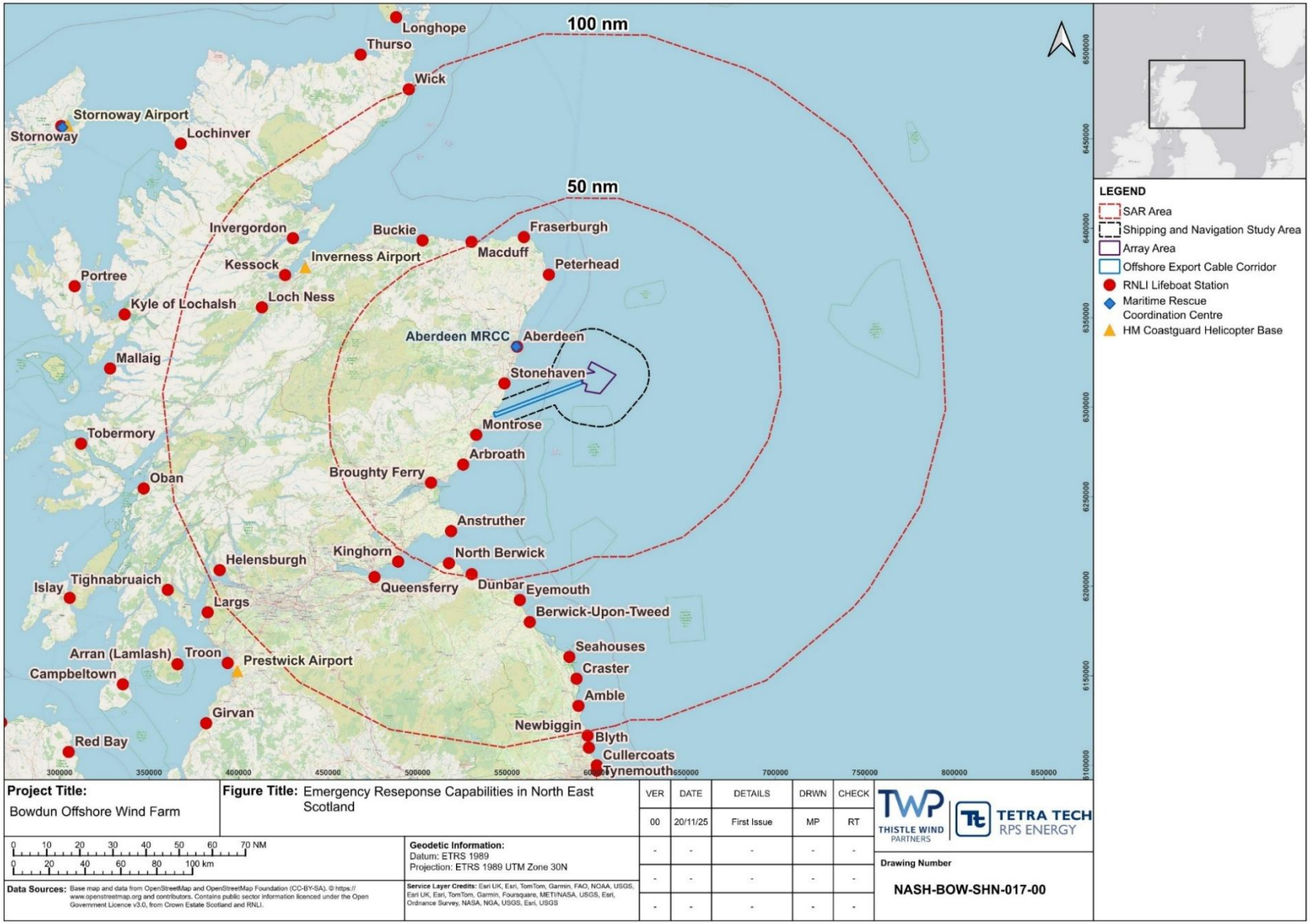

Figure 5.6: Emergency Response Capability

Other Assets

5.10.3 All vessels have an obligation under the SOLAS convention to render assistance to persons or vessels in distress, including CTVs or other project craft.

6 Description of Existing Marine Activities

6.1 Introduction and Data Sources

6.1.1 A description of existing marine activities in the Shipping and Navigation Study Area is presented based on the data collected. Primarily this includes vessel traffic surveys (undertaken in accordance with MGN 654) and analysis of full year May 2024 to April 2025 AIS datasets. The following section includes;

- details of the vessel traffic survey;
- analysis of vessel traffic by:
  - traffic types;
  - traffic size;
  - commercial vessel routes;
  - adverse weather routeing;
  - anchoring and waiting vessels; and
  - analysis of historical maritime incidents.

6.2 Vessel Traffic Survey

6.2.1 MGN 654 sets a requirement that an up to date vessel traffic survey capturing all vessel types (therefore comprising AIS, radar and visual observations) of at least 28-days duration, for a Proposed Development area, should be conducted within a validity period of two years. As per MGN 654 requirements, vessel traffic surveys were undertaken to account for seasonality during winter and summer survey periods.

6.2.2 Commercial vessel traffic are required to carry AIS under SOLAS, and are therefore captured through the AIS receivers; recreational and fishing vessels that do not broadcast AIS are captured by radar and visual observations.

6.2.3 There is no requirement within the guidance, nor precedent, to undertake vessel traffic surveys for the Export Cable Corridor of an OWF. Therefore, analysis of vessel activities within the Export Cable Corridor is primarily undertaken on AIS data. Small boat traffic, particularly fishing and recreational, may therefore be underrepresented. Noting these limitations, stakeholder consultation has been undertaken with fishing and recreational stakeholders to ensure that activity within the Export Cable Corridor is characterised as accurately as is possible throughout this NRA, and any key areas of activity are considered.

6.2.4 A summary of the survey details is provided in Table 6.1. These consist of one summer survey from July 2023 and one winter survey from January 2024. Recent additional surveys include one summer survey from July 2025 and one winter survey from December 2025. For each survey, The track of the survey vessel, Karelle, is presented in Figure 6.1 and Figure 6.2; an overview of the vessel traffic observed during the surveys is shown in Figure 6.3 and Figure 6.4; and the vessel traffic of the busiest day during each survey is presented in Figure 6.2 and Figure 6.6. It should be noted that the busiest day in the Summer

2025 survey coincided with the Tall Ships 2025 race which saw the Port of Aberdeen as one of the stop off points. The survey therefore picked up abnormally high numbers of recreational vessels, although all with AIS. Vessel Traffic Survey summary reports are shown in Section 14.2 and 14.3 of Volume 2, Chapter 14: Shipping and Navigation.

Table 6.1: Vessel Traffic Survey Summary

Attributes	Summer July 2023	Winter January 2024	Summer July 2025	Winter December 2025
Vessel	 Karelle (27.85 m Fishing Vessel)			
Dates	30/06/2023 (08:00) to 14/07/2023 (08:00)	05/01/2024 (12:30) to 19/01/2024 (12:30)	16/07/2025 (05:00) to 29/07/2025 (08:00)	02/12/2025 (17:00) to 16/12/2025 (17:00)
Downtime	No Downtime			
Survey Area	Bowdun Array Area + 10 nm (18.5 km)			
Total Transits Recorded (Survey Area)	328 (23.4/day)	241 (17.2/day)	380 (27.1/day)	137 (9.8/day)
Total Transits Recorded (Array Area)	71 (5.1/day)	53 (3.8/day)	91 (6.5/day)	40 (2.9/day)
Cargo	Survey Area: 71 (5.1/day) Array Area: 31 (2.2/day)	Survey Area: 72 (5.1/day) Array Area: 27 (1.9/day)	Survey Area: 80 (5.7/day) Array Area: 26 (1.9/day)	Survey Area: 64 (4.6/day) Array Area: 29 (2.1/day)
Cruise	Survey Area: 12 (0.9/day) Array Area: 3 (0.2/day)	Survey Area: 0 (0/day) Array Area: 0 (0/day)	Survey Area: 22 (1.6/day) Array Area: 1 (0.1/day)	Survey Area: 0 (0/day) Array Area: 0 (0/day)
Ferry	Survey Area: 0 (0/day)	Survey Area: 1 (0.1/day)	Survey Area: 2 (0.1/day)	Survey Area: 0 (0/day)

Attributes	Summer July 2023	Winter January 2024	Summer July 2025	Winter December 2025
	Array Area: 0 (0/day)	Array Area: 1 (0.1/day)	Array Area: 0 (0/day)	Array Area: 0 (0/day)
Fishing	Survey Area: 24 (1.7/day) Array Area: 11 (0.8/day)	Survey Area: 24 (1.7/day) Array Area: 3 (0.2/day)	Survey Area: 25 (1.8/day) Array Area: 13 (0.9/day)	Survey Area: 13 (0.9/day) Array Area: 5 (0.4/day)
Recreational	Survey Area: 6 (0.4/day) Array Area: 3 (0.2/day)	Survey Area: 0 (0/day) Array Area: 0 (0/day)	Survey Area: 81 (5.8/day) Array Area: 28 (2/day)	Survey Area: 0 (0/day) Array Area: 0 (0/day)
Tanker	Survey Area: 18 (1.3/day) Array Area: 6 (0.4/day)	Survey Area: 12 (0.9/day) Array Area: 8 (0.6/day)	Survey Area: 34 (2.4/day) Array Area: 7 (0.5/day)	Survey Area: 8 (0.6/day) Array Area: 1 (0.1/day)
Tug and Service	Survey Area: 197 (14.1/day) Array Area: 17 (1.2/day)	Survey Area: 132 (9.4/day) Array Area: 14 (1/day)	Survey Area: 136 (9.7/day) Array Area: 16 (1.1/day)	Survey Area: 52 (3.7/day) Array Area: 5 (0.4/day)

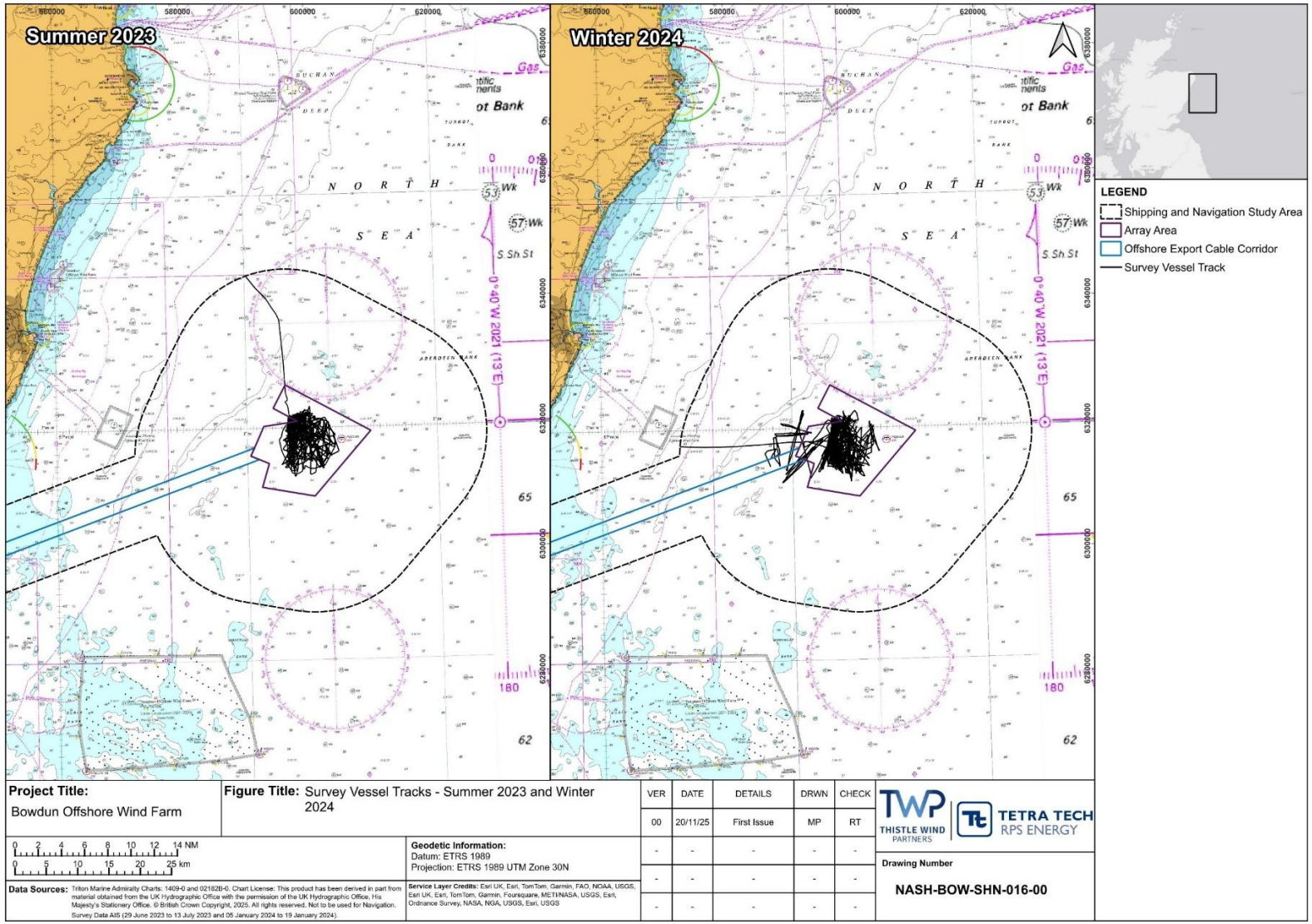

Figure 6.1: Survey Vessel Tracks, Summer 2023 and Winter 2024

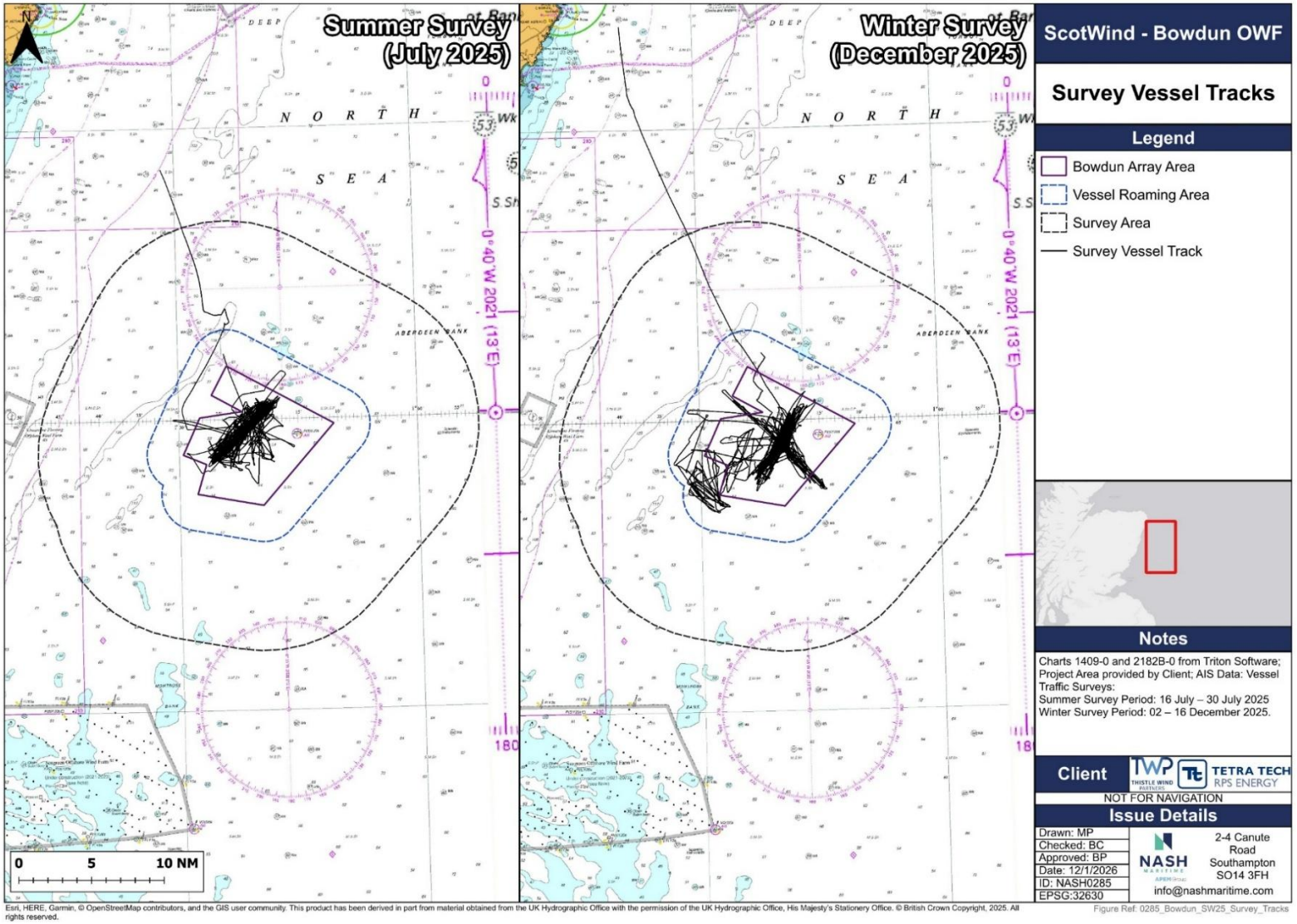

Figure 6.2: Summer and Winter 2025 Survey Vessel Tracks

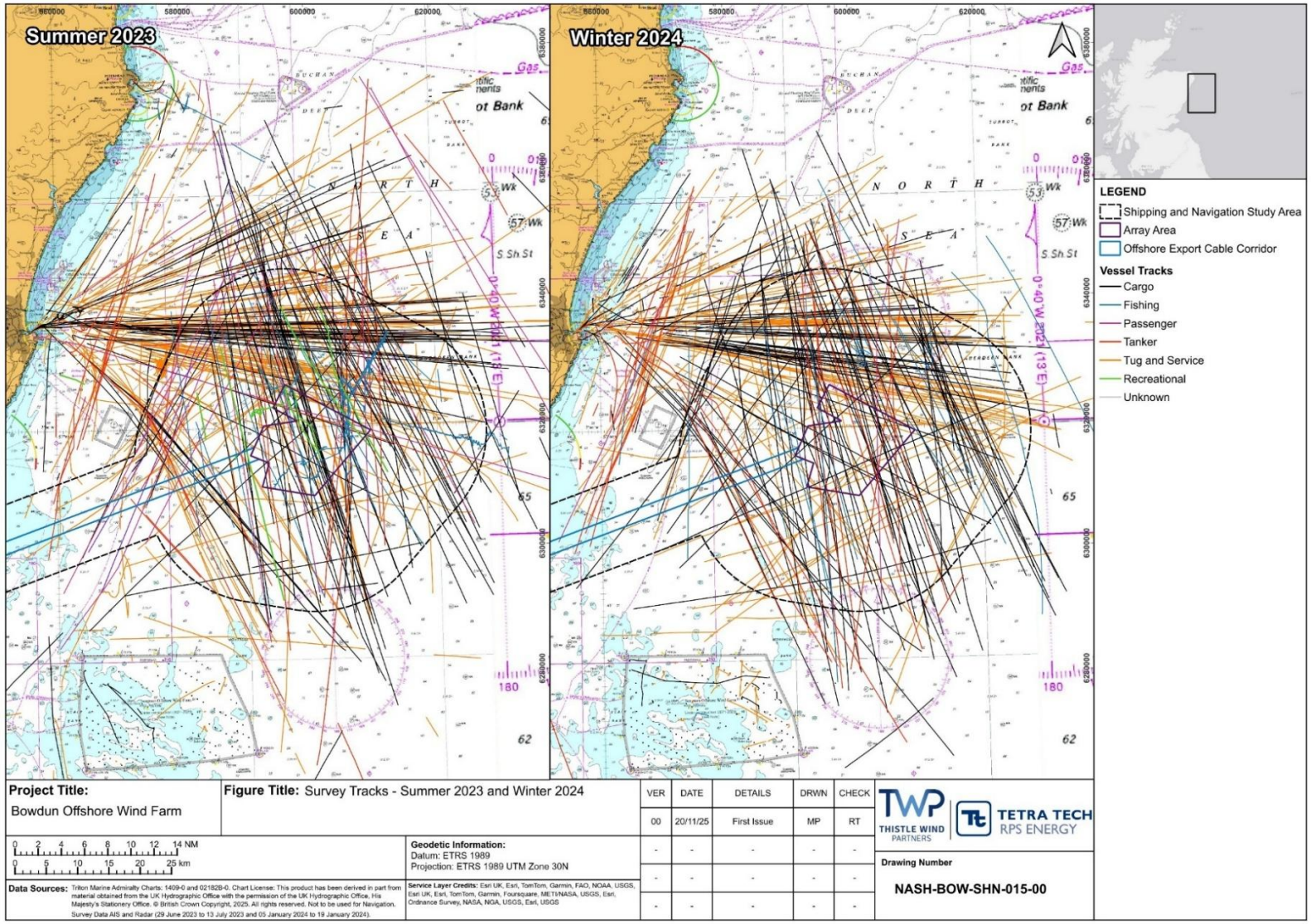

Figure 6.3: Vessels Tracks, Summer 2023 and Winter 2024

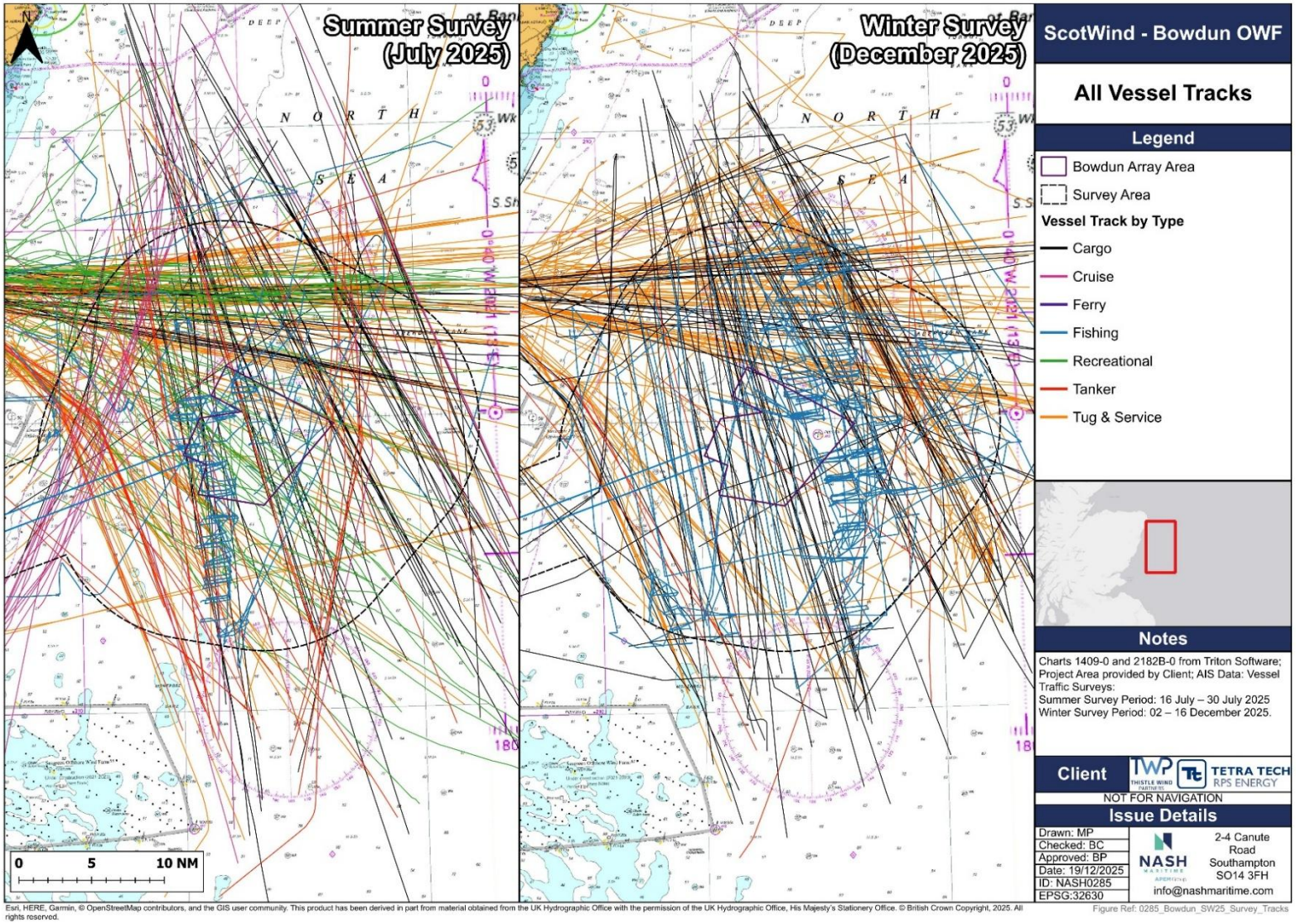

Figure 6.4: Vessels Tracks, Summer and Winter 2025

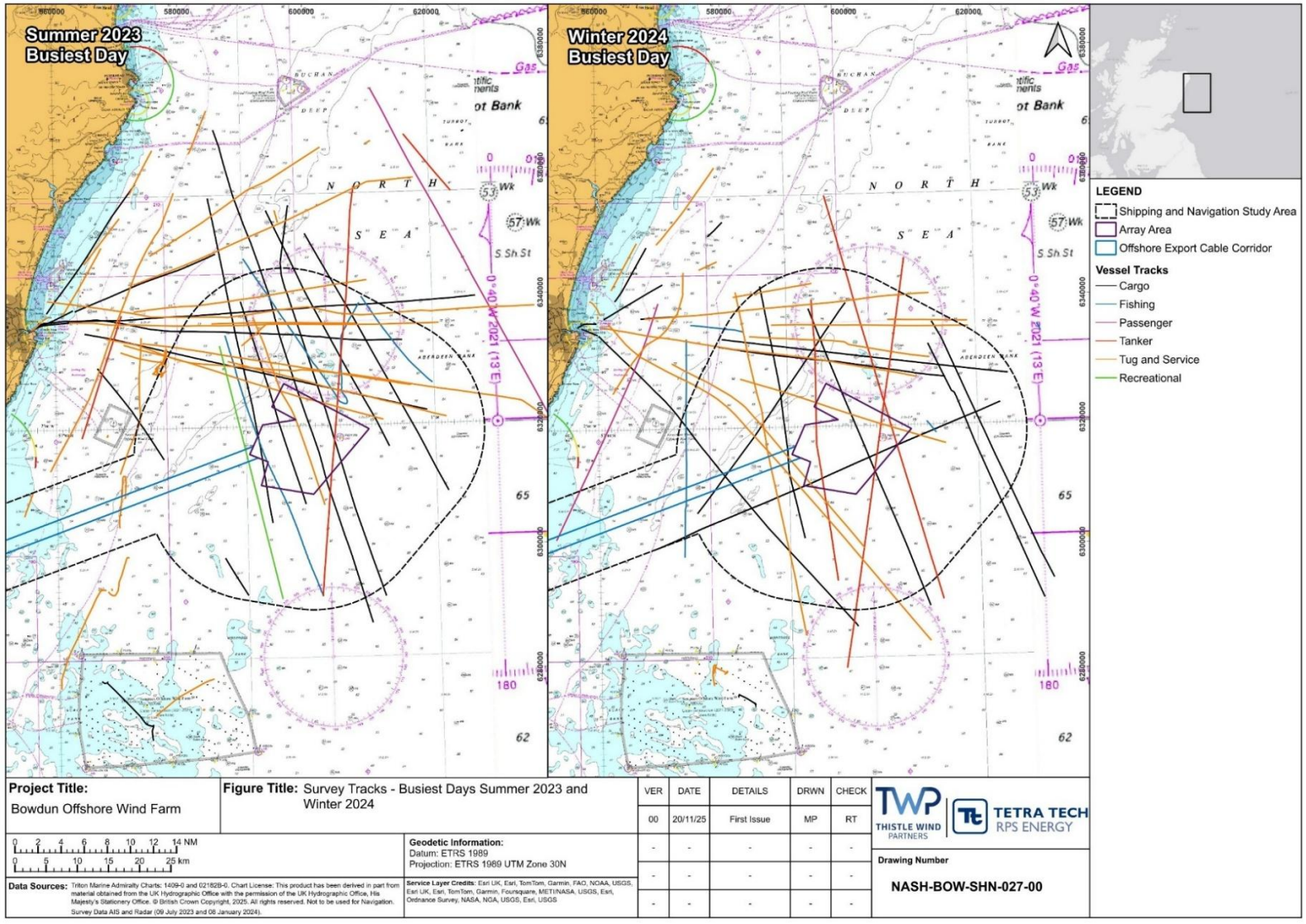

Figure 6.5: Vessels Tracks, Busiest Day Summer 2023 and Winter 2024

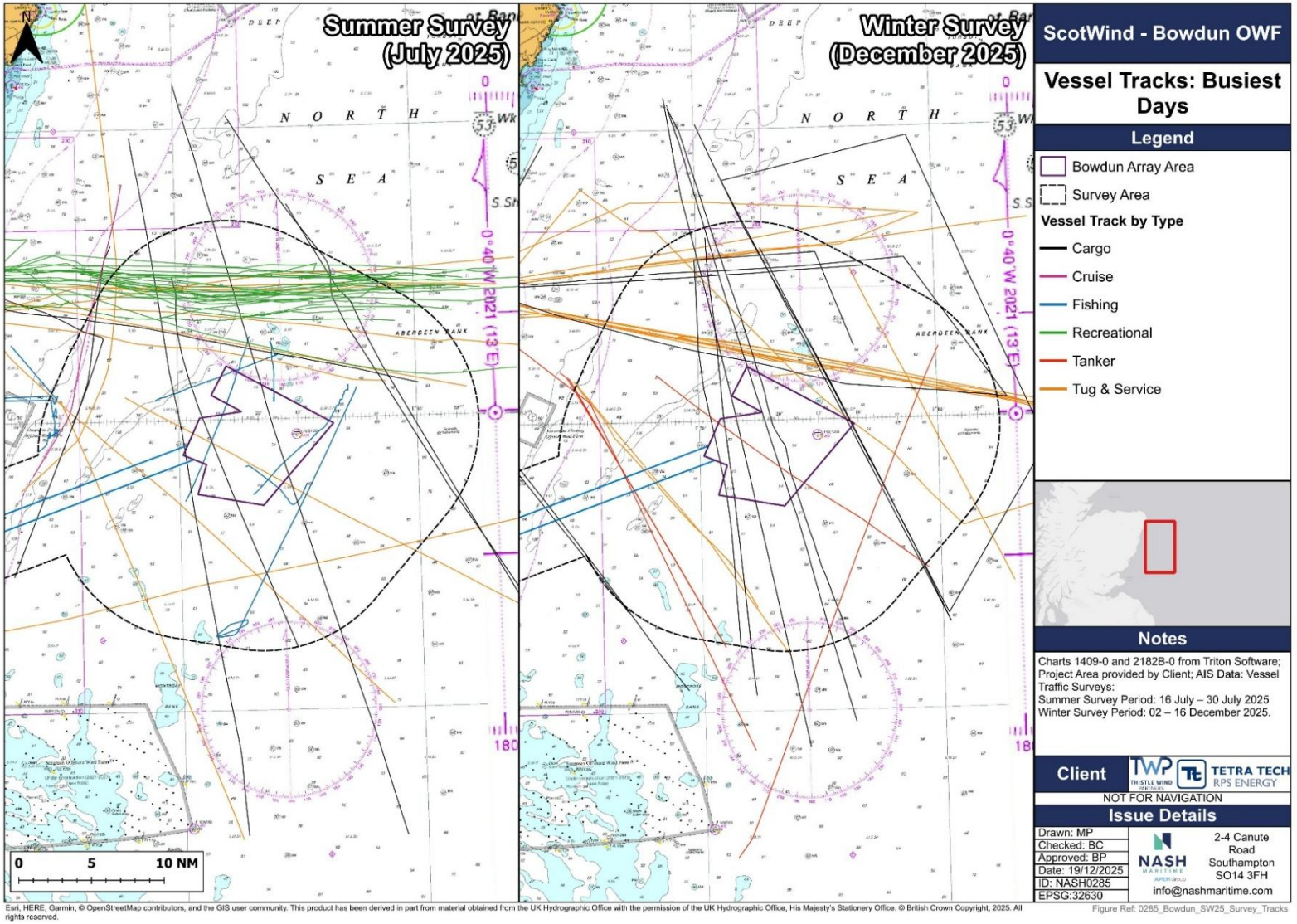

Figure 6.6: Vessels Tracks, Busiest Day Summer and Winter 2025

6.3 Vessel Traffic Analysis

Overview

6.3.1 As detailed in 6.2 the collection of radar and visual data during the two 14-day vessel traffic surveys was used to supplement the understanding of small craft movements in the Shipping and Navigation Study Area.

6.3.2 Annualised vessel traffic density is presented in Figure 6.7 showing the movements of all AIS-broadcasting vessels over the 12-month period between May 2024 and April 2025. Each grid cell is symbolised by the number of vessel transits that intersect it.

6.3.3 The vessels traffic density shows defined routes of heavy traffic operating through the Shipping and Navigation Study Area:

- To/from Aberdeen oriented broadly east-west and passing north of the Array Area, partially intersecting the northern corner.
- Parallel to shore crossing the Export Cable Corridor approximately 3 nm to 11 nm (5.6 km to 20.4 km) east from Landfall.

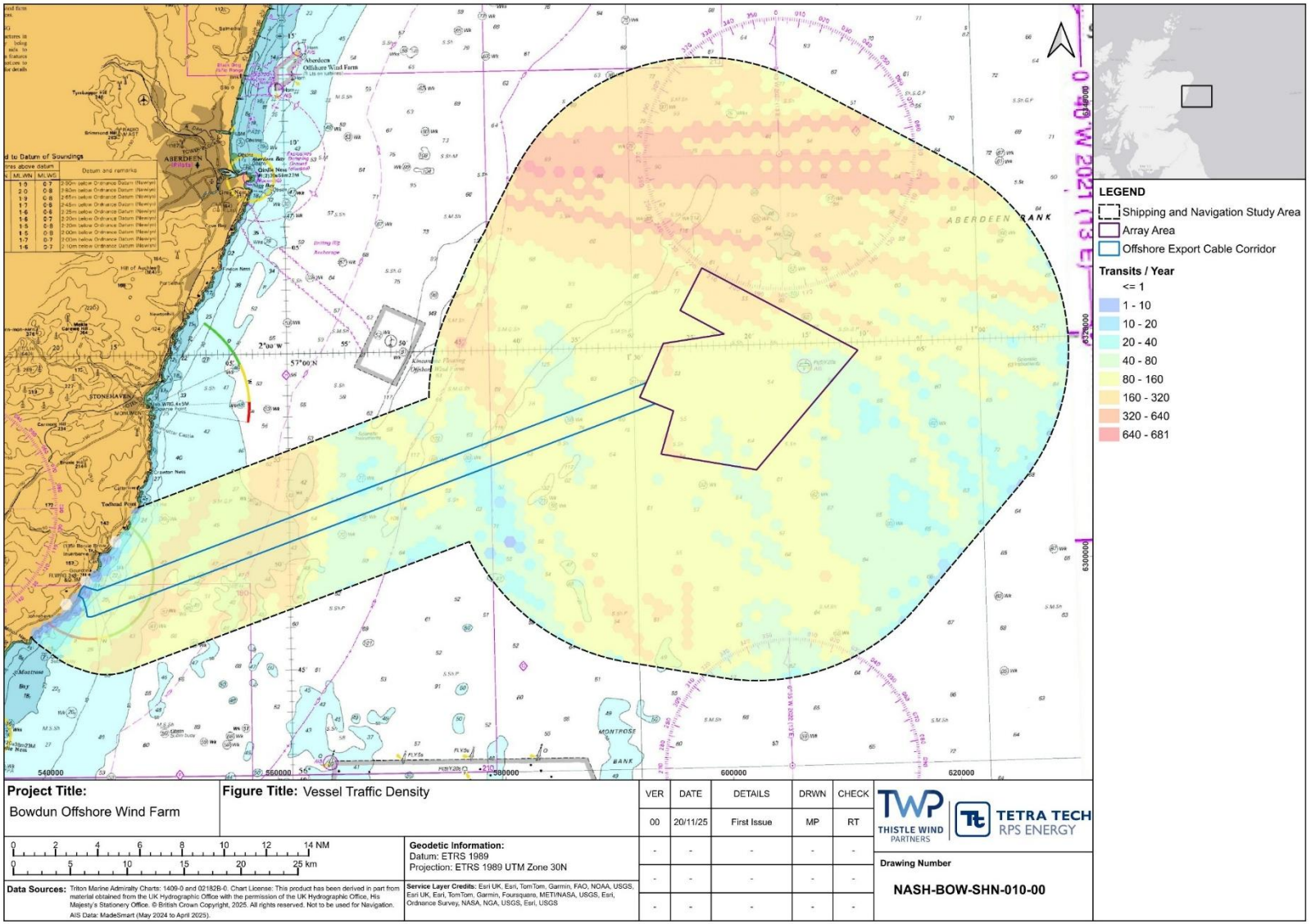

Figure 6.7: Vessel Traffic Density (May 2024 and April 2025)

Traffic by Type

6.3.4 The following sections consider the vessel traffic by types for AIS data obtained for the period May 2024 to April 2025. The tracks have been filtered to remove vessels transiting at less than 0.5 kts.

Cargo

6.3.5 The tracks of cargo vessels are composed of dry cargo, bulk cargo and container vessels, and are shown in Figure 6.8. There were 2,238 individual cargo vessel tracks through the Shipping and Navigation Study Area during the study period.

6.3.6 Cargo vessels in proximity to the Array Area generally transit in either of two main directions: offshore towards Europe/Scandinavia, and north-north-west to/from south-south-east on major routes. During the study period, 768 cargo vessel transits were recorded on AIS to be intersecting the Array Area. Across the Export Cable Corridor there were approximately 779 cargo vessel transits, all of which transited in deep waters (greater than -20 m water depth) beyond 0.7 nm (1.3 km) from Landfall. The numbers of transits per project area are summarised by vessel Length Overall (LOA) in Table 6.2.

6.3.7 Throughout the Shipping and Navigation Study Area, the majority (82.8%) of cargo vessel transits were made by vessels with an LOA of less than 150 m. The most frequently transiting cargo vessel was the 139 m LOA Roll-On-Roll-Off (Ro-Ro) cargo ship *Mykines* with 98 transits, all passing the easternmost corner of the Array Area. Intersecting the Array Area, the most frequent cargo vessel LOA was also greater than 150 m (79.3%). The most transits per cargo vessel through the Array Area were 50 and 46 transits made by the 178 m LOA container ship Vera D, and the 100 m container ship *Samskip Skaftafell* respectively. Both vessels transited north-north-west to/from south-south-east through the Array Area. The largest cargo vessels within the Shipping and Navigation Study Area overall, and one intersecting the Array Area, were recorded to have a 294 m LOA.

Table 6.2: Cargo Vessel Tracks by Length

Length (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
50 to 100	1,107	568	346
100 to 150	745	174	263
150 to 200	234	29	133
200 to 250	82	6	24
250 to 300	70	2	2

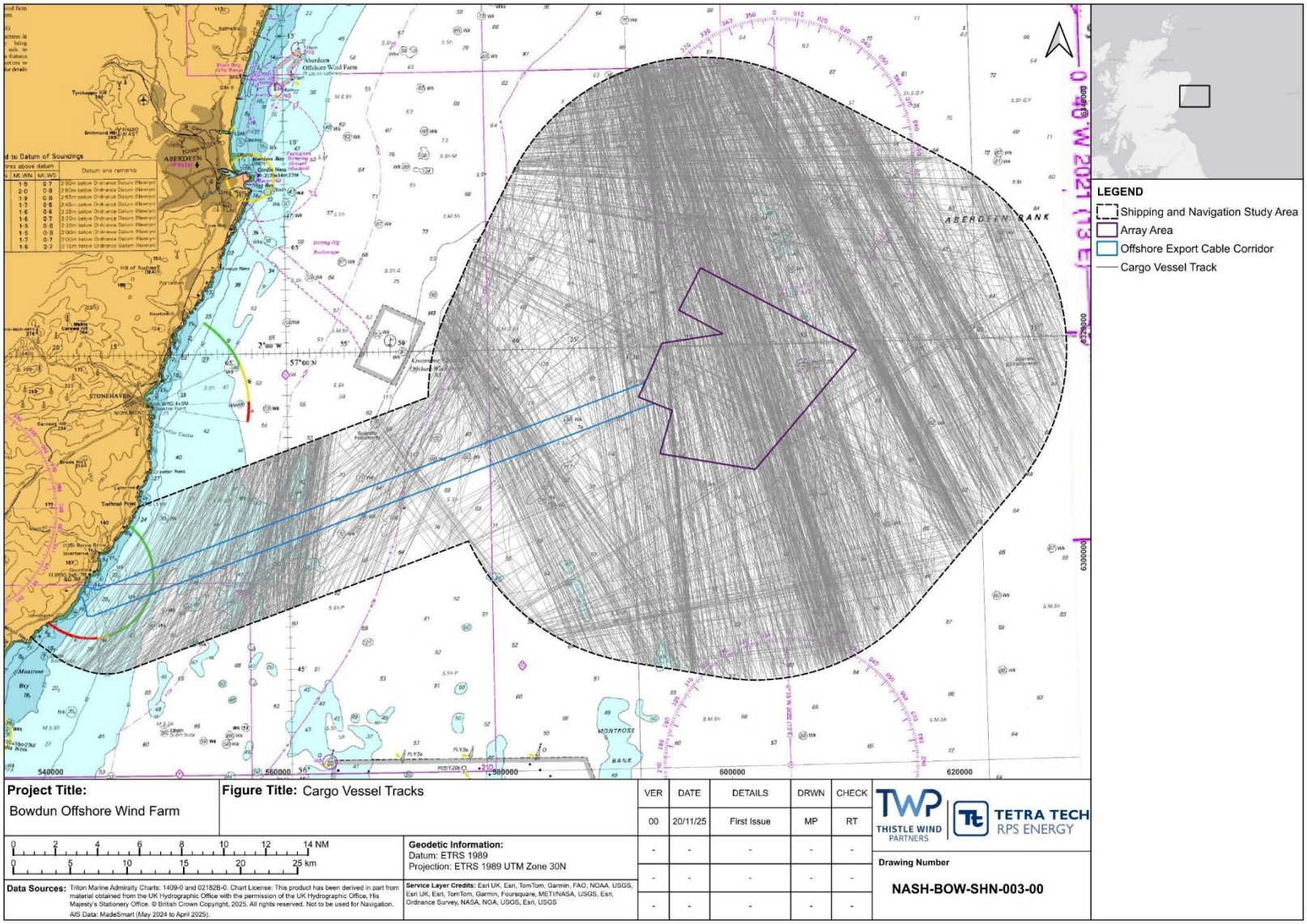

Figure 6.8: Cargo Vessel Tracks

Tanker

6.3.8 The tracks of tanker vessels from the AIS data are presented in Figure 6.9. There were 1,126 tanker vessel transits through the Shipping and Navigation Study Area, with two particularly dense routes. These routes both intersect the Export Cable Corridor, with one oriented north-north-west to/from south-south-east located 4 nm to 11 nm (7.4 km to 20.4 km) from Landfall and the other oriented north-north-west to/from south-south-east located 4.5 nm to 7 nm (8.3 km to 13.0 km) west of the Array Area. Overall, there were 862 transits intersecting the Export Cable Corridor, and 166 offshore transits intersecting the Array Area. The number of transits per area are summarised by vessel LOA in Table 6.3.

