Partners in UK offshore wind

MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 2, chapter 12: Shipping and Navigation

Image of an offshore wind farm

April 2023
FINAL

Document status

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Tables

Figures

Glossary

Term	Meaning
Adverse Weather	Severe weather that creates potentially unsafe conditions for vessel transits.
Aid to Navigation	Any sort of signal or marker to support vessel navigation including buoys, beacons or lights.
Air Draught	The distance from the surface of the water to the highest point of the vessel.
Allision/Contact	Vessel makes contact with a fixed or floating object such as wind turbine.
Anchorage	A designated area where ships lower their anchors to remain in position.
As Low As Reasonably Practical	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	An automatic tracking system carried by ships that broadcasts their position and identity to other nearby vessels.
Beam	Side or width of a vessel.
Berth	The specific location within a port or harbour where a vessel is moored, usually for the purposes of loading or unloading.
Bridge	The principal control centre from a vessel where it is navigated.
Cardinal Mark	A sea mark used in maritime pilotage to indicate the position of a hazard and the direction of safe water.
Cargo Shift	The dangerous movement of goods aboard a vessel, typically resulting in damage.
Chart Datum	The water level surface shown on nautical charts, approximately the lowest level due to astronomical effects.
Closest Point of Approach	The estimated point and distance at which two vessels or objects will reach their minimum value.
Collision	Coming together of two vessels underway.
Draught	The maximum depth of any part of a vessel.
Fog	Where visibility is less than 1,000 metres.
Gale	Winds in excess of 34 knots.
Grounding	Vessel makes contact with the seabed/shoreline or underwater assets.
Gust	A brief increase in wind speed.
Hydrography	The science and measurement of the physical features of the seabed.
Lee	The area of water downwind of an obstacle, such as a landmass.
Mona and Morgan corridor	The area of sea between the Morgan Array Area and Mona Array Area
Master	The designated person in charge of a ship, its crew, passengers and cargo.
Nautical Charts	A graphic representation of a sea area and adjacent coastal regions.
Overcarried	The act of a pilot not disembarking at a port's pilot station and staying onboard the vessel until another destination.
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.
Pilot	Professional seafarers with detailed knowledge of a port and expertise in ship manoeuvring.
Port	The left side of a vessel.
Port or Harbour	A maritime facility compromising of one or more wharves or loading areas where ships load and discharge cargo or passengers.
Roll on Roll off	Ships designed to carry wheeled cargo such as cars or trucks.
Routeing	The path taken by a vessel.
Significant Wave Height	The average wave height from trough to crest of the highest one-third of waves.
Snagging	Fishing Gear or anchors coming fast on subsurface infrastructure such as cables.
Starboard	The right side of a vessel.
Stern	The rear of a vessel.
Tonnage	The weight in tons of cargo or freight.
Traffic Separation Scheme	A routeing measures aimed at the separation of opposing streams or traffic by appropriate means and by the establishment of traffic lanes.
Turnaround	The process and activities necessary between the arrival of a vessel in port and its departure, including unloading and loading of passengers or cargo.
Under Keel Clearance	The vertical distance between the bottom of a ship and the seabed.
Vessel Monitoring System	Satellite tracking system using a device on vessel which transmits the location, speed and course of the vessel.
Vessel Traffic Services	A marine traffic monitoring system established by port authorities to manage vessel movements and safety.

Acronyms

Acronym	Description
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
AtoN	Aid to Navigation
BEIS	Department for Business, Energy and Industrial Strategy
BWEA	British Wind Energy Association

Acronym	Description
CEA	Cumulative Effects Assessment
CPA	Closest Point of Approach
CTV	Crew Transfer Vessel
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DfT	Department for Transport
EIA	Environmental Impact Assessment
ERCOP	Emergency Response and Cooperation Plan
FSA	Formal Safety Assessment
HMCG	His Majesty's Coastguard
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IHO	International Hydrographic Organisation
IMO	International Maritime Organization
IWRAP	IALA Waterway Risk Assessment Program
LAT	Lowest Astronomical Tide
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MNEF	Marine Navigation Engagement Forum
NFFO	National Federation of Fishermen's Organisation
nm	Nautical Miles
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NSIPs	Nationally Significant Infrastructure Projects
OREI	Offshore Renewable Energy Installations
OSP	Offshore Substation Platforms
PEIR	Preliminary Environmental Information Report
PIANC	The World Association for Waterborne Transport Infrastructure
PPE	Personal Protective Equipment
REZ	Renewable Energy Zone
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
SIRA	Simplified IALA Risk Assessment Method
SOLAS	Safety of Life at Sea
TSS	Traffic Separation Scheme
UKHO	UK Hydrographic Office
UNCLOS	UN Convention on the Law of the Sea
VHF	Very High Frequency
VMS	Vessel Monitoring System
VTS	Vessel Traffic Services

Units

Unit	Description
%	Percentage
£	Pound sterling
Hs	Significant wave height
km^2	Square kilometres
Knot	Nautical miles per hour
m	Metres
m/s	Metres per Second
MW	MegaWatts
nm	Nautical miles (1,852 meters)

12 Chapter 12 – Shipping and Navigation

12.1 Introduction

12.1.1 Overview

12.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the assessment of the potential impact of the Mona Offshore Wind Project on shipping and navigation. Specifically, this chapter considers the potential impact of the Mona Offshore Wind Project seaward of Mean High Water Springs (MHWS) during the construction, operations and maintenance, and decommissioning phases.

12.1.1.2 This chapter also draws upon information contained within volume 6, annex 12.1: Navigational Risk Assessment (NRA). The NRA has been produced for the Mona Offshore Wind Project in accordance with Maritime and Coastguard Agency (MCA) requirements under the relevant guidance.

12.1.1.3 A Cumulative Regional Navigational Risk Assessment (CRNRA) was undertaken collaboratively between the developers of the Mona, Morgan and Morecambe Offshore Wind Projects (volume 6, annex 12.1) and is used to inform the cumulative effects assessment.

12.1.1.4 The assessment presented is also informed by the following chapters:

- Volume 2, chapter 11: Commercial fisheries
- Volume 2, chapter 14: Other sea users
- Volume 5, chapter 26: Aviation and Radar.

12.1.2 Purpose of chapter

12.1.2.1 The primary purpose of the PEIR is outlined in volume 1, chapter 1: Introduction of the PEIR. In summary, the primary purpose of an Environmental Statement is to support the Development Consent Order (DCO) application for the Mona Offshore Wind Project under the Planning Act 2008 (the 2008 Act). The PEIR constitutes the Preliminary Environmental Information for the Mona Offshore Wind Project and sets out the findings of the Environmental Impact Assessment (EIA) to date to support the pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Environmental Statement will accompany the application to the Secretary of State for Development Consent.