6.3.9 Within the Shipping and Navigation Study Area, the majority of tanker vessel transits (72.0%) were made by vessels with an LOA between 50 m to 100 m and the second most frequent (15.0%) vessel LOA was 100 m to 150 m. It can be noted that larger vessels tend to transit farthest from shore as only 53.6% of transits crossing the Array Area were from vessels with an LOA of 50 m to 100 m, and 36.1% of transits were from vessels 100 m to 200 m LOA.

6.3.10 Two tanker vessels intersected the Shipping and Navigation Study Area on over 100 occasions each. Making 122 and 111 transits, respectively, were the oil products tankers *Shannon Fisher* and *Solway Fisher* with the same LOA of 85 m. The most frequent vessels to enter the Array Area with 18 and 15 intersecting transits were, respectively, the oil/chemical tankers *Lady Maria Fisher* with a 93 m LOA and Specialty with a 95 m LOA.

6.3.11 The largest tanker to transit the Shipping and Navigation Study Area was the 279 m LOA shuttle tanker *Altera Thule* which made seven transits, and one of these intersected the Array Area. The vessel transited both in the east to/from west orientation to/from Aberdeen and in the north to/from south orientation 2.5 nm (4.6 km) to the east of the Array Area.

Table 6.3: Tanker Vessel Tracks by Length

Length (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
50 to 100	811	708	89
100 to 150	169	115	29
150 to 200	60	3	31
200 to 250	32	13	7
250 to 300	54	23	10

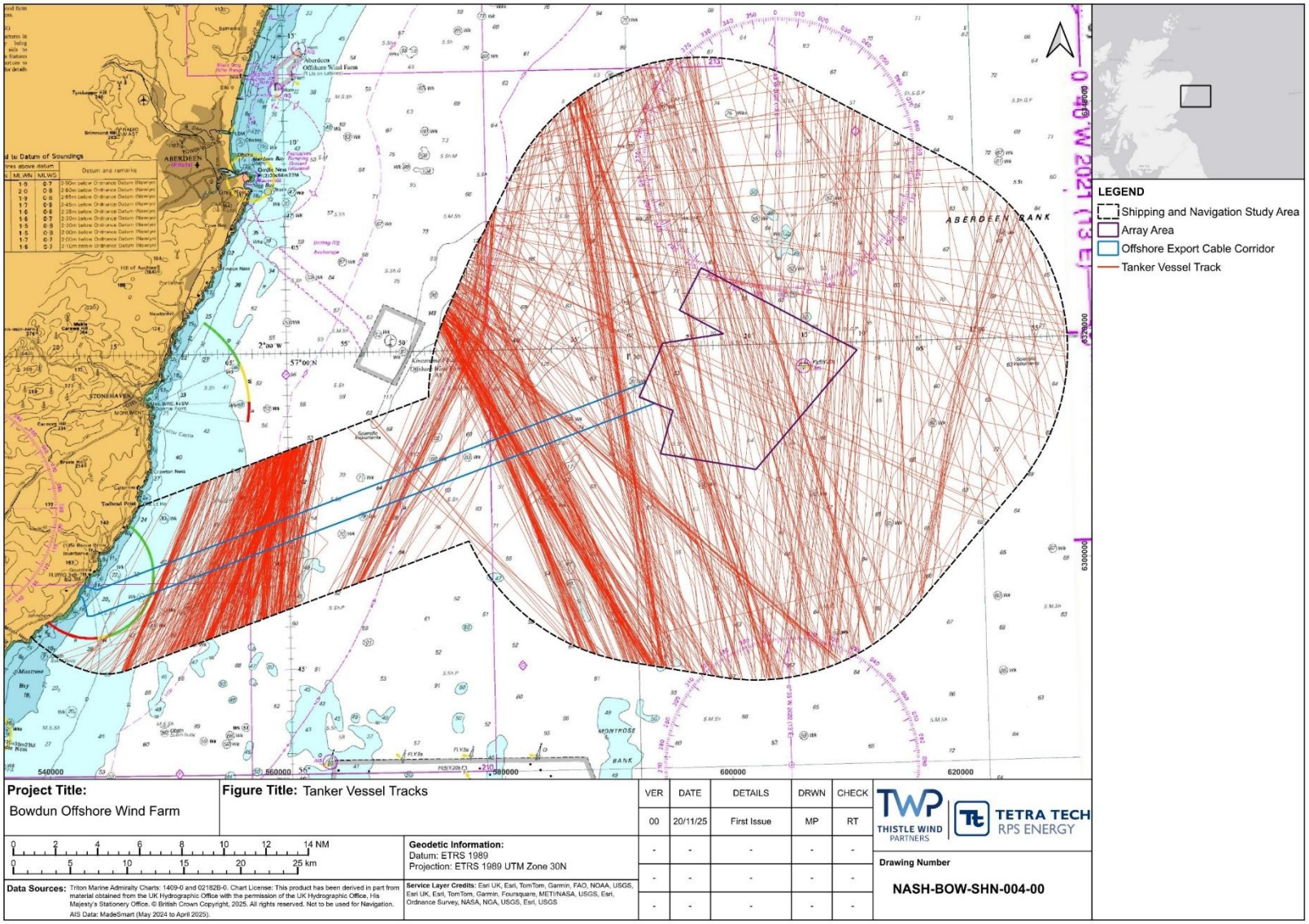

Figure 6.9: Tanker Vessel Tracks

Passenger

6.3.12 Passenger vessel activity is presented in Figure 6.10. There were 257 passenger vessel transits through the Shipping and Navigation Study Area, of which 247 were made by cruise vessels and ten were made by ferries. The primary route was oriented north-north-east to/from south-south-west passing east of Kincardine OWF and west of the Array Area.

6.3.13 The ferry operators include:

- NorthLink with a total of seven transits through the Shipping and Navigation Study Area between three vessels (*MV Hjaltland*, *Hamnavoe*, *Hrossey*). There were three atypical transits made in February and March 2025 by the vessel *Hrossey* out of Aberdeen. These were a result of the vessel's annual maintenance, and it resumed normal service between Aberdeen and the Orkney and Shetland Islands by the end of March 2025.
- Caledonian MacBrayne with two transits through the Shipping and Navigation Study Area made by the vessel *Isle of Lewis* which typically operates in West Scotland. The vessel intersected the Shipping and Navigation Study Area and Array Area while conducting sea trials on 27 March 2025 after being dry-docked in Aberdeen.

6.3.14 A summary of the number of cruise ships and ferries transiting per area is presented by size in Table 6.4.

6.3.15 The size of passenger ships entering the Shipping and Navigation Study Area (and also the Export Cable Corridor and Array Area) is most frequently 200 m to 250 m, however, ferries were recorded only within the 100 m to 150 m LOA range. There were six intersections of the Export Cable Corridor and one intersection of the Array Area by ferry transits, in comparison to the ten total transits intersecting the Shipping and Navigation Study Area.

6.3.16 The most frequent passenger vessels (more than ten transits) operating through the Shipping and Navigation Study Area are the following:

- cruise vessel *Aidasol* with a LOA of 253 m and 13 transits;
- cruise vessel *Regal Princess* with a LOA of 330 m and 12 transits; and
- cruise vessel *Viking Saturn* with a LOA of 228 m and 11 transits.

6.3.17 The cruise vessel *Regal Princess* was the largest passenger ship to enter the Array Area, with two intersecting transits recorded during the study period. The cruise vessel *Queen Mary II* with a 345 m LOA was the largest passenger ship to enter the Export Cable Corridor, with one intersecting transit.

Table 6.4: Passenger Vessel Tracks by Length

Length (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
< 50	7 (All cruise)	6 (All cruise)	3 (All cruise)
50 to 100	7 (All cruise)	6 (All cruise)	0
100 to 150	41 (31 cruise, 10 ferry)	32 (26 cruise, 6 ferry)	6 (5 cruise, 1 ferry)
150 to 200	35 (All cruise)	26 (All cruise)	8 (All cruise)
200 to 250	95 (All cruise)	64 (All cruise)	16 (All cruise)
250 to 300	51 (All cruise)	37 (All cruise)	9 (All cruise)
300 to 350	21 (All cruise)	12 (All cruise)	5 (All cruise)

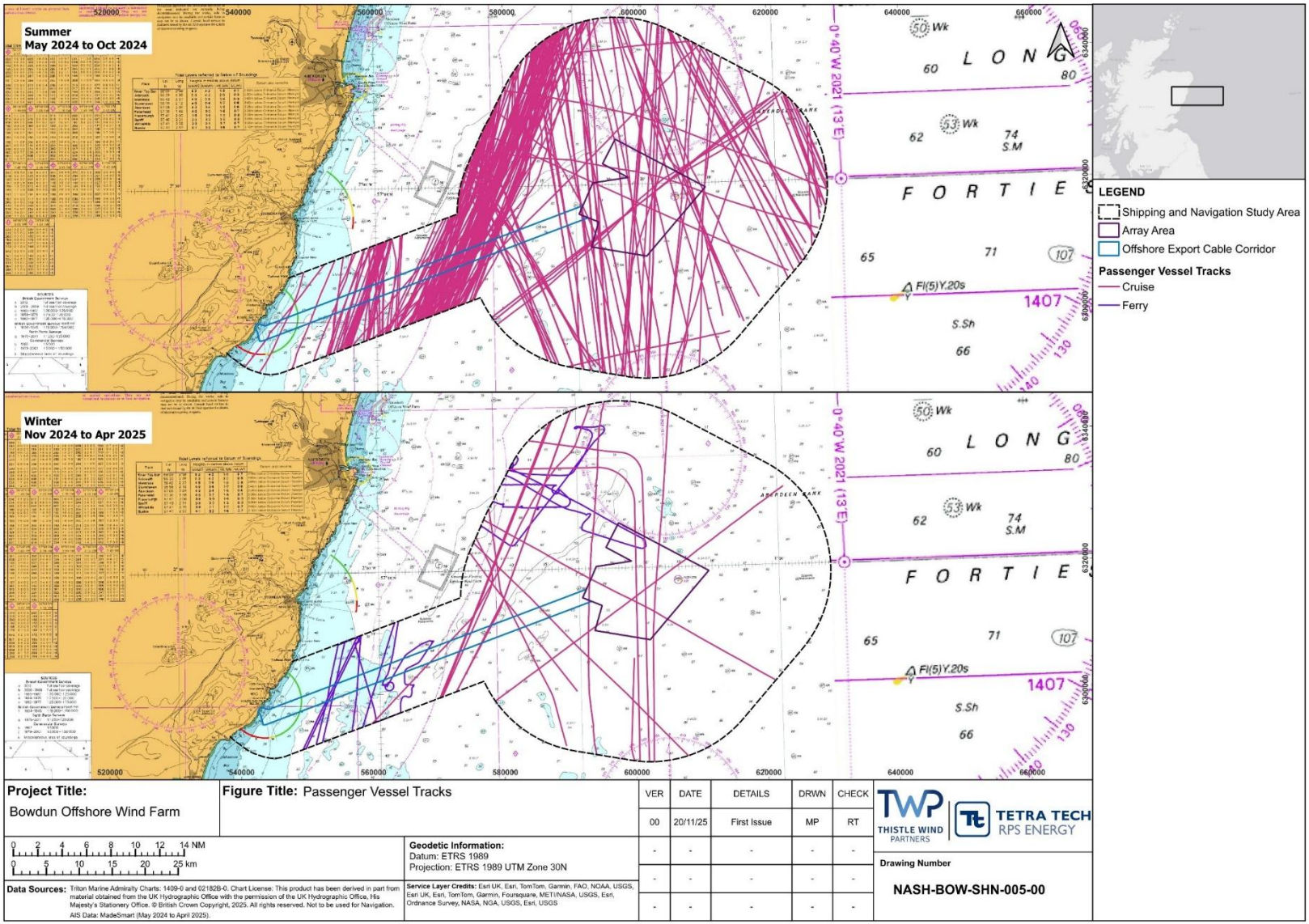

Figure 6.10: Passenger Vessel Tracks

Fishing

6.3.18 More detail on fishing activities can be found in Volume 2, Chapter 13: Commercial Fisheries.

6.3.19 Fishing vessel activity during the study period is presented in Figure 6.11 as vessel tracks derived from AIS data. There were 1,365 individual fishing vessel transits through the Shipping and Navigation Study Area.

6.3.20 Concentrated areas of active fishing include areas 1.2 nm to 2.5 nm (2.2 km to 4.6 km) south-west of the Export Cable Corridor Landfall, 5 nm to 10 nm (9.3 km to 18.5 km) north-east of the Array Area, and intersecting the northern and western sides of the Array Area. Much of the offshore fishing activity undertaken by trawler vessels. As such, the majority of active fishing at the Array Area results from the 15 m LOA trawler *North Star*, the most frequent fishing vessel with 238 transits throughout the study period.

6.3.21 Transits made by fishing vessels not engaged in active fishing cross the Export Cable Corridor at three main locations approximately 2 nm to 10 nm (3.7 km to 18.5 km), 12 nm (22.2 km), and 18 nm (33.3 km) from Landfall. Similarly, vessels transit offshore to/from Peterhead in a north-north-west to/from south-south-east orientation through the Array Area.

6.3.22 The Shipping and Navigation Study Area is located approximately 20 nm (37.0 km) from Peterhead and 30 nm (55.6 km) from Fraserburgh (the largest fishing port in Europe). In addition, a small number of transits indicate the use of other ports, including Montrose and Aberdeen, which are located approximately 5 nm (9.3 km) and 12 nm (22. 2 km) from the Shipping and Navigation Study Area, respectively.

6.3.23 It must be noted that AIS is not mandatory for vessels of less than 15 m length and therefore fishing activities of vessels with a LOA less than 15 m may be underrepresented through the AIS data.

6.3.24 Fishing vessels transiting the Shipping and Navigation Study Area generally had a LOA less than 50 m (1,323 transits). Transits by small fishing vessels were also the most frequent within the Export Cable Corridor (545 transits) and the Array Area (188 transits). There were no transits made by vessels over 100 m LOA observed in the Export Cable Corridor.

6.3.25 The largest fishing vessel to enter the Shipping and Navigation Study Area was *Willem Van Der Zwan* with a 142 m LOA which transited six times within the study period. Of these transits, one intersected the Array Area and five were made between 1.3 nm (2.4 km) and 8.9 nm (16.5 km) to the east. The largest vessels to cross the Export Cable Corridor were *Unity* and *Boemmelbas* at 62 m LOA, each with a single transit recorded.

Table 6.5: Fishing Vessel Tracks by Length

Length (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
< 50	1,323	545	188
50 to 100	17	5	2
100 to 150	25	0	7

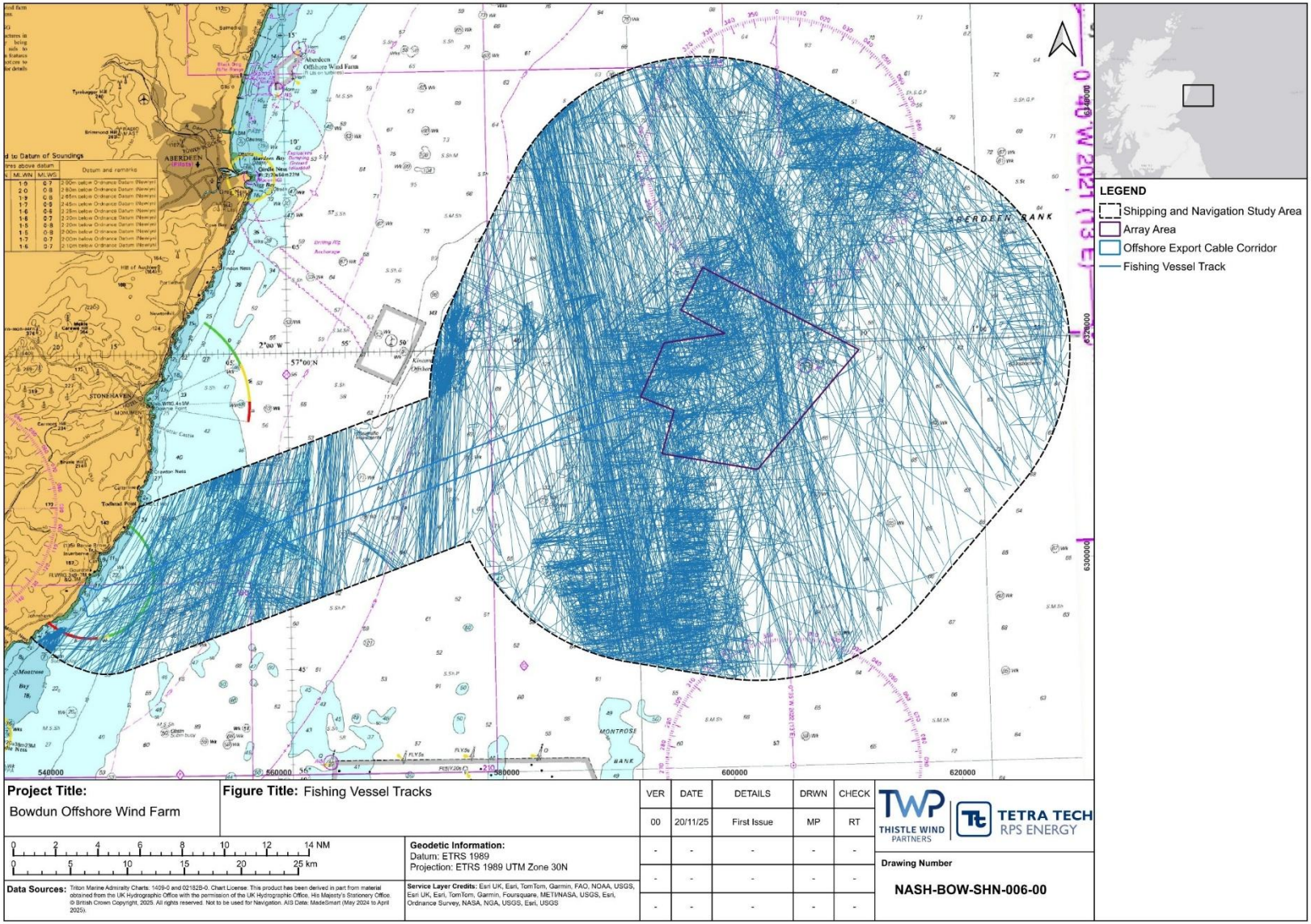

Figure 6.11: Fishing Vessel Tracks

Recreation

6.3.26 Recreational vessel activity is presented in Figure 6.12. Recreational transits are presented by project area and length in Table 6.6. All recreational vessel transits were made by vessels under 100 m in LOA.

6.3.27 There were 310 transits by recreational vessels through the Shipping and Navigation Study Area during the study period.

6.3.28 Generally, recreational vessels try to avoid major commercial traffic routes and the more weather-exposed areas, preferring to stay closer to shore. The majority of transits are concentrated within 5 nm (9.3 km) from shoreline, and are most dense within 2 nm (3.7 km) from shoreline.

6.3.29 Offshore, the concentration of recreational vessels is lower with only ten transits intersecting the Array Area.

6.3.30 The largest vessel to enter the Array Area was the sailing vessel *Perseverance* with a LOA of 42 m, making one intersecting transit. The largest recreational vessel to intersect the Export Cable Corridor also made a single transit. This was the motor yacht Legend with a LOA of 74 m.

6.3.31 It must be noted that recreational vessels are not mandated to carry AIS equipment. Although AIS data provides a good understanding of the routeing used, the level of recreational activity may be underrepresented.

Table 6.6: Recreational Vessel Tracks by Length

Length (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
< 50	304	199	10
50 to 100	6	6	0

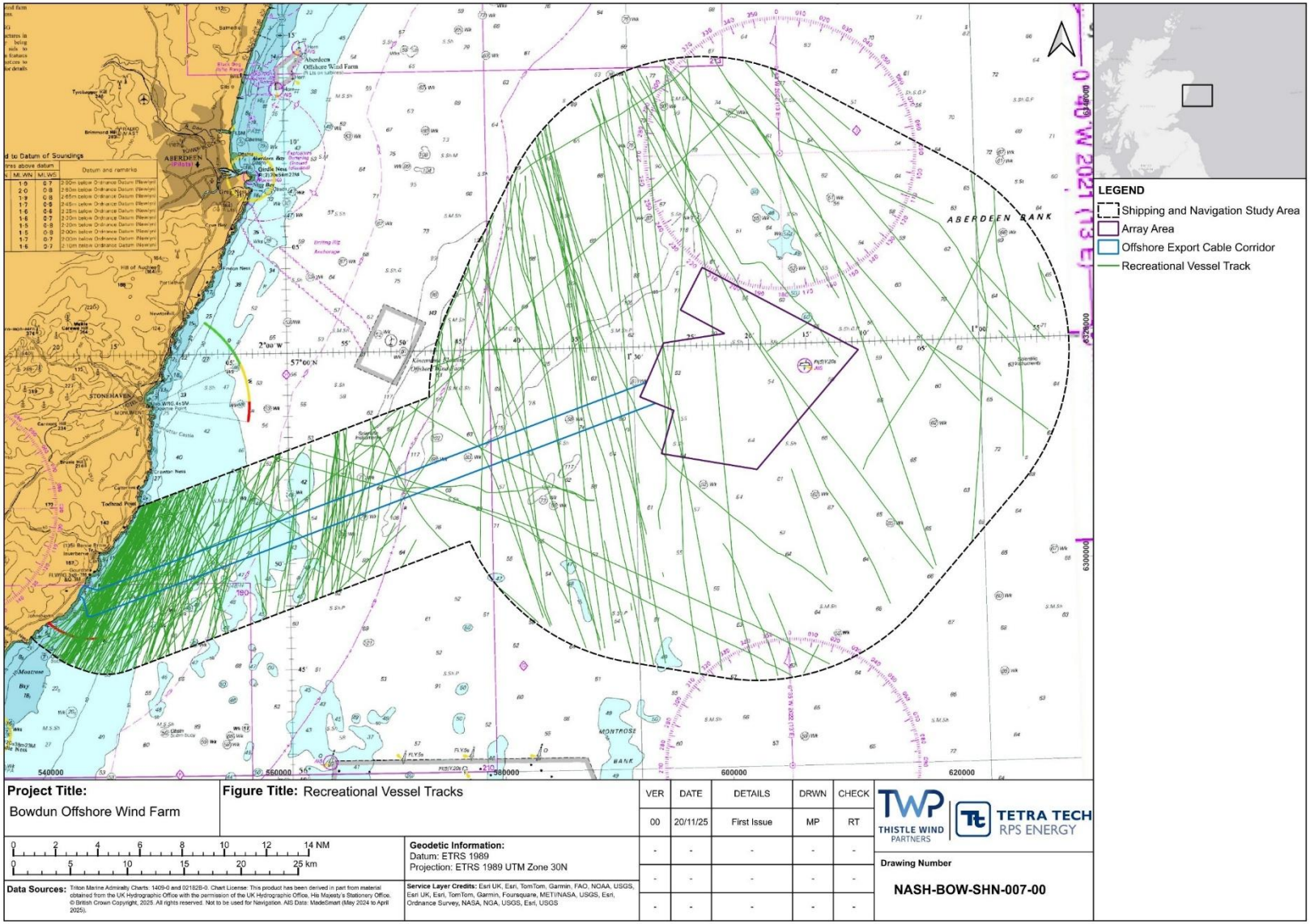

Figure 6.12: Recreational Vessel Tracks

Tug and Service

6.3.32 Tug and service vessel tracks are presented in Figure 6.13 by subcategories determined by vessel activities. The numbers of transits made by each subcategory of vessel are summarised by project area in Table 6.7.

6.3.33 The largest subcategory of tug and service vessels in the Shipping and Navigation Study Area is oil and gas, including supply ships and standby safety vessels. There were 4,501 transits made by oil and gas associated vessels through the Shipping and Navigation Study Area (approximately 12 transits per day), 1,014 transits through the Export Cable Corridor (two to three per day), and 414 transits intersecting the Array Area (one to two per day). The majority of operations were to/from Aberdeen, with two particularly intense routes that disperse offshore. One route is oriented north-north-west to/from south-south-east and passing in between Kincardine OWF and the Array Area, utilised by vessels attending to oil and gas fields further south. The other route is broadly oriented west to/from east to/from Aberdeen and passing north of the Array Area, with some intersection at the northern corner of the Array Area. The most frequent vessels (over 100 transits each) use the route north of the Array Area.

6.3.34 Vessels associated with diving operations also took the offshore routes to/from Aberdeen. These vessels made 127 transits (2.4%) through the Shipping and Navigation Study Area and conducted activities specifically within the Export Cable Corridor and Array Area between 4 May 2024 and 11 May 2024. Survey vessel activity was also prevalent within the Export Cable Corridor and Array Area with 30 high-coverage parallel transit patterns typical of survey activity occurring between May and August 2024. The two vessels conducting surveys were the 55 m LOA *Karina* and the 23 m LOA *Ondine Jule*. The remaining survey vessel transits were generally single passages parallel to the coast or offshore to/from Aberdeen. The spatial distribution of single transits by dredgers was similar, albeit less frequent. Additionally, there was concentrated dredging vessel activity that intersected the east of the Array Area by the vessels *Geo Ocean III* throughout June and July 2024 and *Geo Ocean IV* in March and April 2025. This activity totalled 27 high-coverage transits.

6.3.35 Although being the second most frequent subcategory, port support vessel transits make up 4.7% of all tug and service vessel transits through the Shipping and Navigation Study Area with 248 transits. These vessels tend to operate close to the shoreline with 200 intersections with the Export Cable Corridor, compared to 26 intersections with the Array Area. The distribution of fishing support vessel transits is similar although at a lower frequency with 117 total transits through the Shipping and Navigation Study Area (2.2% of tug and service transits). Fishing support vessels facilitate the fishing industry, likely operating to/from Peterhead as well as Aberdeen.

6.3.36 CTVs comprised approximately 1.7% of all tug and service vessel transits, with 88 transits intersecting the Shipping and Navigation Study Area. These vessels follow the same north-north-east to/from south-south-west and north to/from south routes across the Export Cable Corridor as the oil and gas associated

vessels, albeit extending nearer to shore. The CTV transits and transits by vessels classified as *"other"* also intersect the west of the Array Area in a north-north-west to/from south-south-east orientation, possibly originating at Peterhead or ports located further north.

6.3.37 SAR vessels made the fewest transits (<1%) and were almost exclusively made by RNLI vessels. Of all tug and service vessels recorded, SAR vessels operated closest to shore with the majority of SAR transits made within 10 nm (18.5 km) of land. Although there were offshore transits, none intersected the Array Area.

6.3.38 The number of tug and service vessel transits through each project area are summarised by vessel LOA in

6.3.39 Table 6.8. The most frequently seen vessel size range through all project areas is 50 m to 100 m LOA, with 4,393 transits through the Shipping and Navigation Study Area (82.6%). The vessel with the largest LOA was the 194 m pipe laying vessel *Deep Energy* which made four transits to the north of the Array Area in the route offshore to/from Aberdeen.

Table 6.7: Tug and Service Vessel Transits by Vessel Subcategory

Tug and Service Sub-Type	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
CTV	88	80	10
Diving Ops	127	31	14
Dredger	55	25	16
Fishing Support	117	81	15
Oil and Gas	4,501	1,038	414
Port Support	248	200	26
SAR	18	12	0
Survey	95	66	41
Other	67	32	11

Table 6.8: Tug and Service Vessel Transits by Vessel LOA

Length (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
< 50	702	417	107
50 to 100	4,393	1,106	420
100 to 150	184	38	19
150 to 200	37	4	1

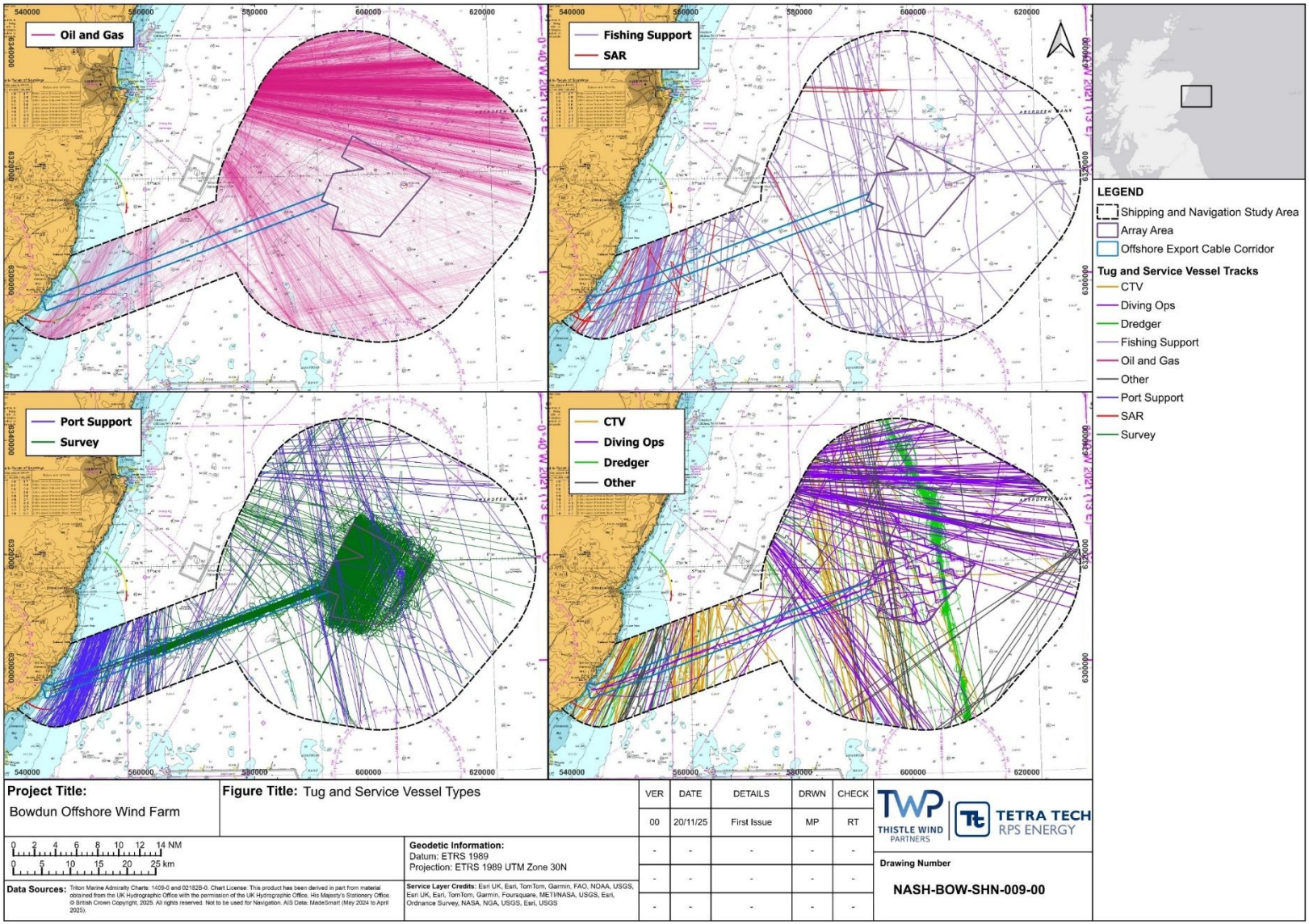

Figure 6.13: Tug and Service Vessel Tracks by Sub-Type

Vessel Traffic Near Landfall

6.3.40 AIS data is used in Figure 6.14 to present a detailed overview of the vessel traffic in proximity to the Export Cable Corridor Landfall area. Overall, there are 28 vessel transits recorded intersecting the Export Cable Corridor and waters with charted depth at less than -20 m (approximately 0.6 nm (1.1 km) from land).

6.3.41 There are no commercial vessel transits intersecting the Landfall area. Two fishing vessel transits occurred from two unique vessels. Tug and service vessels recorded within waters of -10 m to -20 m charted depth totalled six transits by four vessels. Three transits were by survey and diving operations vessels which undertook surveys on the Export Cable Corridor area during May 2024. Two transits were from the CTV *Green Storm,* and one transit was from a fisheries support vessel. The two tug and service vessel transits closest to shore were made by a RNLI inshore lifeboat. Although several recreational vessels transited nearshore, the maximum draught recorded for any of the unique vessels was no more than 4 m. Additionally only three transits (all occurring within June 2024) were made by recreational vessels in waters of less than -10 m charted depth within the Export Cable Corridor area.

6.3.42 Analysis of vessels anchoring/waiting near Landfall is included within Paragraph 6.3.62.

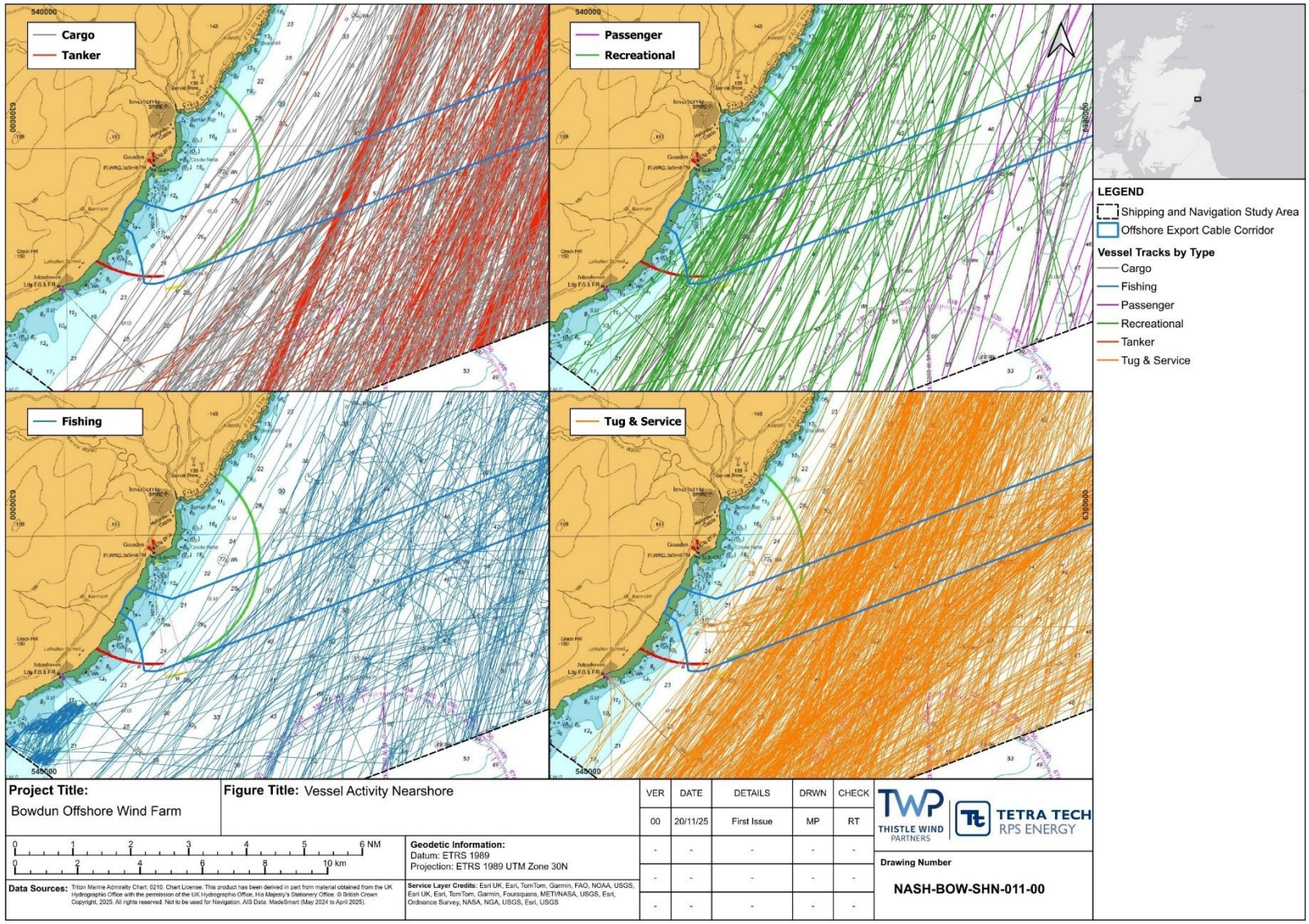

Figure 6.14: Vessel Activity Nearshore

Vessel Traffic by Size

Length

6.3.43 AIS vessel tracks have been categorised by vessel LOA and are summarised by project area in Table 6.9 and presented spatially in Figure 6.15.

6.3.44 Where vessel LOA is unknown, typically in small recreational craft, a value has been derived from the average of similar vessels of the same type. Of the vessel transits within the Shipping and Navigation Study Area, the majority (6,341 transits, 59.8%) were made by vessels 50 m to 100 m in LOA. Primarily, in this size class were tug and service vessels with 4,393 transits (41.4% of all transits). The LOA size class of 50 m to 100 m was also the most frequent for both cargo vessels and tankers; they made 1,107 and 811 transits (10.4% and 7.6% of all transits), respectively. The majority of transits entering the Array Area were also made by vessels with a 50 m to 100 m LOA (857 transits, 49.4% of transits intersecting the Array Area).

6.3.45 Generally, large vessels over 200 m LOA transited offshore. There were 21 transits made through the Shipping and Navigation Study Area by vessels over 300 m LOA, all of which were cruise vessels. The largest vessel in the Shipping and Navigation Study Area was the 345 m LOA *Queen Mary II* which made a single transit, west of the Array Area. The largest vessel to enter the Array Area was the 330 m LOA cruise vessel *Regal Princess* which crossed the Array Area twice within the study period.

Table 6.9: Vessel Tracks by Vessel Length Overall

Length (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
< 50	2,336	1,167	308
50 to 100	6,341	2,399	857
100 to 150	1,164	359	324
150 to 200	366	62	173
200 to 250	209	83	47
250 to 300	175	62	21
300 to 350	21	12	5

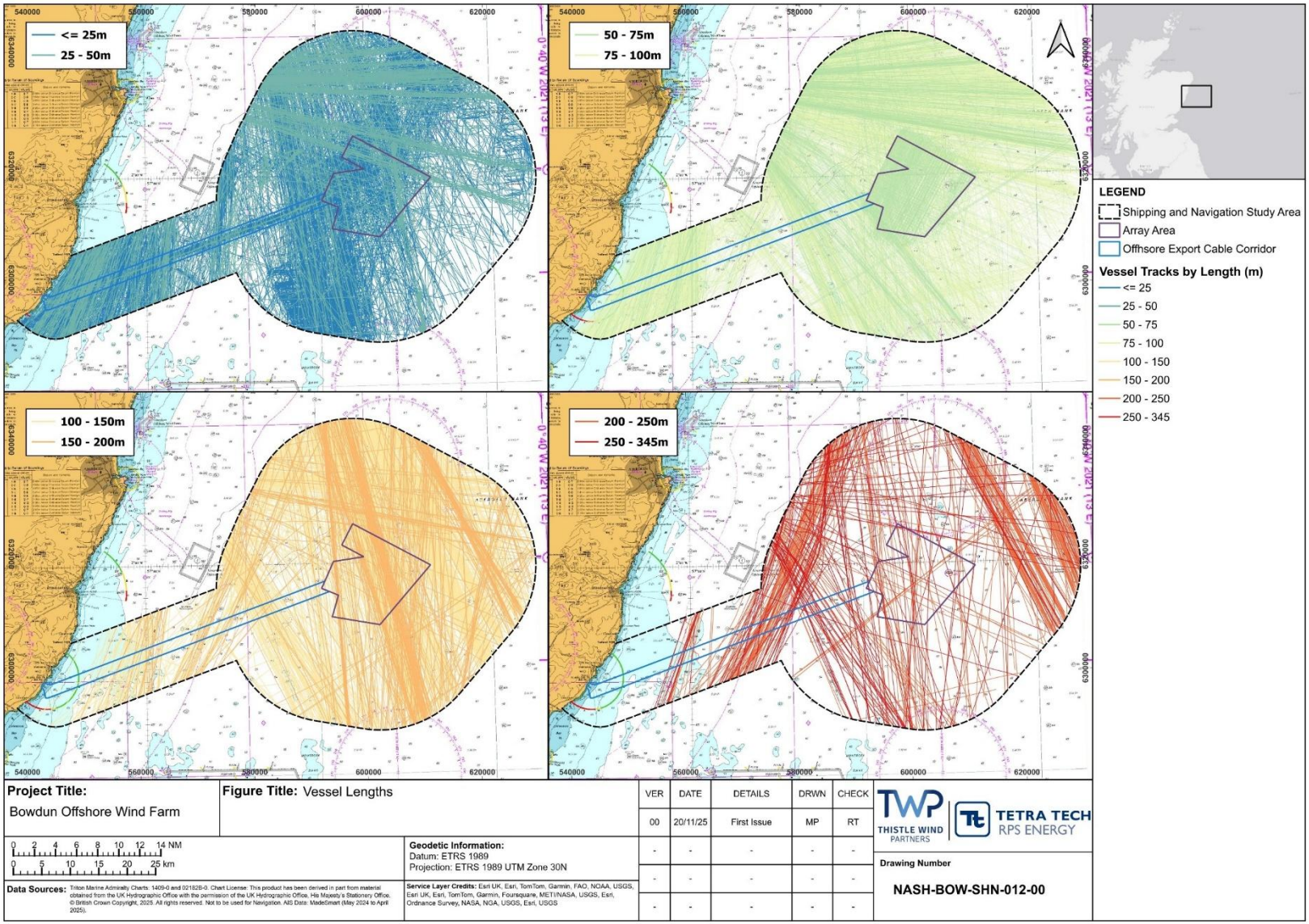

Figure 6.15: Vessel Traffic by Length

Draught

6.3.46 Vessel tracks from the AIS data are summarised by vessel draught in Table 6.10 and presented spatially in Figure 6.16.

6.3.47 Where vessel draught is unknown a value has been derived from the average of similarly sized vessels of the same type. In the whole Shipping and Navigation Study Area, the majority of transits (7,217 transits, 68.0%) were made by vessels with a draught between 4 m to 6 m. This draught range is comprised primarily of tug and service vessels (3,782 transits, 35.6% of all transits) and contains the majority of fishing vessel transits (1,225 transits, 11.5% of all transits). The Array Area has a similar pattern with 945 transits (54.5% of transits intersecting the Array Area) being made by vessels in the 4 m to 6 m draught range.

6.3.48 Generally, larger vessels with draughts over 8 m transit offshore and avoid shallower waters close to the coast. There were few tanker vessel transits or tug and service vessel transits in the draught range over 12 m and the only vessels with draughts over 14 m were cargo vessels. Cargo vessels with a draught greater than 14 m made seven transits through the Shipping and Navigation Study Area, of which one transit intersected the Array Area. The deepest draught vessel recorded was the bulk carrier *Gisela Oldendorff* with a 14.6 m draught, and one transit through the Shipping and Navigation Study Area which also intersected the Array Area.

Table 6.10: Vessel Tracks by Vessel Draught

Draught (m)	Shipping and Navigation Study Area	Export Cable Corridor	Array Area
< 2	73	66	4
2 to 4	944	464	182
4 to 6	7,217	2,778	945
6 to 8	1,763	702	373
8 to 10	370	103	125
10 to 12	165	12	102
12 to 14	73	19	3
14 to 16	7	0	1

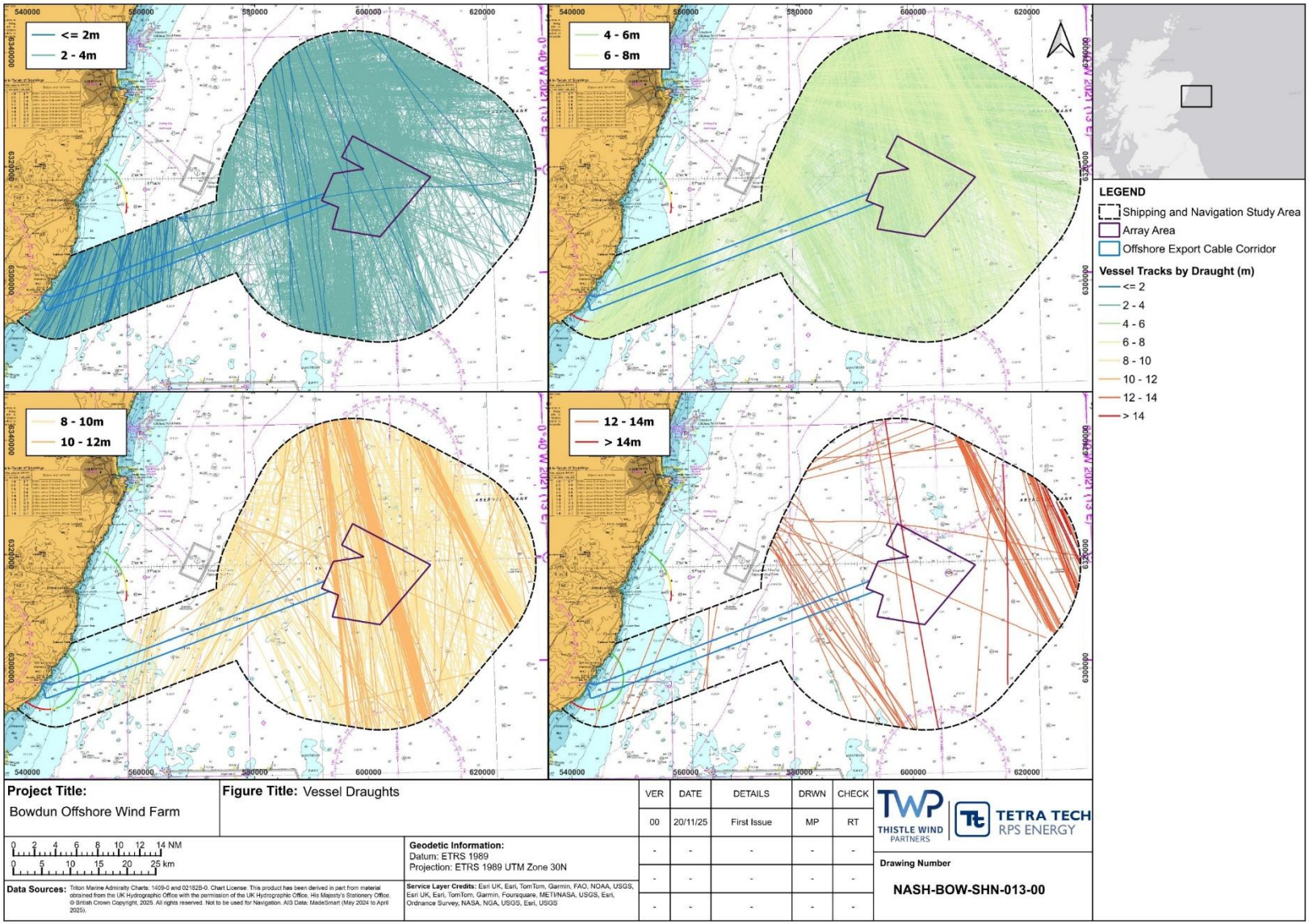

Figure 6.16: Vessel Traffic by Draught

Vessel Traffic Counts and Seasonality

6.3.49 The numbers of transits recorded by AIS in each area are presented by vessel type in Figure 6.17. During the one year study period there were 10,612 vessel tracks through the Shipping and Navigation Study Area. Tug and service vessels contributed the highest proportion of transits with 5,316 transits (50.1%) in the Shipping and Navigation Study Area. This was also true for the Export Cable Corridor with 1,565 transits (37.8%) undertaken by tug and service vessels, out of a total of 4,144 vessel transits. Intersecting the Array Area were 1,735 transits, of which 768 (44.3%) were made by cargo vessels.

6.3.50 A slight seasonal trend can be observed from Figure 6.18 where there is a peak in transits from May to July which remains slightly elevated until after September. The vessel types that generate this trend within the Shipping and Navigation Study Area include recreational vessels and cruise vessels (both with a winter off-season), and fishing vessels which become more active from May to July.

6.3.51 Transits made by passenger vessels are displayed by area and month in Figure 6.19. There was no temporal overlap between ferry and cruise vessel operations. Cruise vessels services began in April; services ran most frequently from May to September with reduction in service frequency from October to December. In contrast, ferries made few transits exclusively between January and March. As noted earlier, the ferry transits recorded were atypical, and are not representative of usual ferry activity. Therefore no assumptions can be made on the seasonality based on these observations.

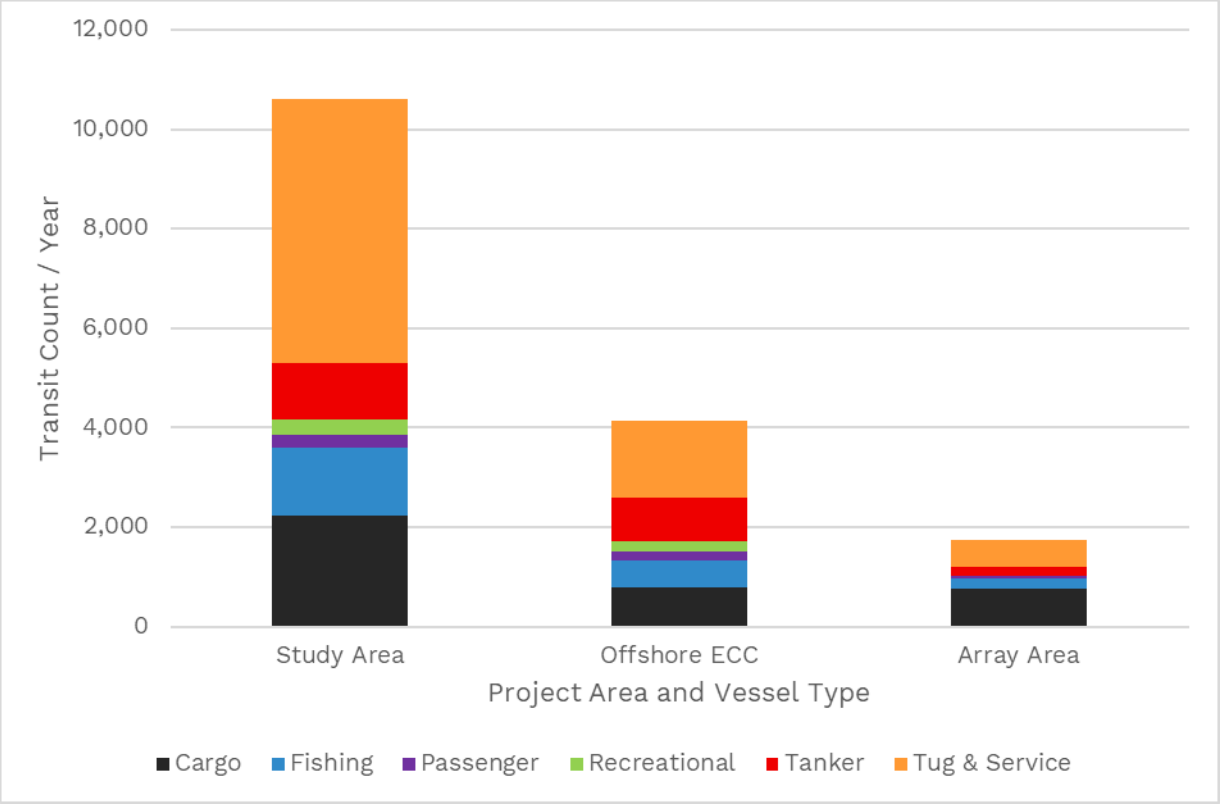

Figure 6.17: Transit Counts per Year by Project Area and Vessel Type

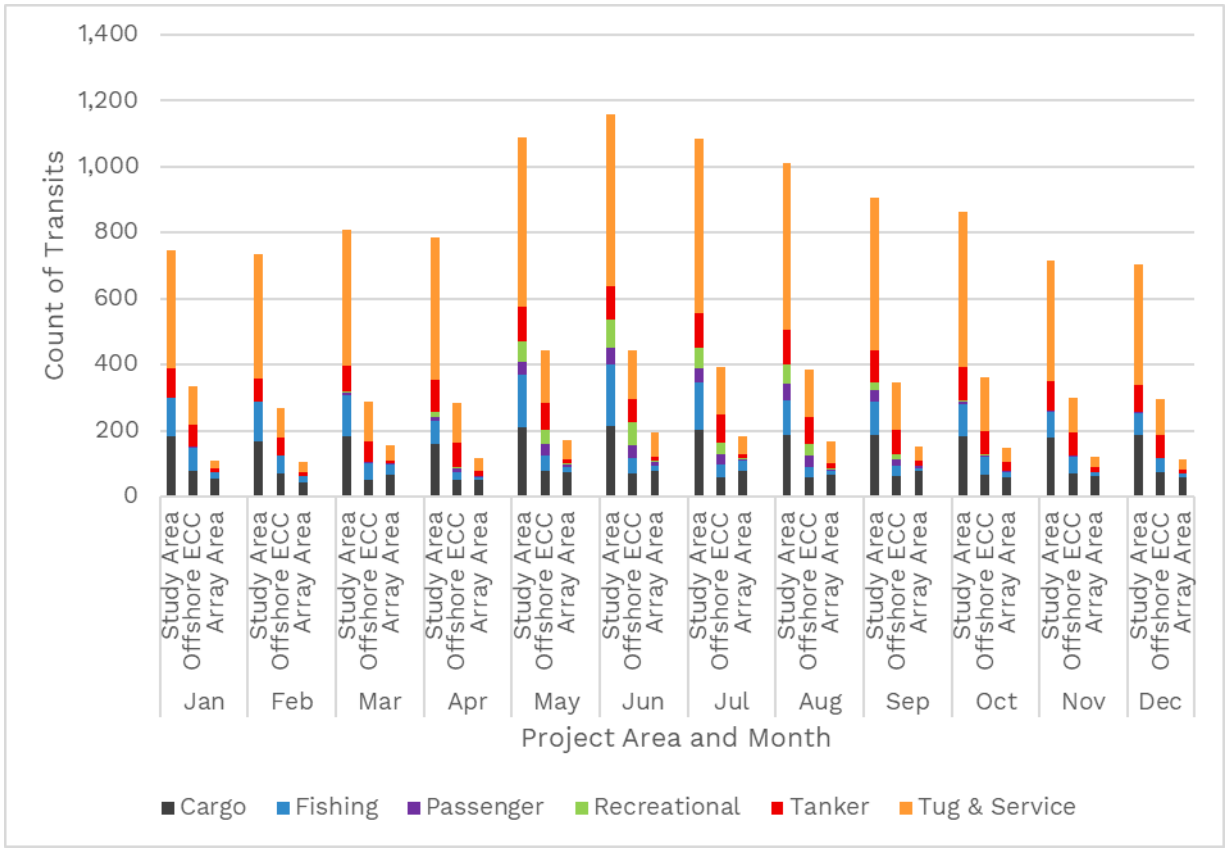

Figure 6.18: Transit Counts per Month (May to December 2024, January to April 2025) by Project Area and Vessel Type

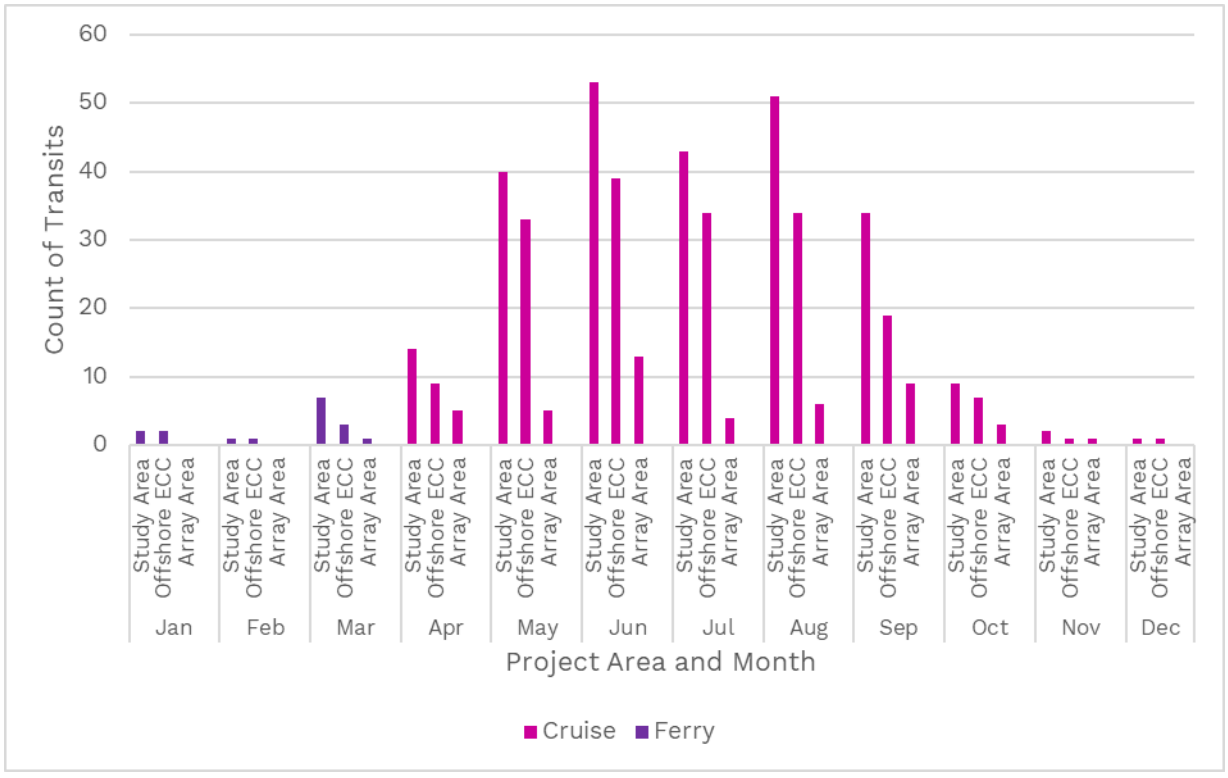

Figure 6.19: Transit Counts of Cruise Vessels and Ferries by Project Area and Month (May to December 2024, January to April 2025)

Identification of Vessel Routes

6.3.52 MGN 654 (MCA, 2021a) provides guidance regarding the definition of shipping routes in order to inform OWF assessments. To account for variation of tracks taken by vessels, the guidance note establishes the 90th percentile corridor principles. The 90th percentile is defined as the route that the central 90% of all vessels on the route took. A schematic of how the 90th percentile routes can be defined is shown in Figure 6.20.

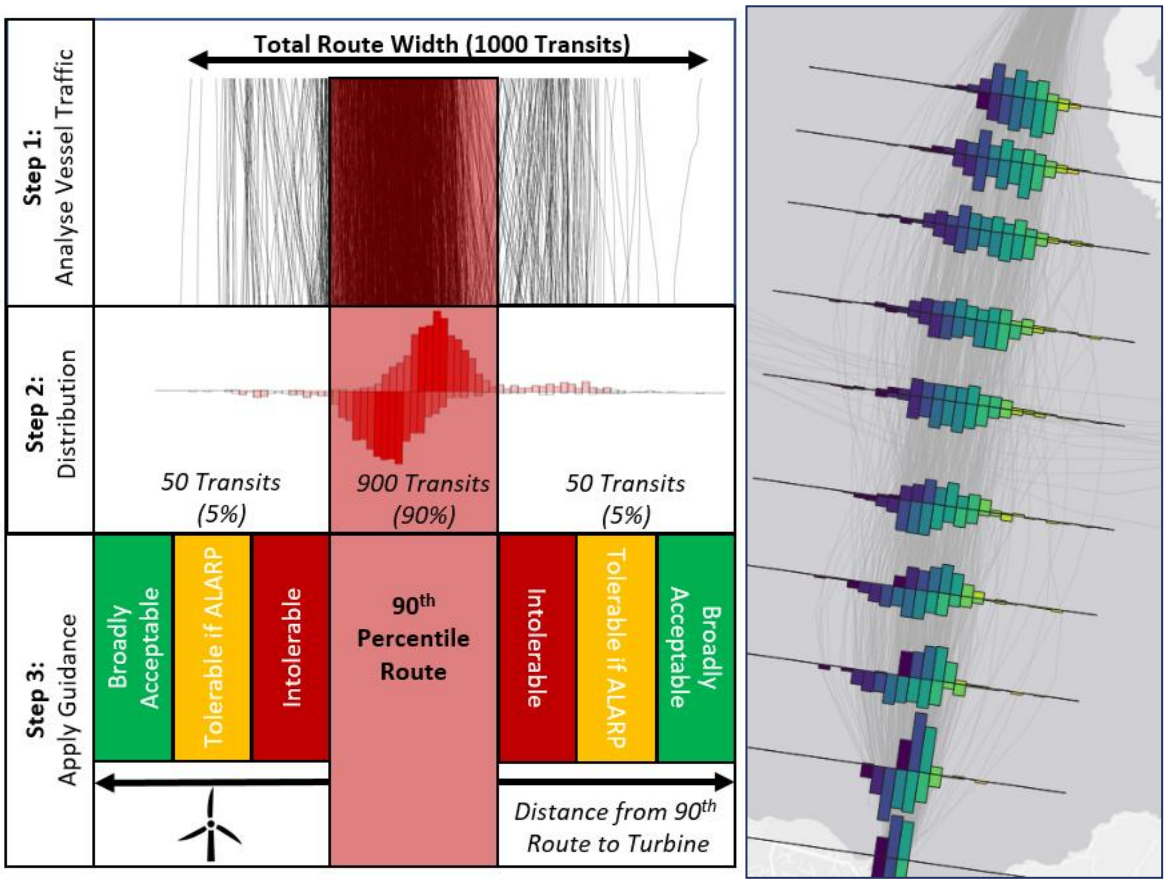

Figure 6.20: MGN 654 90th Percentile Workflow

6.3.53 The AIS data were processed, and 15 routes were identified within 10 nm (18.5 km) of the Array Area, where a route was classified as any line of transits with more than 36 tracks along it (i.e. more than three tracks per month). Each route was then classified into a 90th percentile route, as per the methodology outlined above, and a corresponding centreline produced. These routes are presented in Figure 6.21. Summary details are provided in Table 6.11. The minimum distance to the Array Area is also given, where this is measured as the distance between the closest edge of the 90th Percentile corridor and the Array Area. In total, 5,648 vessel tracks were categorised into 15 transit routes. Of these 15 routes, nine routes intersected the Array Area (Routes 4, 6, 7, 8, 9, 10, 11, 12 and 15) with 2,971 transits (circa 53% of total vessel tracks).

6.3.54 From the analysis of one year of AIS data (May 2024 to April 2025), the highest frequency of vessel transits across the Shipping and Navigation Study Area were recorded on the west to/from east Route 14 between Aberdeen and offshore through the Long Forties area. With 1,762 recorded transits, over 95% of which were made by tug and service vessels, this is considered a major route for offshore oil and gas activity. Similarly, the second most utilised route within the Shipping and Navigation Study Area is Route 15 which recorded 857 transits, of which over 96% were associated with tug and service vessel activity. Route 15 is oriented west-north-west to/from east-south-east to/from Aberdeen and offshore passing south-west of the Long Forties area.

6.3.55 Of the nine routes that intersect the Array Area, the most transited is Route 15 (857 transits). Second to that that is Route 12 with 666 transits (56 transits per month). Route 12 is a wide commercial route, oriented north-north-west to/from south-south-east, with transits primarily from cargo vessels (510 transits, 76.6%). The transit frequency of Route 4 is almost as frequent, with 661 transits recorded (55 transits per month). However, Route 4 intersects the Array Area minimally, and is largely utilised by a mixture of tug and service vessels (351 transits, 53.1%), and cargo and tanker vessels (combined 298 transits, 45.2%). Route 9 also has significant cargo vessel activity, with 394 total transits (33 transits per month) of which 367 transits (93.2%) were made by cargo vessels. Route 4 will not require major deviations to avoid the Proposed Development. Whilst Route 9 does intersect the Array Area, the overlap is minimal and (similarly to Route 4) would not require major deviations to avoid the Proposed Development.

6.3.56 The five remaining routes (Routes 1, 2, 3, 5 and 13) that do not intersect the Array Area are transited less frequently, each with less than ten transits recorded per month.

6.3.57 Table 6.12 presents the vessel routes that will necessitate deviations as well as the details of the deviations.

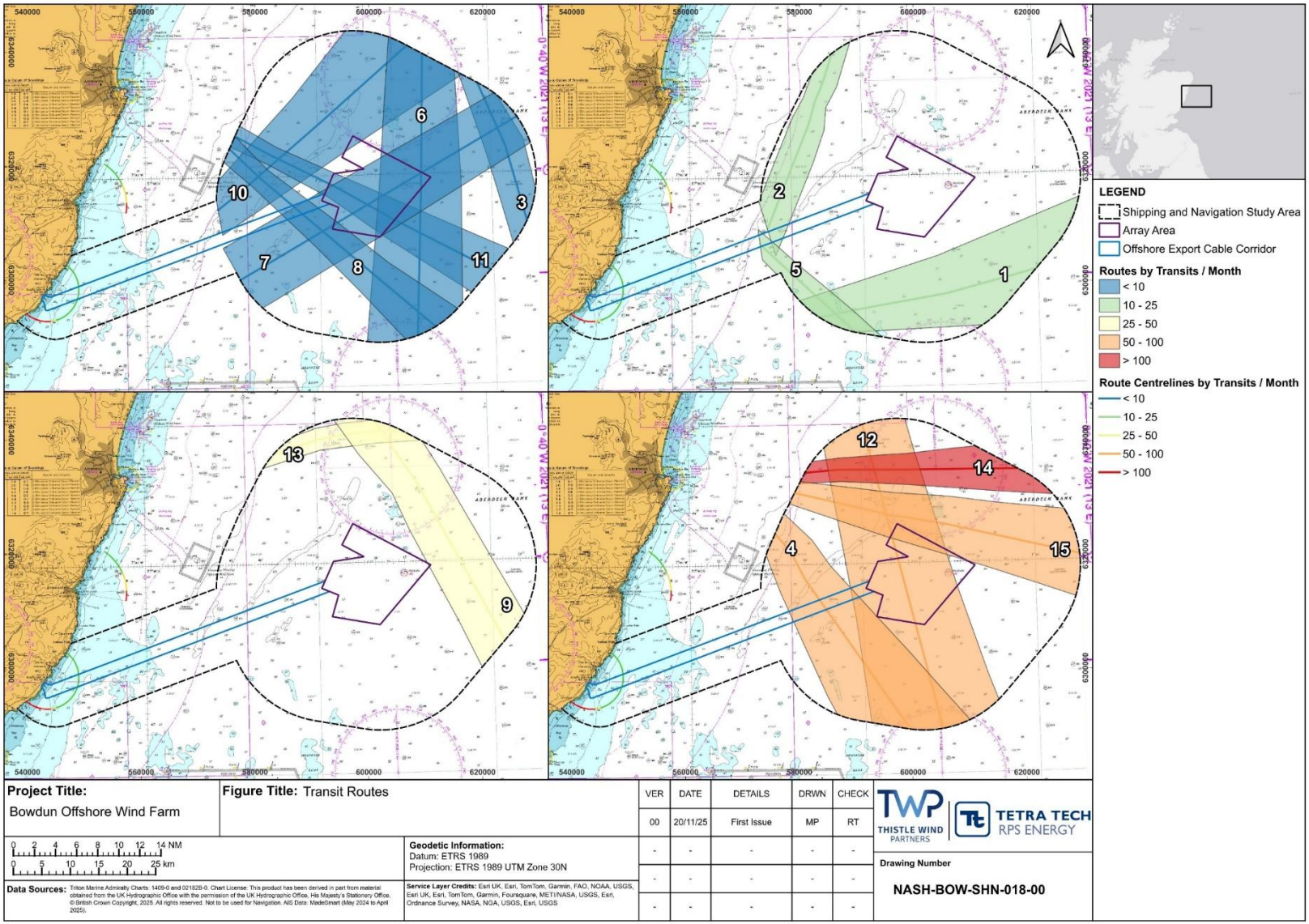

Figure 6.21: Transit Routes

Table 6.11: Route Summary

ID*	Route Description	Total Freq/ Month	Total Freq/Yr	Minimum Distance 90th percentile edge to Array Area (nm)	Vessel Type Freq/Yr			
					Cargo	Tanker	Passenger	Tug and Service
1	West-north-west to/from east-south-east route to/from Montrose and through Long Forties	11	129	2.0	42 (32.6%)	0 (0%)	1 (0.8%)	86 (66.7%)
2	South-south-west to/from north-north-east route passing west of Seagreen OWF and east of Kincardine OWF	12	144	6.0	31 (21.5%)	34 (23.6%)	64 (44.4%)	15 (10.4%)
3	North-north-west to/from south-south-east route passing east of Buchan Deep and west of Long Forties	9	104	5.7	80 (76.9%)	10 (9.6%)	10 (9.6%)	4 (3.9%)
4	North-north-west to/from south-south-east route to/from Aberdeen passing NE of Kincardine OWF and east of Seagreen OWF	55	661	Intersects	131 (19.9%)	167 (25.3%)	12 (1.8%)	351 (53.1%)
5	North-west to/from south-east route to/from Aberdeen passing south of Kincardine OWF and north-east of Seagreen OWF	10	123	7.3	22 (17.9%)	6 (4.9%)	0 (0%)	95 (77.2%)
6	North to/from south route passing east of Buchan Deep Demo and Seagreen OWF	9	113	Intersects	42 (37.2%)	54 (47.8%)	11 (9.7%)	6 (5.3%)
7	North route to/from Montrose or ports to the south passing north of Long Forties	3	36	Intersects	18 (50%)	0 (0%)	5 (13.9%)	13 (36.1%)
8	North-west to/from south-east route to/from Aberdeen passing north-east of Kincardine OWF and 10-15 nm (18.5-27.8 km) north-east of Seagreen OWF	6	76	Intersects	4 (5.3%)	14 (18.4%)	1 (1.3%)	57 (75%)
9	North-north-west to/from south-south-east route passing west of Buchan Deep and south-west of Long Forties	33	394	Intersects	367 (93.2%)	3 (0.8%)	9 (2.3%)	15 (3.8%)

ID*	Route Description	Total Freq/ Month	Total Freq/Yr	Minimum Distance 90th percentile edge to Array Area (nm)	Vessel Type Freq/Yr			
					Cargo	Tanker	Passenger	Tug and Service
10	North-east – south-west route from Montrose passing south of Kincardine OWF and offshore past Turbot Bank	9	108	Intersects	18 (16.7%)	0 (0%)	0 (0%)	90 (83.3%)
11	North-west to/from south-east route to/from Aberdeen passing north of Kincardine OWF an 15-20 nm (27.8-37.0 km) north-east of Seagreen OWF	5	60	Intersects	27 (45.0 %)	1 (1.7%)	4 (6.7%)	28 (46.7%)
12	North-north-west to/from south-south-east route passing west of Buchan Deep and east of Seagreen OWF	56	666	Intersects	510 (76.6%)	103 (15.5%)	12 (1.8%)	41 (6.2%)
13	East-north-east to/from west-south-west route to/from Aberdeen passing north of Long Forties	35	415	7.3	46 (11.1%)	3 (0.7%)	0 (0%)	366 (88.2%)
14	East to/from west route to/from Aberdeen passing through Long Forties	147	1,762	3.8	74 (4.2%)	7 (0.4%)	1 (0.1%)	1,680 (95.4%)
15	East-south-east to/from west-north-west route to/from Aberdeen passing through and south-west of Long Forties	71	857	Intersects	24 (2.8%)	5 (0.6%)	0 (0.0%)	828 (96.6%)

Table 6.12: Route Deviations Bowdun in Isolation

ID*	Route Description	Total Freq/ Month	Total Freq/Yr	Description of Deviations	Direct/Secondary impact from Bowdun	Difference in Transit distance (nm)
6	N-S route passing east of Buchan Deep Demo and Seagreen OWF	9	113	Deviate east of the Proposed Development.	Direct	+ 0.46
7	SW-NE route to/from Montrose or ports to the south passing north of Long Forties	3	36	Deviate south of the Proposed Development.	Direct	+ 0.8
8	NW-SE route to/from Aberdeen passing north-east of Kincardine OWF and 10-15 nm (18.5km – 27.8 km) north-east of Seagreen OWF	6	76	Deviate slightly further south of the Proposed Development to ensure safe passing.	Direct	Negligible difference (less than 0.01 nm)
11	NW-SE route to/from Aberdeen passing north of Kincardine OWF and 15-20 nm (27.8 km – 37.0 km) north-east of Seagreen OWF	5	60	Deviate south of the Proposed Development.	Direct	+ 1.43
12	NNW-SSE route passing west of Buchan Deep and east of Seagreen OWF	56	666	Deviate west of the Proposed Development. Potential to also deviate east of the proposed development with similar impact.	Direct	+ 1.1
15	WNW-ESE route to/from Aberdeen passing through and south-west of Long Forties	71	857	Deviate slightly further north of the Proposed Development to ensure safe passing.	Direct	Negligible difference (less than 0.01 nm)

*see Volume 3, Technical Appendix 4.6: Schedule of Mitigation and Commitments

Analysis of Adverse Weather Routeing

6.3.58 During adverse weather, it is recognised that vessels may travel in less direct routes to minimise the impact of the conditions.

6.3.59 Vessel tracks at the time of four named storms between 01 May 2024 and 30 April 2025 are presented in Figure 6.22. No appreciable differences in vessel routeing are identified, however there is little consideration of small craft or cruise vessels as these vessels were not frequent during the months where named storms occurred.

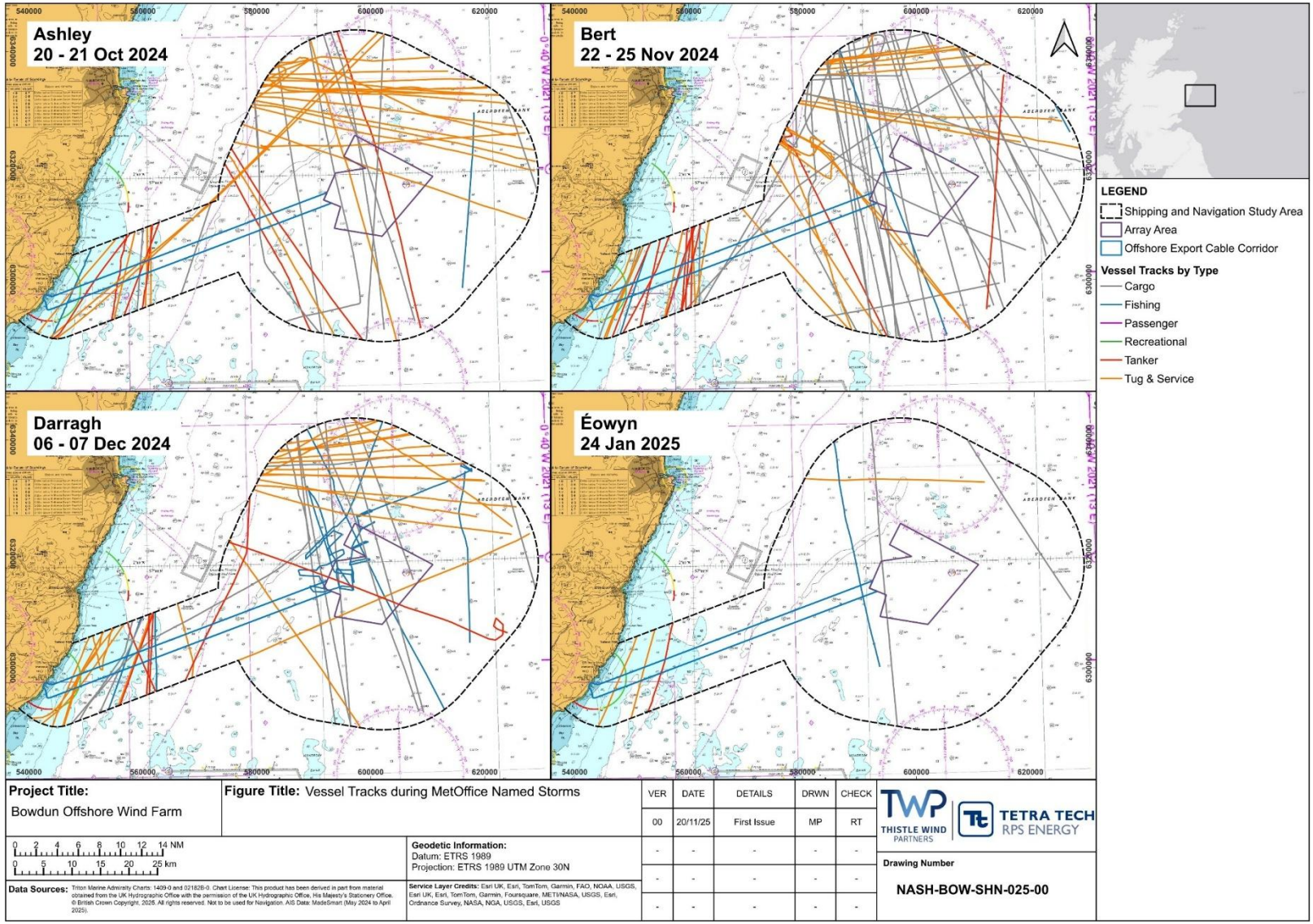

Figure 6.22: Vessel Tracks During Four 2024 to 2025 Met Office Named Storms

Anchoring and Waiting Vessels

6.3.60 Vessels which have been identified as anchoring or loitering from the available vessel traffic data have been presented in Figure 6.23. These were determined by filtering all AIS data to records with vessel speeds less than 0.5 kts. During the study period, there was a total of 106 hours of anchoring/waiting inside the Array Area. There were two locations identified, comprising less than 2% of the Array Area, where at least three hours per year of anchoring/waiting took place: the northernmost corner and to the eastern side. In the north of the Array Area this is most likely attributable to fishing and tug and service vessel activities. In the eastern corner of the Array Area, the activity can be attributed to tug and service vessel activity related to a cluster of scientific instruments consisting of three buoys and one subsurface mooring understood to be associated with the Metocean monitoring undertaken for the Proposed Development. These are temporary features markers and will not be present at or after the time of construction.

6.3.61 Anchoring/waiting within the Export Cable Corridor amounted to 109 hours within the study period (nine hours per month). Anchoring/waiting activity of at least three hours per year took place in less than 5% of the Export Cable Corridor area. Much of this was observed in waters greater than -50 m in depth at locations 3 nm to 5 nm (5.6 km to 9.3 km) and 14 nm to 20 nm (25.9 km to 37 km) from shore. Overall, anchoring/waiting activity within the Export Cable Corridor area was low.

6.3.62 There are areas of moderate to high (over six hours per year) anchoring/waiting activity to the east of the Array Area and south-east of the Export Cable Corridor and Landfall location. These areas of activity can be seen from fishing vessels in Figure 6.11 and in vessels with a draught of at least 1 m in Figure 6.16. It can therefore be assumed that the majority of these non-transiting vessels are small fishing vessels. The high activity area (16 hours in total, or one to two hours per month) located 0.5 nm (0.9 km) east of Landfall was due to tug and service vessel activity. In general, there was very little anchoring/waiting activity at Landfall.

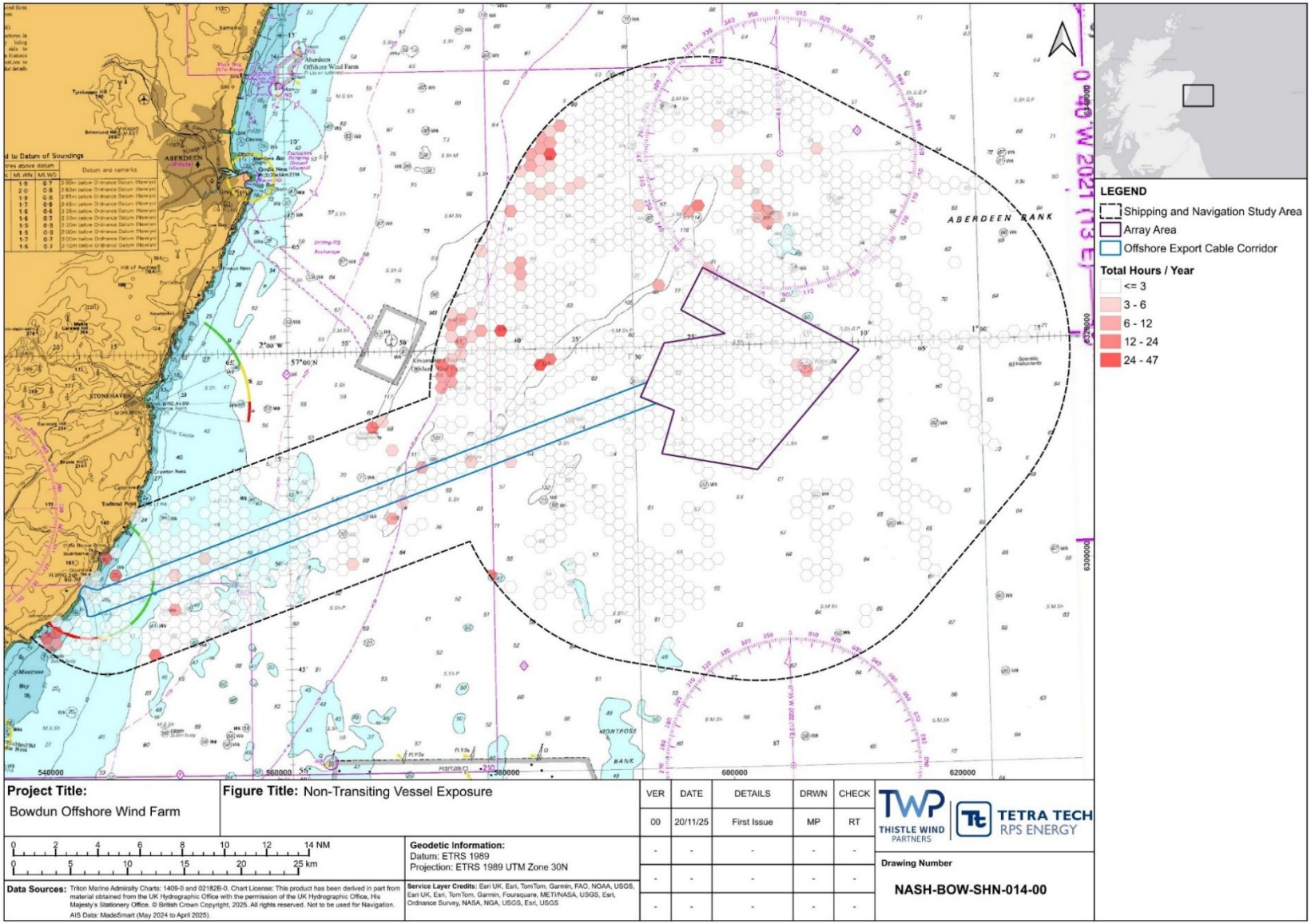

Figure 6.23: Non-Transiting Vessels (Less Than 0.5 kts) Identified within the Shipping and Navigation Study Area

6.4 Maritime Incidents

Shipping and Navigation Study Area Incidents

6.4.1 MAIB (1992 to 2024) and RNLI (2008 to 2024) incident databases have been collated and presented spatially in Figure 6.24. Due to the levels of coordinate accuracy provided in the data from MAIB and RNLI some incidents may share the same coordinate within the corresponding incident figure. This means incidents may be underrepresented illustratively, however the totals counted within the data table are accurate. Incident frequencies in Table 6.13 have been calculated per vessel type and incident category for incidents reported to have occurred within the Shipping and Navigation Study Area.

6.4.2 A total of 47 incidents occurred inside the Shipping and Navigation Study Area. There were no incidents involving tanker vessels, but incidents involving cargo, passenger, or tug and service vessels were recorded at very low frequencies. The majority of incidents are considered non-navigationally significant hazards; this includes 20 instances of mechanical failures and three personal injuries (Table 6.13). The only incident of a collision recorded within the Shipping and Navigation Study Area was in 1997 between two fishing vessels which resulted from failure to keep watch.

6.4.3 Overall, there is a higher concentration of incidents close to shore and one nearshore incident occurred within the Export Cable Corridor. The incident involved a fishing vessel which flooded/foundered in 1998, coinciding with the location of the 17 m wreck (noted in Paragraph 5.7.2). Incidents were also reported offshore, with two inside the Array Area:

- flooding of a 15 m to 24 m LOA fishing vessel occurring in 1995 with no reported deaths or injuries to persons; and
- mechanical incident involving the machinery failure of a commercial fishing vessel in 2019.