12.1.2.2 The PEIR forms the basis for Statutory Consultation which will last for 47 days and conclude on 4 June 2023. At this point, comments received on the PEIR will be reviewed and incorporated (where appropriate) into the Environmental Statement, which will be submitted in support of the application for Development Consent scheduled for quarter one of 2024.

12.1.2.3 In particular, this PEIR chapter:

- Presents the existing environmental baseline developed from desk studies, site-specific surveys and consultation
- Identifies any assumptions and limitations encountered in compiling the environmental information
- Presents the potential environmental effects on shipping and navigation arising from the Mona Offshore Wind Project, based on the information gathered and the analysis and assessments undertaken
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects of the Mona Offshore Wind Project on shipping and navigation.

12.1.3 Study area

12.1.3.1 The shipping and navigation study area consists of waters within 10 Nautical Miles (nm) of the Mona Array Area and 3nm of the export cable corridor, as shown in Figure 12.1. The shipping and navigation study area has been discussed and agreed with key stakeholders during consultation (see section 12.3).

12.1.3.2 Additionally, the waters of the east Irish Sea to the south and east of the Isle of Man (south of 54.5 degrees north and east of 5.0 degrees west) have been considered in terms of shipping routes and their interaction with the Mona Offshore Wind Project and existing and planned offshore wind projects within this area for the cumulative effects assessment.

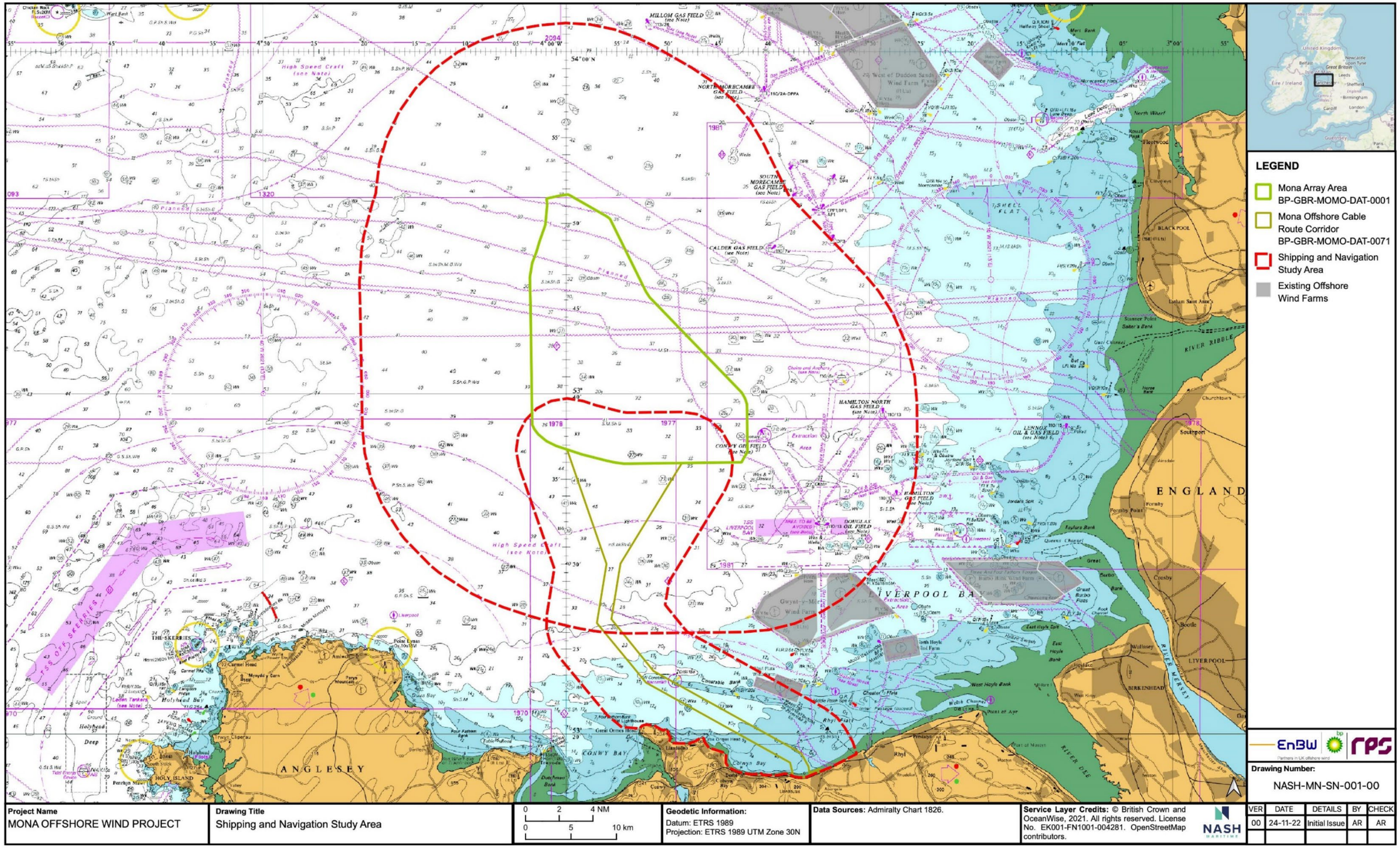

Figure 12.1: Shipping and navigation study area.

12.2 Policy context

12.2.1 National Policy Statements

12.2.1.1 Planning policy on renewable energy infrastructure is presented in volume 1, chapter 2: Policy and legislation of the PEIR. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to shipping and navigation, is contained in the Overarching National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3, DECC, 2011).

12.2.1.2 NPS EN-3 includes guidance on what matters are to be considered in the assessment. These are summarised in Table 12.1. NPS EN-3 also highlight a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 12.2. If the NPS are updated prior to the application for Development Consent, the revised NPS will be fully considered in relation to shipping and navigation within the Environmental Statement.

Table 12.1: Summary of the NPS EN-3 provisions relevant to shipping and navigation.

Summary of NPS EN-3 provision	How and where considered in the PEIR
2.6.153 Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore wind farm and this should continue throughout the life of the development including during the construction, operation, and decommissioning phases. Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and navigation uses of the sea to successfully co-exist.	A summary of the key issues raised during consultation activities, the consultee and the consultation activity undertaken is provided in section 12.3 and Table 12.5. A Marine Navigation Engagement Forum (MNEF) was established for the Mona Offshore Wind Project. A hazard workshop was undertaken and is described in volume 6, annex 12.1: Navigational risk assessment of the PEIR.
2.6.154 Assessment should be underpinned by consultation with the Marine Management Organisation (MMO), Maritime and Coastguard Agency (MCA), the relevant General Lighthouse Authority, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the Royal Yachting Association (RYA), who may be affected.	A summary of the key issues raised during consultation activities, undertaken is provided in section 12.3 and Table 12.5.
2.6.155 Information on internationally recognised sea lanes is publicly available and this should be considered by applicants prior to undertaking assessments. The assessment should include reference to any relevant, publicly available data available on the Maritime Database.	Sea lane locations are presented in section 12.4.4 and impact on vessel routeing measures presented in section 12.8.2 and section 12.8.3.
2.6.156 Applicants should undertake a Navigational Risk Assessment (NRA) in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above.	An NRA was undertaken and is contained within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
2.6.157 The navigation risk assessment will for example necessitate: a survey of vessels in the vicinity of the proposed wind farm; a full NRA of the likely impact of the wind farm on navigation in the immediate area of the wind farm in accordance with the relevant marine guidance; and cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea.	An NRA was undertaken in accordance with Marine Guidance Note (MGN) 654 and is contained within volume 6, annex 12.1: Navigational risk assessment of the PEIR. 2 x 14 day vessel traffic surveys were conducted in compliance with the requirements under MGN654, survey findings are presented in section 12.4.4 and volume 6, annex 12.1: Navigational risk assessment of the PEIR. The cumulative impacts of the Project on vessel routeing, collision and contact, in combination with multiple developments, are examined in section 12.10.
2.6.158 Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on navigation and shipping.	Applied risk controls, including safety zones, are described in volume 6, annex 12.1: Navigational risk assessment of the PEIR. Additional risk control options are identified in section 12.14 and volume 6, annex 12.1: Navigational risk assessment of the PEIR.
2.6.159 Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the MCA and refer to the Government guidance on safety zones.	
2.6.160 The potential effect on recreational craft, such as yachts, should be considered in any assessment.	The potential effects on recreational craft has been considered within volume 6, annex 12.1: Navigational risk assessment of the PEIR, and are described throughout sections 12.8.10 and 12.10.

Table 12.2: Summary of NPS EN-3 policy on decision making relevant to shipping and navigation

Summary of NPS EN-3 provision	How and where considered in the PEIR
2.6.161 The Secretary of State (SoS) should not grant development consent in relation to the construction or extension of an offshore wind farm if it considers that interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development. The use of recognised sea lanes essential to international navigation means: (a) anything that constitutes the use of such a sea lane for the purposes of article 60(7) of the United Nations Convention on the Law of the Sea 1982; or (b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a Renewable Energy Zone (REZ)	Relevant International Maritime Organisation (IMO) routeing measures, including the Liverpool Bay Traffic Separation Scheme, are considered in relation to the Mona Array Area in volume 6, annex 12.1: Navigational risk assessment of the PEIR. Sea lane locations are presented in section 12.4.4 and impact on vessel routeing measures presented in section 12.8.2 and section 12.8.3.

Summary of NPS EN-3 provision	How and where considered in the PEIR
2.6.162 The SoS should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries and recreational users of the sea. Where a proposed development is likely to affect major commercial navigation routes, for instance by causing appreciably longer transit times, the SoS should give these adverse effects substantial weight in its decision making. There may, however, be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the wind farm proposal. Such circumstances should be discussed with the MCA and the commercial shipping sector, and it should be recognised that alterations might require national endorsement and international agreement and that the negotiations involved may take considerable time and do not have a guaranteed outcome	Impact on vessel routeing is considered in section 12.8.3 for ferries and commercial shipping. Routeing in both typical and adverse weather conditions is considered.
2.6.163 Where a proposed offshore wind farm is likely to affect less strategically important shipping routes, a pragmatic approach should be employed by the SoS. For example, vessels usually tend to transit point to point routes between ports (regional, national and international). Many of these routes are important to the shipping and ports industry as is their contribution to the UK economy. In such circumstances the SoS should expect the applicant to minimise negative impacts to as low as reasonably practicable (ALARP). Again, there may be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the wind farm application and such circumstances should be discussed with the MCA and the commercial shipping sector.	
2.6.164 A detailed Search and Rescue Response Assessment should be undertaken prior to commencement of construction should consent for the offshore wind farm be granted. This assessment could be secured by a requirement to any consent. However, where there are significant concerns over the frequency or the consequences of such incidents, a full assessment may be required before the application can be determined.	Impacts on search and rescue are described in section 12.8.6.
2.6.165 The SoS should not consent applications which pose unacceptable risks to navigational safety after all possible mitigation measures have been considered.	Impacts to navigation are described in section 12.8 and in volume 6, annex 12.1: Navigational risk assessment of the PEIR.
2.6.166 The SoS should be satisfied that the scheme has been designed to minimise the effects on recreational craft and that appropriate mitigation measures, such as buffer areas, are built into applications to allow for recreational use outside of commercial shipping routes. In view of the level of need for energy infrastructure, where an adverse effect on the users of recreational craft has been identified, and where no reasonable mitigation is feasible, the SoS should weigh the harm caused with the benefits of the scheme.	Impacts on recreational craft are described in section 12.8.10.
2.6.167 Providing proposed schemes have been carefully designed by the applicants, and that the necessary consultation with the MCA and the other navigation stakeholders listed above has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on navigation to a level sufficient to enable the SoS to grant consent. The MCA will use the NRA as described in paragraph 2.6.156 above when advising the SoS on any mitigation measures proposed.	Relevant stakeholders have been consulted throughout, including the MCA. A summary of the key issues raised during consultation activities, the consultee and the consultation activity undertaken is provided in section 12.3 and Table 12.5. A Marine Navigation Engagement Forum (MNEF) was established for the Mona Offshore Wind Project. A hazard workshop was undertaken and is described in volume 6, annex 12.1: Navigational risk assessment of the PEIR. Impacts to navigation are described in section 12.8 and in volume 6, annex 12.1: Navigational risk assessment of the PEIR. Applied risk controls, including safety zones, are described in volume 6, annex 12.1: Navigational risk assessment of the PEIR. Additional risk control optioned are identified in section 12.14 and volume 6, annex 12.1: Navigational risk assessment of the PEIR.
2.6.168 The SoS should, in determining whether to grant consent for the construction or extension of an offshore wind farm, and what requirements to include in such a consent, have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the development.	Impacts to navigation are described in section 12.8 and in volume 6, annex 12.1: Navigational risk assessment of the PEIR.
2.6.169 In considering what interference, obstruction or danger to navigation and shipping is likely and its extent and nature, the SoS should have regard to the likely overall effect of the development in question and to any cumulative effects of other relevant proposed, consented and operational offshore wind farms.	A cumulative assessment has been undertaken (section 12.10) and is summarised in Table 12.28.