Table 6.13: Incident Frequency within the Shipping and Navigation Study Area from MAIB (1992 to 2024) and RNLI (2008 to 2024)

Incident Type	Cargo	Fishing	Passenger	Recreational	Tanker	Tug and Service	Total
Adverse Weather	0	0	0	2	0	0	**2**
Capsize/Flooding/ Foundering	0	5	0	3	0	0	**8**
Collision	0	1	0	0	0	0	**1**
Mechanical/ Damage	0	9	0	8	0	3	**20**
Missing	0	1	0	0	0	0	**1**
Near Miss	1	4	0	0	0	0	**5**
Personal Injury	0	3	0	0	0	0	**3**
Other	0	2	2	3	0	0	**7**
Total	**1**	**25**	**2**	**16**	**0**	**3**	**47**

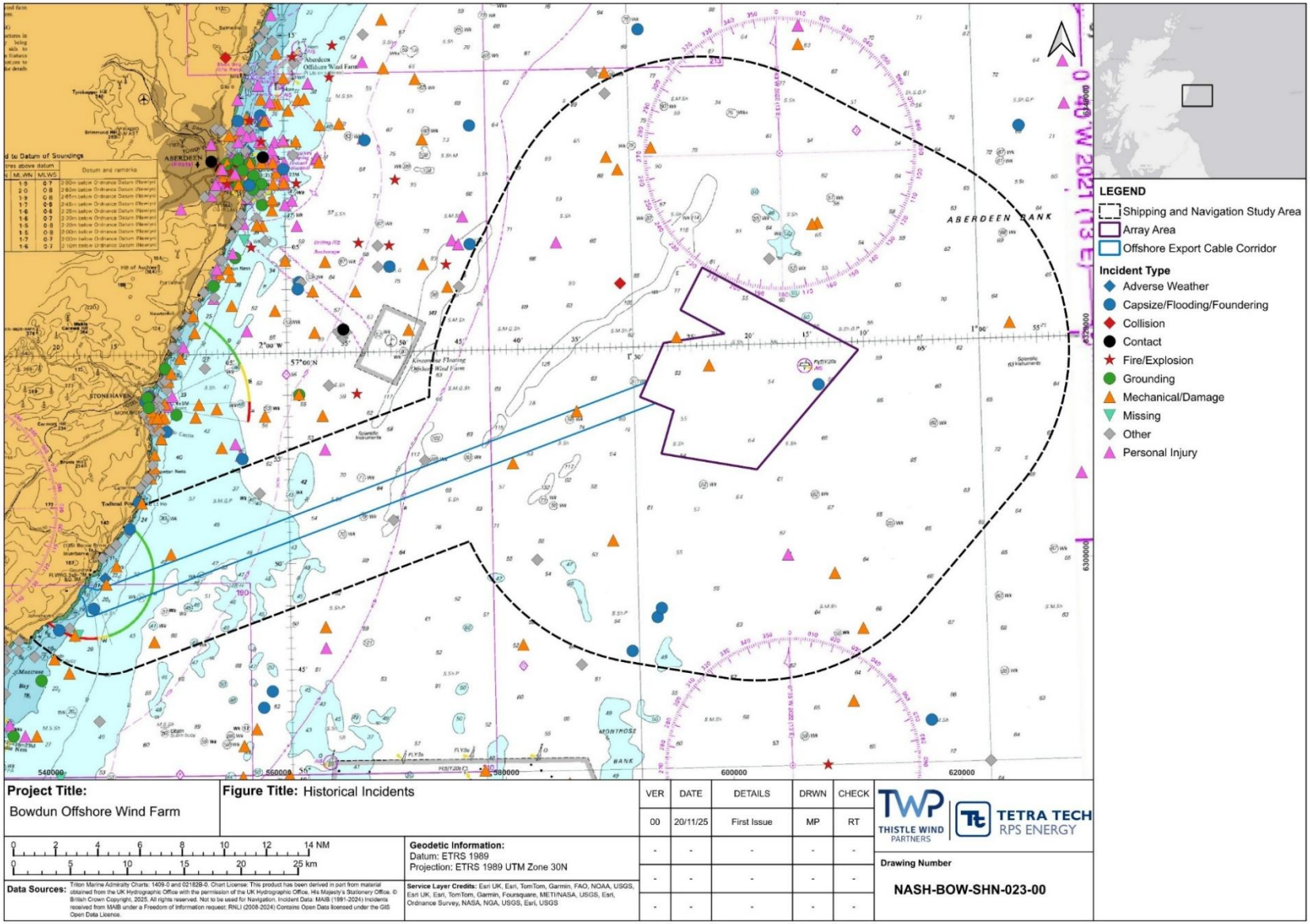

Figure 6.24: Historical Incidents from MAIB (1992 to 2024) and RNLI (2008 to 2024)

Incidents Associated with Existing OWFs

6.4.4 NASH Maritime have developed a database of navigational incidents which have occurred within, or are associated with, OWFs in the UK and Europe. Analysis of this database up until December 2024 was undertaken to better understand the types, frequency, and consequences of such incidents. The analysis primarily draws from the MAIB database, RNLI database and news sources. In total, 327 relevant incidents were identified in the UK, of which detailed information was obtained for 256 of them (78%), the first of which occurred in 2004:

- 48 allisions were recorded, 90% of which involved project vessels. No incidents involving passing commercial ships striking an OWF structure were recorded in the UK. Anecdotally, it is believed that allisions involving fishing and recreational vessels are more common but underreported;
- nine collisions were recorded, all of which involved project vessels;
- 31 groundings were recorded, all of which involved project vessels;
- other incident types occur exclusively to project vessels (ten capsize/flooding, 54 fires, 72 mechanical damage and 82 personnel injuries); and
- where detailed information is available (approximately 78% of all records), 45% of those incidents occurred within the array boundary of OWFs, 13% occurred within ports and harbours, and 42% occurred on transit between the two.

6.4.5 Based on this analysis, the incident rate per year per OWF can be calculated (see Table 6.14). By counting the years of activity for each OWF in the UK, NASH Maritime estimate that there has been a combined total of 496 years of OWF construction and operation in the UK (79.4 years construction and 416.3 years operation, respectively). The accident return rates are generally low, the majority accounted for by project vessels. However, for key navigational safety hazards over a typical 35-year operational duration, it would be expected that a UK project could experience three allisions, a 50% chance of a collision and two groundings. It should be recognised that this analysis considers all incidents and each individual OWF would have its own specific risk profile that might make incident rates higher or lower than the average.

Table 6.14: Average Incident Count, Incident Rate, Return Period, and Likelihood of Occurrence per Project Between 2000 to 2023 in the UK

Incident Type	Incident Count (2000 – 2023)	Rate (incidents per yr)	Return Period (yrs)	Likelihood of occurrence in 35 yrs (%)
Allision	48	0.097	10.3	97%
Capsize/Flooding/Foundering	10	0.020	49.6	51%
Collision	9	0.018	55.1	47%

Incident Type	Incident Count (2000 – 2023)	Rate (incidents per yr)	Return Period (yrs)	Likelihood of occurrence in 35 yrs (%)
Fire/Explosion	54	0.109	9.2	98%
Grounding	31	0.063	16.0	90%
Mechanical/Damage	72	0.145	6.9	99%
Personal Injury	82	0.165	6.0	99%
Total	**306**	**0.617**	**1.6**	**100%**

6.4.6 Further analysis of this data considered the consequences should these incidents occur. Figure 6.25 analyses the database showing the proportion of incidents which resulted in injuries. With the exception of personal injuries, across every hazard type there were no injuries in 80% of reported cases and incidents resulting in multiple injuries are rarer. Allisions account for the highest proportion of injuries, including multiple injuries, amongst navigational accident types. No fatalities were reported in any collision, allision or grounding involving OWFs in the UK, although onboard health and safety fatalities have occurred.

6.4.7 Where information was available, Figure 6.26 shows the reported vessel damage consequence following an OWF-related incident. Whilst there is significant variation by accident type, with the exception of allision, approximately 90% of all incident types resulted in no or minor damage to the vessel. Allisions accounted for the highest proportion of moderate to major damage, with two major damage incidents following allisions between a fishing boat and a Wind Turbine and a CTV and a Wind Turbine.

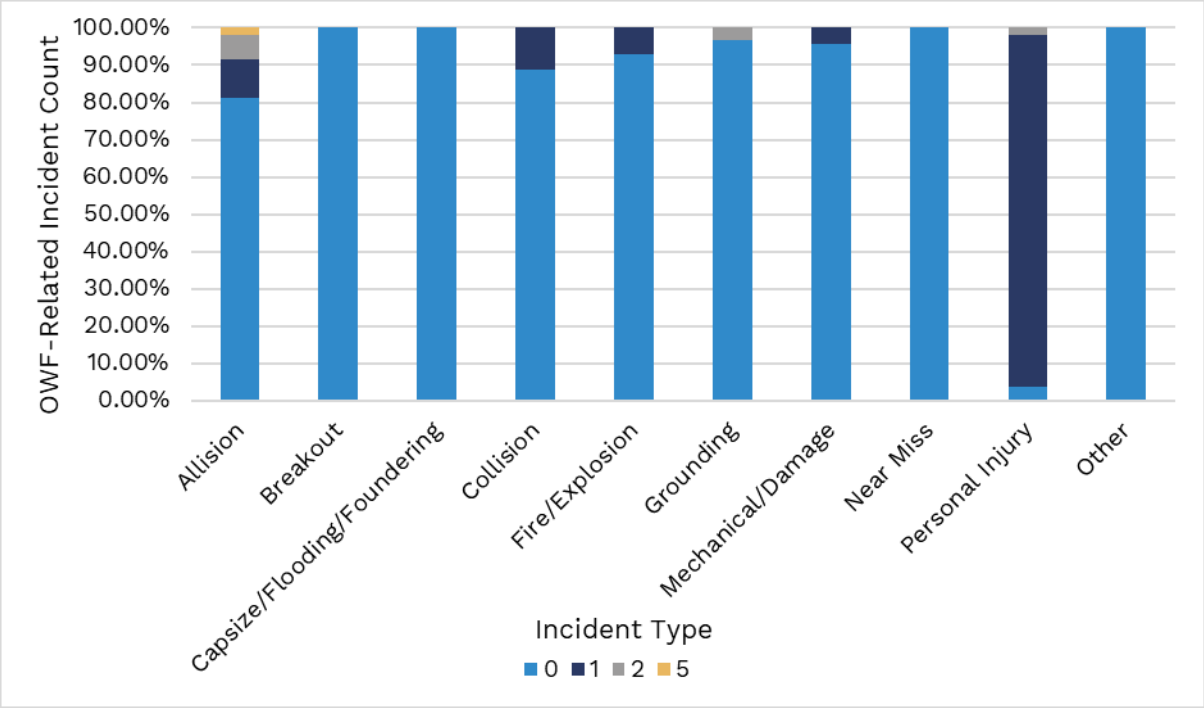

Figure 6.25: Number of Injuries per OWF-Related Incident Type

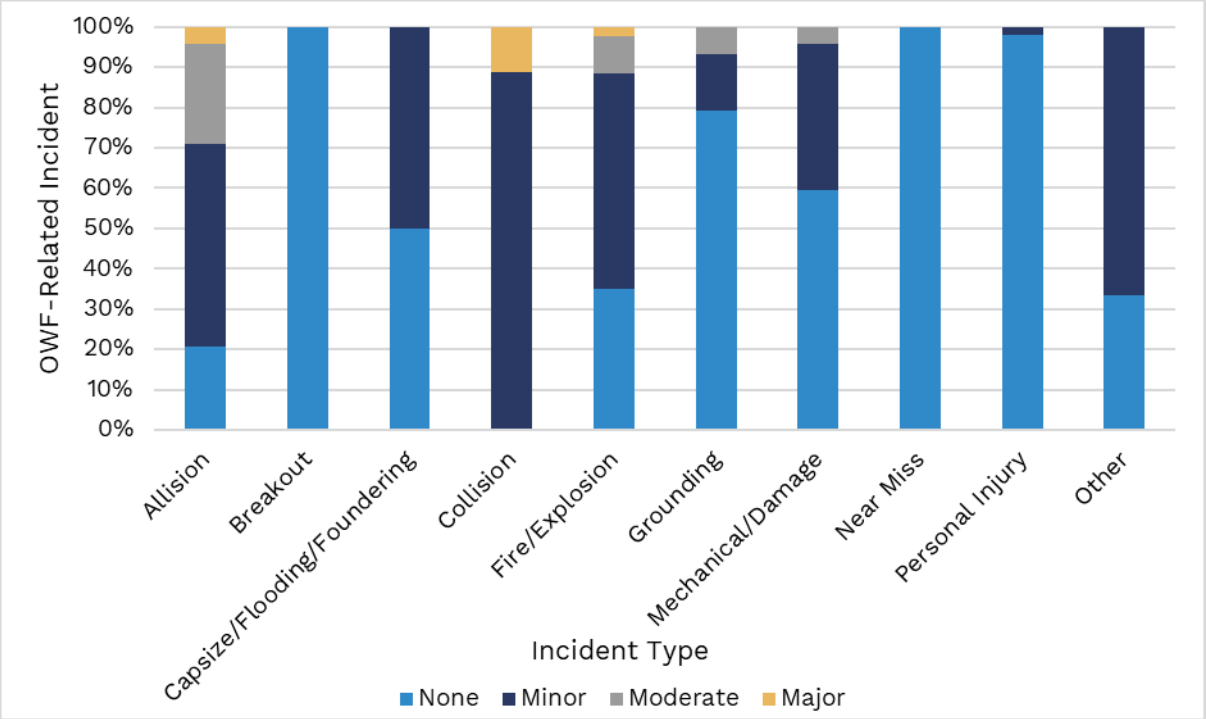

Figure 6.26: Vessel Damage per OWF-Related Incident Type

7 Future Case Traffic Profile

7.1 Commercial Traffic

7.1.1 To provide insight into the potential future commercial traffic through the area, the historic trends of local ports, the major ports in the region and the UK as a whole can be considered. Figure 7.1 provides the annual freight amounts for these ports from DfT data (DfT, 2024a). The data show a decline in port freight in 2020 at both the national and port level, respectively. The DfT report that UK ports were affected by measures to prevent and reduce the global spread of COVID-19 throughout 2020, as well as the UK exiting the European Union (EU) at the end of 2020. However, by 2022, port freight returned to similar pre-pandemic levels. Since this time, it is observed that port freight declined again slightly at the national level.

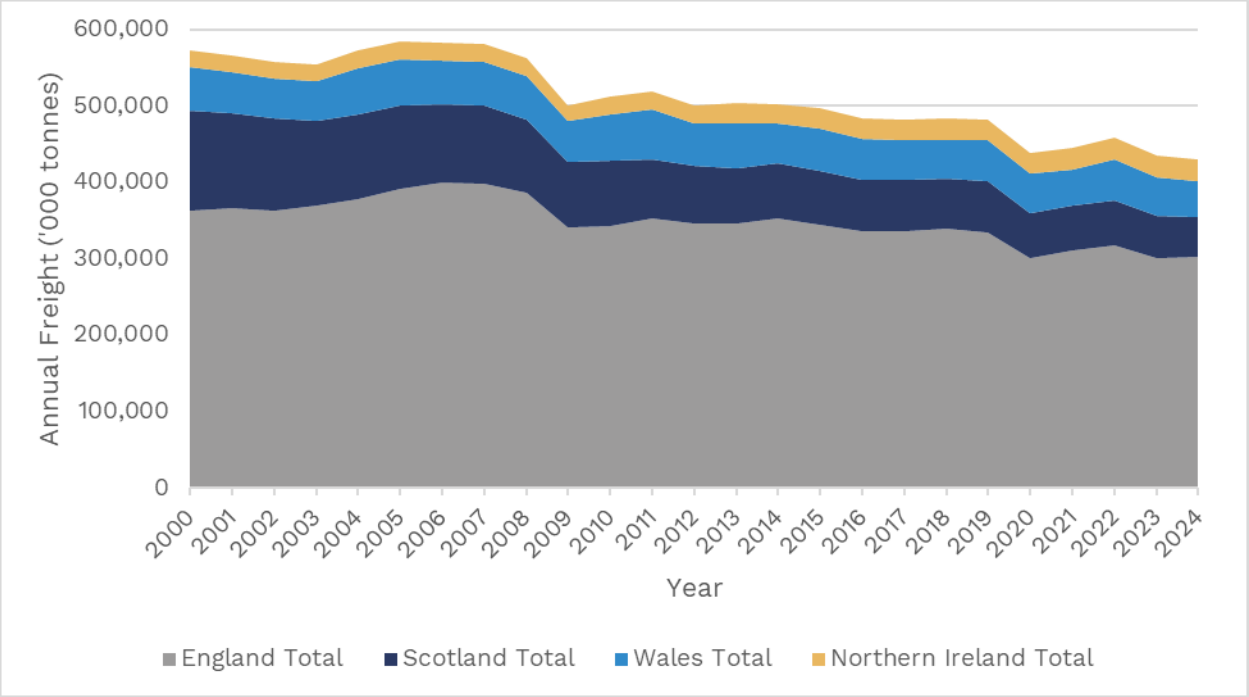

Figure 7.1: Annual Major and Minor Port Freight Tonnage (Source: DfT, 2024a)

7.1.2 Figure 7.3 shows projected freight traffic into UK major ports, produced by the DfT in 2024 (DfT, 2024b). Overall, port traffic is forecast to remain relatively flat in the short term but grow slightly in the long term (ten years and beyond), with total UK port traffic projected to be 7.8% higher in 2050 compared to 2023. This long term growth is driven predominantly by significant increases in unitised and dry bulk freight, which compensates for decreases in liquid bulk traffic. In the short term (by 2035) dry bulk traffic is forecast to have the largest growth due to increases in the transport of agricultural products and ores, which offset the decline in coal cargoes, and are also projected to increase long term. For unitised freight, the Twenty-foot Equivalent Unit (TEU) forecast for Lift On-Lift Off (Lo-Lo) and the unit forecast for Ro-Ro are both forecast to grow significantly. An increase in motor vehicle freight is also forecast, although less

strongly than the TEU Lo-Lo and Ro-Ro freight. Trends in unitised freight categories are driven by the forecast economic growth. Meanwhile, general cargo if forecast to increase quickly in the short term then decline, leading to a marginal long term increase. The fluctuation can be attributed to the short term increase in iron and steel alongside a large long term decrease in forestry products, while the increased containerisation of goods is anticipated for moderate growth. Liquid bulk traffic (principally crude oil) has large forecasted decreases, continuing a historical trend, sustained by the net zero transition and the shift from liquid bulk to tank containers.

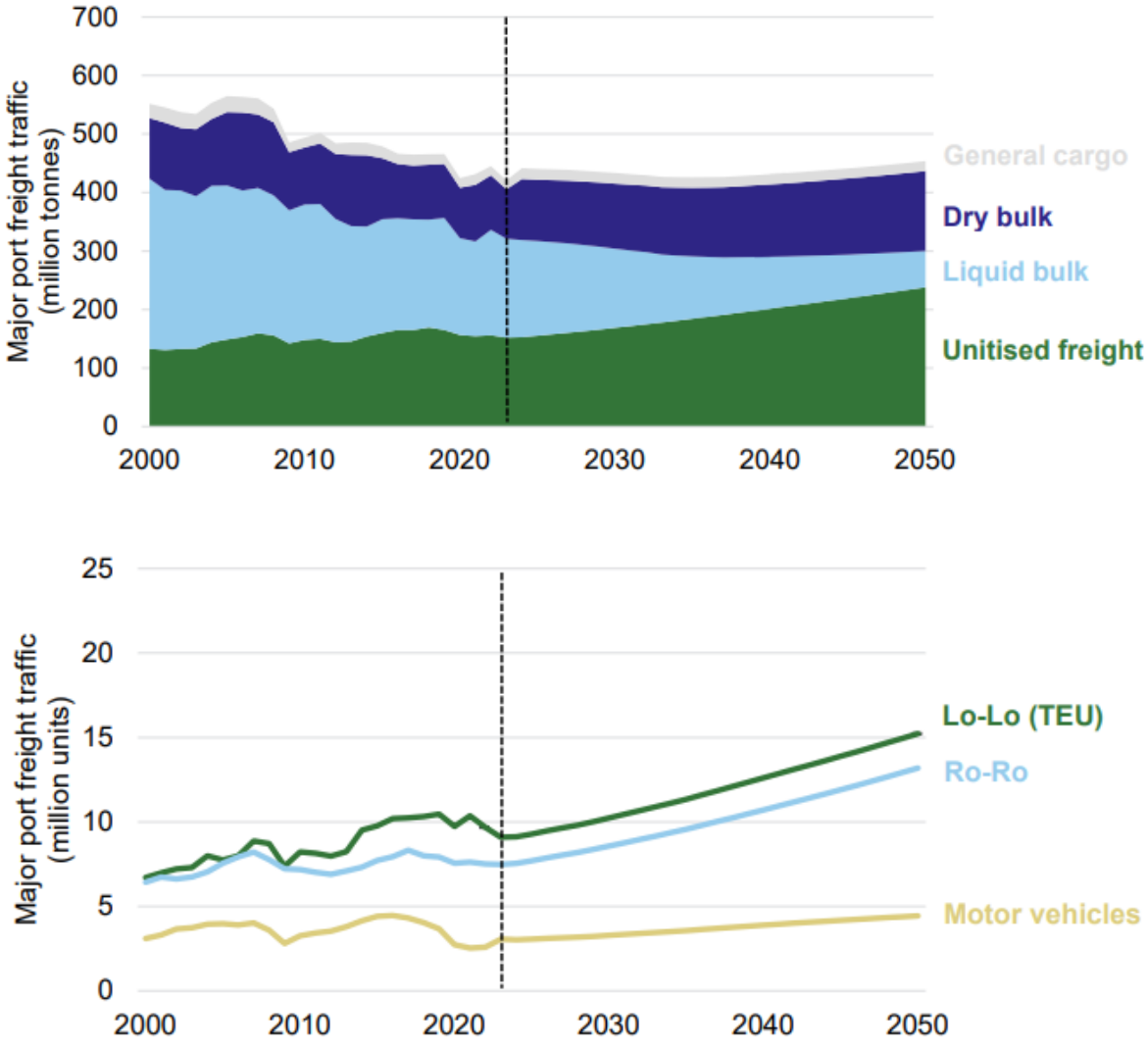

Figure 7.2: UK Port Freight Projections (DfT, 2024b)

7.1.3 An overall gradual decline in annual freight since the early 2010s is evident in the DfT data (DfT, 2024a) for local ports closer in proximity to the Proposed Development which can provide insight into local vessel traffic (see Figure 7.3 and Figure 7.4). Key port annual commercial vessel arrivals are also shown in Figure 7.5.

7.1.4 The port of Montrose was one of the busier minor ports with a peak of 800,000 tonnes of annual freight in 2003, however an overall decreasing trend of annual freight throughput has been observed, with only around 450,000 tonnes of annual freight recorded in 2024 which equates to a 44% reduction over the previous 20 years.

7.1.5 The port of Aberdeen was the busiest major port in the area, showing a peak of around five million tonnes of annual freight in 2007. There was an overall decreasing trend until 2022 with annual freight of 3.4 million tonnes, between 2022 and 2024 there has been gradual increase, reporting 3.7 million tonnes in 2024. Further review of Aberdeen annual port arrivals for commercial traffic over the previous ten years shows a relatively steady number of between 900 and 950 annual port calls since 2020. Vessel calls have not increased at the same rate as annual tonnage indicating that individual vessel size and/or carrying capacity is increasing also, which is a trend observed globally for modern vessel design and is anticipated to continue. It should be noted that these numbers do not consider other vessel types which are discussed in other sections.

7.1.6 The port of Peterhead has remained comparatively steady over the previous 20 years; however, shows a steady decrease in annual freight tonnage since 2015 with a peak of 1.5 million tonnes, reducing on a steady downward trend to 2024 with 670,000 tonnes. Recorded annual port arrivals for Peterhead are similarly on a general declining trend over the same period.

7.1.7 Despite the overall local commercial tonnage decreasing over the previous 20 years (based on DfT, 2024a), the north-south route passing these ports is linked to vessels to/from EU ports via the Pentland Firth and should also be considered. To account for the potential increase in commercial vessel traffic, an allowance of 10% additional commercial vessel traffic has been assumed in the future case scenario.

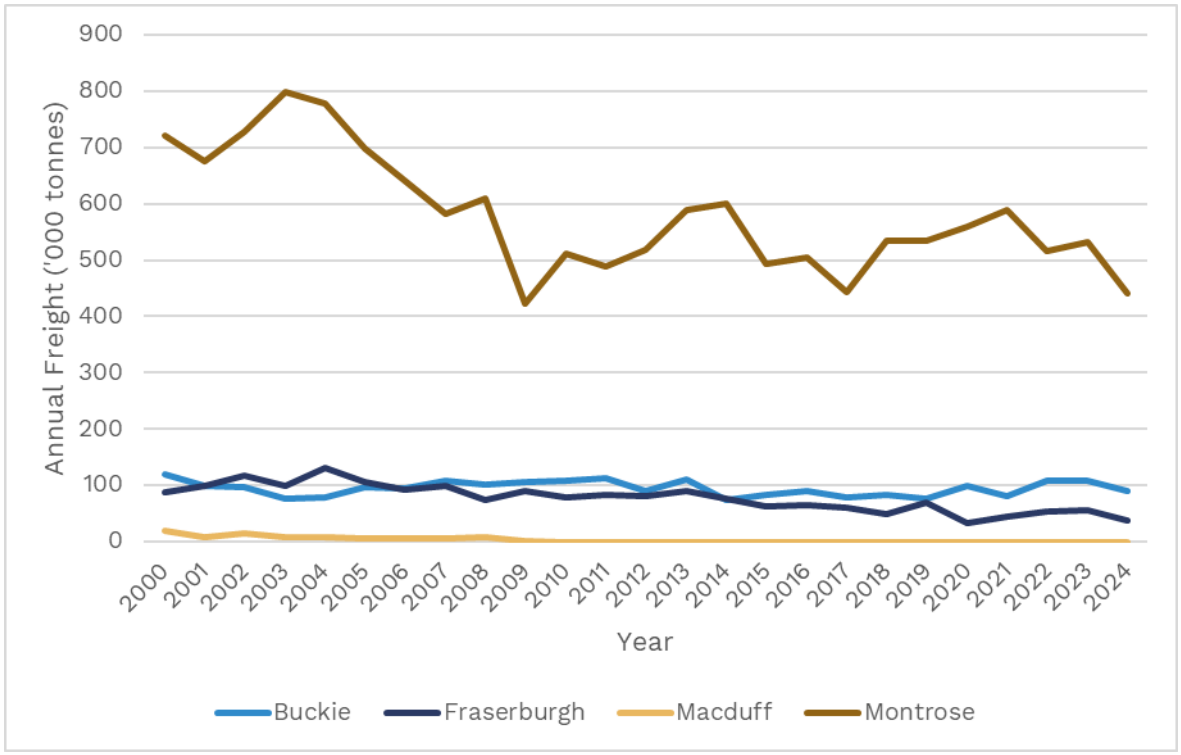

Figure 7.3: Annual Freight for Local Minor Ports (DfT, 2024a)

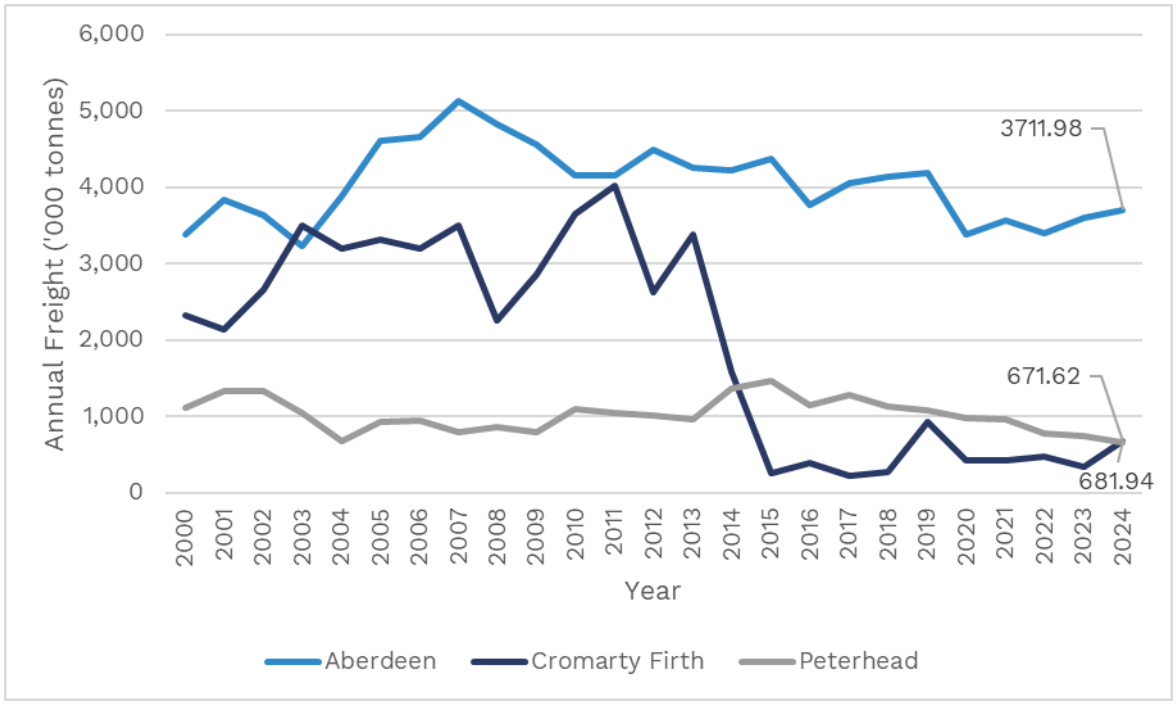

Figure 7.4: Annual Freight for Local Major Ports (DfT, 2024a)

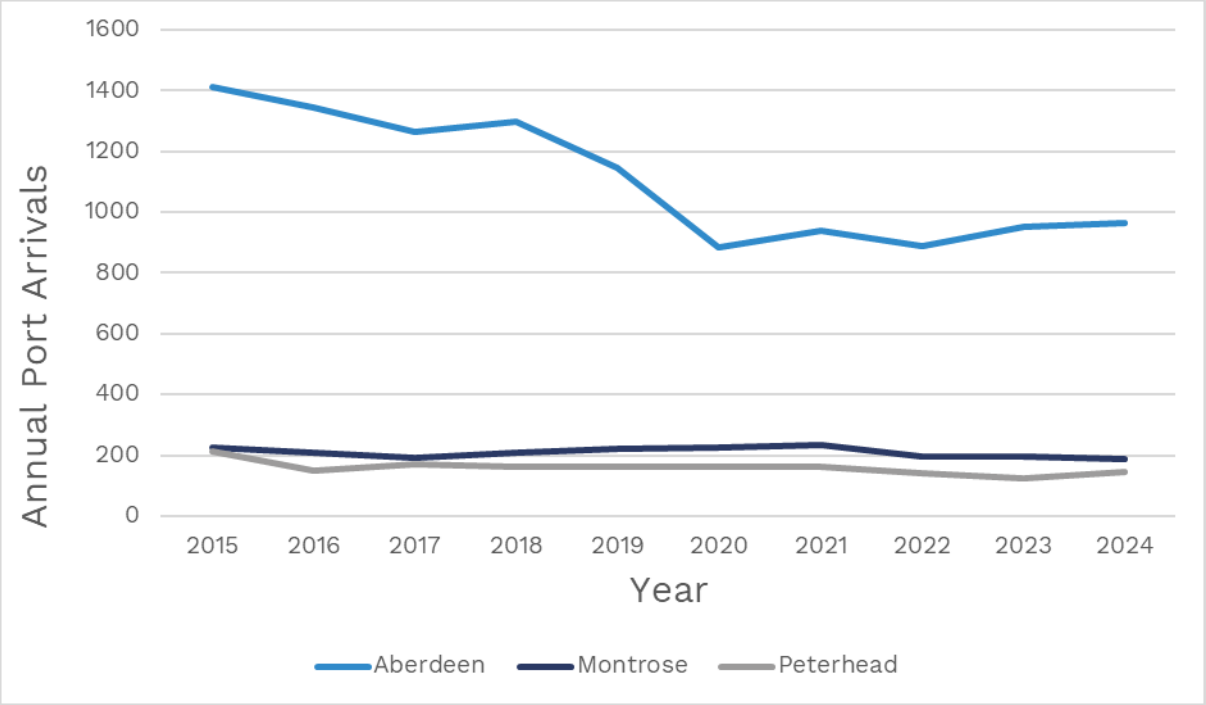

Figure 7.5: Annual Port Arrivals for Local Ports of Aberdeen, Peterhead and Montrose (DfT, 2024a)

7.2 Passenger Traffic

7.2.1 The majority of passenger vessel traffic through the Shipping and Navigation Study Area is generated by the cruise industry. The cruise vessel activity near the Proposed Development is likely to increase, continuing recent upward trends at the Port of Aberdeen. From 2022 there has been a steady increase in cruise calls up to 70 calls in 2025 between April and October (typical cruise season). By 2027, the Port of Aberdeen is anticipating more than 100 cruise calls annually (Port of Aberdeen, 2024). The berths at the Port of Aberdeen can accommodate vessels up to 300 m in LOA, such as the 290 m cruise vessel *Costa Favolosa* which first visited in July 2024.

7.2.2 Although NorthLink and Caledonian MacBrayne both operate ferries that intersected the Shipping and Navigation Study Area, these were outside of their respective operational routes and therefore do not greatly contribute to the local passenger traffic profile.

7.3 Fishing

7.3.1 It is anticipated that fishing activity is unlikely to change over the next five years, with both UK and non-UK vessels continuing to be active in the region as per the Trade and Cooperation Agreement agreed to by the UK upon exit from the EU and applicable from January 2021. In May 2025, it is understood that the EU-UK deal will permit EU fishing in UK waters, keeping the current status quo, giving EU boats continued access to UK waters until 2038. More detail on expected future changes according to different fishing types can be found in Volume 2, Chapter 13: Commercial Fisheries.

7.3.2 It is noted that fisheries patterns can change based on a range of factors, including market demand and prices, abundance of stock and sustainability. However, given that the main fishing activities that take place in proximity to the Shipping and Navigation Study Area are well-established it is therefore envisaged that fishing activity levels will remain constant.

7.4 Recreational

7.4.1 The RYA Water Sports Participation Survey conducted in 2019 (RYA, 2019b) found that the proportion of adults participating in boating activities has fluctuated between 6% and 8% between 2002 and 2018. Between 2008 and 2018, the proportion participating in yacht cruising, motor boating and power boating have remained consistent at 0.8%, 1.1% and 0.7% respectively. More recent data published in the 2021 Water Sports Participation Survey is greatly influenced by COVID-19 with a considerable variation between 2020 and 2022 due to national/local lockdowns (RYA, 2022).

7.4.2 Therefore, it is unlikely that there will be an appreciable change in the number of recreational users due to macro trends.

7.4.3 Furthermore, the Proposed Development is located approximately 21 nm (38.9 km) offshore so little recreational activity is expected.

7.5 Oil and Gas

7.5.1 Many oil and gas platforms within the North Sea are nearing their end of life and will be transitioning to decommissioning phase. As various projects cease operations, they will see a reduction in O&M vessel activity. However, there will be a temporary increase in traffic associated with decommissioning which will be localised at those specific assets being decommissioned.

7.5.2 It is noted that Aberdeen's South Harbour is a large decommissioning facility, located near to the key fields to facilitate nearby decommissioning activities, particularly of subsea infrastructure. As a result, the tug and service vessel traffic approaching Aberdeen from the east is expected to increase in activity during oil and gas decommissioning campaigns.

7.5.3 To account for continued oil and gas decommissioning and other service vessel activity, an increase of 20% was applied to tug and service vessel traffic for the future case modelling. The increase resulted in increased risk particularly on east-west/west-east routes to/from Aberdeen passing to the north of the Array Area. Such routes are identified to be the busiest routes utilised primarily by tug and service vessels, with multiple intersections with commercial routes.

7.6 Increases in Traffic Associated with the Project

7.6.1 The Proposed Development will require additional vessel movements during construction, and to perform maintenance and inspection activities, before eventual decommissioning.

7.6.2 The construction base for the Project has yet to be determined, however it is anticipated that the additional number of vessel movements within the Array Area would be comparatively low (compared to existing service vessel traffic volume) with up to 2,120 expected total return transits over the entire construction phase of five years (Array Area and Export Cable Corridor). The peaks in traffic across this period are not yet defined, but conservatively assuming peaks of traffic are condensed over the summer six-month period, this equates to, on average, 71 per month or 2.4 per day.

7.6.3 The O&M base for the Project has yet to be determined, however it is anticipated that the additional number of vessel movements within the Array Area would be comparatively low (compared to existing service vessel traffic volume) with up to 713 expected total return transits per year (Array Area and Export Cable Corridor), or 59 per month on average (~ two per day). In addition to this, a further number of vessels will undertake another 146 (Array Area) and 114 (Export Cable Corridor) return trips spread over the 30-year O&M phase.

8 Potential Impact Assessment

8.1 Impact Identification

8.1.1 A range of potential impacts on shipping and navigation have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development.

Table 8.1: Identified Impacts

ID*	Impact	Description
1	Impact on commercial vessel and ferry routes	Commercial vessels and ferries will potentially be displaced from existing routes due to the presence of the Proposed Development.
2	Impact on risk of collision	Marine craft associated with construction will be transiting to/from the area throughout the construction period. There will be potential interaction with other vessels transiting the area which leads to an increased risk of collision.
3	Impact on risk of contact/allision	Infrastructure in the area will create a risk of contact for either powered or drifting vessels transiting the area.
4	Impact on risk of grounding	Changes to vessel routing as a result of the cable or project vessels may lead to a potential increase in the risk of grounding.
5	Impact on SAR capability	The potential for reduced access for SAR responders due to infrastructure may affect SAR capability. This along with the increase in vessel activity may result in an increase in incidents further affecting capability.
6	Impact on radar, communications and positioning systems	Communication and positioning systems may be affected by the presence of infrastructure.
7	Impact on Under Keel Clearance (UKC) due to subsurface Offshore Infrastructure	Use of cable protection associated with the Proposed Development has the potential to reduce the available depth of water along the cable route. This would reduce the available UKC for vessels transiting the area.
8	Impact on port/harbours and nearshore operations	Access to local ports may be affected by the presence of the Proposed Development and operations associated with it.
9	Impact on small vessel activity (fishing and recreation)	Fishing and recreational vessels may be displaced from their current routes and/or activity areas due to the presence of infrastructure and activities associated with the Proposed Development.

*see Volume 3, Technical Appendix 4.6: Schedule of Mitigation and Commitments

8.2 Impact on Commercial Vessel and Ferry Routes

8.2.1 The construction of an OWF in otherwise navigable waters necessitates vessels to deviate from existing routes to avoid the obstruction. This can result in increased transit distance and time that might make some services unviable or make passage planning challenging for bridge teams. Figure 6.21 shows the key commercial vessel routes identified from the vessel traffic analysis (see Section 6.3) and numbered according to Table 6.11. These routes are presented by the volume of traffic using each route.

8.2.2 The base case routes which require rerouting as a result of the Array Area are presented in Figure 8.1, alongside the predicted future routes. None of the high-density routes (over 100 vessels per month) intersect the Array Area. One route centreline (Route 12) with between 50 and 100 vessels per month intersects the Array Area and will have to deviate around the Array Area. It is most likely that Route 12 will deviate and instead take a path inshore of the Array Area. Three lower density route centrelines (Routes 6, 7 and 11) with less than ten transits per month on each route intersect the Array Area and will also require to be deviated. Route number 11 passes close to the centre of the Array Area, however based on the start and end point, it is most realistic that the vessels following this route will deviate and pass south of Bowdun OWF. Routes 8 and 15 will necessitate a slight deviation to ensure a safe passing distance from Bowdun OWF.

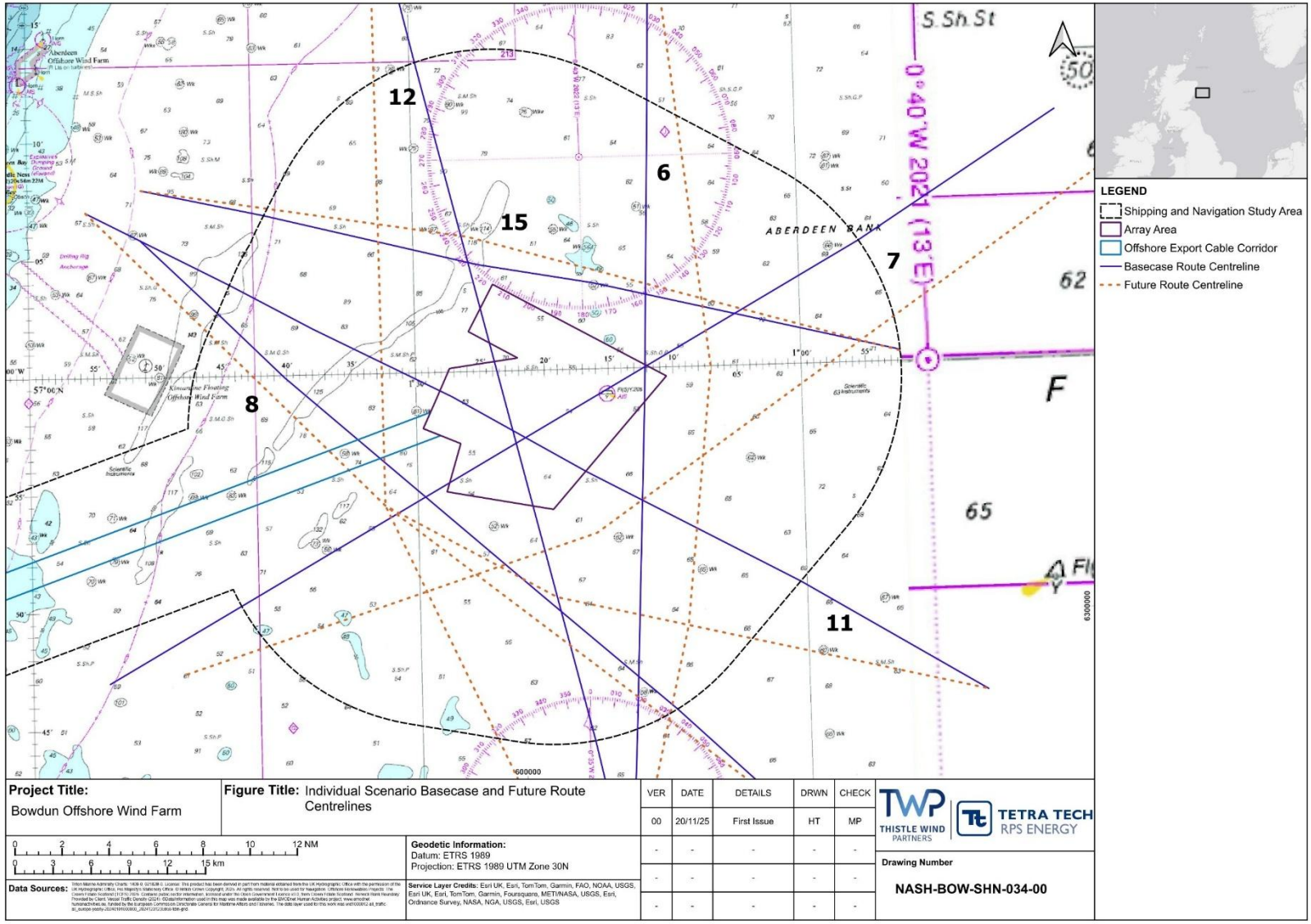

Figure 8.1: Base Case and Future Route Deviations

8.2.3 It is recognised that during adverse weather, vessels may take less direct routes to minimise the impact of the conditions on the vessel. Figure 6.22 shows the vessel tracks recorded during four named storms in 2024 and 2025. With the exception of a reduction in vessel traffic numbers (particularly small craft), no appreciable differences in vessel routeing are identified.

8.3 Impact on Risk of Collision

8.3.1 An OWF can increase the risk of collision in two ways. Firstly, the construction of an OWF in an otherwise navigable area can constrain shipping routes and result in pinch points or areas of high vessel traffic density. This would increase the number of encounters between vessels and the number of potential collision situations, which might increase the risk of collision.

8.3.2 Secondly, the risk of collision can be heightened through additional vessel movements, particularly during construction and decommissioning, or during O&M where there will be more vessel movements between the Proposed Development and the O&M base. Furthermore, these vessels will be required to comply with the principles of good seamanship and COLREGs.

Modelled Collision Risk

8.3.3 The IWRAP risk analysis tool was utilised to quantitatively assess the likelihood of a collision between vessels navigating within the buffered (10 nm (18.5 km)) Array Area. The model analysed a baseline traffic scenario (no Proposed Development *in situ*), a future traffic profile (uplifted traffic frequency with no Proposed Development *in situ*), and a future case traffic scenario (Proposed Development *in situ* and uplifted traffic frequency).

8.3.4 The results of the collision modelling for the base case scenario are provided in Figure 8.2, Table 8.4 and Table 8.5.

8.3.5 The modelling indicates a baseline collision frequency of one in 892 years. The highest contribution to total collision risk is crossing collisions, with a frequency of one in 1,092 years. This is largely due to two routes intersecting one route with high transit counts. This can be seen in Figure 8.2, the north-north-west to/from south-south-east Route 9 and Route 12 intersect the east to/from west Route 14 to/from Aberdeen. Route 14 is the busiest route with approximately 147 transits per month, of which 95% are from tug and service vessels.

8.3.6 Tug and service vessels were calculated as the most likely vessel type to be involved in a collision, with a frequency of one in 6,209 years in the baseline scenario. This is primarily due to vessels of this type operating most frequently and densely on routes with the highest collision return periods.