12.2.2 Welsh National Marine Plan

12.2.2.1 The assessment of potential changes to shipping and navigation has also been made with consideration to the specific policies set out in the Welsh National Marine Plan published in 2019 (Welsh Government, 2019). Key provisions are set out in Table 12.3 along with details as to how these have been addressed within the assessment.

Table 12.3: Welsh National Marine Plan policies of relevant to shipping and navigation.

Policy	Key provisions	How and where considered in the PEIR
ECON_02	Proposals should demonstrate how they have considered opportunities for coexistence with other compatible sectors in order to optimise the value and use of the marine area and marine natural resources	Impacts to commercial shipping routes are considered in section 12.8.2, 12.8.3 and 12.8.4. Impacts to the navigation safety of all marine users are assessed throughout section 12.8 and within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
GOV_01	Proposals should demonstrate that they have assessed potential cumulative effects and should, in order of preference: a. avoid adverse effects; and/or b. minimise effects where they cannot be avoided; and/or c. mitigate effects where they cannot be minimised. If significant adverse effects cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding.	Impacts on navigational safety are considered in section 12.8 and 12.10. Applied risk controls, including safety zones, are described in volume 6, annex 12.1: Navigational risk assessment of the PEIR. Additional risk control optioned are identified in section 12.14 volume 6, annex 12.1: Navigational risk assessment of the PEIR. A cumulative effects assessment has been undertaken and is presented in section 12.10.
SAF_01	a. Proposals likely to have significant adverse impacts upon an established activity covered by a formal application or authorisation must demonstrate how they will address compatibility issues with that activity. Proposals unable to demonstrate adequate compatibility must present a clear and convincing case for the proposal to progress under exceptional circumstances. b. Proposals likely to have significant adverse impacts upon an established activity not subject to a formal authorisation must demonstrate how they will address compatibility issues with that activity. Proposals unable to demonstrate adequate compatibility must present a clear and convincing case for proceeding. Under SAF 01 a and b, compatibility should be demonstrated through, in order of preference: • Avoiding significant adverse impacts on those activities, and/or • Minimising significant adverse impacts where these cannot be avoided; and/or • Mitigating significant adverse impacts where they cannot be minimised	
SOC_01	Proposals that maintain or enhance access to the marine environment are encouraged.	Impacts on recreational craft are described in section 12.8.10.

12.2.3 North West Inshore and North West Offshore Coast Marine Plans

12.2.3.1 The assessment of potential changes to shipping and navigation has also been made with consideration to the specific policies set out in the North West Inshore and North West Offshore Coast Marine Plans (MMO, 2021). Key provisions are set out in Table 12.4 along with details as to how these have been addressed within the assessment.

Table 12.4: North West Inshore and North West Offshore Marine Plan policies of relevance to shipping and navigation.

Policy	Key provisions	How and where considered in the PEIR
NW-PS-1	Only proposals demonstrating compatibility with current port and harbour activities will be supported. Proposals within statutory harbour authority areas or their approaches that detrimentally and materially affect safety of navigation, or the compliance by statutory harbour authorities with the Open Port Duty or the Port Marine Safety Code, will not be authorised unless there are exceptional circumstances. Proposals that may have a significant adverse impact upon future opportunity for sustainable expansion of port and harbour activities, must demonstrate that they will, in order of preference: a) avoid, b) minimise, c) mitigate adverse impacts so they are no longer significant. If it is not possible to mitigate significant adverse impacts, proposals should state the case for proceeding.	Impacts to navigation are described in section 12.8 and in volume 6, annex 12.1: Navigational risk assessment of the PEIR.
NW-PS-2	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance must not be authorised within or encroaching upon International Maritime Organization routeing systems unless there are exceptional circumstances.	Sea lane locations are presented in section 12.4.4 and impact on vessel routeing measures presented in section 12.8.2.
NW-PS-3	Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance which encroaches upon high density navigation routes, strategically important navigation routes, or that pose a risk to the viability of passenger services, must not be authorised unless there are exceptional circumstances.	Impacts on Under Keel Clearance are presented in section 12.8.12 and in volume 6, annex 12.1: Navigational risk assessment of the PEIR.

12.2.4 Principal guidance for shipping and navigation

12.2.4.1 The primary guidance for undertaking NRAs for UK offshore wind farms is MGN654: Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021). This highlights how to conduct shipping and navigation assessments, the impacts and risk control measures that should be considered.

12.2.4.2 The assessment has been conducted using the principles of the IMO's Formal Safety Assessment (FSA) (IMO, 2018).

12.2.4.3 MGN372: OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008) describes issues to be taken into account when planning and undertaking voyages near offshore renewable energy installations off the UK coast.

12.2.4.4 International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) G1162 The Marking of Offshore Man-Made Structures (IALA, 2021) provides guidance on the lighting and marking arrangements for offshore wind farms.

12.2.4.5 RYA Position of Offshore Renewable Energy Developments: Wind Energy (RYA, 2019) describes key impacts of offshore wind farms on recreational activities.

12.2.4.6 The World Association for Waterborne Transport Infrastructure (PIANC) WG161 Interaction Between Offshore Wind Farms and Maritime Navigation (PIANC, 2018) provides guidelines and recommendations on impacts and mitigations for shipping routes near offshore wind farms.

12.2.4.7 Nautical Institute (2013) The Shipping Industry and Marine Spatial Planning provides guidance on benefits and risks of marine spatial planning for shipping and navigation.

12.2.4.8 G+ IOER (2019) Good practice guidelines for offshore renewable energy developments provides guidance on emergency response for offshore wind farms.

12.3 Consultation

12.3.1.1 A summary of the key issues raised during consultation activities undertaken to date specific to shipping and navigation is presented in Table 12.5, together with how these issues have been considered in the production of this PEIR chapter. Further detail is presented within the volume 6, annex 12.1: Navigational risk assessment of the PEIR.

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Table 12.5: Summary of key consultation issues raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to shipping and navigation.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
14 October 2021	MCA Consultation meeting.	Project introduction and proposed approach. Data collection strategy (incl. survey timings).	Survey details contained within section 12.4.3.
10 November 2021	MNEF Members	Project introduction and proposed approach. Site selection in relation to shipping and navigation constraints. Impacts of COVID-19 on data collection. Impacts to ferry operators (Safety and Commercial). Relation of impacts on ferry routes with regulation and guidance. Sensitivity of ferry operator schedules.	Data collection strategy is provided in sections 12.4.1, 12.4.2 and 12.4.3. Commercial impacts to ferry operators are described in section 12.8.3. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8.3 and section 12.8.4 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
01 February 2022	MCA & Trinity House Consultation meeting.	Methodological engagement. Update on proposed approach for assessment. Status of NPS updates. Requirement for cumulative assessment. Adverse ship routeing assessment. Consenting of Walney Extension and assessment of gap with the North East Potential Development Area. Modelling to reflect local navigational conditions.	Relevant methodology and guidance is given in sections 12.4.1, 12.5 and 12.9.1 and section 12.2. Cumulative impacts are assessed in section 12.10 and summarised in Table 12.28. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8.3 and section 12.8.4 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
09 February 2022	Department for Business, Energy and Industrial Strategy (BEIS) Consultation meeting.	Methodological engagement. Introduction to project and proposed approach for assessment. Status of NPS updates and role of BEIS. Engagement with wider stakeholders.	Relevant methodology and guidance is given in sections 12.4.1, 12.5 and 12.9.1 and section 12.2.
14 February 2022	UK Chamber of Shipping Seatruck Ferries Stena Line Isle of Man Steam Packet Company MCA Consultation meeting.	Methodological engagement. Relation of impacts on ferry routes with regulation and guidance. Site selection in relation to shipping and navigation constraints. Impacts to ferry operators (Safety and Commercial). Need for a cumulative assessment. Adverse weather routeing decision making. Need for collaborative engagement in assessment.	Commercial impacts to ferry operators are described in section 12.8.3. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8.3 and section 12.8.4 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR. Cumulative impacts are assessed in section 12.10 and summarised in Table 12.28. Adverse weather routeing impacts are described in section 12.8.4.
15 March 2022	Request for Info Letter: Seatruck Ferries Stena Line Isle of Man Steam Packet Company P&O Written correspondence.	Request for Info Letter. Questionnaire issued to operators requesting details of existing operational details and constraints in normal and adverse weather.	Commercial impacts to ferry operators are described in section 12.8.3. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8.3 and section 12.8.4 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
04 April 2022	Isle of Man Steam Packet Company Consultation meeting.	Baseline data gathering. Review of current operations and constraints. Review of impacts and decision making in adverse weather. Review of future changes to operations. Significance and potential impacts to Isle of Man Steam Packet Company and Isle of Man.	Commercial impacts to ferry operators are described in section 12.8.3. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8.3 and section 12.8.4 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
05 April 2022	Isle of Man Steam Packet Company Consultation meeting.	Crossing from Douglas to Heysham aboard Ben-my-Chree. Discussions with master on decision making and passage planning.	N/A.
05 April 2022	Seatruck Ferries Consultation meeting.	Baseline data gathering. Site selection and shipping and navigation constraints. Potential impacts of projects on safety and commercial operations for Seatruck. Review of current operations and constraints. Review of impacts and decision making in adverse weather. Review of future changes to operations.	Commercial impacts to ferry operators are described in section 12.8.3. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8.3 and section 12.8.4 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR. Future case scenario development is described in section 12.4.5 and within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
14 April 2022	Stena Consultation meeting.	Baseline data gathering. Potential impacts of projects on safety and commercial operations for Stena. Review of current operations and constraints. Review of impacts and decision making in adverse weather. Review of future changes to operations.	Commercial impacts to ferry operators are described in section 12.8.3. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8.3 and section 12.8.4 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR. Future case scenario development is described in section 12.4.5 and within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
20 April 2022	Spirit Energy Written correspondence.	Impacts to Spirit Energy. Impacts to marine and aviation movements to offshore platforms and rigs. Requirement for safe passing distances and exclusion areas. Increased traffic flow and collision risk.	Oil and gas activities are described in section 12.4.4. Safety impacts to oil and gas operations are described throughout the impact assessment within section 12.8 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
21 April 2022	RYA Consultation meeting.	RYA Consultation and Survey Strategy. Introduction to project and assessment approach. Availability of RYA Recreational Atlas. Summer survey strategy. Further engagement opportunities.	Data collection strategy is provided in sections 12.4.1, 12.4.2 and 12.4.3. Impacts on recreational craft are described in section 12.8.10.
05 May 2022	Harbour Energy Written correspondence.	Impacts to Harbour Energy. Decommissioning Plan for Millom West. Impacts to marine and aviation movements to offshore platforms and rigs. Requirement for safe passing distances and exclusion areas. Increased traffic flow and collision risk.	Oil and gas activities are described in section 12.4.4. Safety impacts to oil and gas operations are described throughout the impact assessment within section 12.8 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
06 May 2022	MNEF Members	Project update. Cumulative impacts of multiple projects on ferry operations. How the cumulative impacts will be assessed or examined. Impacts of projects on Isle of Man economy/society. Extent of incident data. Safety of navigating in gaps. Consequences of allisions with wind turbines.	Cumulative impacts are presented in section 12.10 and summarised in Table 12.28. Data collection strategy is provided in sections 12.4.1, 12.4.2 and 12.4.3. Impacts of project, including consequences, are described in section 12.8 and the risk assessment within volume 6, annex 12.1: Navigational risk Assessment of the PEIR.
23 May 2022	Trinity House Scoping Response.	Scoping Opinion. Assessment approach MGN654 compliance. Cumulative impacts to be assessed. Additional and impacts to existing Aids to Navigation. Decommissioning Plan. Export cable corridor marking and protection.	Relevant methodology and guidance is given in sections 12.4.1, 12.5 and 12.9.1 and section 12.2. Cumulative impacts are summarised in section 12.10. Applied risk controls, including safety zones, are described within volume 6, annex 12.1: Navigational risk assessment of the PEIR. Additional risk control optioned are identified in section 12.13 and within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
30 May 2022	MCA Scoping Response.	Scoping Opinion. Assessment approach MGN654 compliance Impacts on vessel routeing and adverse weather routeing. Cumulative impacts to be assessed. Wind turbine layouts to comply with MGN654. Export cable corridor marking and protection.	Relevant methodology and guidance is given in sections 12.4.1, 12.5 and 12.9.1 and section 12.2. Cumulative impacts are summarised in section 12.10. Impacts on vessel routeing are described in section 12.8.3. Applied risk controls, including safety zones, are described within volume 6, annex 12.1: Navigational risk assessment of the PEIR. Additional risk control optioned are identified in section 12.13 and within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
31 May 2022	Isle of Man Government Scoping Response.	Scoping Opinion. Cumulative impacts of multiple developments. Inclusion of Isle of Man Orsted offshore wind farm proposal. Impacts on Isle of Man Steam Packet Company routes into Douglas. Impacts to adverse weather routeing and safe shelter. Impacts to Search and Rescue capabilities.	Cumulative impacts are presented in section 12.10 and summarised in Table 12.28. Commercial impacts to ferry operators are described in section 12.8.3. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR. Impacts to Search and Rescue are described in section 12.8.6.
15 June 2022	Planning Inspectorate Scoping Response.	Scoping Opinion. Assessment approach and shipping and navigation study area.	Relevant methodology and guidance is given in sections 12.4.1, 12.5 and 12.9.1 and section 12.2. The shipping and navigation study area is described in section 12.1.3.
30 June 2022	Seatruck Consultation meeting.	Bridge Simulations Preparations. Determination of routes for assessment. Review of weather conditions and constraints. Definition of traffic and emergency scenarios. Assessment criteria and run order.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR provides a high-level summary of the navigational simulations.
20 July 2022 21 July 2022	Isle of Man Steam Packet Company Consultation meeting.	Bridge Simulations Preparations. Determination of routes for assessment. Review of weather conditions and constraints. Definition of traffic and emergency scenarios. Assessment criteria and run order.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR provides a high-level summary of the navigational simulations.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
11 August 22 12 August 22	Stena Line Consultation meeting.	Bridge Simulations Preparations. Determination of routes for assessment. Review of weather conditions and constraints. Definition of traffic and emergency scenarios. Assessment criteria and run order.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR provides a high-level summary of the navigational simulations.
17 August 2022 18 August 2022 19 August 2022	Isle of Man Steam Packet Company Consultation meeting.	Bridge simulations. Safety of transits in adverse weather and traffic through Morgan-Walney corridor.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR provides a high-level summary of the navigational simulations. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8 and the risk assessment within volume 6, annex 12.1: NRA. Cumulative impacts are presented in section 12.10 and summarised in Table 12.28.
23 Aug 2022 24 Aug 2022 25 Aug 2022	Stena Line Consultation meeting.	Bridge simulations. Safety of transits in adverse weather and traffic through the Mona-Morgan/Mona-Morecambe Offshore Cable Corridors.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR provides a high-level summary of the navigational simulations. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8 and the risk assessment within volume 6, annex 12.1: NRA.
08 September 22 09 September 22	Seatruck Consultation meeting.	Bridge simulations. Safety of transits in adverse weather and traffic through the Mona-Morgan corridor.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR provides a high-level summary of the navigational simulations. Safety impacts to ferry routes are described throughout the impact assessment within section 12.8 and the risk assessment within volume 6, annex 12.1: Navigational risk assessment of the PEIR.
03 October 2022	Various Online workshop.	Webinar to prepare for hazard workshops.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR describes the findings of the hazard workshop.
10 October 2022	MNEF Members	Project update. Application process. Approach to cumulative assessment. Introduction to Morgan/Morecambe combined transmission Project.	Section 12.2 describes the relevant legislation and policies.
10 October 2022	Various – Hazard Workshop In person workshop.	Cumulative Hazard Workshop.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR describes the findings of the hazard workshop.
11 October 2022	Various – Hazard Workshop In person workshop.	Mona and Morgan Hazard Workshops.	Volume 6, annex 12.1: Navigational risk assessment of the PEIR describes the findings of the hazard workshop.
19 October 2022	Isle of Man Government Consultation meeting.	Impacts on Isle of Man economy. Status of future Isle of Man offshore developments.	Cumulative impacts are presented in section 12.10 and summarised in Table 12.28.
20 October 2022	Orsted Consultation meeting.	Update on Isle of Man Offshore Wind Farm.	Cumulative impacts are presented in section 12.10 and summarised in Table 12.28.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
18 January 2023	MNEF Members	Project update on boundary amendments and how commitments will be tested post PEIR.	Review of commitments to be explored with stakeholders following PEIR.