8.3.7 In the scenario using the future traffic profile and no Proposed Development *in situ*, the traffic frequency is altered to reflect the future case traffic profile. The most likely collision scenario by vessel activity remains crossing collisions, with a higher frequency of one in 839 years. The most likely vessel type to be involved in a collision remains tug and service vessels, with a higher frequency of one in 1,097 years. These results demonstrate the risks of anticipated future traffic

volume on the baseline routes without the physical features of the Proposed Development, and are included in Table 8.4 and Table 8.5.

8.3.8 A minimum distance of 1.2 nm (2.2 km) from the Array Area was applied to deviated traffic legs. The traffic legs associated with Routes 6, 8, 12 (western side) and 15 were shifted marginally away from the Array Area while their overall orientations were maintained.

8.3.9 It is possible that north to/from south transiting vessels would pass either east or west of the Array Area depending on factors including weather and other traffic. Therefore, the north-north-west to/from south-south-east traffic leg that bisects the Array Area (associated with central and westernmost traffic on Route 12) was split. Half of the traffic was merged with the leg associated with the western side of Route 12, passing to the west of the Array Area. The other half of the traffic was merged with the traffic leg associated with Route 6 to the east of the Array Area.

8.3.10 Two other traffic legs were adjusted to avoid intersecting the Array Area. The traffic leg associated with the south-west to/from north-east Route 7 to/from Montrose was deviated to pass south of the Array Area, remaining north of the west-south-west to/from east-north-east Route 1 to/from Montrose. The traffic leg associated with the north-west to/from south-east Route 11 to/from Aberdeen was combined with Route 8 to pass south-west of the Array Area.

8.3.11 The modelling has future case collision return period increasing to one in 412 years. The highest contribution to total collision remains crossing collisions, with a frequency of one in 662 years. After deviations, the Routes 9 and 12 still cross Route 14 and contribute to crossing collision risk. Route 9 and the adjusted Route 6 also cross each other at an intersection with Route 15. In both baseline and future case scenarios Route 12 intersects Route 15, however the reconfigured traffic distribution onto a single traffic leg results in higher traffic frequency at one intersection point (west of the Array Area) and increases the risk probability (Figure 3.1).

8.3.12 The results of the collision modelling for the future case scenario are provided in Figure 8.2, Table 8.2, Table 8.3, Table 8.4 and Table 8.5.

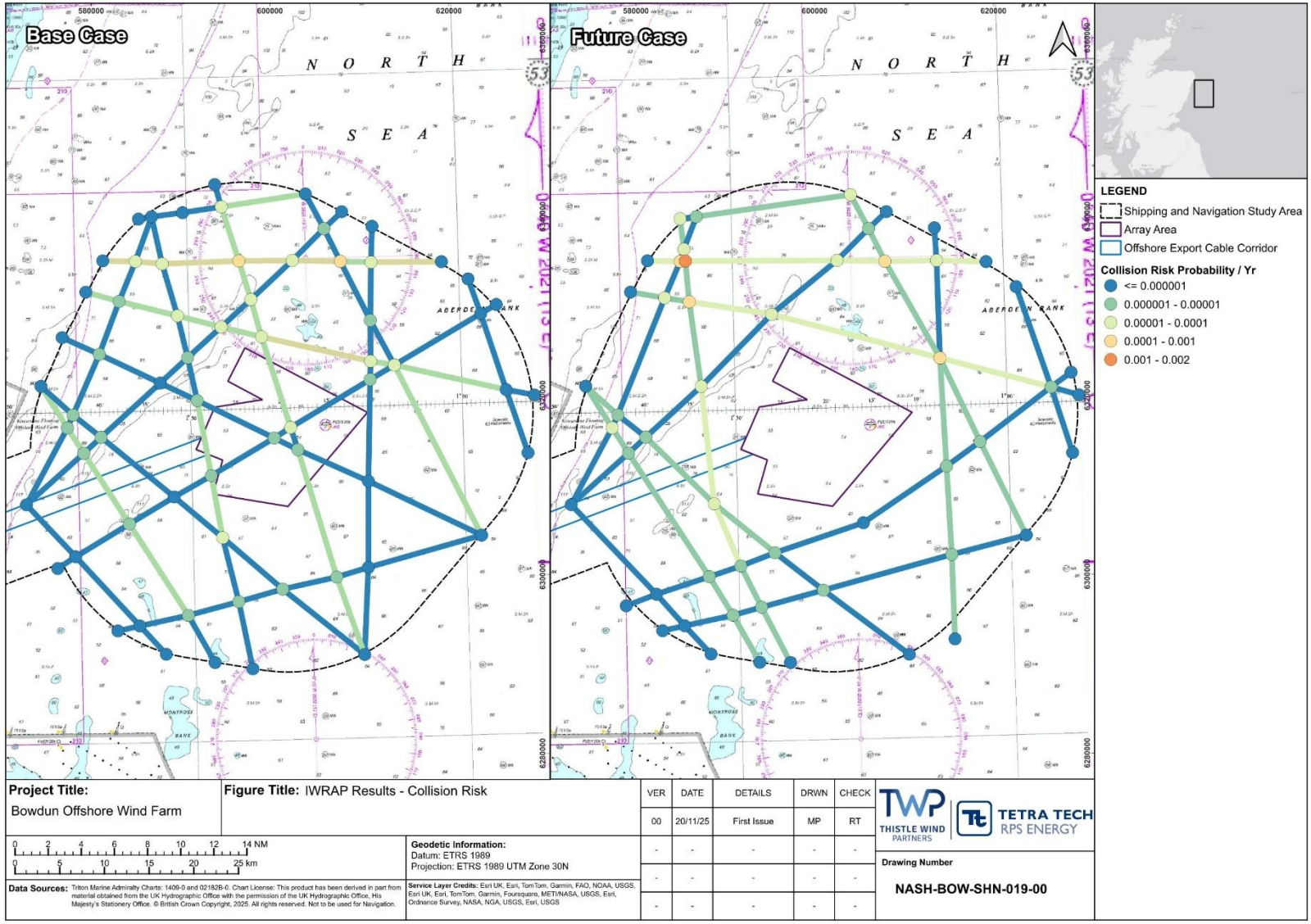

Figure 8.2: IWRAP Results - Base Case and Future Case Collision Risk

Table 8.2: Base Case Collision Probability by Vessel Type

		Struck					
		Tanker	**Cargo**	**Passenger**	**Tug and Service**	**Fishing**	**Recreation**
Striking	**Tanker**	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years
	Cargo	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years
	Passenger	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years
	Tug and Service	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	1 in 6,630 years	< 1 in 10,000 years	< 1 in 10,000 years
	Fishing	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years
	Recreational	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years

Table 8.3: Future Case Collision Probability by Vessel Type

		Struck					
		Tanker	**Cargo**	**Passenger**	**Tug and Service**	**Fishing**	**Recreation**
Striking	**Tanker**	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years
	Cargo	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	1 in 2,638 years	< 1 in 10,000 years	< 1 in 10,000 years
	Passenger	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years
	Tug and Service	< 1 in 10,000 years	1 in 2,396 years	< 1 in 10,000 years	1 in 851 years	< 1 in 10,000 years	< 1 in 10,000 years
	Fishing	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years
	Recreational	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years	< 1 in 10,000 years

Table 8.4: Base Case, Uplifted Traffic, and Future Case (Uplifted Traffic with Proposed Development) Collision Modelling Results by Activity

Hazard	Activity	Base Case Frequency	Uplifted Traffic Frequency	Future Case Frequency	Change (Base Case to Future Case)
Collision	**Overtaking**	< 1 in 10,000 years (1 in 55,660 years)	< 1 in 10,000 years (1 in 42,830 years)	< 1 in 10,000 years (1 in 22,720 years)	+59.2%

Hazard	Activity	Base Case Frequency	Uplifted Traffic Frequency	Future Case Frequency	Change (Base Case to Future Case)
	Head On	< 1 in 1,000 years (1 in 5,383 years)	< 1 in 1,000 years (1 in 3,804 years)	< 1 in 1,000 years (1 in 2,769 years)	+48.6%
	Crossing	< 1 in 1,000 years (1 in 1,092 years)	< 1 in 500 years (1 in 839 years)	< 1 in 500 years (1 in 662 years)	+49.4%
	Merging	< 1 in 100,000 years (1 in 692,100 years)	< 1 in 100,000 years (1 in 588,700 years)	< 1 in 1,000 years (1 in 2,827 years)	+99.6%
	Bend	< 1 in 100,000 years (1 in 4,461,000,000 years)	< 1 in 100,000 years (1 in 4,461,000,000 years)	< 1 in 1,000 years (1 in 6,333 years)	+100.0%
	Total	< 1 in 500 years (1 in 892 years)	< 1 in 500 years (1 in 676 years)	< 1 in 400 years (1 in 412 years)	+53.9%

Table 8.5: Base Case, Uplifted Traffic, and Future Case (Uplifted Traffic with Proposed Development) Collision Modelling Results by Type

Hazard	Vessel type	Base Case Frequency	Uplifted Traffic Frequency	Future Case Frequency	Change (Base Case to Future Case)
Collision	**Tanker**	< 1 in 10,000 years (1 in 86,175 years)	< 1 in 10,000 years (1 in 11,439 years)	< 1 in 1,000 years (1 in 7,959 years)	+90.8%
	Cargo	< 1 in 10,000 years (1 in 61,441 years)	< 1 in 1,000 years (1 in 2,274 years)	< 1 in 1,000 years (1 in 1,778 years)	+97.1%
	Passenger	< 1 in 100,000 years (1 in 3,150,148 years)	< 1 in 100,000 years (1 in 137,489 years)	< 1 in 10,000 years (1 in 97,797 years)	+96.9%
	Tug and Service	< 1 in 10,000 years (1 in 23,812 years)	< 1 in 1,000 years (1 in 1,097 years)	< 1 in 500 years (1 in 593 years)	+97.5%
	Fishing	< 1 in 100,000 years (1 in 139,920 years)	< 1 in 10,000 years (1 in 30,175 years)	< 1 in 10,000 years (1 in 23,836 years)	+83.0%
	Recreational	< 1 in 100,000 years (1 in 12,828,434 years)	< 1 in 100,000 years (1 in 2,352,552 years)	< 1 in 100,000 years (1 in 387,709 years)	+97.0%

8.4 Impact on Risk of Contact/Allision

8.4.1 Wind Turbine lighting and marking, as listed in the Embedded Mitigation, mitigate against the allision risk between a vessel and Wind Turbine by ensuring Wind Turbines remain visible to passing traffic at all times. Commercial vessels typically plan a minimum distance of 1 nm (1.85 km) from an obstruction, whilst smaller vessels such as fishing and recreational vessels may transit through the Array Area but are expected maintain a minimum distance of 50 m from a Wind Turbine.

8.4.2 The IWRAP risk analysis tool was utilised to quantitatively assess the likelihood of a contact between vessels navigating within 10 nm (18.5 km) of the Array Area in a baseline traffic scenario (no Proposed Development *in situ*) and a future case traffic scenario (the Proposed Development *in situ* and future case traffic profile). No contact modelling was carried out for the baseline vessel traffic (i.e. with the Proposed Development not in place) as there are no permanent allision features within 10 nm (18.5 km) of the Array Area. For the future case, the MDS provisional array layout was modelled with a conservative 100 m radius buffer to represent the potential size of Wind Turbine or OSP substructure for use in the contact modelling, which was a conservative size appropriate for the largest structure: OSP jacket foundations.

8.4.3 Introducing the surface structures for contact modelling produced a modelled allision frequency of one in 180 years. Figure 8.3 shows that the Wind Turbines with the highest contact risk probability were those along the north-eastern and western edges. This is due to the proximity of the relatively high-density future routes that run past the northern, eastern, and western edges of the Array Area. These western routes include traffic from the centre and west of north-north-west to/from south-south-east Route 12, and traffic on the north-east to/from south-west Route 10 which passes the Array Area to the north-east. Contributing to the risk on the north-eastern side of the Array Area is traffic associated with the west-north-west to/from east-south-east Route 15 which is mainly utilised by tug and service vessels heading between offshore fields and Aberdeen. Allision risk at the eastern corner of the Array Area is due to traffic associated with Route 6 (oriented north to/from south) and Route 9 (oriented north-north-west to/from south-south-east) which contain mostly cargo and tanker vessels. It is also possible that the transiting vessels on these future routes will have a more condensed distribution compared to the base case scenario due to the deviations around the Array Area.

8.4.4 The southern region of the Array Area has the least contact risk probability due to comparatively low traffic densities on routes to the south and south-east of the Array Area.

8.4.5 The results of modelling for the future case for allision events are provided in Figure 8.3, Table 8.6, and Table 8.7.

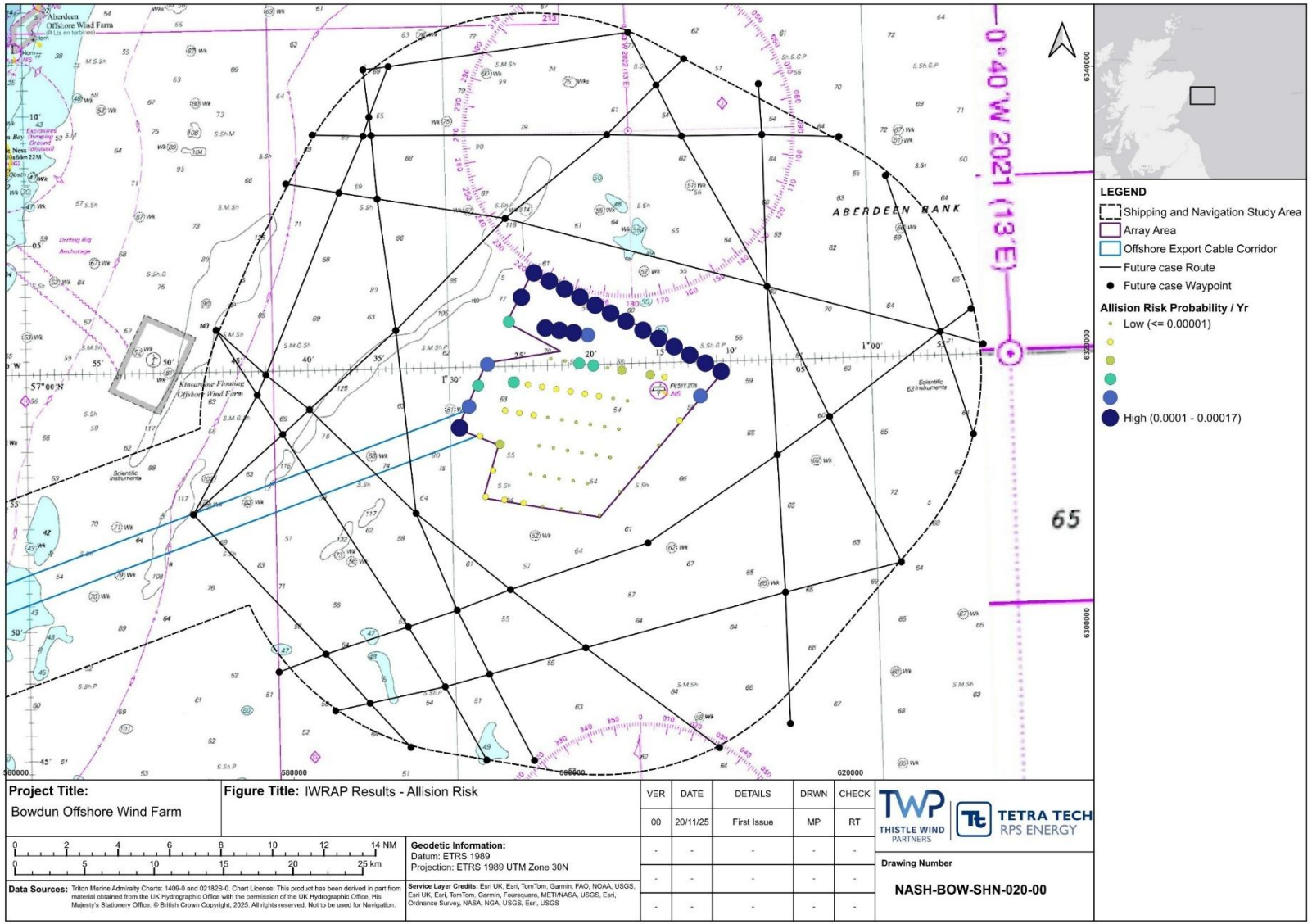

Figure 8.3: Future Case Allision Results

Table 8.6: Array Area Future Case Contact Results by Activity

Hazard	Activity	Frequency
Contact	Powered	< 1 in 10,000 years
	Drifting	1 in 180 years
	Total contact	1 in 180 years

Table 8.7: Array Area Future Case Contact Results by Vessel Type.

Hazard	Vessel type	Future Case Frequency
Contact	Tanker	1 in 1,384 years
	Cargo	1 in 4,874 years
	Passenger	< 1 in 10,000 years
	Support/Other	1 in 220 years
	Fishing	< 1 in 10,000 years
	Recreational	< 1 in 10,000 years

8.5 Impact on Risk of Grounding

8.5.1 There is the potential for displacement of vessels due to the Proposed Development which, when close to shallower areas, can lead to a potential increase in the risk of grounding. Given the distance of the Array Area offshore in combination with the fact that water depths in and around the Array Area are in excess of 50 m, any route deviations required because of the proposed Array Area will not be at an increased risk of grounding.

8.5.2 Grounding on the cables is also possible as a result of a reduction UKC. The MCA and RYA recommend that any protection should not reduce the depth of water (referenced to Chart Datum) by more than 5%. Given the distance offshore, the Array Area sits within water depths in excess of -50 m. The maximum height of IAC protection within the PDE is 2 m, and therefore, reduces the water depth by a maximum of 4%. The impact of IACs on UKC within such deep water is considered negligible and the percentage reduction also remains within MCA and RYA recommendations.

8.5.3 Analysis of vessel draughts within the Array Area is shown in Figure 8.4 and demonstrates that the majority (over 86%) of transits are made by vessels (where the draught is known) less than 8 m in draught.

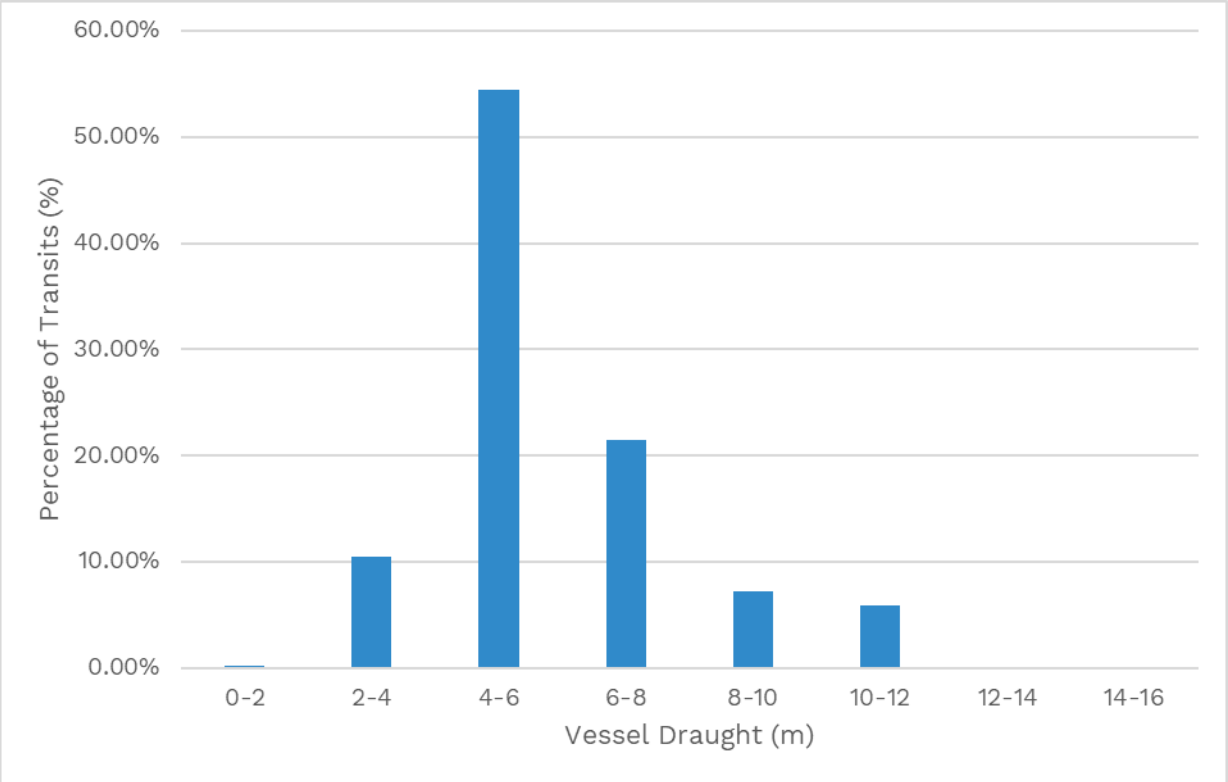

Figure 8.4: Percentage of Vessel Transits in the Array Area by Vessel Draught (m)

8.5.4 Vessel routeing changes close to shore as a result of the Offshore Export Cable or Project vessels closer to Landfall may lead to a potential increase in the risk of grounding due to the shallower depths.

8.5.5 The water depth would only be reduced by 5% for the Offshore Export Cables in any regions where the depth of waters is less than or equal to -40 m, which accounts for approximately the first 3 nm (5.6 km) from Landfall. Less than 80 vessel transits (i.e. less than seven transits per month) made by vessels with a draught of at least 6 m were recorded within 3 nm (5.6 km) of the Landfall, with the closest vessel being a tug and service vessel transiting 0.9 nm (1.6 km) away from the Landfall where the depth exceeds -20 m. Larger vessels with draught of at least 7 m that transit within 3 nm (5.6 km) of Landfall are typically oil and gas associated tug and service vessels that pass directly through the Export Cable Corridor area. This means that it is considered very unlikely that a vessel will ground as a result of interaction with the Proposed Development or its associated vessels. Furthermore, there is considerable sea room and water depths around the Export Cable Corridor further away from Landfall, and therefore the risk of grounding is not expected to be significantly increased due to the Proposed Development.

8.6 Impact on SAR Capability

8.6.1 Aviation and Radar is discussed in Volume 2, Chapter 15: Aviation and Radar and Volume 3, Technical Appendix Report 15.1: Aviation and Radar Technical Report.

8.6.2 A potential impact associated with the construction, O&M, and decommissioning phases of the Proposed Development is a reduction in emergency response capability due to increased incident rates and reduced access for SAR responders.

8.6.3 In the unlikely event of an incident, SAR assets are required to access the site or surrounding area without risk to themselves. In particular, Wind Turbines can pose a hazard to SAR helicopters and, therefore, the design of the Array Area should be such to enable helicopter access safeguarding HMCG obligations within the UK SAR Region. An ERCoP is required to facilitate information sharing regarding the OWF and SAR organisations. The principles of SAR access for OWFs are contained in MGN 654 Annex 5 (MCA, 2021c), and can be summarised as:

- Lines of Orientation – developers should maintain two lines of orientation for the Array Area layout unless a safety case is produced, and additional mitigation is proposed, that one line of orientation is tolerable. This allows multiple directions for aircraft entry and improves access, whilst a linear regular grid is both more efficient and safer for conducting SAR;
- SAR Lanes – to be of sufficient width to enable safe transit of a SAR helicopter between the Wind Turbines. MGN 654 Annex 5 recommends Wind Turbine spacing (blade tips to blade tips) of greater than 500 m;
- Helicopter Refuge Areas – in larger developments (over 10 nm (18.5 km) width, not applicable to the Proposed Development), a refuge area clear of Wind Turbines may be required to enable aircrews to reorientate themselves and change direction safely; and
- Wind Turbine Preparation – to support winching of a casualty, the Wind Turbine needs to be configured to a specific position as requested by the SAR crew. This might include rotating the nacelle to 90 degrees from the wind, and both locking and positioning the blades to facilitate SAR access (e.g. Y configuration – see MGN 654 Annex 5).

8.6.4 Several trials have been conducted by HMCG and MCA in SAR at OWFs (MCA, 2005; 2019). They found that searching within an OWF is more complex than in open sea and there may be a delay for entry into an OWF whilst the crew familiarise themselves with the site and layouts. During poor visibility, the importance of linear SAR lanes of sufficient width was identified as of significant importance. When transiting through an OWF, all communications and navigation equipment was reported to be operating successfully with Wind Turbines identifiable through radar. Unfamiliarity with transiting and winching in vicinity of Wind Turbines results in slower speeds and delays, which increases fuel consumption and may make searches less effective. Concerns have also been raised regarding visual identification of casualties, as Wind Turbines block the view, particularly during rough weather.

8.6.5 The current minimum spacing between the Wind Turbines will be 1,038 m with 236 m blade diameter (15 MW Wind Turbine option) leaving 566 m clear between blade tips. Therefore, a minimum 500 m clearance distance for helicopter access will be maintained, aligning with SAR principles outlined in MGN 654 Annex 5. Furthermore, as with other similar projects, the first responders to incidents within the OWF are most likely to be Project vessels, to some extent mitigating any loss in aerial SAR effectiveness.

8.6.6 Specific layouts are subject to detailed studies and will not be finalised until post-consent. Therefore, the Section 36 Consent and Marine Licence would typically stipulate that the MCA and NLB must agree to the design layout, in order to ensure that access of SAR assets is not compromised and confirm that principles contained in MGN 654 Annex 5 are followed.

8.7 Impact on Radar, Communications and Positioning Systems

8.7.1 MGN 654 notes that an OWF may have adverse impacts on the equipment used for navigation, collision avoidance or communications. A significant body of work has been conducted to examine these impacts in detail, and reference is made to the following studies:

- MCA and QinetiQ (2004). Results of the electromagnetic investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle Wind Farm by QinetiQ and the MCA;
- BWEA (2007). Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats OWF; and
- Ocean Studies Board's Division on Earth and Life Studies (2022). Wind Turbine Generator Impacts to Marine Vessel Radar.

8.7.2 Table 8.8 provides a summary of these potential impacts, for which there are not anticipated to be any appreciable effects.

Table 8.8: Summary of Impacts on Equipment

Hazard	Vessel Type
Very High Frequency (VHF)	VHF is essential for the communication between vessels and shore. VHF radio waves could be blocked or interfered with by the presence of Wind Turbines. The MCA and QinetiQ (2004) study found no noticeable effect on VHF communications both ship-shore and ship-ship within or adjacent to the wind farm. A trial aboard SAR helicopters (MCA, 2005) also determined no significant impact on VHF direction finding capabilities. Therefore, no appreciable impact on VHF communications is anticipated.
AIS	AIS enhances the identification between vessels for collision avoidance. AIS signal could be blocked or interfered with by the presence of Wind Turbines. The MCA and QinetiQ (2004) study found no noticeable effect on AIS reception. Therefore, no appreciable impact on AIS communications is anticipated.
Global Navigation Satellite System (GNSS)	GNSS (such as Global Positioning System (GPS)) is used for satellite positioning systems and navigation. Satellite reception could be impacted by the presence of Wind Turbines. The MCA and QinetiQ (2004) study found no noticeable effect on GPS reception, even in very close proximity to the Wind Turbines. Therefore, no appreciable impact on GPS is anticipated.

Hazard	Vessel Type
Marine Radar	Marine radar is used for both collision avoidance and vessel navigation. Wind Turbines, like other structures, can result in spurious returns such as side lobes, echoes, reflections and blanketing. These effects were studied extensively in both the MCA and QinetiQ (2004) and BWEA (2007) studies. Both studies determined that the reduced capability to track small vessels within OWFs and the risk of losing acquired targets should be considered by mariners navigating adjacent to OWFs. Some of these effects can also be mitigated by careful adjustment of radar controls, such as Gain. Based on this, the MCA developed a shipping route template (MGN 654) that placed the extent of these effects at 1.5 nm (2.8 km), increasing as the vessels transit closer to the Wind Turbines. Intolerable impacts may be experienced up to 0.5 nm (0.9 km) from the OWF. Historical evidence suggests that most vessels pass more than 0.5 nm (0.9 km) from an OWF and therefore these effects are lessened. Furthermore, it is likely that the majority of vessels this far offshore would have AIS fitted to mitigate some of these impacts. Therefore, no appreciable impact on navigation safety due to impacts on marine radar is anticipated.
Shore Radar	Similar to marine radars, shore radars could be impacted by the Wind Turbines. The Array Area is located 38 km offshore, well clear of any ports and harbours, and any Vessel Traffic Services (VTS) coverage. Therefore, no appreciable impact on shore radar for managing navigational safety is anticipated.
Noise	The sound generated by the Wind Turbines could mask navigational sound signals from vessels or AtoN. Whilst Wind Turbines make an audible sound whilst rotating, the low density of shipping and distance to other navigational marks makes this potential impact negligible. Furthermore, maritime regulations for audibility of a ship's whistle are well in excess of the typical Wind Turbine sound emissions even at very close range. Therefore, no appreciable impact on navigation safety from increased noise is anticipated.
Compass	Compasses are used for vessel navigation. These are potentially impacted by electromagnetic interference from the Wind Turbines or cables. The degree of this impact is related to the depth of water, cable design and alignment with the earth's magnetic field. Whilst this has impact has not been directly observed in studies, it is possible that small vessel compasses could be impacted near to cable Landfall. However, it is considered likely that small craft would navigate visually near to cable Landfall and therefore the impact on navigation safety is reduced. Therefore, no appreciable impact on navigation safety from electromagnetic interference is anticipated.

8.8 Impact on Under Keel Clearance due to Subsurface Offshore Infrastructure

8.8.1 The Proposed Development has a target cable burial depth of 1.5 m which mitigates the risk of snagging post-construction, and the CBRA will ensure that these risks are adequately addressed for the types of gear used within the Export Cable Corridor. In some areas, cable burial may not be practicable, and therefore the cables must be protected by other means such as standard rock berm or concrete mattresses. Where this is the case, the depth of water may be reduced, alongside the UKC of vessels.

8.8.2 As presented in Section 8.5, water depth will be reduced by a maximum of 4% for the IACs with the associated protection, therefore, the impact of IACs on UKC is negligible and acceptable according to the MCA and RYA recommendations.

8.8.3 Similarly in Section 8.5, it was noted that the water depth would only be reduced by 5% in any regions where the depth of waters is less than or equal to 40 m for the Offshore Export Cables, where deep draught vessels do not frequently transit. As a result, the impact on UKC is not expected to have a significant effect.

8.9 Impact on Port/Harbours and Nearshore Operations

8.9.1 Access to local ports may be affected by the presence of the Proposed Development and the operations associated with it. This can occur due to construction taking place in the vicinity of the port or due to Proposed Development vessel operations from a port affecting the vessel traffic management in the area. The construction and O&M ports have not been determined so it is not possible to assess the effects on them. Therefore, this section considers the effects of construction vessels operating in the vicinity of ports in the Shipping and Navigation Study Area.

8.9.2 The nearest ports are Montrose (5 nm (9.2 km) south-west), Aberdeen (located 12 nm (22.2 km) east) and Peterhead (located 19 nm (35.2 km) north-west). Distances relative to nearest point of the Shipping and Navigation Study Area.

8.9.3 The port of Aberdeen is the largest operating port in the local area and is a hub for oil and gas service vessels and oil and gas decommissioning, as well as an operating international commercial port and cruise destination. The primary route to/from the port typically operate clear of the Array Area and this access to and from the port is therefore considered to be affected by the presence of the Proposed Development. It was identified through consultation and on navigational charts that oil and gas operations also allow for rig towage and mooring near Aberdeen; however, no rigs were observed in the AIS dataset within the Shipping and Navigation Study Area and therefore the Proposed Development is considered not to impact the ports operations at the anchorage and access to/from the port.

8.9.4 All ports are located over 20 nm (37.0 km) from the Array Area and it is considered that there is sufficient room for manoeuvring in and out of all three ports (Aberdeen, Montrose and Peterhead) would not be impacted by the Proposed Development.

8.9.5 Overall, because the Export Cable Corridor is located approximately 8 nm (14.8 km) from the port of Montrose, and the construction will be a limited footprint for a relatively short period of time, there will be a limited impact on access to the ports.

8.10 Impact on Small Vessel Activity (Fishing and Recreation)

Fishing Vessel Activity

8.10.1 Fishing vessel activity throughout the Shipping and Navigation Study Area is presented in Section 6.3 and further information is provided in Volume 2, Chapter 13: Commercial Fisheries. During the different phases of the Proposed Development, commercial fisheries may have reduced access to fishing grounds, be temporarily excluded from fishing in discrete areas, or be at risk of gear snagging on cables or allision with Wind Turbines. This could be in response to installation/removal activities and the physical presence of (de)constructed Offshore Infrastructure during construction and decommissioning, or the presence of surface and subsurface Offshore Infrastructure throughout the O&M phase.

8.10.2 During the construction phase, the presence of partially protected cables during installation and the lack of awareness of the cable's presence may increase anchor and fishing gear snagging risk. During construction, Safety Zones are considered an Embedded Mitigation measure which would be established at an appropriate configuration and extent to mitigate for potential snagging hazards. The vessel traffic data used in this assessment indicated that the provision of a Safety Zone is not considered to have a major impact on the navigational safety of fishermen as there is sufficient sea room around the Safety Zone to enable access to the established fishing grounds outside of the Array Area.

8.10.3 It is possible that fishermen may continue to transit through the Array Area once construction is complete. Throughout the O&M phase of the Proposed Development, fishermen and vessel masters should be familiar with the location of cables and Wind Turbines as they will be marked and charted, in agreement with the MCA and NLB, thereby reducing the likelihood of a snagging or allision incident. The minimum spacing between Wind Turbines (1,038 m) is also considered sufficient for fishing vessels to safely transit between Wind Turbines. Any maintenance works required would be communicated with the fishing community in accordance with the Embedded Mitigation measures outlined in Section 9.3. Cables would then either be removed or decommissioned *in situ* with their presence charted. When considering the impact where cables are decommissioned *in situ*, impacts would be expected to be the same as during construction.

8.10.4 Cable burial and adequate protection would also mitigate the risk of snagging once construction is complete. A CBRA and Cable Burial Assessment (CBA) are Embedded Mitigations for the Proposed Development to ensure these risks are adequately addressed for the types of gear used within the Shipping and Navigation Study Area, as per Section 9.3. As such, with Embedded Mitigation measures in place, snagging is expected to be extremely unlikely and, were a fishing vessel to snag a cable, the most credible outcome is loss of gear and minor damage to the cable. A more severe credible outcome is the loss of the fishing vessel and potential fatalities however, this is considered unlikely.

Recreational Activity

8.10.5 Recreational activity throughout the Shipping and Navigation Study Area is presented in Section 6.3. During the Proposed Development's construction, O&M, and decommissioning phases, recreational vessel routes may be displaced, resulting in increased transit distance or a navigation safety incident. This could be in response to Proposed Development vessel traffic, installation/removal activities, and/or the physical presence of fully or partially constructed surface and subsurface Offshore Infrastructure.

8.10.6 The presence of the partially constructed/deconstructed Offshore Infrastructure (during construction and decommissioning phases) or fully built out Offshore Infrastructure (during O&M) may increase the likelihood of an allision with a Wind Turbine. However, given the low density of recreational vessels as far offshore as the Array Area, and Embedded Mitigation measures including site marking/charting, and temporary construction and decommissioning buoyage, this is unlikely.

8.10.7 If recreational vessels did choose to transit through the Array Area on passage to other ports, the minimum spacing between Wind Turbines (1,038 m) is considered sufficient for safe navigation. Moreover, Wind Turbines will be marked and charted in agreement with the MCA and NLB, which would reduce the risk of an allision. Nevertheless, in adverse weather for instance, it may be more preferable to deviate around the Array Area given that there is sufficient sea room and that this is unlikely to significantly increase the journey time or distance. Overall, little impact is expected as a result of the Array Area.

8.10.8 Impacts to recreational vessels are considered more likely where there is a higher density of recreational activity. Generally, recreational vessels stay closer to shore. As a result, it is noted that recreational vessels are more likely to be displaced from their current routes between Stonehaven and Montrose due to the presence of the Offshore Export Cable installation. Nevertheless, there is sufficient sea room to enable vessel deviation, and Embedded Mitigation measures including the promulgation of information will ensure that recreational vessels are aware of any planned cable construction or maintenance activity.

8.10.9 Another potential impact to recreational vessels is the possibility for Proposed Development vessels to cut across the main recreational vessel route on transit to the Array Area, increasing the risk of a collision between a recreational vessel and a Proposed Development vessel. However, risk controls would be established (as set out in the Embedded Mitigation listed in Section 9.3) to deconflict CTV movements with other passing traffic. Coordinated passage plans for CTVs would be developed to reduce the potential impact on other vessel traffic. Given these embedded risk controls that will enable recreational vessels to plan around any planned maintenance activity, and the sea room available for collision avoidance, the impact to recreational vessels is considered to be low.

9 Navigation Risk Assessment

9.1 HAZID

9.1.1 This assessment considers all identified hazards of the Proposed Development on shipping and navigation receptors. In developing the hazard log, consideration was given to Proposed Development phases, areas, hazard types and vessel types.

9.1.2 Three phases were considered, construction (C), O&M (O), and decommissioning (D). To be concise, and reflect similar impacts during construction and decommissioning, these two categories were combined in all cases.

9.1.3 Two areas were identified:

- Area 1: Array Area plus 10 nm (18.5 km) buffer; and
- Area 2: Export Cable Corridor plus 3 nm (5.56 km) buffer.

9.1.4 Five hazard types were identified:

- collision between two navigating vessels;
- allision/contact between a navigating vessel and a fixed object (e.g. Wind Turbine/OSP/oil and gas platform, etc);
- snagging of fishing gear or anchors on subsurface Offshore Infrastructure (e.g. Offshore Export Cables);
- grounding of vessel on seabed/shoreline or underwater assets; and
- partial or full breakout of buoyage from mooring or towage breakaway.

9.1.5 Seven vessel types were identified, which are described in Table 9.1. Given the exponential combinations of vessel types in collisions, the hazard log has grouped these hazard types into large or small vessels, to reflect the broadly similar consequences that could be expected following an incident, whilst maintaining a manageable number of hazards.

Table 9.1: Vessel Type Definitions

Vessel	Vessel Types/Receptors	Includes	Collision Refined Vessel Types
1	Ferry/Passenger Vessel	Passenger Ferry Freight/Ro-Ro Ferry Cruise Ship	Passenger Vessel
2	Large Commercial	Cargo (Container, Bulk, Reefer, General etc.) Tanker (Oil, Chemical, Gas etc.) Large Offshore Supply Ship	Large Commercial
3	Tug/Service Vessels	Tugs Standby Rescue Vessels Pilot Boats Wind Farm CTVs Other Service Vessels	Tug and Service

Vessel	Vessel Types/Receptors	Includes	Collision Refined Vessel Types
4	Fishing	Trawlers Fishing Boats	Small Craft
5	Recreational	Sailing Yachts Pleasure Boats	Small Craft
6	Large Project Vessels	Pipeline Lay Vessel, Large Installation and maintenance vessels, Survey Vessels	Project Vessel
7	Small Project Vessels	Guard Vessels, CTVs, Small maintenance vessels	Project Vessel

9.1.6 In total, 39 hazards were identified which are summarised in Table 9.2.

Table 9.2: HAZID

Hazard ID	Phase (C/O/D)	Area	Hazard Type	Hazard Title
1	C/O/D	1	Collision	Collision: Large commercial ICW Large Commercial
2	C/O/D	1	Collision	Collision: Large commercial ICW Tug and Service
3	C/O/D	1	Collision	Collision: Large commercial ICW Small Craft
4	C/O/D	1	Collision	Collision: Large commercial ICW Project Vessel
5	C/O/D	1	Collision	Collision: Large commercial ICW Passenger Vessel
6	C/O/D	1	Collision	Collision: Tug and Service ICW Tug and Service
7	C/O/D	1	Collision	Collision: Tug and Service ICW Small Craft
8	C/O/D	1	Collision	Collision: Tug and Service ICW Project Vessel
9	C/O/D	1	Collision	Collision: Tug and Service ICW Passenger Vessel
10	C/O/D	1	Collision	Collision: Small Craft ICW Small Craft
11	C/O/D	1	Collision	Collision: Small Craft ICW Project Vessel
12	C/O/D	1	Collision	Collision: Small Craft ICW Passenger Vessel
13	C/O/D	1	Collision	Collision: Passenger Vessel ICW Passenger Vessel
14	C/O/D	1	Collision	Collision: Passenger Vessel ICW Project Vessel
15	C/O/D	1	Collision	Collision: Project Vessel ICW Project Vessel
16	C/O/D	1	Allision	Allision: Large commercial
17	C/O/D	1	Allision	Allision: Passenger Vessel
18	C/O/D	1	Allision	Allision: Tug and Service
19	C/O/D	1	Allision	Allision: Fishing and Recreational

Hazard ID	Phase (C/O/D)	Area	Hazard Type	Hazard Title
20	C/D	1	Allision	Allision: Large Project Vessel
21	O	1	Allision	Allision: Small Project Vessel
22	C/O/D	1	Snagging	Snagging: Large Commercial or Passenger vessel
23	C/O/D	1	Snagging	Snagging: Fishing Vessel
24	C/O/D	1	Snagging	Snagging: Recreational Vessel
25	C/D	2	Collision	Collision: Large Project Vessel ICW Third-Party Vessel
26	O	2	Collision	Collision: Small Project Vessels ICW Third-Party Vessel
27	C/O/D	2	Collision	Collision: Large Commercial or Passenger Vessel ICW Large Commercial or Passenger Vessel
28	C/O/D	2	Collision	Collision: Large Commercial or Passenger Vessel ICW Tug and Service or Small Craft
29	C/O/D	2	Collision	Collision: Tug and Service or Fishing and Recreational ICW Tug and Service or Small Craft
30	C/O/D	2	Grounding	Grounding: Fishing Vessel
31	C/O/D	2	Grounding	Grounding: Recreational Vessel
32	C/O/D	2	Grounding	Grounding: Large Commercial or Passenger
33	C/O/D	2	Grounding	Grounding: Tug and Service
34	C/O/D	2	Snagging	Snagging: Large Commercial or Passenger
35	C/O/D	2	Snagging	Snagging: Fishing Vessel
36	C/O/D	2	Snagging	Snagging: Recreational Vessel
37	C/O/D	2	Snagging	Snagging: Tug and Service
38	C/D	1	Breakout	Breakout: Small Craft IWC Buoy (Breakout)
39	C/D	2	Breakout	Breakout: Small Craft IWC Buoy (Breakout)

9.2 Methodology

9.2.1 Having identified all relevant impacts and hazards as a result of the Proposed Development, a hazard log is constructed as described in MGN 654 Annex 1 (Annex A). Whilst there is no generally accepted standard for risk matrices, the following is proposed as suitable for the Proposed Development and is consistent with industry best practice. The matrix was also discussed with stakeholders during the HAZID workshop and revised to reflect their feedback. Each hazard is scored based on its predicted frequency of occurrence (Table 9.3) and consequence (Table 9.4). Each hazard is scored on frequency of occurrence and severity of consequence for two scenarios, the 'most credible' and 'worst credible'. Severity of consequence with each hazard under both scenarios is considered in terms of damage to:

- people;
- property;
- environment; and
- business.

9.2.2 The frequency and consequence scores for each scenario are then combined to produce an overall risk score, which is used to assign hazard risk rating in the risk matrix (Table 9.5). The tolerability of these risks with regards to significance and acceptability with or without further action are shown in Table 9.6. In general, hazards which score as medium risk are considered further to determine whether any additional mitigations can be applied which are proportionate to reduce the level of risk to ALARP. If so, these additional mitigations are recommended to ensure that the hazard is tolerable. If no proportionate additional mitigations can be identified, the hazard can be considered ALARP and therefore tolerable.