12.4 Baseline environment

12.4.1 Methodology to inform baseline

12.4.1.1 To characterise the baseline environment for the shipping and navigation study area (see section 11.1.3) a range of data sources was collated and reviewed, in addition to feedback from project-specific consultation and site-specific surveys. Further information is included within volume 6, annex 12.1: Navigational risk assessment of the PEIR.

12.4.1.2 Since early 2020, the COVID-19 pandemic has substantially impacted recreational and commercial vessel movements both globally and locally. It is therefore possible that data collected between 2020 and 2022 may be influenced by the pandemic although vessel traffic is expected to have largely returned to pre-pandemic levels. Where appropriate, datasets have been used that precede the pandemic to benchmark those collected more recently, and in order to provide a representative overview of the baseline vessel traffic activity. This was agreed with the MCA and key stakeholders during consultation as a suitable mitigation to the impacts of COVID-19.

12.4.2 Desktop study

12.4.2.1 Information on shipping and navigation within the shipping and navigation study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 12.6 below.

Table 12.6: Summary of key desktop data sources/reports.

Title/Dataset	Source	Year	Author
High fidelity data from the Automatic Identification System (AIS) for the Irish Sea for 2019	MarineTraffic	2019	MarineTraffic
Anonymised AIS Data for UK waters for 2019	Marine Management Organisation (MMO)	2019	MMO
Vessel density grids for 2021	EMODNet	2021	EMODNet
RYA Coastal Atlas	RYA	2022	RYA
Vessel Monitoring System (VMS) data for 2019	MMO	2019	MMO
Department for Transport (DfT) shipping statistics	DfT	2022	DfT
Marine Accident Investigation Branch (MAIB) incident data	MAIB	1992-2021	MAIB
Royal National Lifeboat Institute (RNLI) incident data	RNLI	2008-2019	RNLI
DfT Search and Rescue (SAR) helicopter taskings	DfT	2022	DfT
G+ accident data	G+	2013-2021	G+
Marine aggregate dredging licenses	Crown Estate	2022	Crown Estate
Offshore renewables	Crown Estate	2022	Crown Estate
Industrial infrastructure (wind turbines, oil and gas, cables etc.)	Oceanwise	2022	Oceanwise
Oil and gas infrastructure	Oil and Gas Authority	2022	Oil and Gas Authority
Admiralty Charts	Admiralty	2022	Admiralty
Admiralty Sailing Directions	Admiralty	2022	Admiralty
Passage plans provided by Irish Sea ferry operators	Various	2022	Isle of Man Steam Packet Company Stena Line Seatruck P&O
Tidal data	Admiralty Total Tide	2022	Admiralty
Metocean data	Mona Offshore Wind Project	2021	Mona Offshore Wind Project

12.4.3 Site specific surveys

12.4.3.1 In order to inform the PEIR, site-specific surveys were undertaken, as agreed with the statutory consultees (see Table 12.5 for further details). A summary of the surveys undertaken to inform the shipping and navigation impact assessment is outlined in Table 12.7 below.

Table 12.7: Summary of site-specific survey data.

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
Winter vessel traffic survey	Mona Array Area plus 10nm	AIS, radar and visual observations collected as part of the 14 day marine traffic survey, as required in MGN654.	NASH Maritime	09:00 05 December 2021 to 09:00 19 December 2021	Volume 6, annex 12.1: Navigational risk assessment of the PEIR.
Summer vessel traffic survey	Mona Array Area plus 10nm	AIS, radar and visual observations collected as part of the 14 day marine traffic survey, as required in MGN654.	NASH Maritime	10:00 30 June 2022 to 10:00 14 July 2022	Volume 6, annex 12.1: Navigational risk assessment of the PEIR.
Navigation simulations Isle of Man Steam Packet Company	Irish Sea	Full bridge simulations of ferry passages through the Irish Sea were commissioned by bp/EnBW. The aim of the simulations was to understand, in more detail, potential navigation impacts of the projects on existing commercial ferries and to test the viability and safety of commercial ferry transits through corridors between the offshore wind farms in normal and adverse weather conditions. These were attended by representatives from the Isle of Man Steam Packet Company, including masters, who generously provided their time and expertise by participating in the simulations.	HR Wallingford / NASH Maritime	21/22 July 2022 16-19 July 2022	Volume 6, annex 12.1: Navigational risk assessment of the PEIR.
Navigation simulations Stena	Irish Sea	Full bridge simulations of ferry passages through the Irish Sea were commissioned by bp/EnBW. The aim of the simulations was to understand, in more detail, potential navigation impacts of the projects on existing commercial ferries and to test the viability and safety of commercial ferry transits through corridors between the offshore wind farms in normal and adverse weather conditions. These were attended by representatives from Stena Line, including masters, who generously provided their time and expertise by participating in the simulations.	HR Wallingford / NASH Maritime	11/12 August 2022 23-25 August 2022	Volume 6, annex 12.1: Navigational risk assessment of the PEIR.
Navigation simulations Seatruck	Irish Sea	Full bridge simulations of ferry passages through the Irish Sea were commissioned by bp/EnBW. The aim of the simulations was to understand, in more detail, potential navigation impacts of the projects on existing commercial ferries and to test the viability and safety of commercial ferry transits through corridors between the offshore wind farms in normal and adverse weather conditions. These were attended by representatives from Seatruck, including masters, who generously provided their time and expertise by participating in the simulations.	HR Wallingford / NASH Maritime	08/09 August 2022	Volume 6, annex 12.1: Navigational risk assessment of the PEIR.
Navigation simulations P&O	Irish Sea	Full bridge simulations of ferry passages through the Irish Sea were commissioned by bp/EnBW. The aim of the simulations was to understand, in more detail, potential navigation impacts of the projects on existing commercial ferries and to test the viability and safety of commercial ferry transits through corridors between the offshore wind farms in normal and adverse weather conditions.	HR Wallingford / NASH Maritime	26 August 2022	Volume 6, annex 12.1: Navigational risk assessment of the PEIR.

12.4.4 Baseline environment

12.4.4.1 A full assessment of the baseline environment for shipping and navigation is provided in volume 6, annex 12.1: Navigational risk assessment of the PEIR., including details of navigational features, maritime incidents, and an assessment of the marine traffic baseline. This section provides a summary of the key findings from the assessment of the baseline environment in the NRA and therefore both documents should be read in parallel. This section is intended to provide an overview of the baseline environment relevant to shipping and navigation and does not provide any additional information over that presented in the NRA. Key features relevant to the Mona Offshore Wind Project and features relating to the management of vessels and safety of navigation are described in this section.

Description of the Marine Environment

12.4.4.2 Figure 12.2 presents the principal navigational features in proximity to the Mona Array Area. The key navigational features in the area are considered to be the two IMO adopted routeing measures located within the Irish Sea. These are the Liverpool Bay Traffic Separation Scheme (TSS), located approximately 1.8nm southeast of the most southeast boundary of the Mona Array Area and the Off Skerries TSS, located 18nm southwest of the Mona Array Area.

12.4.4.3 The area surrounding the Douglas Oil Field infrastructure is charted on Admiralty Chart 1826 as an Area to be Avoided with the accompanying note: 'The IMO-adopted Area to be Avoided should only be entered by authorised vessels to access the Douglas Oil Field'. There are no reporting measures within the shipping and navigation study area.

12.4.4.4 All Aids to Navigation (AtoNs) within the shipping and navigation study area are fixed on offshore structures such as oil and gas platforms and wind turbines. The Mona Offshore Cable Corridor passes within 500m of the West Constable cardinal mark, north of Llandudno.

12.4.4.5 Gwynt-y-Mor is the only operational offshore wind farm within the shipping and navigation study area, located 7.6nm southeast of the Mona Array Area. There are four oil fields within the shipping and navigation study area, these are Conwy Oil Field (1nm southeast), Hamilton North Gas Field (6nm east), Douglas Oil Field (7nm southeast), and South Morecambe Gas Field (8nm northeast). Calder Gas Field is the only gas field located within the shipping and navigation study area, and this is located 5nm northeast. Further offshore wind farms and oil and gas infrastructure exist outside the shipping and navigation study area but within the eastern Irish Sea.

12.4.4.6 There are no charted anchorages within the shipping and navigation study area, but several are located within the eastern Irish Sea. Two charted anchorages are located within the Port of Liverpool Statutory Harbour Authority Area, as shown on Figure 12.2. One of these lies to the south of the approaches to Liverpool between the Burbo Bank Extension and Gwynt y Mór windfarms. The other anchorage is to the north of the approaches to the Mersey. Douglas Bay is used as an anchorage for vessels waiting to enter the Port of Douglas and for cruise vessels when undertaking tendering operations. There is an anchorage called Rhyl North used by vessels waiting for pilotage to the Port of Mostyn located directly north of the Mostyn Pilot Boarding Station. Whilst not charted, analysis of vessel traffic data identified a commercial ship anchorage located to the east of Anglesey, by Point Lynas, that offers good shelter in westerly winds.

12.4.4.7 There are no ports or harbours within the shipping and navigation study area. The largest nearby port is the Port of Liverpool, located 25nm southeast of the Mona Array Area.

12.4.4.8 A total of 10 submarine cables pass through the shipping and navigation study area and six pass through the Mona Array Area, these are shown in in Figure 12.2.

12.4.4.9 There are two production agreement marine aggregate dredging areas within the shipping and navigation study area, these include Liverpool Bay (area number 457) located 2nm east and Hilbre Swash (area number 392/393) located 9nm southeast. There is an exploration and option area called Liverpool Bay (area number 1808).

12.4.4.10 A single spoil ground located to the north of Hamilton Gas Field was identified within the shipping and navigation study area. There are over 1,300 charted wrecks in the Irish Sea. These are identified on navigational charts.