Table 9.3: Frequency of Occurrence Criteria

Rank	Definition	Description	Definition
1	Remote	Remote probability of occurrence at Proposed Development site and few examples in wider industry.	<1 occurrence per 1,000 years
2	Extremely Unlikely	Extremely unlikely to occur at Proposed Development site and has rarely occurred in wider industry.	1 per 100 to 1,000 years
3	Unlikely	Unlikely to occur at Proposed Development site during Proposed Development lifecycle and has occurred at other OWFs.	1 per 10 to 100 years
4	Reasonably Probable	May occur once or more during OWF lifecycle.	1 per 1 to 10 years
5	Frequent	Likely to occur multiple times during OWF lifecycle.	Yearly

Table 9.4: Severity of Consequence Categories and Criteria

Rank	Description	People	Property	Environment	Business
1	Negligible	Minor injuries	No Perceptible Impact or less than £10,000	No Perceptible Impact	Minimal impact on activities.
2	Minor	Multiple minor injuries	£10,000 to £100,000	Tier 1 Local assistance required	Local adverse publicity. Short term loss of revenue to port/OWF. Temporary interruption of commercial services.
3	Moderate	Multiple major injuries	£100,000 to £1 million	Tier 2 Limited external assistance required	Widespread adverse publicity. Temporary suspension of activities at port/OWF.

Rank	Description	People	Property	Environment	Business
					Short term interruption of commercial services.
4	Serious	Single fatality	£1 million to £10 million	Tier 2 Regional assistance required	National adverse publicity. Prolonged closure or restrictions to port/OWF. Long term interruption of commercial services.
5	Major	Multiple fatalities	>£10 million	Tier 3 National assistance required	International adverse publicity. Serious disruption to operations to port/OWF. Permanent interruption of commercial services.

Table 9.5: Risk Matrix

Risk Matrix							
Severity of consequence	Major	5	5	10	15	20	25
	Serious	4	4	8	12	16	20
	Moderate	3	3	6	9	12	15
	Minor	2	2	4	6	8	10
	Negligible	1	1	2	3	4	5
			1	2	3	4	5
			Remote	Extremely unlikely	Unlikely	Reasonably probable	Frequent
			Frequency of Occurrence				

Table 9.6: Tolerability and Risk Ratings

Hazard Scores	Acceptability	Description
Negligible Risk (0 to 4)	Broadly Acceptable	Generally regarded as not significant and adequately mitigated. Additional risk reduction should be implemented if reasonably practicable and proportionate
Low Risk (4.1 to 6)		
Medium Risk (6.1 to 12)	Tolerable if ALARP	Generally regarded as within a zone where the risk may be tolerable in consideration of the Proposed Development. Requirement to properly assess risks, regularly review and implement risk controls to maintain risks to within ALARP where practicable.
High Risk (12.1 to 20)	Unacceptable	Generally regarded as significant and unacceptable for Proposed Development to proceed without further review.
Extreme Risk (20.1 to 25)		

9.3 Embedded Mitigation

9.3.1 Table 9.7 describes industry standard risk controls that are considered embedded in the risk assessment process rather than additional requirements.

Table 9.7: Embedded Mitigation Measures

ID*	Description	Justification
1	Development of, and adherence to, a Cable Specification and Installation Plan (CSIP) post-consent.	Decreases the risk of grounding or snagging of anchors and fishing gear.
2	Use of anti-corrosion protective coatings and Scour Protection will be used where there is potential for scour to develop around the Offshore Infrastructure, and it is appropriate to do so.	Decreases the risk of grounding or snagging of gear. Decreases risk and impacts arising from unplanned maintenance or failure of offshore infrastructure, such as those arising from structural degradation, exposure of subsea components, and additional O&M vessel traffic.
4	Development of, and adherence to, a CBRA and the CBA. Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible, will be undertaken as informed by these assessments. Results of these assessments, and commitments to post-construction monitoring, will be provided in the Cable Plan (CaP).	Decreases the risk of grounding or snagging of gear.
5	Development of, and adherence to, an Environmental Management Plan (EMP), including a Marine Pollution Contingency Plan (MPCP) and a Biosecurity Plan with commitments to monitoring and actions to minimise Invasive Non-Native Species (INNS).	Decreases the risk of pollution as a result of an allision with Offshore Infrastructure and/or a collision involving a Project vessel.
7	Development of, and adherence to, a Construction Method Statement (CMS) along with a Code of Construction Practice (CoCP).	Decreases the risk of collision, grounding and allision during the construction phase.
8	All relevant Health and Safety Executive (HSE) procedures will be followed.	Decreases the risk of collision.
9	Development of, and adherence to, a combined Navigational Safety and Vessel Management Plan (NSVMP), describing Project vessels' requirements, passages, monitoring and controls.	Decreases the risk of collision.
11	Appointment of a Company Fisheries Liaison Officer (CFLO). The CFLO will support ongoing liaison and ensure clear communication between the Applicant and commercial fishers.	Reduction in all direct impacts of the Proposed Development related to commercial fishers.
12	Advance warning and accurate location details of planned operations, associated Safety Zones and advisory passing distances will be given via NtMs and Kingfisher Bulletins.	All direct impacts of the Proposed Development mitigated.

ID*	Description	Justification
13	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.	Decreases the risk of allision/contact with Offshore Infrastructure.
16	Application for, and use of, Safety Zones of up to 500 m during construction, major maintenance, and decommissioning phases. Advisory safe passing distances of up to 500 m will also be applied for mobile installation vessels.	Decreases the risk of allision with Offshore Infrastructure or collision with construction vessels.
17	Any objects dropped on the seabed during works associated with the Proposed Development will be reported in line with MD-LOT procedures and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.	Decreases the risk of allision/contact and collision. Risk of fishing gear snagging.
18	All vessels working on the Proposed Development will meet the required certification standards and carriage requirements, along with following international marine regulations.	Decreases the risk of allision with Offshore Infrastructure or collision with vessels.
20	Suitable AtoN lighting and marking of the Proposed Development including construction buoyage and the use of a Cable Marker Board shall be implemented complying with International Association of Marine AtoN and Lighthouse Authorities (IALA) Recommendations G1162 (IALA, 2021), to be finalised and approved in consultation with the MCA and NLB through a LMP.	Decreases the risk of allision/contact with offshore infrastructure
21	Wind Turbine design to have a minimum lower blade tip height of 33.12 m above Lowest Astronomical Tide (LAT),	This exceeds the minimum 22 m above Mean High Water Springs (MHWS) as per MGN 654 (MCA, 2021) requirement, and decreases the risk of allision/contact with offshore infrastructure.
22	Development of, and adherence to, an ERCoP in consultation with the MCA.	Decreases the risk of impact to SAR capabilities;
23	Development of, and adherence to, an Operation and Maintenance Programme (OMP) in conjunction with approved post-consent construction plans.	Decreases the risk of collision.
24	Development of, and adherence to, a DSLP. The development of the DSLP includes consultation with the relevant authorities for approval, including the MCA and NLB.	Decreases the risk of allision/contact with Offshore Infrastructure and ensuring access for SAR.
34	Drafting and implementation of a decommissioning programme, prepared in accordance with requirements of the Energy Act 2004, which will set out the	All direct impacts of the Proposed Development decommissioning phase mitigated.

ID*	Description	Justification
	extent of infrastructure to be removed as well as the methods and processes which will be used.	
40	Creation of a Waste Management Plan (WMP), which will describe the processes for handling and managing any waste materials.	The WMP will set out procedures to ensure all waste processing and handling activities with the potential to affect the environment are appropriately managed.
41	The Proposed Development will be marked on admiralty charts including an appropriate chart note.	Reduction in all direct impacts of the Proposed Development.
42	Compliance of project vessels with international marine regulations as adopted by the Flag State, including International Regulations for Preventing Collisions at Sea (COLREGS) (IMO, 1972) and International Convention for the SOLAS (IMO, 1974).	Decreases the risk of allision with Offshore Infrastructure or collision with vessels.
43	Use of a trenchless technique (e.g. HDD or pipe jack tunnelling) as the Landfall installation option.	Decreases the risk of grounding or snagging of cables and cable protection near shore.
48	Where boulder removal is required during site preparation, the location of large boulders that are relocated and may pose a snagging risk for fishing gear, will be disclosed to the fishing industry within a timely manner and in an accessible format.	Decreases the risk of snagging.
49	Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances to mitigate any impact which poses risk to surface navigation during construction, O&M and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards.	Decreases the risk of collision and risk of allision/contact with Offshore Infrastructure.
50	MGN 654 Annex 4 (MCA, 2021a) requires that hydrographic surveys will fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager and the UKHO.	Decreases the risk of grounding or snagging of cables/gear.

*see Volume 3, Technical Appendix 4.6: Schedule of Mitigation and Commitments

9.4 Hazard Scoring

9.4.1 The identified hazards were assessed, and a hazard log was prepared. The hazard log was then refined at a series of individual stakeholder consultation meetings and one final HAZID Workshop for which all stakeholders (identified in Paragraph 3.2.1) were invited to attend:

- Joint NLB and the UKCoS, 07 August 2025;
- HAZID Workshop, 19 August 2025. Attended by: RYA Scotland, NLB, MCA, SFF, SWFPA, Ossian OWF, Morven North and South OWF
- Kincardine OWF, 27 August 2025.

9.4.2 The full revised hazard log is provided in Annex A.

9.5 Results

9.5.1 The 39 identified hazards presented in Table 9.2 have been split out into the two key areas (Array Area and the Export Cable Corridor area) in this section, and ranked by their overall risk score.

Area 1: Array Area

9.5.2 Table 9.8 lists the 25 hazards identified for the Array Area, ranked by their overall risk score. 19 of these hazards have been scored as 'Medium Risk – Tolerable if ALARP', and six hazards have been scored as 'Low Risk – Broadly Acceptable'.

Table 9.8: Array Area - Ranked Hazard List

Hazard ID	Hazard Rank	Hazard title	Phase (C/O/D)	Area	Overall Risk Score	Overall Risk Rating
2	**1**	Collision: Large commercial ICW Tug and Service	C/O/D	1	7.9	Tolerable (if ALARP)
3	**1**	Collision: Large commercial ICW Small Craft	C/O/D	1	7.9	Tolerable (if ALARP)
19	**3**	Allision: Fishing and Recreational	C/O/D	1	7.8	Tolerable (if ALARP)
21	**4**	Allision: Small Project Vessel	O	1	7.7	Tolerable (if ALARP)
1	**5**	Collision: Large commercial ICW Large Commercial	C/O/D	1	7.5	Tolerable (if ALARP)
18	**5**	Allision: Tug and Service	C/O/D	1	7.5	Tolerable (if ALARP)
10	**8**	Collision: Small Craft ICW Small Craft	C/O/D	1	6.4	Tolerable (if ALARP)
20	**9**	Allision: Large Project Vessel	C/D	1	6.4	Tolerable (if ALARP)

Hazard ID	Hazard Rank	Hazard title	Phase (C/O/D)	Area	Overall Risk Score	Overall Risk Rating
13	11	Collision: Passenger Vessel ICW Passenger Vessel	C/O/D	1	6.3	Tolerable (if ALARP)
4	12	Collision: Large commercial ICW Project Vessel	C/O/D	1	6.2	Tolerable (if ALARP)
5	12	Collision: Large commercial ICW Passenger Vessel	C/O/D	1	6.2	Tolerable (if ALARP)
9	12	Collision: Tug and Service ICW Passenger Vessel	C/O/D	1	6.2	Tolerable (if ALARP)
12	12	Collision: Small Craft ICW Passenger Vessel	C/O/D	1	6.2	Tolerable (if ALARP)
14	12	Collision: Passenger Vessel ICW Project Vessel	C/O/D	1	6.2	Tolerable (if ALARP)
6	17	Collision: Tug and Service ICW Tug and Service	C/O/D	1	6.1	Tolerable (if ALARP)
7	17	Collision: Tug and Service ICW Small Craft	C/O/D	1	6.1	Tolerable (if ALARP)
8	19	Collision: Tug and Service ICW Project Vessel	C/O/D	1	6.1	Tolerable (if ALARP)
11	19	Collision: Small Craft ICW Project Vessel	C/O/D	1	6.1	Tolerable (if ALARP)
15	19	Collision: Project Vessel ICW Project Vessel	C/O/D	1	6.1	Tolerable (if ALARP)
16	24	Allision: Large commercial	C/O/D	1	5.8	Broadly Acceptable
17	31	Allision: Passenger Vessel	C/O/D	1	4.1	Broadly Acceptable
24	31	Snagging: Recreational Vessel	C/O/D	1	4.1	Broadly Acceptable
23	34	Snagging: Fishing Vessel	C/O/D	1	3.9	Broadly Acceptable
22	37	Snagging: Large Commercial or Passenger vessel	C/O/D	1	2.9	Broadly Acceptable
38	39	Breakout: Small Craft IWC Buoy (Breakout)	C/D	1	2.1	Broadly Acceptable

9.5.3 Nearly two thirds of the hazards were scored as 'Medium Risk – Tolerable if ALARP', however, all 16 of these hazards had an overall risk score between 6.1 and 7.9, which is just on the cusp of 'Medium Risk', and are generally considered to have a very low likelihood or very low consequence. Therefore, only the six hazards with an overall risk score above 6.5 have been discussed below.

9.5.4 The highest scoring hazards, with a risk score of 7.9 each, are the risk of a large commercial vessel in collision with a tug or service vessel; or large commercial vessel in collision with a small craft. Although the consequence to people is considered slightly higher for a collision with a small craft (i.e. fishing or recreational), the consequence to business is considered to be higher for a collision with a tug and service vessel. Although these collisions involving larger commercial vessels carry a higher potential consequence, they are typically less frequent than for smaller vessels. The risk of collisions can be managed through promulgation of information through NtMs and the Kingfisher bulletin, which will allow vessels to passage plan in advance, and ensure sufficient sea room for collision avoidance.

9.5.5 The risk of allision involving fishing and recreational vessels with Offshore Infrastructure was scored at 7.8. Although the impact to people and property could be significant in a worst credible scenario (multiple fatalities and £10 to £100 million property damages), the likelihood of such an incident is considered low due to the Embedded Mitigation measures in place. These include appropriate site marking and charting, the use of AtoNs in accordance with IALA guidelines, and the development of a LMP in consultation with the MCA and NLB. The ERCoP will also ensure that any incident is responded to swiftly and effectively, reducing the potential for escalation.

9.5.6 The allision of a small project vessel with a Wind Turbine or OSP was identified with a risk score of 7.7. While the consequence to property and business could be high in a worst credible scenario (multiple fatalities and £10 to £100 million property damages), the likelihood is considered low due to the presence of Embedded Mitigation. These include the DSLP, which will be developed in consultation with the MCA and NLB to ensure navigational clarity and safe spacing between structures. The use of AtoNs, site charting, and the production of a NSVMP will further reduce the risk of allision by guiding vessel movements and maintaining safe distances.

9.5.7 The collision of two large commercial vessels within or near the Proposed Development was scored at 7.5. Although the consequence to people is lower than for smaller craft, the property and business impact could be higher. This hazard is considered tolerable (if ALARP) and can be managed through the promulgation of information, site marking and charting, and adherence to international maritime regulations. The availability of sea room around the Proposed Development will help mitigate both the likelihood and consequence of such an event. In addition, the development of a MPCP will reduce the severity of the consequence of a collision taking place.

9.5.8 Lastly, the allision of a tug and service vessel with Offshore Infrastructure was also scored at 7.5. The risk is considered tolerable (if ALARP) and is mitigated through several Embedded Mitigation. These include the use of AtoNs, a LMP, and regular maintenance of Offshore Infrastructure to ensure visibility and structural integrity. The ERCoP will also play a key role in managing any incidents that do occur, ensuring a coordinated and timely response.

Area 2: Export Cable Corridor

9.5.9 Table 9.9 lists the 14 hazards identified for the Export Cable Corridor area, ranked by their overall risk score. Two of these hazards have been scored as 'Medium Risk – Tolerable if ALARP', and 12 hazards have been scored as 'Low Risk – Broadly Acceptable'.

Table 9.9: Export Cable Corridor - Ranked Hazard List

Hazard ID	Hazard Rank	Hazard title	Phase (C/O/D)	Area	Overall Risk Score	Overall Risk Rating
27	**7**	Collision: Large Commercial or Passenger Vessel ICW Large Commercial or Passenger Vessel	C/O/D	2	6.6	Medium Risk - Tolerable (if ALARP)
28	**10**	Collision: Large Commercial or Passenger Vessel ICW Tug and Service or Fishing and Recreational	C/O/D	2	6.3	Medium Risk - Tolerable (if ALARP)
25	**22**	Collision: Large Project Vessel ICW Third-Party Vessel	C/D	2	5.9	Broadly Acceptable
26	**22**	Collision: Small Project Vessels ICW Third-Party Vessel	O	2	5.9	Broadly Acceptable
29	**25**	Collision: Tug and Service OR Fishing and Recreational ICW Tug and Service OR Small Craft	C/O/D	2	5.1	Broadly Acceptable
35	**26**	Snagging: Fishing Vessel	C/O/D	2	4.8	Broadly Acceptable
36	**26**	Snagging: Recreational Vessel	C/O/D	2	4.8	Broadly Acceptable
37	**26**	Snagging: Tug and Service	C/O/D	2	4.8	Broadly Acceptable
31	**29**	Grounding: Recreational Vessel	C/O/D	2	4.7	Broadly Acceptable
39	**30**	Breakout: Small Craft IWC Buoy (Breakout)	C/D	2	4.3	Broadly Acceptable
34	**31**	Snagging: Large Commercial or Passenger	C/O/D	2	4.1	Broadly Acceptable
33	**35**	Grounding: Tug and Service	C/O/D	2	3.8	Broadly Acceptable
30	**36**	Grounding: Fishing Vessel	C/O/D	2	3.8	Broadly Acceptable
32	**38**	Grounding: Large Commercial or Passenger	C/O/D	2	2.9	Broadly Acceptable

9.5.10 The highest scoring hazard in the Export Cable Corridor, with a risk score of 6.6, is the risk of a large commercial or passenger vessel colliding with another large commercial or passenger vessel. Although this is considered to have a high consequence risk to people, property and business, the likelihood is considered extremely low. This is based on the Embedded Mitigation that would be in place to manage this risk, including the promulgation of information through NtMs and Kingfisher bulletins, and appropriate site marking and charting. These measures will allow vessels to passage plan in advance and ensure sufficient sea room for collision avoidance. Additional controls include compliance with maritime regulations such as COLREGS and SOLAS, and the development of a NSVMP, which will help coordinate vessel movements and reduce the potential for conflict.

9.5.11 The same Embedded Mitigation will help manage the second highest scoring hazard in the Export Cable Corridor: the collision of a large commercial or passenger vessel with a tug and service vessel or fishing or small craft. Given the likelihood is considered to be broadly the same, with a lower consequence risk to business but a higher consequence to people, the overall risk score was slightly lower at 6.3. In addition to the promulgation of information and site charting, the use of Safety Zones during construction and major maintenance phases will help reduce the risk of vessel interference. The requirement for all vessels to meet certification standards and for crew to hold appropriate qualifications will further support safe operations. The ERCoP will also ensure that any incidents are managed effectively, minimising the impact to people and property.

9.6 Possible Additional Risk Control Measures

9.6.1 Following the HAZID workshop and NRA, some additional control measures were identified and recommended to ensure all hazards are ALARP. These control measures are presented in Table 9.10, alongside a brief explanation about how these will be incorporated into the Project.

Table 9.10: Possible Additional Risk Control Measures

Suggested Risk Control	Description	Inclusion within the Project
AtoN status monitoring	NLB identified during the HAZID workshop that an AtoN status monitoring plan would be an effective way to manage AtoN outages and effective maintenance.	The use of an AtoN status monitoring will be evaluated within the LMP, in agreement with the NLB post-consent.
MCC technicians to have AtoN outage management training	NLB mentioned in the HAZID workshop that there is a need for MCC technicians to have the technical abilities and skills required to manage AtoN outages as part of their training. Rather than being only Wind Turbine trained.	The inclusion of AtoN technical training will be evaluated within the post-consent plans, specifically the LMP (Table 9.7).

Suggested Risk Control	Description	Inclusion within the Project
Build in a broader cumulative impact review	It was a highlighted concern by many stakeholders within the HAZID workshop that the cumulative effects should take into consideration all future developments within the area. Preference from stakeholders was to assess this quantitatively, as per the in isolation scenario, but generally recognised this would be best achieved at a national/strategic level due to limitations of individual project extents and information.	Future scenarios are highly subject to change and therefore quantitative cumulative modelling was only undertaken for the Bowdun in isolation detailed NRA. The consideration of the wider cumulative impacts has been included qualitatively within this NRA (Section 10).

9.7 Risk Assessment Summary

9.7.1 The NRA contained in Section 9.5 has determined, in agreement with stakeholders through consultation and the HAZID workshop, that after the application of the Embedded Mitigation measures, the Proposed Development does not pose an unacceptable risk to navigational safety. Following the HAZID workshop, possible additional risk control measures were identified (in Table 9.10). As a result, these were adopted as part of the appropriate existing Embedded Mitigation (Table 9.7). Therefore, it is determined that the 21 hazards scored as Medium Risk can be considered as ALARP with the Embedded Mitigation measures as described in Table 9.7, and therefore the risk deemed Tolerable.

10 Effects of Cumulative Offshore Developments on Findings of NRA

10.1 Introduction

10.1.1 During consultation, stakeholders raised discussion points around the increasing usage of the offshore waters for renewable projects, including the Bowdun OWF (see consultation summary in Section 3.2). The assessments within this section are derived from consideration of the Bowdun OWF in isolation effects (as described in Section 8), review of additional data and supported by cumulative assessments undertaken by other projects that have previously submitted consent applications including Aspen OWF (Aspen, 2025) and Ossian OWF (Ossian, 2024).

10.1.2 When the Bowdun OWF is considered collectively with other proposed offshore renewable projects, there are potential cumulative effects on shipping and navigation that may have a compounding or contributory effect by the Project. The OWFs which are proximate to (within 50 nm (92.6 km)) the Proposed Development are show in Table 10.1 and Figure 10.1.

10.1.3 The impacts identified in Section 8 are also qualitatively assessed for potential cumulative scenarios with the inclusion of other projects and proposed developments. Given the varying type, status and location of developments, a tiered approach to cumulative scenario assessment has been undertaken. The separation into tiering was used to facilitate a structured and progressive thought process of the effects from subsequent projects based primarily upon confidence of the project being constructed (project status) and proximity to the Array Area 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. Existing, operational OWFs are included within the base case and have already been assessed within the NRA. The tiering used in this NRA differs slightly to the tiering using in the EIA Shipping and Navigation Chapter (Volume 2, Chapter 14: Shipping and Navigation). The tiering applied below is:

- Tier 1: Under Construction or Granted Consent (highest confidence of project influencing the future cumulative scenario/most likely to be constructed as they are defined/likely the project will go ahead).
- Tier 2: Application submitted or Scoping submitted (moderate confidence of project influencing the future cumulative scenario/still possible to have differences from how they are defined/possible the project will not go ahead).
- Tier 3: Pre-planning (scoped out of assessment) (lowest confidence of project influencing the future cumulative scenario/possible to have differences from how they are defined/possible the project will not go ahead/project is likely substantially later in delivery than the Proposed Development).

Table 10.1: Summary of Proposed Offshore Renewable Projects Considered Within the Cumulative Assessment

Project	Status	Target Operation	Distance from Bowdun OWF Array Area (km)	Included/Excluded
Tier 1: Under Construction or Granted Consent				
Berwick Bank Wind Farm	Consented	2033-2067	46.53	Included
Green Volt OWF (Innovation and Targeted Oil and Gas Site 6 Flotation Energy)	Consented	2030-2054	92.16	Included
Inch Cape OWF	Under construction	2027-2051	56.03	Included
Salamander OWF	Consented	2030-2054	56.68	Included
Seagreen 1A Project	Consented	2033-2057	36.30	Included
Tier 2: Application submitted or Scoping submitted				
Aspen OWF	Application submitted but not yet determined	2032-2056	88.37	Included
Bellrock OWF	Pre-application	2031-2055	62.23	Included
Morven North OWF	Pre-application	2037-2061	10.03	Included
Morven South OWN	Pre-application	2037-2061	43.61	Included
Muir Mhor OWF	Application submitted but not yet determined	2031-2055	52.50	Included
Ossian OWF	Application submitted but not yet determined	2039-2073	25.36	Included
Tier 3: Pre-planning (scoped out of assessment)				
Flora Floating Wind Farm	Pre-Planning	Unknown	46.83	Excluded

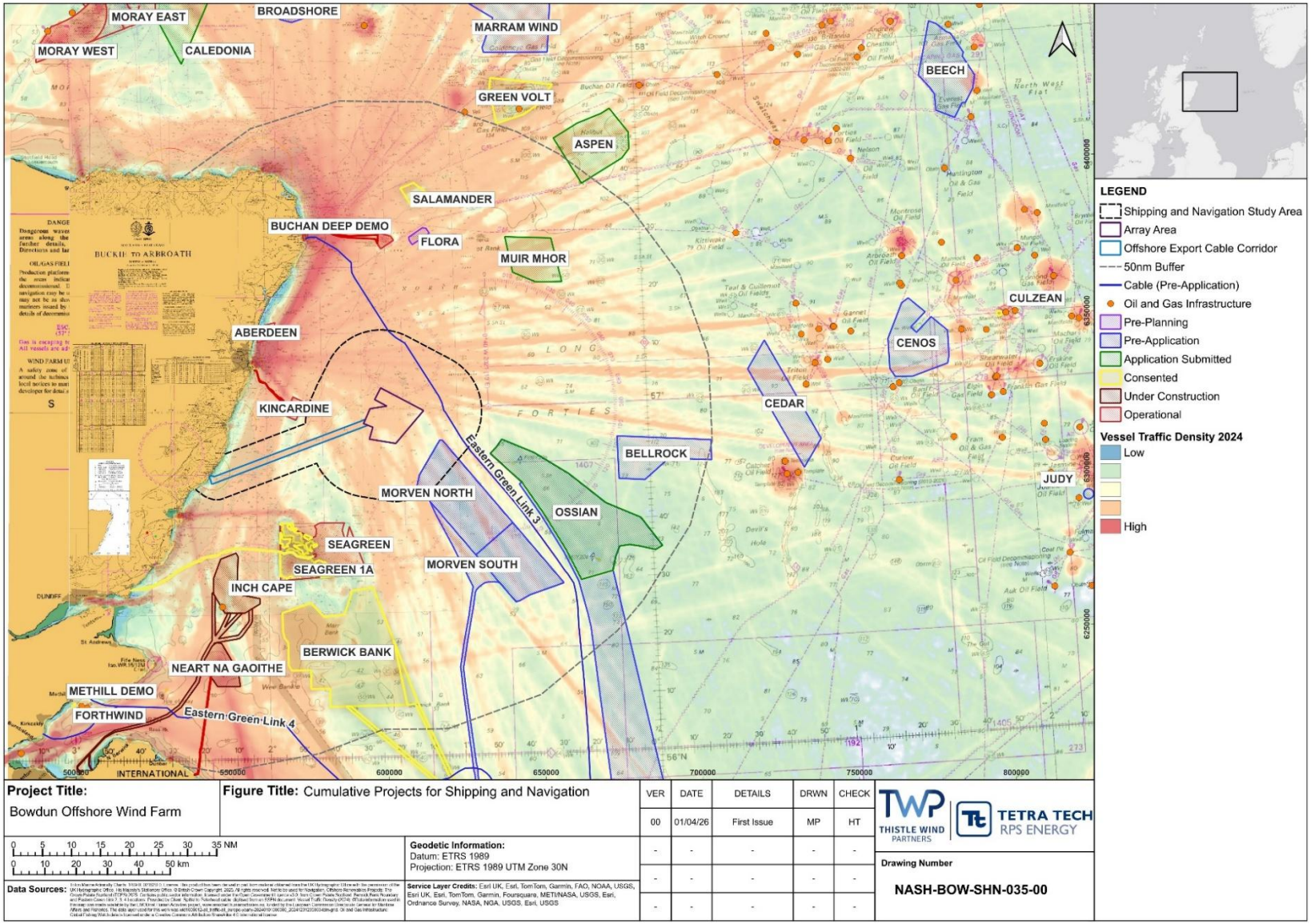

Figure 10.1: Cumulative Projects for Shipping and Navigation

10.2 Impact on Commercial Vessel and Ferry Routes

10.2.1 There are potential cumulative effects on shipping and navigation receptors as a result of the Proposed Development, when considered collectively with the large number of other existing and proposed OWFs (including ScotWind and Innovation and Targeted Oil & Gas Projects). Existing projects that are operational are considered to be accounted for within the baseline assessment (given use of recent AIS data and surveys) and therefore are not discussed within this section. The planned projects which are considered and their distances from the Array Area and Export Cable Corridor, are given in Table 10.2.

Table 10.2: List of Other Proposed Offshore Renewable Projects Scoped Into Assessment Within the Cumulative Assessment 50 nm (92.6 km) Shipping and Navigation Study Area

Project	Status	Target Operation	Distance from Array Area (km)	Distance from Export Cable Corridor (km)
Bellrock	Pre-application	2031-2055	62.23	79.55
Berwick Bank	Consented	2033-2067	46.53	47.70
Inch Cape	Under construction	2027-Unknown	56.03	23.40
Morven North	Pre-application	2037-2061	10.03	22.20
Morven South	Pre-application	2037-2061	43.61	53.83
Muir Mhor	Application submitted	2031-2055	52.50	66.47
Ossian	Application submitted	2039-2073	25.36	40.14
Salamander	Consented	2030-2054	58.68	69.52
Seagreen 1A Project	Consented	2033-2057	36.30	19.47

10.2.2 By following MGN 654 guidance, the impacts assessed within the NRA will be considered both in isolation and cumulatively with other plans, developments or activities. The extent to which cumulative assessments will be undertaken will depend to some extent on the nature of the information available for other developments at the point of assessment, and the certainty with which they may come forward.

10.2.3 Figure 10.2 shows the commercial vessel density through the area (EMODnet, 2024) underlying the other proposed developments within 50 nm (92.6 km) of the Array Area and the Export Cable Corridor. This has been used to undertake a qualitative assessment of the main commercial routes through the area and how these may be affected by the cumulative development scenario, and the Proposed Development's contribution to these impacts.

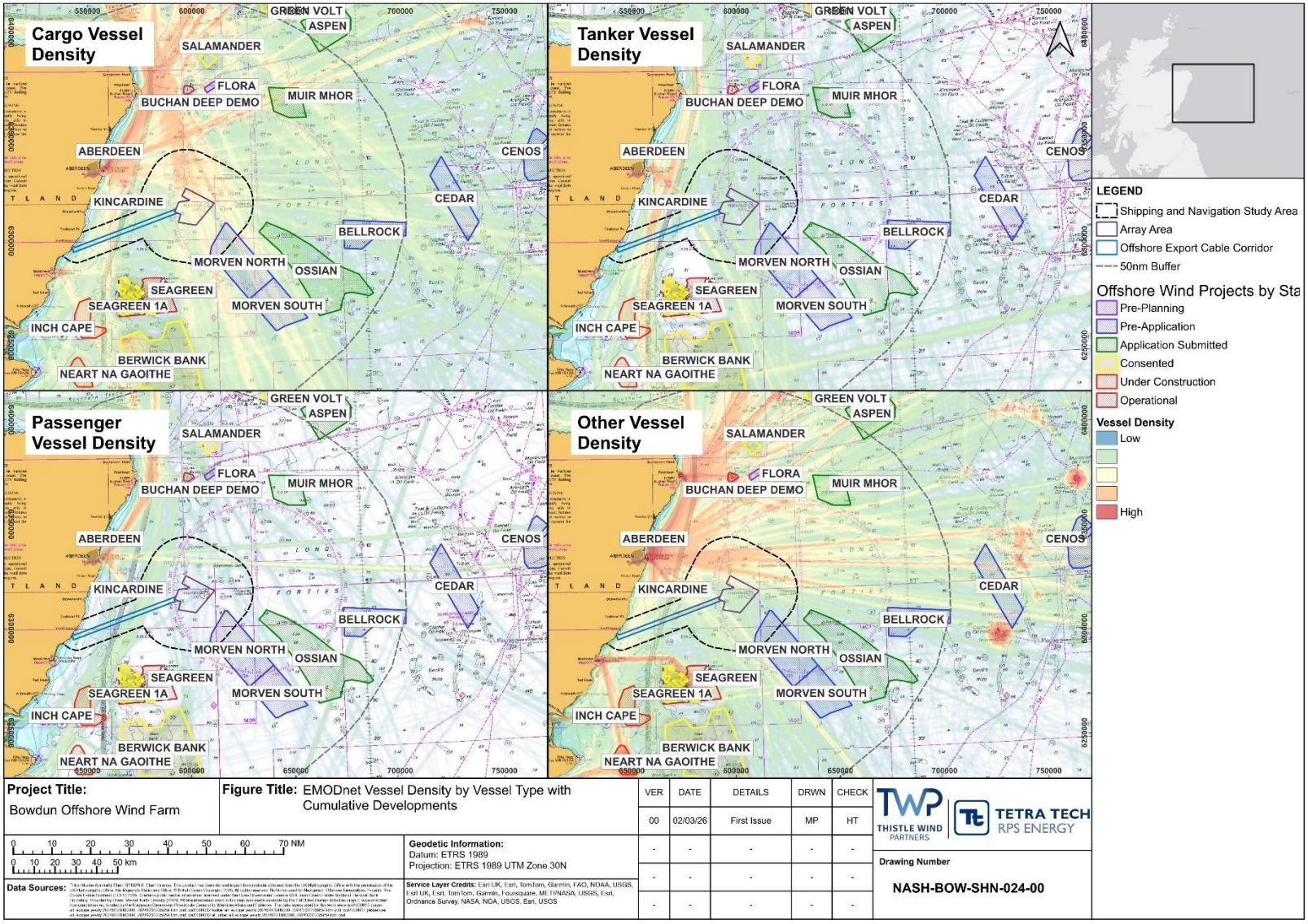

Figure 10.2: Vessel Density (EMODnet 2024) by Type with Cumulative Scenario

10.2.4 A number of commercial vessel routes were identified in Section 8.2 and also considering the vessel densities presented in Figure 10.2. Routes identified which will need to deviate as a result of the Bowdun OWF were reviewed by a master mariner and are presented in Table 10.3. Where applicable, these routes have been numbered to align with the routes presented earlier in Section 6.3. It is noted that three of these routes are not directly affected by the Bowdun OWF, however the Bowdun OWF will have a secondary impact on these routes. These are highlighted within the table. Figure 10.3 presents the base case routes requiring deviations, alongside the predicted future route.

Table 10.3: Cumulative Route Deviations

ID*	Route Description	Total Freq/ Month	Total Freq/Yr	Description of Deviations	Direct/ Secondary impact from Bowdun	Difference in transit distance (nm)	Previous Bowdun in isolation deviation (nm)
1	WSW-ENE route to/from Montrose and through Long Forties	11	129	Deviate slightly north to pass between Bowdun and Morven North, and continue east passing north of Ossian and Bellrock.	Secondary	+ 1.79	Not impacted by Bowdun in isolation
3	SSE-NNW route passing east of Buchan Deep and west of Long Forties	9	104	Deviate inshore of Bowdun, before continuing south passing between Seagreen/Berwick Bank and Morven North/South.	Secondary	+ 4.58	Not impacted by Bowdun in isolation
6a	N-S route passing east of Buchan Deep Demo and Seagreen OWF	9	113	Deviate west of Salamander, before continuing south inshore of Bowdun, then passing between Seagreen/Berwick Bank and Morven North/South.	Direct	+ 3.35	+0.46
6b					Direct	Negligible difference (less than 0.01 nm)	Negligible difference (less than 0.01 nm)
7	SW-NE route to/from Montrose or ports to the south passing north of Long Forties	3	36	Deviate south of Bowdun between Bowdun and Morven North, before heading north-east and passing east of Muir Mhor.	Direct	+ 1.2	+ 1.2
8	NW-SE route to/from	6	76	Deviate west of Morven North/South, and	Direct	Negligible difference	Negligible difference

ID*	Route Description	Total Freq/ Month	Total Freq/Yr	Description of Deviations	Direct/ Secondary impact from Bowdun	Difference in transit distance (nm)	Previous Bowdun in isolation deviation (nm)
	Aberdeen passing north-east of Kincardine OWF and 10-15 nm north-east of Seagreen OWF			travel inshore of Bowdun to Aberdeen.		(less than 0.01 nm)	(less than 0.01 nm)
9	NNW-SSE route passing west of Buchan Deep and south-west of Long Forties	33	394	Deviate west of Morven North/South, and therefore also inshore of Bowdun before rejoining original route further north.	Secondary	+ 4.73	Not impacted by Bowdun in isolation
11	NW-SE route to/from Aberdeen passing north of Kincardine OWF an 15-20 nm north-east of Seagreen OWF	5	60	Deviate north of Ossian between Ossian and Bellrock, before continuing west passing north of Bowdun into Aberdeen.	Direct	+ 1.81	+1.43
12	NNW-SSE route passing west of Buchan Deep and east of Seagreen OWF	56	666	Deviate slightly inshore, west of Bowdun, and between Seagreen/Berwick Bank and Morven North/South.	Direct	+ 1.1	+1.1
15	WNW-ESE route to/from Aberdeen passing through and south-west of Long Forties	71	857	Deviate slightly north to pass clear of Bellrock, and Bowdun.	Direct	+ 1.09	Negligible difference (less than 0.01 nm)

*see Volume 3, Technical Appendix 4.6: Schedule of Mitigation and Commitments

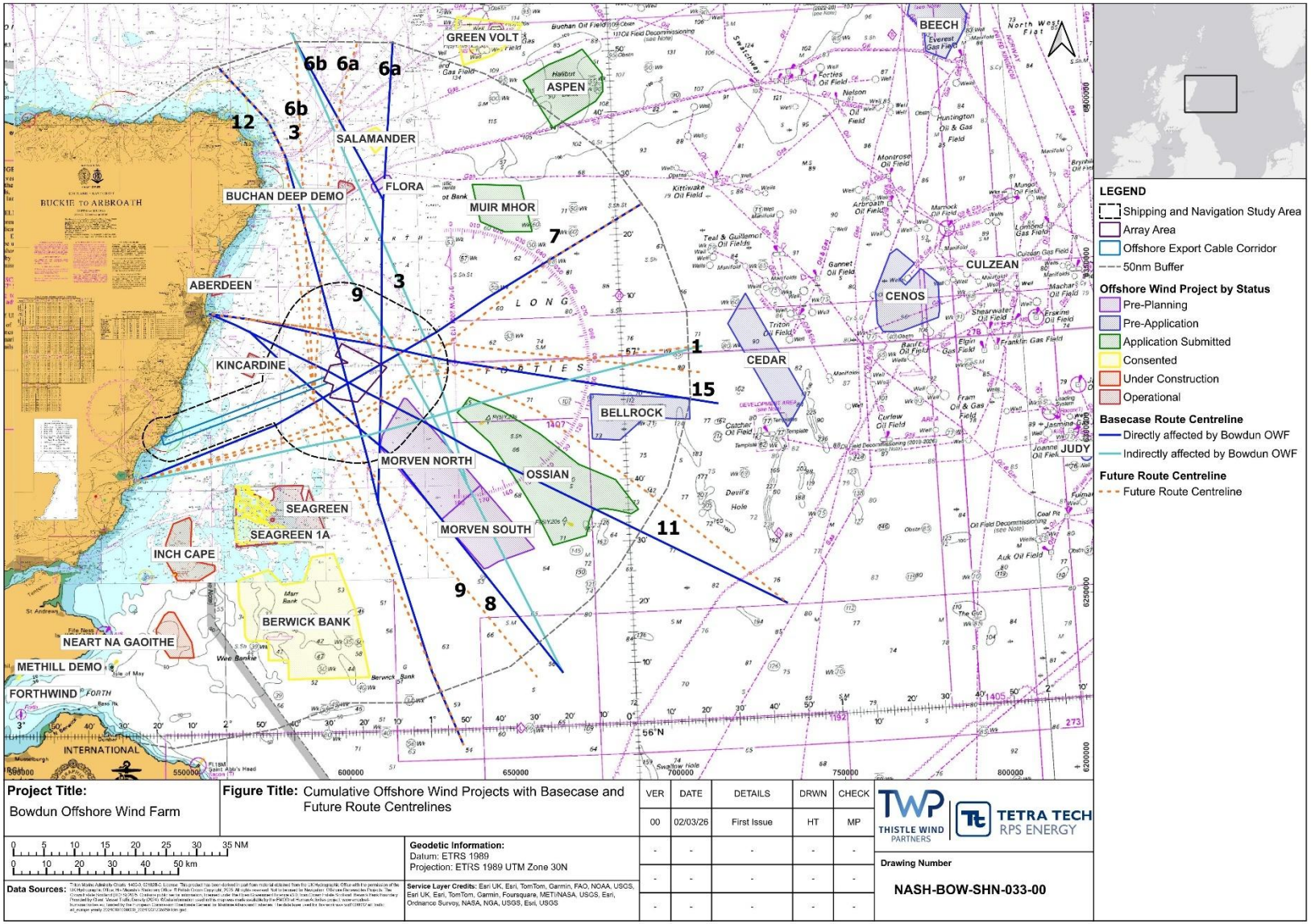

Figure 10.3: Cumulative Offshore Projects with Base Case and Assumed Future Route Centrelines

10.2.5 Whilst not displayed in Table 10.3 or Figure 10.3, it is notable that any displacement associated with the installation of offshore export cables cumulatively with the Array Area will be spatially limited to the area immediately around the installation vessel activities and will be temporary in nature. Details of the installation would be promulgated in advance via the usual means including NtMs and Kingfisher bulletins ensuring awareness will be maximised and facilitating passage planning. Once installation is completed, there would be no displacement impact unless maintenance works are required (which will likely be an infrequent event).

10.2.6 Commercial route deviations are comparably small to the overall commercial vessel routes (typically international trade voyages or coastal shipping) and are therefore only expected to introduce comparatively small additional time onto the overall journey of the vessel which are within normal voyage duration tolerances. Oil and gas traffic is predominately already clear of the Bowdun OWF and transiting east – west to the north of the Array Area and may be more affected by projects further offshore. Oil and gas traffic operating out of Montrose may experience deviations between Bowdun, Morven North, Morven South and Ossian; however, the separation of over 5 nm (9.3 km) between Bowdun and Morven North and over 10 nm (18.5 km) between Bowdun and Ossian is expected to only produce comparatively small overall deviations for this traffic with greater deviation that may be introduced by other projects further offshore, depending on their field destination.

10.2.7 The funnelling of traffic due to other offshore developments is expected to increase the traffic passing to the north of Bowdun (for east to west traffic including the primary oil and gas vessel traffic) and west of Bowdun (for north to south traffic, or traffic approaching the Port of Aberdeen from the south-east). There is in excess of 10 nm (18.5 km) between Bowdun and Kincardine OWF and there it is considered to be sufficient sea room to accommodate any additional transits from vessels choosing an inshore passage.

10.2.8 There is in excess of 10 nm (18.5 km) of navigable sea area between Seagreen OWF and Morven North OWF, and therefore there is considered to be sufficient sea room to accommodate any additional transits from vessels choosing an inshore passage as a result of adverse weather. It is considered likely based on the cumulative routeing assessment, that most vessels will choose this routeing option for deviation, passing inshore of the Bowdun OWF, Morven North OWF, Morven South OWF and Salamander OWF.

10.2.9 Given the spacing between Ossian and Bellrock, it is likely that in the case of adverse weather, Route 11 may take a slightly longer deviation west of Morven North and Morven South, where greater sea room is available. This is a low density route with approximately 60 transits per year, so it is anticipated that the route will be affected by adverse weather only infrequently.

10.2.10 As such no notable cumulative impact on adverse weather routeing is anticipated as a result of the Bowdun OWF.

10.3 Impact on Risk of Collision

10.3.1 As per the cumulative routeing assessment, some of the existing commercial and passenger ferry traffic in the area would likely be displaced and/or be required to transit between multiple wind farms, due to surrounding wind farms and/or cable installations/maintenance. Impacts on routeing may in turn lead to increased collision risk.

10.3.2 In particular, the corridor between Seagreen OWF and Morven North OWF and around the west of Bowdun OWF (between Bowdun OWF and Kincardine OWF) may see funnelling and increased traffic due to deviations. Similarly, this may also be the case to a lesser degree between Morven North OWF and Bowdun OWF, and between Bowdun OWF and Ossian OWF, as traffic volumes on these existing routes are lower and north-south bound vessels may still choose to navigate north-west of Bowdun. Table 10.4 presents an estimate of the traffic currently using these corridors alongside a prediction of future transit levels.

Table 10.4: Anticipated Future Traffic in Navigation Corridors

Gap	Routes Deviated into Gap
Bowdun – Morven North OWF	1, 7
Bowdun – Kincardine OWF	3, 6a, 6b, 9, 12
Seagreen – Morven North OWF	8, 9
Ossian – Bellrock OWF	11

10.3.3 It is also noted that small vessel activity has the potential to be pushed into these corridors.

10.3.4 In addition to the funnelling of traffic, increased vessel numbers may be observed within the cumulative scenario associated with the projects themselves. However, it is expected that the precedent for offshore renewable energy developments, including Bowdun OWF and other OWF projects, will each establish appropriate vessel management systems, marine coordination and lighting and marking to manage the potential for increased encounters with project vessels. These encounters will also be managed through COLREGs and SOLAS.

10.3.5 With regard to the available sea room, there is in excess of 10 nm between Bowdun OWF and Kincardine OWF, over 5 nm (9.3 km) between Morven North OWF and Bowdun OWF, and over 10 nm (18.5 km) between Bowdun OWF and Ossian OWF, so the remaining sea room is still anticipated to be sufficient to safely accommodate any required deviations and collision avoidance. In adverse weather, as discussed, vessels may take slightly longer deviations to ensure more sea room if required. These routes would be further inshore, where vessels may prefer to transit anyway if conditions are poor.

10.4 Impact on Risk of Contact/Allision

10.4.1 Based on the cumulative routeing assessment it is likely that most vessels currently transiting within or near the Array Area will choose to pass inshore between Bowdun OWF and Kincardine OWF, where there is in excess of 10 nm (18.5 km) of width of sea room available for transit (which is considered sufficient to safely accommodate additional vessel transits without unduly increasing allision risk given allision risk is localised to each development).

10.4.2 Any vessels choosing to pass further offshore will likely use either the corridor between Ossian OWF and Bellrock OWF, or north of Bellrock OWF.

10.4.3 All screened in developments will be required to agree lighting and marking with the NLB via a LMP to ensure navigational safety including managing allision risk. Similarly, layouts must also be agreed with the MCA and NLB via a DSLP, with these discussions including consideration of internal allision risk.

10.4.4 Given the Embedded Mitigations in place and the requirements for cumulative wind farms to undergo their respective risk assessments prior to development, no significant impacts from the cumulative scenario are anticipated.

10.5 Impact on Risk of Grounding

10.5.1 Subsea cables associated with the other projects considered have the potential to reduce UKC, particularly near to shore, therefore increasing the risk of grounding. However, it is noted that with the cumulative projects considered, there is still adequate sea room available to route around any temporary construction or maintenance activities or areas where UKC is compromised. Moreover, Embedded Mitigation will be in place for all subsea infrastructure associated with the projects, such as marking and charting, compliance with MGN 654, and cable burial where feasible. It is therefore not anticipated that a grounding event is likely to occur as a result of the cumulative projects.

10.5.2 In the unlikely event of a grounding, the most credible outcome is minor injuries and minor adverse publicity. However, while unlikely, the worst case scenario could involve loss of small craft, with a single fatality. Therefore, the outcome of a grounding event is not likely to result in major consequences.

10.5.3 Given the negligible likelihood of a grounding event occurring as well as the low severity of potential consequences in the most credible scenario, the impact on vessels as a result of the cumulative projects on the risk of grounding is considered to be broadly acceptable.

10.6 Impact on SAR Capability

10.6.1 All wind farm developments within the cumulative scenario have the potential to impact SAR capabilities, and the increase in vessel traffic related with the developments could lead to an increase in the number of incidents requiring emergency response. Existing incident rates within the study area are considered to be low based on the data presented in Section 6.4. Furthermore, there would be additional resources available at other projects and, as a result,

there is not considered likely to be a notable effect on emergency response resources on a cumulative level.

10.6.2 All wind farm developments will be required to agree a layout with the MCA via a DSLP, in alignment with MGN 654, and ensure suitable SAR access is available. Each wind farm development will also be required to have a corresponding ERCoP. Moreover, SAR operations within a given development will be localised to the area of the operation.

10.7 Impact on Radar, Communications and Positioning Systems

10.7.1 All the planned projects could impact equipment used for navigation, collision avoidance and communications, as well as masking sound signals from vessels or AtoNs. While the increased number of Wind Turbines and cables may increase the frequency with which some of the impacts are felt, adverse impacts are still very unlikely to be felt regularly given the sea room that will be available between projects, enabling vessels to still maintain a sufficient distance from the Wind Turbines to reduce the impacts, such as on marine radar.

10.7.2 Therefore, whilst the projects in the cumulative scenario make these impacts more likely, the consequences will be low due to the space between projects. As a result, the risk is considered to be broadly acceptable.

10.8 Impact on Under Keel Clearance due to Subsurface Offshore Infrastructure

10.8.1 The cumulative scenario introduces a higher quantity of subsea infrastructure, albeit these will all be similar in nature to those associated with the Proposed Development and there will be adequate sea room should vessels want to navigate around such assets. As there is sufficient sea room maintained between the Proposed Development and cumulative projects, the consequence of effects of reduced UKC is experienced locally within the individual projects. Given the proximity of the projects, the likelihood of the UKC impact is relatively low.

10.8.2 Given the low likelihood as well as the low severity of potential consequences, the impact on UKC as a result of the cumulative projects is considered to be acceptable.

10.9 Impact on Port/Harbours and Nearshore Operations

10.9.1 The Array Area is located approximately 20.5 nm (38 km) from the coast and therefore there would be a negligible effect on ports and harbours from the Array Area. Similarly, given the depth of water and available sea room, it is not anticipated that the construction of the Offshore Export Cables will adversely affect the ability for vessels to access ports. The addition of the cumulative projects will mean there is an increase in wind farm related vessel traffic in proximity to ports and harbours. However, the base ports are not yet defined and will be determined post-consent.

10.9.2 In addition, vessels associated with the construction of the Proposed Development are not anticipated to notably increase overall baseline traffic levels in the area, with a maximum of 25 construction vessels required on site at any one time for the Array Area and 16 for the Offshore Export Cables. It is anticipated that the other offshore wind projects will introduce similar levels of vessel traffic which would further increase the level of traffic in the vicinity of those OWFs; however, given the location of other wind farms from the Array Area, it is not anticipated to increase traffic levels significantly higher than the baseline in the Shipping and Navigation Study Area. Given the Embedded Mitigation, including NSVMP that ensure management of project vessels, the likelihood of port access being impeded is low. Given the traffic volumes serving the local ports, and the minimal amount of disruption that would likely be experienced in the event that access is impacted, it is considered that the impact on port access is acceptable.

10.10 Impact on Small Vessel Activity (Fishing and Recreational)

10.10.1 Fishing and recreational vessel activity throughout the Shipping and Navigation Study Area is presented in Section 6.3.

10.10.2 Recreational vessel activity within the Shipping and Navigation Study Area was focused closer to the coastline east of the Array Area, with little activity in the Array Area itself. In the cumulative scenario, small vessels which may have deviated to avoid Proposed Development activities will have adequate sea room to make safe deviations.

10.10.3 Concentrated areas of active fishing include areas 1.2 nm to 2.5 nm (2.2 km to 4.6 km) south-west of the Export Cable Corridor Landfall, 5 nm to 10 nm (9.3 km to 18.5 km) north-east of the Array Area, and intersecting the northern and western sides of the Array Area. Given the available space around the Array Area in the cumulative scenario, it is anticipated that fishing activity can still take place outside of the Array Area. Further information on commercial fishing is presented in Volume 2, Chapter 13: Commercial Fisheries.

10.10.4 The available sea room is considered to remain sufficient for safe navigation and collision avoidance, and the cumulative impacts will be limited to the discrete areas where construction works are ongoing simultaneously which is likely to be short term in nature.

10.10.5 Therefore, the impact to small vessel activity is anticipated to be acceptable.

11 Conclusions and Recommendations

11.1 Conclusions

11.1.1 This assessment has reached the following conclusions:

1. An NRA has been conducted recognising that OWFs have potential impacts on navigational safety as highlighted under UNCLOS and Scotland's NMP.
2. The NRA methodology has been conducted in accordance with the MCA's MGN 654 and IMO FSA approach to risk assessment. Where appropriate, additional guidance and lessons learnt from previous NRAs have been referred to within this NRA.
3. Consultation has been conducted with both regulators and stakeholders (see Section 3.2), and feedback received through scoping responses, consultation meetings, HAZID Workshops and written correspondence has been addressed.
4. The project description has been reviewed to determine a MDS against which the NRA is undertaken. Where there is uncertainty regarding specific engineering details a conservative approach to assessment has been undertaken.
5. A review of the baseline environment has identified that the Shipping and Navigation Study Area has predominantly south-westerly wind and north-north-easterly wave conditions (Section 5.8). Mean tidal current speeds of 0.3 to 1.5 kts occur just south-east of the Array Area on a spring tide and 0.2 to 0.8 kts on a neap tide (see Section 5.9).
6. SAR assets, including RNLI stations and helicopter stations, are located in Montrose, Aberdeen, and Peterhead (RNLI) and Inverness (SAR Helicopter) (Section 5.10).
7. Summer and winter boat based marine vessel traffic surveys were conducted in July 2023 and January 2024, each of 14 days duration (Section 6.2). An additional 14-day top-up summer survey was conducted in July 2025 and a winter survey conducted in December 2025 to ensure validity in accordance with the MGN 654 checklist (Annex B). The surveys determined that:
    a) The dominant shipping routes are the west-east route to/from Aberdeen and offshore fields (Route 14), and the north-west–south-east route (Route 15) used primarily by tug and service vessels.
    b) Tug and Service vessels were the most frequently identified, followed by cargo vessels.
    c) Few non-AIS vessels were identified in any of the surveys, indicating that the year-long AIS dataset is representative of overall traffic.
    d) Similar vessel types and movements were observed in both the 2023 and 2025 summer surveys. Recreational vessel activity was observed in 2025, but most of this was seen to be nearshore rather than within the Array Area.
8. Surveys were supplemented with a full year of AIS data from May 2024 to April 2025. Analysis of this AIS data identified:

a) Routes of highest commercial vessel density exist through the Export Cable Corridor, oriented east to west and north-west to south-east.
b) High tug and service vessel density was observed on routes between Aberdeen/Peterhead and offshore oil/gas fields.
c) Most fishing vessel activity was transitory, with limited active fishing observed in the Array Area.
d) Recreational activity was minimal in the Array Area due to its offshore location.

9. Historical incident analysis (1992–2023) identified 47 incidents within the Shipping and Navigation Study Area, mostly nearshore and non-navigationally significant (see Section 6.4). No incidents were recorded within the Array Area, and three occurred within the Export Cable Corridor, all non-navigational (e.g. mechanical failure, personal injury).
10. A prediction of future traffic profile was undertaken for the Proposed Development phases (Section 7). While local port freight tonnage has declined gradually between 2000 and 2023, national projections indicate a long term increase in commercial vessel traffic, particularly from major ports and offshore service activity. Passenger traffic is expected to grow modestly, driven by increased cruise vessel calls at Aberdeen. Fishing and recreational activity are anticipated to remain broadly consistent over the next 15 to 20 years, with concentrated fishing observed nearshore and around the Array Area. Recreational vessels were mostly nearshore and underrepresented in AIS data. Tug and service vessels dominate offshore movements, particularly on routes to/from Aberdeen, and will increase during construction and operation phases. These vessels will operate under procedures defined in the outline NSVMP.
11. An assessment of the impact of the Proposed Development on vessel routeing (Section 8.2) determined that the proposed OWF will require rerouting of several routes, though no high-density routes intersect the Array Area. Only one moderate use route (Route 12) and a handful of low use routes require deviation, with most vessels likely to divert inshore or around the western/southern edges of the site. Evidence from storm-event tracking indicates that adverse weather does not significantly alter routing behaviour.
12. Section 8.3 outlines how the Bowdun OWF may increase collision risk. Using IWRAP, collision risk was modelled across three scenarios; baseline, uplifted traffic without the Bowdun OWF, and future case with the Bowdun OWF in place. The baseline collision frequency was estimated at one in 892 years, rising to one in 412 years in the future case. Crossing collisions were the most significant contributor to risk, particularly where busy routes intersect, such as Route 14 (Aberdeen) with Routes 9 and 12. Tug and service vessels were identified as the most likely to be involved in collisions due to their high traffic density. To mitigate risk, several traffic legs were re-routed to maintain a minimum 1.2 nm (2.2 km) distance from the Array Area, redistributing vessel traffic around the site. Despite these adjustments, increased traffic concentration at certain intersections, especially west of the Array Area, led to a higher collision probability in the future case, during the O&M phase of the OWF.

13. The assessment on risk of vessel grounding and reduced UKC due to the Proposed Development determined that the Array Area, being located offshore in waters deeper than 50 m, made grounding unlikely even with route deviations. Cable protection measures, such as those for IACs, reduce water depth by a maximum of 4%, which is within MCA and RYA guidelines. Most vessels transiting the Array Area have draughts under 8 m, and safe passing distances of at least 1 nm (1.9 km) further reduce grounding risk. Nearshore, the Export Cable Corridor may reduce depth by up to 5% in areas shallower than 40 m, but vessel traffic in this zone is minimal and typically involves smaller vessels. Overall, the risk of grounding due to the Proposed Development is considered very low.
14. OWFs can impact the effectiveness of SAR. Best practice, including lines of orientation and consultation with the MCA can facilitate safe access. The Applicant has held a meeting with the MCA and NLB to discuss the Array Area layout and has developed the proposed layout options following this consultation. Further consultation with the MCA will be undertaken post-consent with regards to SAR via the ERCoP. A DSLP will be agreed with the MCA and NLB prior to construction, to confirm Wind Turbine positioning does not impede SAR.
15. OWFs can impact shipboard navigation and communication equipment, particularly marine radar when navigating within 1.5 nm (2.8 km) of the Proposed Development (Section 8.7). Historical traffic analysis and industry best practice suggests that most mariners will maintain a safe buffer from the site and as such this impact would be mitigated.
16. A hazard log was developed, and consultation meetings, in addition to a HAZID workshop, were utilised to score the likelihood and consequences of each hazard occurring. The risk assessment concluded that:

    a) Of a total of 25 hazards within the Array Area, 19 hazards were Medium Risk – Tolerable if ALARP, and 6 hazards were Low Risk – Broadly Acceptable.
    b) Of a total of 14 hazards within the Export Cable Corridor, two hazards were Medium Risk – Tolerable if ALARP, and 12 hazards were Low Risk – Broadly Acceptable.

17. The following additional risk controls were identified (Section 9.6) and will be further considered during development of post-consent plans as per the Embedded Mitigation measures (Table 9.7):

    a) AtoN Status Monitoring Plan, to identify and highlight any AtoN outages immediately, enabling timely maintenance.
    b) AtoN Outage Management Training for MCC Technicians, to ensure technicians have the necessary skills to manage AtoN outages, not just Wind Turbine systems.
    c) Broader Cumulative Impact Review, to include other existing and planned developments in the area, rather than assessing the Project in isolation.

18. The qualitative CEA (Section 10) concluded that overall, the Proposed Development has limited effect on potential routing impacts and that there is still adequate sea room for displacements.

11.2 Recommendations

11.2.1 The following recommendations are made:

- The risk controls identified in Section 9.3 are adopted by the Proposed Development.
- A risk assessment review is conducted once engineering design principles relating to the layout of the site, O&M base of operations is finalised to ensure the assumptions and conclusions of this NRA remain valid.
- A risk assessment review is undertaken once construction phase operations are known in connection with possible cumulative effects from other projects.

12 Summary

12.1.1 The NRA for the Project concludes that, with the Embedded Mitigation measures, there are no unacceptable risks to navigational safety and that, with adoption of the identified additional risk controls (as an extension of existing Embedded Mitigation measures), the risk associated with the Proposed Development are ALARP and can be deemed Tolerable.

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ANNEX A. HAZARD LOG

Table A.1: Full Hazard Log

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
2	1	C/O/D	1	Collision: Large commercial ICW Tug and Service	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Multiple major injuries; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**3**	**3**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	7.9	Tolerable (if ALARP)
3	1	C/O/D	1	Collision: Large commercial ICW Small Craft	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**3**	**4**	**4**	**2**	**3**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	7.9	Tolerable (if ALARP)
19	3	C/O/D	1	Allision: Fishing and Recreational	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; AtoN failure; Avoidance of other vessels.	Marking and charting, Safety zones, AtoN, Promulgation of information, Layout plan, LMP, AtoN Management Plan Guard Vessels	Multiple minor injuries; Moderate property damage (c.£1M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**4**	**2**	**3**	**2**	**3**	Multiple fatalities; Catastrophic property damage (c.£100M); Moderate pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**3**	**4**	7.8	Tolerable (if ALARP)
21	4	O	1	Allision: Small Project Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints;	Marking and charting, Safety zones, AtoN, Promulgation of information, Layout plan, LMP, AtoN Management Plan	Multiple minor injuries; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**3**	**2**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	7.7	Tolerable (if ALARP)

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
					AtoN failure; Avoidance of other vessels.															
1	5	C/O/D	1	Collision: Large commercial ICW Large Commercial	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Multiple minor injuries; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**3**	**2**	**4**	**2**	**3**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	7.5	Tolerable (if ALARP)
18	5	C/O/D	1	Allision: Tug and Service	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; AtoN failure; Avoidance of other vessels.	Marking and charting, Safety zones, AtoN, Promulgation of information, Layout plan, LMP, AtoN Management Plan Guard Vessels	Multiple minor injuries; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**3**	**2**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Moderate pollution incident (Tier 2); Moderate adverse publicity/short term interruption to activities.	**1**	**5**	**5**	**3**	**3**	7.5	Tolerable (if ALARP)
27	7	C/O/D	2	Collision: Large Commercial OR Passenger Vessel ICW Large Commercial OR Passenger Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Multiple minor injuries; Major property damage (c.£10M); Minor pollution (Tier 1); Major adverse publicity/long term interruption to activities.	**2**	**2**	**4**	**2**	**5**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.6	Tolerable (if ALARP)
10	8	C/O/D	1	Collision: Small Craft ICW Small Craft	Reduced Sea room; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue;	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards,	Multiple major injuries; Moderate property damage (c.£1M); Minor pollution (Tier 1); Minor adverse	**3**	**3**	**3**	**2**	**2**	Single fatality; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**4**	**5**	**4**	**4**	6.4	Tolerable (if ALARP)

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
					Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Compliance with maritime regulations, NSVMP	publicity/short term interruption to activities.													
20	9	C/D	1	Allision: Large Project Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; AtoN failure; Avoidance of other vessels.	Marking and charting, Safety zones, AtoN, Promulgation of information, Layout plan, LMP, AtoN Management Plan	Multiple minor injuries; Moderate property damage (c.£1M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**3**	**2**	**3**	**2**	**3**	Single fatality; Catastrophic property damage (c.£100M); Moderate pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**4**	**5**	**3**	**4**	6.4	Tolerable (if ALARP)
28	10	C/O/D	2	Collision: Large Commercial OR Passenger Vessel ICW Tug and Service OR Small Craft	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Single fatality; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**2**	**4**	**4**	**3**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.3	Tolerable (if ALARP)
13	11	C/O/D	1	Collision: Passenger Vessel ICW Passenger Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP Guard Vessels	Single fatality; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**2**	**4**	**4**	**3**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**4**	6.3	Tolerable (if ALARP)

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
4	12	C/O/D	1	Collision: Large commercial ICW Project Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP Guard Vessels	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**2**	**4**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.2	Tolerable (if ALARP)
5	12	C/O/D	1	Collision: Large commercial ICW Passenger Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**2**	**4**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.2	Tolerable (if ALARP)
9	12	C/O/D	1	Collision: Tug and Service ICW Passenger Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**2**	**4**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.2	Tolerable (if ALARP)

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
12	12	C/O/D	1	Collision: Small Craft ICW Passenger Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**2**	**4**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.2	Tolerable (if ALARP)
14	12	C/O/D	1	Collision: Passenger Vessel ICW Project Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**2**	**4**	**4**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.2	Tolerable (if ALARP)
6	17	C/O/D	1	Collision: Tug and Service ICW Tug and Service	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Multiple minor injuries; Moderate property damage (c.£1M); No pollution; Minor adverse publicity/short term interruption to activities.	**3**	**2**	**3**	**1**	**2**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**4**	6.1	Tolerable (if ALARP)

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
7	17	C/O/D	1	Collision: Tug and Service ICW Small Craft	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Multiple minor injuries; Moderate property damage (c.£1M); No pollution; Minor adverse publicity/short term interruption to activities.	**3**	**2**	**3**	**1**	**2**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**4**	6.1	Tolerable (if ALARP)
8	19	C/O/D	1	Collision: Tug and Service ICW Project Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP Guard Vessels	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**2**	**4**	**4**	**2**	**3**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.1	Tolerable (if ALARP)
11	19	C/O/D	1	Collision: Small Craft ICW Project Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP Guard Vessels	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**2**	**4**	**4**	**2**	**3**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.1	Tolerable (if ALARP)

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
15	19	C/O/D	1	Collision: Project Vessel ICW Project Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**2**	**4**	**4**	**2**	**3**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	6.1	Tolerable (if ALARP)
25	22	C/D	2	Collision: Large Project Vessel ICW Third-Party Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP Guard Vessels	Multiple major injuries; Moderate property damage (c.£1M); Major pollution incident (Tier 2); Minor adverse publicity/short term interruption to activities.	**2**	**3**	**3**	**4**	**2**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	5.9	Broadly Acceptable
26	22	O	2	Collision: Small Project Vessels ICW Third-Party Vessel	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP Guard Vessels	Multiple major injuries; Moderate property damage (c.£1M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**2**	**3**	**3**	**2**	**4**	Multiple fatalities; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**5**	**4**	**5**	5.9	Broadly Acceptable

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
16	24	C/O/D	1	Allision: Large commercial	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; AtoN failure; Avoidance of other vessels.	Marking and charting, Safety zones, AtoN, Promulgation of information, Layout plan, LMP, AtoN Management Plan Guard Vessels	Multiple minor injuries; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**2**	**2**	**4**	**2**	**4**	Single fatality; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Moderate adverse publicity/short term interruption to activities.	**1**	**4**	**5**	**4**	**3**	5.8	Broadly Acceptable
29	25	C/O/D	2	Collision: Tug and Service OR Fishing and Recreational ICW Tug and Service OR Small Craft	Reduced Searoom; Increased meeting situations; Human Error/Poor Seamanship; Failure to Comply with COLREGs; Fatigue; Radar Interference; Mechanical Failure; Adverse Weather; Avoidance of Other Vessels; Reduced Visibility.	Marking and charting, Safety zones, Promulgation of information, Vessel requirements and standards, Compliance with maritime regulations, NSVMP	Multiple major injuries; Moderate property damage (c.£1M); Minor pollution (Tier 1); Minor adverse publicity/short term interruption to activities.	**2**	**3**	**3**	**2**	**2**	Single fatality; Catastrophic property damage (c.£100M); Major pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**4**	**5**	**4**	**4**	5.1	Broadly Acceptable
35	26	C/O/D	2	Snagging: Fishing Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Anchoring in an emergency; Inadequate stowage of equipment; Charts not up to date.	CBRA, Marking and charting, Safety zones, Promulgation of information, Hydrographic surveys, Maintenance, Compliance with maritime regulations Guard Vessels	Multiple minor injuries; Moderate property damage (c.£1M); No pollution; Minor adverse publicity/short term interruption to activities.	**2**	**2**	**3**	**1**	**2**	Multiple fatalities; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**4**	**3**	**5**	4.8	Broadly Acceptable
36	26	C/O/D	2	Snagging: Recreational Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Anchoring in an emergency; Inadequate stowage of equipment; Charts not up to date.	CBRA, Marking and charting, Safety zones, Promulgation of information, Hydrographic surveys, Maintenance, Compliance with maritime	Multiple minor injuries; Moderate property damage (c.£1M); No pollution; Minor adverse publicity/short term interruption to activities.	**2**	**2**	**3**	**1**	**2**	Multiple fatalities; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**4**	**3**	**5**	4.8	Broadly Acceptable

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
						regulations Guard Vessels														
37	26	C/O/D	2	Snagging: Tug and Service	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Anchoring in an emergency; Inadequate stowage of equipment; Charts not up to date.	CBRA, Marking and charting, Safety zones, Promulgation of information, Hydrographic surveys, Maintenance, Compliance with maritime regulations Guard Vessels	Multiple minor injuries; Moderate property damage (c.£1M); No pollution; Minor adverse publicity/short term interruption to activities.	**2**	**2**	**3**	**1**	**2**	Multiple fatalities; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**4**	**3**	**5**	4.8	Broadly Acceptable
31	29	C/O/D	2	Grounding: Recreational Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; Interaction with project vessel; Siltation; AtoN failure; Reduction of underkeel clearance; Charts not up to date.	CBRA, Marking and charting, Promulgation of information, Hydrographic surveys, Maintenance	Multiple minor injuries; Minor property damage (c.£100k): No pollution; Minor adverse publicity/short term interruption to activities.	**3**	**2**	**2**	**1**	**2**	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**1**	**4**	**4**	**2**	**4**	4.7	Broadly Acceptable
39	30	C/D	2	Breakout: Small Craft IWC Buoy (Breakout)	Adverse weather; Incorrect towage arrangements; Equipment failure.	AtoN; Promulgation of information; Maintenance; Compliance with maritime regulations; ERCoP; NSVMP; FLO; Guard Vessels;	Multiple minor injuries; Negligible property damage (c.£10k): No pollution; Minor adverse publicity/short term interruption to activities.	**2**	**2**	**1**	**1**	**2**	Multiple major injuries; Minor property damage (c.£100k): No pollution; Minor adverse publicity/short term interruption to activities.	**2**	**3**	**2**	**1**	**2**	4.3	Broadly Acceptable
17	31	C/O/D	1	Allision: Passenger Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area;	Marking and charting, Safety zones, AtoN, Promulgation of	Multiple major injuries; Major property damage (c.£10M); Minor pollution	**1**	**3**	**4**	**2**	**4**	Single fatality; Catastrophic property damage (c.£100M); Moderate pollution incident (Tier 2);	**1**	**4**	**5**	**3**	**4**	4.1	Broadly Acceptable

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
					Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; AtoN failure; Avoidance of other vessels.	information, Layout plan, LMP, AtoN Management Plan Guard Vessels	(Tier 1); Moderate adverse publicity/long term interruption to activities.						Moderate adverse publicity/long term interruption to activities.							
24	31	C/O/D	1	Snagging: Recreational Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Anchoring in an emergency; Inadequate stowage of equipment; Charts not up to date.	CBRA, Marking and charting, Safety zones, Promulgation of information, Hydrographic surveys, Maintenance, Compliance with maritime regulations, Guard Vessels	Single fatality; Moderate property damage (c.£1M); Minor pollution (Tier 1); Moderate adverse publicity/short term interruption to activities.	**1**	**4**	**3**	**2**	**3**	Multiple fatalities; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**4**	**3**	**5**	4.1	Broadly Acceptable
34	31	C/O/D	2	Snagging: Large Commercial or Passenger	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Anchoring in an emergency; Inadequate stowage of equipment; Charts not up to date.	CBRA, Marking and charting, Safety zones, Promulgation of information, Hydrographic surveys, Maintenance, Compliance with maritime regulations, Guard Vessels	Minor injuries; Negligible property damage (c.£10k): No pollution; Moderate adverse publicity/short term interruption to activities.	**2**	**1**	**1**	**1**	**3**	Minor injuries; Minor property damage (c.£100k): No pollution; Major adverse publicity/long term interruption to activities.	**1**	**1**	**2**	**1**	**5**	4.1	Broadly Acceptable
23	34	C/O/D	1	Snagging: Fishing Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Anchoring in an emergency; Inadequate stowage of equipment; Charts not up to date.	CBRA, Marking and charting, Safety zones, Promulgation of information, Hydrographic surveys, Maintenance, Compliance with maritime regulations, Guard Vessels	Single fatality; Moderate property damage (c.£1M); No pollution; Minor adverse publicity/short term interruption to activities.	**1**	**4**	**3**	**1**	**2**	Multiple fatalities; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Major adverse publicity/long term interruption to activities.	**1**	**5**	**4**	**3**	**5**	3.9	Broadly Acceptable

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
33	35	C/O/D	2	Grounding: Tug and Service	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; Interaction with project vessel; Siltation; AtoN failure; Reduction of underkeel clearance; Charts not up to date.	CBRA, Marking and charting, Promulgation of information, Hydrographic surveys, Maintenance	Multiple minor injuries; Minor property damage (c.£100k): No pollution; Minor adverse publicity/short term interruption to activities.	**2**	**2**	**2**	**1**	**2**	Single fatality; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**4**	**4**	**3**	**4**	3.8	Broadly Acceptable
30	36	C/O/D	2	Grounding: Fishing Vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; Interaction with project vessel; Siltation; AtoN failure; Reduction of underkeel clearance; Charts not up to date.	CBRA, Marking and charting, Promulgation of information, Hydrographic surveys, Maintenance	Multiple minor injuries; Minor property damage (c.£100k): No pollution; Minor adverse publicity/short term interruption to activities.	**2**	**2**	**2**	**1**	**2**	Single fatality; Major property damage (c.£10M); Minor pollution (Tier 1); Moderate adverse publicity/long term interruption to activities.	**1**	**4**	**4**	**2**	**4**	3.8	Broadly Acceptable
22	37	C/O/D	1	Snagging: Large Commercial or Passenger vessel	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Anchoring in an emergency; Inadequate stowage of equipment; Charts not up to date.	CBRA, Marking and charting, Safety zones, Promulgation of information, Hydrographic surveys, Maintenance, Compliance with maritime regulations, Guard Vessels	Minor injuries; Negligible property damage (c.£10k): No pollution; Moderate adverse publicity/short term interruption to activities.	**1**	**1**	**1**	**1**	**3**	Minor injuries; Minor property damage (c.£100k): No pollution; Major adverse publicity/long term interruption to activities.	**1**	**1**	**2**	**1**	**5**	2.9	Broadly Acceptable

ID	Individual Hazard Rank	Project Phase	Area	Hazard Title	Possible causes	Designed in Mitigation	Realistic Most Credible Scenario						Realistic Worst Credible Scenario						Overall Risk Score	Overall Risk Rating
							Realistic Most Credible Scenario	Frequency	People	Property	Environment	Business	Realistic Worst Credible Scenario	Frequency	People	Property	Environment	Business		
32	38	C/O/D	2	Grounding: Large Commercial or Passenger	Insufficient Lookout; Inadequate Passage Planning; Human Error/Fatigue; Poor Visibility in Area; Equipment or Mechanical Failure on Vessel; Reduced Seakeeping due to Tidal or Weather Constraints; Interaction with project vessel; Siltation; AtoN failure; Reduction of underkeel clearance; Charts not up to date.	CBRA, Marking and charting, Promulgation of information, Hydrographic surveys, Maintenance	Multiple minor injuries; Minor property damage (c.£100k): No pollution; Minor adverse publicity/short term interruption to activities.	**1**	**2**	**2**	**1**	**2**	Single fatality; Major property damage (c.£10M); Moderate pollution incident (Tier 2); Moderate adverse publicity/long term interruption to activities.	**1**	**4**	**4**	**3**	**4**	2.9	Broadly Acceptable
38	39	C/D	1	Breakout: Small Craft IWC Buoy (Breakout)	Adverse weather; Incorrect towage arrangements; Equipment failure.	AtoN; Promulgation of information; Maintenance; Compliance with maritime regulations; ERCoP; NSVMP; FLO; Guard Vessels;	Multiple minor injuries; Negligible property damage (c.£10k): No pollution; Minor adverse publicity/short term interruption to activities.	**1**	**2**	**1**	**1**	**2**	Multiple major injuries; Minor property damage (c.£100k): No pollution; Minor adverse publicity/short term interruption to activities.	**1**	**3**	**2**	**1**	**2**	2.1	Broadly Acceptable

ANNEX B. MGN 654 CHECKLIST

Table B.1: MGN 654 (M+F) Safety of Navigation: OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response

MGN Section	Yes/No	Comments
4. Planning Stage – Prior to Consent		
4.5 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 (ETRS89) datum.		
4.6 Traffic Survey – includes:		
All vessel types	✓	Analysis of all vessel types within the study area is contained within Section 6.3.
At least 28 days duration, within either 12 or 24 months prior to submission of the EIA Report	✓	An MGN 654 compliant vessel survey (during Summer July 2023 and Winter January 2024) and 2 top-up surveys (Summer July 2025 and Winter December 2025) has been conducted and are described in Section 6.1. Vessel Traffic survey reports are shown in Volume 3, Technical Appendices 14.2: Shipping and Navigation Vessel Traffic Survey Report 2024 and 14.3: Shipping and Navigation Vessel Traffic Survey Report 2025.
Multiple data sources	✓	Section 3.2 describes the vessel traffic, incident and secondary data sources used to inform the NRA.
Seasonal variations	✓	Seasonality has been accounted for within the 2x 14-day traffic surveys (Section 6.1) and is referenced throughout Section 6. Additional summer and winter survey comparison is shown in Volume 3, Technical Appendices 14.2: Shipping and Navigation Vessel Traffic Survey Report 2024 and 14.3: Shipping and Navigation Vessel Traffic Survey Report 2025.
MCA consultation	✓	Consultation with the MCA has been conducted (see Section 3.2).
General Lighthouse Authority (GLA) consultation	✓	Consultation with NLB has been conducted (see Section 3.2).
CoS and shipping company consultation	✓	Consultation with the UK CoS has been conducted (see Section 3.2).
Recreational and fishing vessel organisations consultation	✓	Consultation with the SFF, SWFPA and RYA Scotland has been conducted (see Section 3.2). Invitations to consult have been issued to SPFA, NECRIFG, Montrose Sailing Club and Aberdeen and Stonehaven Yacht Club Cruising Association.

MGN Section	Yes/No	Comments
Port and navigation authorities consultation, as appropriate	✓	Port of Aberdeen, Aberdeenshire Harbours (Gourdon and Stonehaven Harbours), Peterhead Port Authority and Montrose Port Authority were contacted for consultation but did not attend any meetings (see Section 3.2).
4.6.d Assessment of the cumulative and individual effects of (as appropriate):		
i. Proposed OREI site relative to areas used by any type of marine craft.	✓	Vessel traffic analysis within the study area is described in Section 6.3.
ii. Numbers, types and sizes of vessels presently using such areas	✓	Vessel traffic analysis within the study area is described in Section 6.3. This includes statistical analysis of vessel activity.
iii. Non-transit uses of the areas, e.g. fishing, day cruising of leisure craft, racing, aggregate dredging, personal watercraft etc.	✓	Vessel traffic analysis within the study area is described in Section 6.3.
iv. Whether these areas contain transit routes used by coastal, deep draught or international scheduled vessels on passage.	✓	Vessel traffic analysis within the study area is described in Section 6.3, including identification of key shipping routes in Paragraph 6.3.52.
v. Alignment and proximity of the site relative to adjacent shipping routes	✓	Vessel traffic analysis within the study area is described in Section 6.3, including identification of key shipping routes in Paragraph 6.3.52.
vi. Whether the nearby area contains prescribed routeing schemes or precautionary areas	✓	Navigational features are highlighted in Section 5.
vii. Proximity of the site to areas used for anchorage (charted or uncharted), safe haven, port approaches and pilot boarding or landing areas.	✓	Navigational features are highlighted in Section 5. Analysis of anchoring activity is contained within Paragraph 6.3.59.
viii. Whether the site lies within the jurisdiction of a port and/or navigation authority.	✓	Navigational features are highlighted in Section 5.
ix. Proximity of the site to existing fishing grounds, or to routes used by fishing vessels to such grounds.	✓	Analysis of fishing vessel activity is contained within Paragraph 6.3.24.
x. Proximity of the site to offshore firing/bombing ranges and areas used for any marine military purposes.	✓	Navigational features are highlighted Section 5.
xi. Proximity of the site to existing or proposed submarine cables or pipelines, offshore oil/gas platform, marine aggregate dredging, marine archaeological sites or wrecks, Marine Protected Area or other exploration/exploitation sites	✓	Navigational features are highlighted in Section 5.

MGN Section	Yes/No	Comments
xii. Proximity of the site to existing or proposed OREI developments, in cooperation with other relevant developers, within each round of lease awards.	✓	Navigational features are highlighted in Section 5. Future proposed OREIs are described in Section 10.
xiii. Proximity of the site relative to any designated areas for the disposal of dredging spoil or other dumping ground	✓	Navigational features are highlighted in Section 5.
xiv. Proximity of the site to AtoN and/or VTS in or adjacent to the area and any impact thereon.	✓	Navigational features are highlighted in Section 5.
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.	✓	The impact on vessel routeing is assessed within Section 8.2.
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.	✓	Analysis of historical incident data is contained within Section 6.4.
xvii. Proximity of the site to areas used for recreation which depend on specific features of the area	✓	Analysis of recreational traffic is contained within Paragraph 6.3.26.
4.7 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.	✓	The impact on vessel routeing is assessed within Section 8.2 and the impact on allision risk is contained within Section 8.4.
b. The width of a corridor between sites or OREIs to allow safe passage of shipping.	✓	The cumulative effects of multiple OREIs is assessed within Section 10.
4.8. 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.	✓	The risks of snagging on Proposed Development infrastructure are assessed in Section 8.8 and Section 8.10.

MGN Section	Yes/No	Comments
b. Clearances of fixed or floating Wind Turbine blades above the sea surface are not less than 22 metres (above MHWS for fixed). Floating Wind Turbines allow for degrees of motion.	✓	The risk of allision with Wind Turbine blades is assessed in Section 8.4. Risk controls are described in Section 9.3.
c. Underwater devices **i. changes to charted depth** **ii. maximum height above seabed** **iii. UKC**	✓ ✓ ✓	The impact on UKC is assessed in Section 8.8.
d. Whether structure block or hinder the view of other vessels or other navigational features.	P	Impacts on visual navigation and collision avoidance are considered within Section 8.4.
4.9 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.	✓	Analysis of tidal conditions are given in Section 5.9. The impact on UKC is assessed in Section 8.8.
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.	✓	Analysis of tidal conditions are given in Section 5.9. Collision (Section 8.3) and allision (Section 8.4) assessments consider the impact of metocean conditions.
c. The maximum rate tidal stream runs parallel to the major axis of the proposed site layout, and, if so, its effect.	✓	Analysis of tidal conditions are given in Section 5.9. Collision (Section 8.3) and allision (Section 8.4) assessments consider the impact of metocean conditions.
d. The set is across the major axis of the layout at any time, and, if so, at what rate.	✓	Analysis of tidal conditions are given in Section 5.9. Collision (Section 8.3) and allision (Section 8.4) assessments consider the impact of metocean conditions.
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.	✓	Analysis of tidal conditions are given in Section 5.9. Collision (Section 8.3) and allision (Section 8.4) assessments consider the impact of metocean conditions.
f. The structures themselves could cause changes in the set and rate of the tidal stream.	✓	No effect anticipated.
g. The structures in the tidal stream could be such as to produce siltation, deposition of sediment or scouring, affecting navigable water depths in the	✓	Analysis of tidal conditions are given in Section 5.9. The impact on UKC is assessed in Section 8.8.

MGN Section	Yes/No	Comments
wind farm area or adjacent to the area		
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.	✓	Adverse weather vessel activity is presented within Paragraph 6.3.56.
i. The structures could create problems in the area for vessels under sail, such as wind masking, turbulence or sheer.	✓	Analysis of tidal conditions are given in Section 5.9. Collision (Section 8.3) and allision (Section 8.4) assessments consider the impact of metocean conditions.
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.	✓	Analysis of tidal conditions are given in Section 5.9. Collision (Section 8.3) and allision (Section 8.4) assessments consider the impact of metocean conditions.
4.10 Assessment of Access to and Navigation Within, or Close to, an OREI **To determine the extent to which navigation would be feasible within the OREI site itself by assessing whether:**		
a. Navigation within or close to the site would be safe: **for all vessels, or** **for specified vessel types, operations and/or sizes.** **in all directions or areas, or** **in specified directions or areas.** **in specified tidal, weather or other conditions**	✓	Impacts to vessel routeing are assessed in Section 8.2.
b. Navigation in and/or near the site should be prohibited or restricted: **for specified vessel types, operations and/or sizes.** **in respect of specific activities,** **in all areas or directions, or** **in specified areas or directions, or** **in specified tidal or weather conditions.**	✓	Embedded mitigation measures are outlined in Section 9.3.
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	✓	Impacts to vessel routeing are assessed in Section 8.2.

MGN Section	Yes/No	Comments
d. Guidance on the calculation of safe distance of OREI boundaries from shipping routes has been considered	✓	Vessel routes are identified in Paragraph 6.3.54.
4.11 SAR, maritime assistance service, counter pollution and salvage incident response.		
The MCA, through HM Coastguard, is required to provide SAR and emergency response within the sea area occupied by all OREIs in UK waters. To ensure that such operations can be safely and effectively conducted, certain requirements must be met by developers and operators.		
a. An ERCoP will be developed for the construction, operation and decommissioning phases of the OREI.	✓	Impacts to SAR are considered within Section 8.6. Embedded mitigation measures are outlined in Section 9.3.
b. The MCA's guidance document Offshore Renewable Energy Installation: Requirements, Advice and Guidance for SAR and Emergency Response for the design, equipment and operation requirements will be followed.	✓	Impacts to SAR are considered within Section 8.6. Embedded mitigation measures are outlined in Section 9.3.
c. A SAR checklist will be completed to record discussions regarding the requirements, recommendations and considerations outlined in the above document (to be agreed with MCA)	✓	Impacts to SAR are considered within Section 8.6. Embedded mitigation measures are outlined in Section 9.3.
4.12 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	✓	Embedded mitigation measures are outlined in Section 9.3.
ii. On a pre-established periodicity during the life of the development	✓	Embedded mitigation measures are outlined in Section 9.3.
ii. Post-construction: Cable route(s)	✓	Embedded mitigation measures are outlined in Section 9.3.
iii. Post-decommissioning of all or part of the development: the installed generating assets area and cable route	✓	Embedded mitigation measures are outlined in Section 9.3.
4.13 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	✓	Impact on communications, radar and positioning systems are considered within Section 8.7.

MGN Section	Yes/No	Comments
borne, ashore or fitted to any of the proposed structures, to: i. Vessels operating at a safe navigational distance 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 iv. Racon to/from vessel	✓	Impact on communications, radar and positioning systems are considered within Section 8.7.
c. The structures and generators might produce sonar interference affecting fishing, industrial or military systems used in the area.	✓	Impact on communications, radar and positioning systems are considered within Section 8.7.
d. The site might produce acoustic noise which could mask prescribed sound signals.	✓	Impact on communications, radar and positioning systems are considered within Section 8.7.
e. Generators and the seabed cabling within the site and onshore might produce electromagnetic fields affecting compasses and other navigation systems.	✓	Impact on communications, radar and positioning systems are considered within Section 8.7.
4.14 Risk mitigation measures recommended for OREI during construction, operation and decommissioning. Mitigation and safety measures will be applied to the OREI development appropriate to the level and type of risk determined during the EIA. The specific measures to be employed will be selected in consultation with the MCA and will be listed in the developer's Environmental Statement (ES). These will be consistent with international standards contained in, for example, the SOLAS Convention - Chapter V, IMO Resolution A.572 (14)3 and Resolution A.671(16)4 and could include any or all of the following:		
i. Promulgation of information and warnings through NtMs and other appropriate maritime safety information (MSI) dissemination methods.	✓	Embedded mitigation measures are outlined in Section 9.3.
ii. Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).	✓	Embedded mitigation measures are outlined in Section 9.3.

MGN Section	Yes/No	Comments
iii. Safety zones of appropriate configuration, extent and application to specified vessels1	✓	Embedded mitigation measures are outlined in Section 9.3.
iv. Designation of the site as an area to be avoided (ATBA).	✓	Embedded mitigation measures are outlined in Section 9.3.
v. Provision of AtoN as determined by the GLA	✓	Embedded mitigation measures are outlined in Section 9.3.
vi. Implementation of routeing measures within or near to the development.	✓	Embedded mitigation measures are outlined in Section 9.3.
vii. Monitoring by radar, AIS, Closed Circuit Television (CCTV) or other agreed means	✓	Embedded mitigation measures are outlined in Section 9.3.
viii. Appropriate means for OREI operators to notify, and provide evidence of, the infringement of Safety Zones.	✓	Embedded mitigation measures are outlined in Section 9.3.
ix. Creation of an ERCoP with the MCA's SAR Branch for the construction phase onwards.	✓	Embedded mitigation measures are outlined in Section 9.3.
x. Use of guard vessels, where appropriate	✓	Embedded mitigation measures are outlined in Section 9.3.
xi. Update NRAs every 2 years e.g. at testing sites.	✓	Embedded mitigation measures are outlined in Section 9.3.
xii. Device-specific or array-specific NRAs	✓	Embedded mitigation measures are outlined in Section 9.3.
xiii. Design of OREI structures to minimise risk to contacting vessels or craft	✓	Embedded mitigation measures are outlined in Section 9.3.
xiv. Any other measures and procedures considered appropriate in consultation with other stakeholders.	✓	Embedded mitigation measures are outlined in Section 9.3.

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

ANNEX C. CONSULTATION MEETING MINUTES

C1.1 MCA – 14 January 2025

AYRE AND BOWDUN OFFSHORE WIND FARMS

Project Title	Ayre and Bowdun Offshore Wind Farms
Project Number	22-NASH-0285
Meeting subject / purpose	Vessel Traffic Survey Requirements MCA
Revision	R01-00
Date of meeting	14-Jan-2025
Start time	1430 GMT
Finish time	1500 GMT
Client	TWP
Location	MS Teams (remote)

DOCUMENT CONTROL

Revision	Date of Issue	Description	Approved
R01-00	14-Jan-2025	Issued to attendees for comment	BBP

ATTENDEES

Organisation	Role	Initial
NASH Maritime	Principal Consultant Maritime Consultant	BP HT
MCA	Offshore Renewables Lead Offshore Renewables Project Lead	NS VJ
TWP	Offshore Consents Manager (Ayre) Assistant Consents Manager (Ayre) Offshore Consents Manager (Bowdun)	RMa EM RMc
RPS	EIA Lead	AR

AGENDA

1. Ayre Vessel Traffic Surveys Overview
2. Requirements for Ayre Vessel Traffic Surveys
3. Bowdun Vessel Traffic Surveys Overview
4. Requirements for Bowdun Vessel Traffic Surveys

NOTES OF MEETING

1	Introductions	Action
1.1	Introductions and an outline of the agenda were given.	
2	**Ayre Offshore Wind Farm**	
2.1	The current EIA application submission date for Ayre is Q4 2025 (~December). Vessel traffic surveys were undertaken in summer (15-29 Jul 2023) and winter (6-21 Dec 2023). Vessel traffic survey findings showed that very little non-AIS traffic was observed, with only 2 non-AIS vessels in winter and none in summer. No recreational or cruise vessels were recorded in winter.	
2.2	Based on the current schedule, surveys undertaken, and the 24 month validity period set out in MGN 654: • Summer survey will be ~5 months outside of the MGN 654 validity period. • Winter survey will be ~0 months outside of the MGN 654 validity period.	
2.3	VJ said that there are 12 months of AIS from September 2023 - August 2024. He noted the MCA have been asked before at examination why the MCA have granted extensions beyond MGN 654 validity. Therefore they would need to have good reasoning to justify extensions of validity. NS responded that the MCA wouldn't accept five months out of date and therefore would ask for additional top-up survey data. Five months was too long and that the MCA haven't got a formalised decision making for any grace periods. This is not a process and is at the MCA's discretion. BP noted that there were no non-AIS vessels within the summer survey, and queried whether a more recent AIS data top up would suffice. NS noted that it was not unexpected that there were no non-AIS, but doesn't think that that is justification enough for not requiring a survey. NS added that if TWP weren't to meet the December 2025 submission target, the current summer survey data will be more than 30 months old with no time for additional data collection. He noted that collecting top-up survey data would also make it less likely for questioning around data during examination. NS asked if the submission was able to be brought forward at all. RMa said that he wouldn't think it's possible to bring it forward based on deliverables and the current schedule. It was agreed that an additional top-up summer vessel traffic survey would be required for the Ayre Offshore Wind Farm to ensure data remained valid.	
3	**Bowdun Offshore Wind Farm**	
3.1	The current EIA application submission date for Bowdun is Q2 2026 (~April). The 12 month AIS period is still to be determined and input from the MCA is welcomed as to whether the selection of this data period could support a grace period for survey validity. Vessel traffic surveys were undertaken in summer (30 Jun - 14 Jul 2023) and winter (5-19 Jan 2024). Vessel traffic survey findings showed that very little non-AIS traffic was observed, with only 7 non-AIS vessels in summer and none in winter.	
3.2	Based on the current schedule, surveys undertaken, and the 24 month validity period set out in MGN 654: • Summer survey will be ~9-10 months outside of the MGN 654 validity period.	

	• Winter survey will be ~3-4 months outside of the MGN 654 validity period.	
3.3	NS said that a new summer top-up survey will need to be undertaken as the existing survey data will be almost a year out of date at submission. He said the MCA could potentially be more flexible about the winter survey, dependent on the AIS data (and findings of its analysis). In general a later 12-month AIS data period would be desirable to assist data sources being as up to date as possible. AR asked if about the validity of doing another survey when we know things are going to change anyway with future wind farms and vessel routeing. NS responded that the point in having up to date data is to capture these changes as well as others changes that may have occurred. AR reiterated that the wind farms aren't there yet and won't be present for the top-up surveys. VJ added that the MCA understand surveys are inconvenient and expensive, but highlighted the importance of data and for this to be in line with MGN 654 as close as possible to avoid unwanted comments at examination. It was agreed that an additional top-up summer vessel traffic survey would be required for the Bowdun Offshore Wind Farm to ensure data remained valid. The out of date winter survey may be justifiable depending on AIS data; however it was understood that an additional top-up winter survey in validity in line with MGN 654 guidance would still be preferred.	

MEETING ACTIONS

Number	Owner	Action	Status

C1.2 NLB and UKCoS – 07 August 2025

BOWDUN OFFSHORE WIND FARM

Project Title	Bowdun Offshore Wind Farm
Project Number	NASH-0285
Meeting subject / purpose	Joint NLB & UKCoS NRA Consultation
Revision	R02-00
Date of meeting	07-Aug-2025
Start time	15:00 GMT
Finish time	16:10 GMT
Client	Thistle Wind Partners
Location	Online: Teams

DOCUMENT CONTROL

Revision	Date of Issue	Description	Approved
R01-00	16/09/2025	Issued to attendees for comment	BP
R02-00	02/10/2025	Final Issue to attendees	DP

ATTENDEES

Organisation	Role	Initial
NASH Maritime	Principal Consultant Senior Consultant Maritime Consultant	BP HT DP
Thistle Wind Partners (TWP)	Consents manager Assistant consents manager	RhM RaM
TetraTech RPS Energy (RPS)	Senior Consultant and EIA coordinator	CR
Northern Lighthouse Board (NLB)	Coastal Inspector Navigational Officer	AL GB
UK Chamber of Shipping (UKCoS)	Policy Manager	RoM

AGENDA

1. Introductions
2. Description of Project
3. Review of Data Gathering
4. Review of Vessel Activity

5. NRA Methodology
6. Review of Hazards
7. HAZID workshop

NOTES OF MEETING

1	Introduction	Action
1.1	The meeting began with introductions and an agenda outline. A project overview of the Bowdun Offshore Wind Farm (OWF) was presented, noting that base ports for construction; and operation and maintenance (O&M) are still to be confirmed.	
2	**Description of Project**	
2.1	There are a range of capacity options for wind turbine generators (WTGs) as well as foundations being monopile or jackets. There are up to three fixed Offshore Substation Platforms also on jacket foundations with a footprint up to L: 100m x B: 80 m x H: 60 +10 m. Key WTG capacity parameters were explained at a minimum and maximum WTG size options. RoM asked whether the minimum clearance above sea level was above Highest Astronomical Tide (HAT) and wanting to make sure we are seeing standardisation across projects. [Post-meeting updated: confirmed air gap is referenced to HAT] AL highlighted that IALA has released a new publication IALA 1185 which supports safe and efficient navigation around offshore renewable energy sites, which targets navigation rather than lighting and marking. NASH confirmed this and will include in reference materials. GB queried the additional 10 m + on the OSP and raised concerns that there could be three OSPs then asked where these may be positioned in the array area. BP highlighted that the 10m + on top was communications and lightning mast. BP also advised the number of OSPs and site selection has not yet been determined. Export cables are targeted to be buried to a depth of 1.5m and the use of cable protection where burial is unavailable. Landfall is to be 65m from shoreline using horizontal directional drilling or pipe jacking tunnel.	1
2.2	The indicative layout options have been discussed between developer and the MCA and NLB in the early stages of planning showing the min and max WTGs [post-meeting note: these are not agreed / approved layouts by the MCA]. BP pointed out that there are spare locations within the shown layout options which means some of these dots will not be used for WTGs or OSPs. GB expressed concerns over WTG not being designated yet and that if any of the spare sites are located on the perimeter then this should be highlighted as early as possible. AL also highlighted the need for consistent spacing between lighting and marking on the perimeters in reference to the possibility of having spare options on the perimeter. Upon review, RoM agreed that consistent spacing of turbines along the perimeters is ideal. RoM also noted that while the likelihood of allision may be similar between Offshore Substations (OSPs) and Wind Turbine Generators (WTGs), the consequence of an allision involving an OSP would be greater due to the potential for more serious damage. Therefore, OSPs should be considered as having a higher allision risk profile, not due to increased likelihood but due to the greater impact of an allision event. RoM raised awareness of the 'Lines of Orientation' suggesting he could see two lines but not always able to see two. He asked whether the project is committing to	2

	two lines of orientation or whether the project is putting forward a potential safety case for a single line of orientation. He stated that internally the grid is visible however when it comes to the boundaries these become more unclear. RhM and RaM replied stating they will get back to stakeholders for confirmation. RoM also queried if there was a reason for the exclusion of the triangular area on the western boundary edge? Stating that consistent shapes are more helpful for surface navigation and safety. RhM assured that this is the leasing area that was designated and that she was not sure what the specific reasons were.
3	**Review of Data Gathering**
3.1	Summary of data collected for the project were given by BP. RoM asked a question regarding what data is used for the wider routing studies, when high fidelity AIS data is used for the array area. BP stated that vessel traffic data used to inform on commercial routing outside of the study area is the latest EMODNet data. When looking at the wider routes and impacts to potential routes in the area they are addressed by considering EMODNet data in addition to localised AIS data and surveys for within he study area. BP also noted that the 90th percentile route assessment and the quantitative modelling of allisions and collisions uses the high-fidelity AIS data. Regarding cumulative impacts, BP also highlighted that TWP developers are part of Eastern Developers Group (EDG), alongside Ossian OWF and Morven OWF, assessing a wider cumulative assessment for shipping and navigation in the area.
3.2	BP presents the navigational features and other activities within the local area. No comments were made.
4	**Review of Vessel Activity**
4.1	BP ran through the vessel traffic surveys, explaining additional top up surveys from for both winter and summer have/will be undertaken. BP noted that there were comparatively similar numbers of vessels between the surveys. BP then discussed the AIS data derived vessel traffic analysis, going into more detail of specific vessels in additional slides. RoM asked what time period of data was represented by the AIS data? BP advised it was 12 months data. RoM also pointed out erratic ferry tracks from NorthLink Ferries – he suggests following up and reaching out to NorthLink about what was going on? BP advised that NASH had issued a letter to NorthLink as well to advise on any specific feedback. [Post-meeting update: follow up email was sent asking specifically about these tracks].
4.2	BP summarised the collision and allision likelihood modelling. RoM highlights the inner row having a high rate of allision on the northern structures. BP explained that this is part of IALA's IWRAP modelling software which also accounts for vessel loss of power, steering failure, and human error probabilities for vessels directly out of the Port of Aberdeen being the likely reasoning behind this.
4.3	RoM then asks if the modelling also considers other projects proposed or under construction in the local vicinity? BP explained that the turbine modelling included only Bowdun OWF (note: no other wind farms are within the Study Area). The modelling considered a future case of increase traffic, but that focus of the quantitative modelling was Bowdun in-isolation so did not include traffic re-routing caused by unconsented OWFs such as Morven or Ossian. Regarding the Eastern Developers Groups, RaM explained that TWP are waiting to see what is said in next meeting (which takes place every 6 months). To date, the Eastern Developers Group have done the baseline works, so they are now looking at what the next steps of group will be. RoM agreed in isolation accepting the probabilistic method taken for the Bowdun project and its outlook but stated this would all change when looking at a wider cumulative basis. He stated that the cumulative modelling for a

	wider assessment would be welcomed and recommended by the UKCoS. BP noted that that the cumulative impact of shipping and navigation will be qualitatively discussed in the EIA chapter, but detailed modelling of the cumulative scenario was not part of the Bowdun OWF NRA.	
4.4	RoM noted that the windfarms consented within the last year would not be represented by data, stating that these could now have with a high certainty an effect on the shipping and navigation. BP acknowledged RoM's comment and advised that the possible impact that newly consented windfarms may have on existing traffic will be discussed in the NRA report.	
5.0	**NRA Methodology**	
5.1	BP explained the approach to the NRA, the embedded risk controls. BP queried whether there were any additions to the risk controls that any of the stakeholders have expected to see and no responses were received.	
5.2	AL noted that there should be a Monitoring Programme for Aids to Navigation (AtoN). He noted this was something the NLB were regularly requesting to ensure the OWF would be aware if any AtoN were to fail and be able to respond quickly.	3
6.0	**Review of Hazards**	
6.1	BP gave an overview of the risks and the preliminary scoring.	
6.2	RoM commented that the risk scoring looked broadly as expected, and recognising the location of the development and what is going on around it, did not immediately see anything that looked unacceptable. He noted however, that there may need additional mitigations in full HAZID phase but at this point in consultation had no further questions.	

6.3	GB reiterated the NLB's position that:
	• Preparedness for Maritime Incidents is essential, especially within offshore wind farm arrays.
	• Projects should proactively consider incident response during both the operational and maintenance phases of wind farms.
	• Asset Protection is a priority but if a vessel sinks within array there are critical considerations:
	  ○ Wreck management within the array.
	  ○ Information distribution following an incident.
	  ○ Environmental consequences, such as pollution.
	• Policies and Procedures must be in place to handle incidents effectively.
	• Exercises and Drills should be conducted to ensure readiness for worst-case scenarios.
	• GB emphasizes that when things go wrong, they can go drastically wrong, so awareness and preparation are vital.
		4

7.0	**HAZID workshop awareness**	
7.1	RoM expressed general comfort with the hazard / risk assessment outcomes. He suggested a brief follow-up following the HAZID or reviewing the HAZID minutes. Adam queried Eastern Greenlink 2 (EGL2) subsea cable which intersects with the Bowdun site. He highlighted the risk of possible simultaneous operations in the area if construction schedules aligned, which could lead to allision or collision during cable deployment. RaM confirmed that a portion of the EG2 cable does run through the Bowdun area. She noted that timings and coordination between the two developers are being actively discussed and communicated. EGL2 is currently ahead of the Bowdun OWF timeline.	5

MEETING ACTIONS

Number	Owner	Action	Status
1	NASH	Confirm that minimum clearance above sea is above HAT	Complete
2	TWP	To provide feedback on the lines of orientation of the project.	Open
3	TWP	Ensure inclusion of AtoN monitoring system within the AtoN Manamgent Plan.	Open
4	TWP	Ensure inclusion of points raised by NLB on responding to maritime incidents is considered within the Emergency Response and Cooperation Plan (ERCoP)	Open
5	NASH/TWP	Offer UKCoS follow-up meeting or review of slides after HAZID workshop has been undertaken and minutes have been prepared.	Open

C1.3 Kincardine OWF – 26 August 2025

BOWDUN OFFSHORE WIND FARM

Project Title	Bowdun Offshore Wind Farm
Project Number	NASH-0285
Meeting subject / purpose	Consultation Meeting Kincardine
Revision	R02-00
Date of meeting	27-Aug-2025
Start time	13:00 GMT
Finish time	14:00 GMT
Client	Thistle Wind Partners
Location	Online: Teams

DOCUMENT CONTROL

Revision	Date of Issue	Description	Approved
R01-00	16/09/2025	Issued to attendees for comment	HT
R02-00	02/10/2025	Final issue to attendees	DP

ATTENDEES

Organisation	Role	Initial
NASH Maritime	Principal Consultant Senior Consultant Maritime Consultant	BP HT DP
Thistle Wind Partners (TWP)	Offshore Consent manager Assistant Consent Manager – Bowdun Project	RhM RaM
TetraTech RPS Energy	EIA Shipping and Navigation Lead Senior Consultant	AR CW
Kincardine Offshore Wind Farm (Kincardine)	OWF environmental clerk of works; HSC manager for developer and principle client	CF
Blackhall and Powis	Fisheries Liaison Officer (FLO) for Kincardine OWF	MS

AGENDA

1. Introduction
2. Description of Project
3. Review of Data Gathering
4. Review of Vessel Activity

5. Hazard Scoring Methodology
6. Review of Hazards
7. HAZID Workshop Summary
8. Close

NOTES OF MEETING

1.0	Introduction	Action
1.1	The meeting began with introductions and a review of the agenda. BP outlined the primary objectives: to ensure all potential impacts identified, discuss the hazards, review risk control options, and discuss requirements for additional mitigation and discuss any potential concerns related to the Project.	
2.0	**Description of Project**	
2.1	A project overview of the Bowdun Offshore Wind Farm (OWF) was presented, noting that base ports for construction and; operation and maintenance (O&M) are still to be confirmed. There are a range of capacity options for wind turbine generators (WTGs) as well as foundations being monopile or jackets. There are up to three fixed Offshore Substation Platforms (OSPs) also on jacket foundations. Key WTG capacity parameters were explained at a minimum and maximum WTG size options.	
2.2	Export cables target burial depth of 1.5 m and the use of cable protection where burial is unavailable. Landfall is intended to be made by horizontal directional drilling or pipe jacking tunnel.	
2.3	The indicative layout options had been discussed between TWP and the Maritime and Coastguard Agency (MCA) and Northern Lighthouse Board (NLB) in the early stages of planning showing the minimum and maximum WTGs; however, it was noted that the layouts shown were not agreed / approved layouts by the MCA and layout agreement or refinements would be subject to consultation with them post-consent. BP pointed out that there are spare locations within the layout options shown. BP also noted that after consultation with NLB and the UK Chamber of Shipping (UKCoS), that there was a preference not to have spare locations on the perimeter and to have consistent spacing around the perimeter.	
3.0	**Review of Data Gathering**	
3.1	Summary of data collected for the project were given by BP.	
3.2	BP presented the navigational features and any other activities within the local area. No comments were made.	
4.0	**Review of Vessel Activity**	
4.1	BP described the summer and winter vessel traffic surveys undertaken for data gathering, explaining additional top up surveys for both winter and summer have/will be undertaken. BP noted that there were comparatively similar numbers of vessels between the surveys. However, in the top up survey there was increased recreational vessels due to the tall boats race arriving and departing Aberdeen. BP then discussed the into more detail of specific vessels in additional slides.	
4.2	BP summarised the collision and allision likelihood modelling undertaken.	

5.0	**NRA Methodology**	
5.1	BP explained the approach to the NRA, the embedded risk controls and explained hazard identification. BP queried whether there were any additions to the risk controls that any of the stakeholders had expected to see. No responses received.	
5.2	BP gave a risk scoring summary overview.	
6.0	**Review of Hazards**	
6.1	BP explained the hazards would be evaluated in descending order of their overall risk score. Noting that all medium risk hazards identified had a score in the low end of the medium risk score range. BP notes that these hazards were talked through during the HAZID workshop with stakeholders.	
6.2	BP noted the two changes from the HAZID workshop: • ID 1; collision of a Large Commercial vessel with another Large commercial vessel, increasing property to a 4 from 3. • ID 19; Allision with a fishing vessel frequency from a 3 to a 4, relating to the regularity of occurrences seen from incident reports of fishing vessel allisions and the anticipated under-reporting of minor incidents. BP highlighted the additional comments made by RYA Scotland and Fisheries representatives, who emphasised hazard ID's 38 and 39 related to 'breakout of buoys' and the concern over the risk to recreational and fishing vessels. Following the discussion and summary, BP welcomed any questions or comments. CF and MS replied that they agreed with the proposed scorings.	
6.3	BP asked CF and MS about their understanding of how frequently allisions with buoys and buoy breakouts occurs, relating to the Kincardine OWF or others they were aware of. MS replied stating that fishing boats do allide with buoys and added to his surprise that there has been very few if not no incidents within the Kincardine OWF. He added that sometimes buoys have been lost but fishers have also been helpful in the recovery of lost buoys.	
6.4	MS noted that known fishing areas can be fished intensely, with nomadic scallop trawlers fishing in packs as they travel around the UK, he then added that any cables would need to be buried to specifications to avoid incidents. He then added that the main fishing in the area is small creel fishing and noted the smaller vessels will not always have AIS, especially in the inshore fleet. MS noted the relationship synergies between Kincardine and Bowdun in relation to the fishing industry, noting a key difference that Kincardine is a floating OWF and Bowdun is fixed foundation.	
6.5	MS commented on the maintenance towage between the Kincardine Array Area and the Netherlands (the route passing near to Bowdun). He noted the need to have a specific towage route identified and communicated between the two projects. BP noted this was a specific concern within the HAZID and requested information regarding the Kincardine towage routes. MS agreed to sending the towage routes. **ACTION: MS to provide information regarding the current Kincardine WTG towage routes.** BP asked how frequently this towage occurs. MS replied stating that this was infrequent, noting that there should not be any need for towage unless major works are required. He added that there was only one occurrence within the last year.	1

	CF added that the frequency is not known in advance as it is on an as-needed basis.	
7.0	**HAZID Workshop Summary**	
7.1	BP gave a summary of the HAZID workshop and its general discussion points. He noted that there were no additional mitigation measures identified. MS asked whether the risks assessed cover the entirety of the project. BP replied stating that the risk assessment covers the entire lifetime of the project and indicated the column within the risk assessment that addresses which stage in particular the risk applies to (C = Construction, O = Operation and maintenance, D = Decommissioning) and that the worst phase was considered when scoring.	
7.2	BP also noted the suggestion from the NLB regarding the need for a remote monitoring capability to identify any Aid to Navigation (AtoN) outages and to respond to these promptly. CF agreed, noting that she had had similar conversations with stakeholders which highlighted the need and prospects of monitoring outages electronically. She suggested this could be something the Bowdun project considers. **[post meeting note: an AtoN Management Plan will be developed for the Bowdun Offshore Wind Farm, which will include details on AtoN availability and monitoring, as well as procedures to be followed in the event of an outage.]**	
7.3	BP noted the concerns of the UKCoS and the NLB regarding spare locations within the Bowdun Array Area, noting that stakeholders were keen to see a consistent perimeter with no gaps. BP also noted that the layout is not final and subject to variation following feedback prior to post-consent approval by the MCA.	
7.4	BP noted that the future-case scenario is a stakeholder wide concern regarding cumulative navigational risk, highlighting the number of projects either consented or in planning stages that have the potential to be developed in the area. BP added the general consensus was that it is difficult to define exactly how the future-case will look, noting that this work was more encompassing than any individual project. BP added that stakeholders also commented that the cumulative scenario was at a national strategic level and that it should be addressed at a national level considering all potential developments. BP noted that there have been some steps taken via the formation of the Eastern Developers Group [post meeting update: six developers including Bellrock, Bowdun, CampionWind, Morven, Muir Mhòr, and Ossian] to address the cumulative impact scenario with their projects. MS noted that this was a noticeable concern and they are aware of it. MS added that there is a number of potential developments which could cause a lot of displacement and changing fishing patterns due to windfarms. He noted that changing of fishing patterns have already been seen at Kincardine, with fishing vessels arriving due to displacement from other areas. He noted the existence of the Forth and Tay Commercial Fisheries Working Groups (CFWGs) (based in Aberdeen) that is looking to consider the cumulative impact too, including their cables.	
8.0	**Close**	
8.1	BP gave thanks for attendees and their feedback. CF added that communication with Kincardine, fisheries and other stakeholders during construction and operation phase of Bowdun would be paramount, highlighting the importance of good relationships with coast guard and emergency services. MS added the need to maintain and continue building relationships through communication and regular updates with fisheries, an example being what Kincardine use now.	

MS also asked for a copy of the slides to disseminate to stakeholders. **ACTION: NASH to provide a copy of the presentation slides.**	2

MEETING ACTIONS

Number	Owner	Action	Status
1	MS	MS to provide information regarding the current Kincardine WTG towage routes.	Open
2	NASH	NASH to provide a copy of the presentation slides.	Open

C1.4 Hazard Workshop – 19 August 2025

BOWDUN OFFSHORE WIND FARM

Project Title	Bowdun Offshore Wind Farm
Project Number	NASH-0285
Meeting subject / purpose	HAZID Workshop
Revision	R02-00
Date of meeting	19-Aug-2025
Start time	09:00 GMT
Finish time	12:30 GMT
Client	Thistle Wind Partners
Location	Online: Teams

DOCUMENT CONTROL

Revision	Date of Issue	Description	Approved
R01-00	16/09/2025	Issued to attendees for comment	HT
R02-00	02/10/2025	Final Issue	DP

ATTENDEES

Organisation	Role	Initial
NASH Maritime	Principal Consultant Senior Consultant Maritime Consultant	BP HT DP
Thistle Wind Partners (TWP)	Offshore Consent Manager Assistant Consent Manager – Bowdun Project	RhM RaM
RYA Scotland	Planning and Environment Officer	GR
TetraTech RPS Energy (RPS)	EIA Shipping and Navigation Lead	AR
Northern Lighthouse Board (NLB)	Navigational Officer	GB
MCA	Offshore Renewables Lead Offshore Renewables Lead	NS VJ
Scottish Fishermen's Federation (SFF)	Representative	AI
Scottish White Fish Producers Association (SWFPA)	Representative	RH
Ossian Wind Farm	Offshore Consent Manager – Ossian Project	FM
SWFPA	Fisheries Policy Officer	KL

Morven Offshore Windfarm Project	Offshore Consent Lead	AH

APOLOGIES

Organisation	Attendee	Role	Initial
NLB	Adam Lewis Peter Douglas	Coastal Inspector Navigation Manager	AL PD
UK Chamber of Shipping (UK CoS)	Robert Merrylees	Policy Manager	RM
North & East Coast Regional Inshore Fisheries Group (NECRIFG)	Jenny Mouat	Region Chair	JM
Port of Aberdeen	Benji Morrison	Harbour Master	BM

AGENDA

1. Introduction
2. Description of Project
3. Review of Data Gathering
4. Review of Vessel Activity
5. Hazard Scoring Methodology
6. Review of Hazards
7. Close

NOTES OF MEETING

1.0	Introduction	Action
1.1	The meeting began with introductions and a review of the agenda. BP outlined the primary objectives: to identify all potential impacts, define the associated hazards, assess the key risks, and reach a collective agreement on those risks. The discussion focused on establishing a shared understanding of the risk landscape and aligning on mitigation strategies to support informed decision-making going forward. BP gave thanks to all previous input before and leading up to the HAZID Workshop.	
1.2	GR introduced himself from RYA Scotland and noted he was also representing the interests of the Cruising Association.	
	AI introduced himself from SFF and noted the SFF comprised of eight constituent Scottish fisheries associations within its membership.	

1.3	RH introduced himself from SWFPA and noted he was also representing the interests of the Mallaig and North - West Fishermen's Association (MNWFA).
2.0	**Description of Project**
2.1	A project overview of the Bowdun Offshore Wind Farm (OWF) was presented, noting that base ports for construction and operation and maintenance (O&M) are still to be confirmed. There are a range of capacity options for wind turbine generators (WTGs) as well as foundations being monopile or jackets. There are up to three fixed Offshore Substation Platforms also on jacket foundations. Key WTG capacity parameters were explained at a minimum and maximum WTG size options. Export cables are targeted to be buried to a depth of 1.5 m and the use of cable protection where burial is unavailable. Landfall is to be 65 m from shoreline using horizontal directional drilling or pipe jacking tunnel.
2.2	The indicative layout options used in the NRA. BP pointed out that there are spare locations within the shown layout options which means some of the dots won't be used for WTGs or OSPs. BP also noted that after consultation with NLB and the UK Chamber of Shipping, that there was a preference not to have spare locations on the perimeter and to have consistent spacing around the perimeter.
2.3	AI raised a question regarding why the fishing industry was not consulted on the Array Area layouts earlier. BP explained that, during the early stages, there are specific requirements for search and rescue coordination with stakeholders such as the MCA to develop a preliminary layout. BP emphasised the importance of early engagement for rescue operations. Additionally, BP noted that there are post-consent obligations to finalise the layout, including agreements on elements such as the Lighting and Marking Plan. NS added that although the layouts have been discussed these are far from the final version and there will be further refinement of the layouts in the post consents stage. AR agreed with NS, adding that this is where the layouts are currently at, but they are far from the final product. She also added that feedback is welcomed on the layout. AI suggested streamlining the process by asking for input on turbine layouts at the start of the process with all interested stakeholders at one time in the future.
2.4	NS noted that the layouts used were not agreed or approved by the MCA and asked whether the project intends on adopting design commitments at the post-consent stage, such as a single- or double-line orientation. He noted that currently the design includes a packed boundary with an internal array and queried whether this configuration is being formally committed to. BP replied that there will be commitments in layout related to agreement / approval in consultation with the MCA to define requirements, e.g. lines of orientation and/or necessity for safety justification. BP also said that the design at present is the preferred maximum and minimum options of the developer and what has been used within the NRA. AR added that further geotechnical assessments need to be completed at this time to assess the viability of the seabed and that could change the array layout, therefore the layout design is indicative at this time. RhM agreed that there are still lots of surveys that need to take place first to fully inform the layout, as well as design reviews, survey feedback and consultation input to refine the layout. Noting that they are welcoming any feedback.

	GR noted that in the NRA layouts needed to represent the worst-case scenario, which also may not be of any resemblance to the final layouts used. He then asked if the layouts used in the NRA were worst case. BP confirmed that the layout considered in the NRA are the worst-case option, e.g. for allision risk the maximum number of WTGs were considered.
3.0	**Review of Data Gathering**
3.1	Summary of data collected for the project were given by BP.
3.2	BP presented the navigational features and any other activities within the local area. No comments were made.
4.0	**Review of Vessel Activity**
4.1	BP described the vessel traffic surveys, explaining additional top up surveys for both winter and summer have/will be undertaken. BP noted that there were comparatively similar numbers of vessels between the surveys. However, in the top up survey there was increased recreational vessels due to the tall boats race arriving and departing Aberdeen. BP then discussed the AIS data derived vessel traffic analysis, going into more detail of specific vessels in additional slides.
4.2	GR agreed with the recreational vessel traffic, stating the data is as expected. He also noted the need to know what had been scoped out of the base case scenario to gain an understanding of where vessel displacement may be put.
4.3	BP summarised the collision likelihood modelling. NS asked whether the future case likelihood modelling takes into account the cumulative effect of other offshore wind farms. BP stated that the likelihood modelling used in the NRA was undertaken to assess the Bowdun project in isolation. But added there is ongoing collaboration work with the Easten Developers Group between Bowdun, Ossian, Morvan and other windfarms to consider the development of their OWFs that are in planning or pre-planning stage. RhM added that futurecase modelling that is being discussed at the working group and if there are any updates these can be passed on as they find out. VJ noted that there is a commitment for a 'tiered system of appraisal' used for the cumulative effect assessment, and a questioned as to where this assessment will be addressed. BP replied, noting that the Environmental Impact Assessment (EIA) approach to the cumulative effects assessment (CEA) of environmental impacts. This qualitatively considers the impacts of the project and when included alongside other projects ranked in tiers based on their level of confidence (e.g. Bowdun + Tier 1 projects; then tier 1 + tier 2 projects; then tier 1 + tier 2 + tier 3 projects, etc.). BP added that the CEA is a fundamental part of the EIA process and will also be done for the shipping and navigation chapter. However, specifically relating to quantitative modelling and the scoring of risk, the NRA had considered the Bowdun in Isolation scenario. NS adds that routing in a cumulative picture would be extremely useful, noting all local windfarms in the vicinity.
4.4	BP explained the allision likelihood modelling. NS highlights the previous point for route changes, noting the north-south route east of Bowdun, noting that the introduction of Morven to the west of Bowdun will affect the allision modelling. BP acknowledged this point. He noted again that the quantitative allision modelling was undertaken to assess the project in isolation. But noted this information was

	intended to be drawn out within the qualitative conversations within the EIA Shipping and Navigation chapter's CEA of impacts.	
5.0	**NRA Methodology**	
5.1	BP explained the approach to the NRA, the embedded risk controls and explained hazard identification. BP queried whether there were any additions to the risk controls that any of the stakeholders had expected to see. No responses were received.	
5.2	GB described that a mitigation strategy, from an Aids to Navigation (AtoN) perspective, is that an AtoN monitoring and Supervisory Control and Data Acquisition (SCADA) programme should be implemented throughout the Operational phase to identify and act upon any outages. In addition, the Marine Control Centre (MCC) and technicians should be suitably trained to deal with AtoNs and not just WTGs. GB also added the possibility of an internal audit of this monitoring as well. Finally, as part of the Emergency Response and Cooperation Plan (ERCoP), the NLB aims to see wreck management, including emergency response planning for a wreck within the site, new or existing. AR gave thanks for the info. Noting the geophysical data is being analysed for wrecks right now at this stage.	
5.3	GR asked whether the breakout hazard type includes breakout of buoyage. BP confirmed that buoyage breakout has been included as one of the hazards. GB checked definition of buoyage, as any buoyage that may have instruments mounted onto something metal (i.e. AtoNs) or trailing rope', and should also include anything not marked on a navigation chart that could be a hazard in poor conditions. He commented that issuing notice to mariners would not be enough as from experience it can take up to 6 weeks to rectify problems. BP acknowledged this point and asked the NLB to provide insight into buoys and AtoN, if anything was to leave station unexpectedly. GB replied saying it is the responsibility of the owner of the asset, to notify and respond in a timely manner. Buoyage design should be fit for purpose i.e. construction phase buoyage moorings, length of time, etc. NLB will chase owners of assets but haven't the resources to do much more.	
5.4	BP gave a risk scoring walkthrough.	
6.0	**Review of Hazards**	
6.1	BP explained the hazards would be evaluated in descending order. BP advised the group that he would talk through each hazard in the "medium risk" rank and will ask if there are any comments or suggested changes to be made, but if no comments or suggestions were received, they would be considered appropriate and agreed.	
6.2	BP explained risk ID 2, Array Area (AA) - Collision: Large commercial vessel in collision with (ICW) a Tug and Service vessel. No comments.	
6.3	BP explained risk ID 3, AA - Collision: Large Commercial ICW Small Craft. GR explained he was happy with the scoring. No other comments.	
6.4	BP explained risk ID 21, AA - Allision: Small Project Vessel. No comments.	
6.5	BP explained risk ID 18, AA - Allision: Tug & Service No comments.	
6.6	BP explained risk ID 1, AA - Large Commercial ICW Large Commercial.	1

	NS noted that risk ID 10 had a property consequence scoring of 4 under realistic most likely scenario and that a large commercial vessel should be the same if not higher in terms of scoring. BP agreed and noted the scoring will be updated for this. **[Action: Property scoring increased from 3 to 4 under realistic most likely scenario]**	
6.7	BP explained risk ID 10, AA - Collision: Small Craft ICW Small Craft. No comments.	
6.8	BP explained risk ID 19, AA - Allision: Fishing and Recreational. GR added that guard vessels will presumably only be needed during the construction phase and not operational phase. Also adding that he was happy with the rest, adding that allision with a recreational vessel is very low frequency. BP confirmed that guard vessels are primarily for construction phase or if any significant maintenance is required throughout O&M phase. NS stated that there are increasing reports of allision with fishing vessels. Therefore, identifying the definition of a likelihood score 3 for a most likely scenario, offered that this could be increased to a 4. Adding an allision occurred just one week ago. BP asked whether the impacts are in line with the scoring for consequence, based on what has been reported. RH agreed and repeated GR, saying that for every incident reported there is one that isn't reported. Agrees that the scoring should be higher. BP agreed the scoring would be updated to reflect this change. **[Action: Frequency of occurrence from a 3 to a 4 under realistic most likely scenario]**	2
6.9	BP explained risk ID 20, AA - Allision: Large Project Vessel. No comments.	
6.10	BP explained risk ID 13, AA - Collision: Passenger Vessel ICW Passenger Vessel. No comments.	
6.11	BP explained risk ID 4, AA - Collision: Large Commercial ICW OWF Service Vessels. No comments.	
6.12	BP explained risk ID 5, AA - Collision: Large commercial ICW Passenger Vessel. No comments.	
6.13	BP explained risk ID 9, AA - Collision: Tug & Service ICW Passenger Vessel. No comments.	
6.14	BP explained risk ID 12, AA - Collision: Small Craft ICW Passenger Vessel. RH stated whether an accurate score can be made at present knowing that more vessels will be squeezed out of their areas into new areas when taking into consideration the cumulative effect from other offshore developments. BP noted that this NRA looks at Bowdun in isolation. However, did state that information regarding cumulative effects is being gathered as well and will be taken into consideration during the EIA chapter's CEA of impacts too. BP asked for thoughts on how fishing vessel activity may change in the future with the presence of Bowdun OWF. RH replied that some fishing methods won't be able to continue. Especially when taking into consideration stocks migrating north with climate change. Therefore, it is hard to predict.	

	AR followed up on previous comments, stating that there is a specific fisheries consultation planned in September to discuss commercial fisheries points related to Bowdun.	
6.15	BP explained risk ID 14, AA - Collision: Passenger Vessel ICW Project Vessel No comments.	
6.16	BP explained risk ID 6, AA - Collision: Tug & Service ICW Tug & Service. No comments.	
6.17	BP explained risk ID 7, AA - Collision: Tug & Service ICW Small Craft. No comments.	
6.18	BP explained risk ID 27, ECC - Collision: Large Commercial OR Passenger Vessel ICW Large Commercial OR Passenger Vessel. No comments.	
6.19	BP explained risk ID 28, ECC - Collision: Large Commercial OR Passenger Vessel ICW Tug & Service OR Small Craft. No comments.	
6.20	Following the scoring review, BP then sought stakeholder comments / feedback on the cumulative scenario with other projects. He again explained this would be used to inform the CEA as part of the shipping and navigation chapter of the ES BP also noted the attendance of Bowdun, Morven and Ossian developers at the workshop and encouraged any comments / feedback related to cumulative effects of projects and concerns could be taken away by these projects in supporting the Eastern Developers Group assessments. GR noted that Kincardine have maintained their devices in Rotterdam, therefore it would be good to know their intentions when they are manoeuvring their floating turbines, especially as the area has limited manoeuvrability, which would be quite a high concern to risk. Requests that they are explicit in how they will maintain operations and ask whether there will be any towage within the area. BP noted that Kincardine has received stakeholder letter as part of the stakeholder process and that consultation with them was ongoing. RH explained the difficulty to visualise the effects of all cumulative projects given the mix of fixed and floating OWFs, noting the size of OSP's, the size of turbines and the limited space between some of the projects. Stating that under adverse conditions this could be quite difficult for all mariners to navigate and that cumulatively quite a large amount of risk could be generated with the number of projects within a relatively small area and is a real concern. GB asked, in reference to all ongoing projects, what the cumulative timetable is looking like for all the projects and if there is any overlap with towage during Bowdun's construction, adding that if proper thought goes into considering these risks at an early time, then mitigation can be planned well ahead as a joint group. Especially over the next decade. AR highlighted that there have been no conversations as of yet regarding timelines. But acknowledged here the ability to take stakeholders concerns to the next meeting in September. AH noted the difficulty to align projects together due to final operations not being confirmed just yet, however there are indicative timelines but there is thought into addressing cumulative projects timelines. FM agreed with AH regarding project timelines and acknowledged that the planning is high level at his time. Also adding that the Eastern Developers Group is limited to the 6 developers, stating that there are a lot of wider developers not part of the group. There is no project level requirement to undertake modelling at a cumulative level, which is also likely out of the remit of each single project. Noting the question comes down to who should be doing this work?	

	GB agreed it is a national strategic issue that needs to be addressed at a national level. BP also noted that project risk assessments are a snapshot at one time and should be reconsidered when new information comes to light. Post-consent construction planning and coordination can be supported by the risk assessment undertaken within the project's NRA checked against updated information. GR noted it is almost impossible to do a true cumulative assessment but suggests doing the inverse by identifying how sensitive the risks are to change i.e. if traffic was to double would the risk matrix scoring still come in under tolerable (if ALARP).
6.21	AH added that there is a consultation on the updated Sectoral Marine Plan closing soon, encouraging feedback of concerns raised here as it is a good opportunity to share views.
7.0	**Close**
7.1	BP gives thanks to all for inputting into the consultation. Addressing minutes to follow.

MEETING ACTIONS

Number	Owner	Action	Status
1	NASH	Under risk ID 1, AA - Large Commercial ICW Large Commercial. Property scoring increased from 3 to 4 under realistic most likely scenario.	Closed
2	NASH	Under risk ID 19, AA - Allision: Fishing and Recreational. Frequency of occurrence from a 3 to a 4 under realistic most likely scenario.	Closed