12.4.4.11 The predominant wind direction is from the southwest, and accounts for the greatest proportion of strong wind events. The Admiralty Sailing Directions state that gales are reported between 12 days/year (at Walney) and 30 days/year (at Ronaldsway). Wave conditions are predominately southwesterly with monthly significant wave heights of 2.9m and annual significant wave extremes of 4.2m. There are limited tidal currents within the shipping and navigation study area, with spring flows less than 1.5m/s.

12.4.4.12 The Admiralty Sailing Directions report fog conditions between 12 days/year (at Crosby) and 24 days/year (at Ronaldsway).

12.4.4.13 His Majesty's Coastguard (HMCG) is responsible for requesting and coordinating SAR activities within the UK's search and rescue (SAR) region. The local coastguard base for the region is Holyhead Coastguard Operations Centre. The nearest HMCG helicopter base is located at Caernarfon Airport, Gwynedd. The Caernarfon facility provides a 24-hour SAR service, with two Sikorsky S-92 helicopters.

12.4.4.14 There are 19 Royal National Lifeboat Institute (RNLI) lifeboat stations within the east Irish Sea. The nearest lifeboat station is Llandudno, situated 16nm south of the Mona Array Area and equipped with a Shannon class all-weather lifeboat and a D class inshore boat.

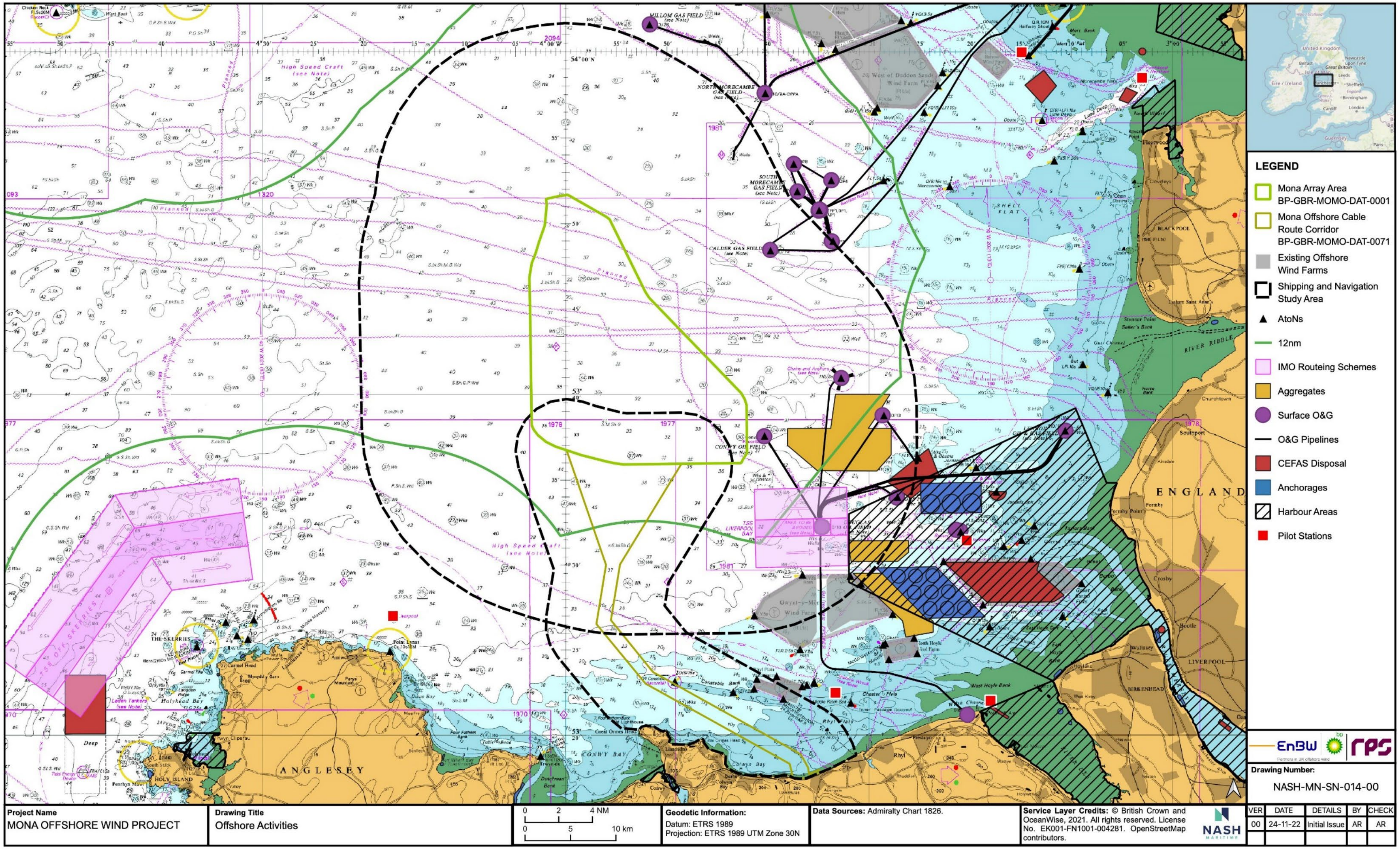


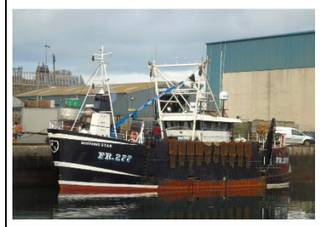
Figure 12.2: Overview of the marine environment (note circles within anchorage areas show anchorage slots on the base map. Yellow circles around AtoNs indicate lights).

Vessel Traffic

12.4.4.15 This section presents a summary of the vessel traffic analysis undertaken in volume 6, annex 12.1: Navigational risk assessment of the PEIR.

12.4.4.16 Analysis of vessel traffic has been conducted using summer and winter vessel traffic survey data and a year of 2019 AIS data. Table 12.8 provides a summary of the vessel traffic surveys. Figure 12.3 and Table 12.8 show that cargo, fishing, passenger, tanker, tug and service vessels were recorded in both winter and summer vessel traffic surveys, whilst recreational vessels were only recorded during the summer survey. Fishing vessel activity was greater during the winter survey.

Table 12.8: Summary of vessel traffic surveys.

Attributes	Winter	Summer
Vessel	Karelle (28m Fishing Vessel) 	Morning Star (23m Fishing Vessel) 
Dates	09:00 05 December 2021 to 09:00 19 December 2021	10:00 30 June 2022 to 10:00 14 July 2022
Downtime	None	None
Survey Area	Array Area + 10nm	Array Area + 10nm
Total Vessels Recorded (Array Area + 10nm)	857 (61.2/day)	771 (55.1/day)
Total Vessels Recorded (Array Area)	188 (13.4/day)	175 (12.5/day)
Cargo	**Array + 10nm**: 182 (13/day) **Array**: 31 (2.2/day)	**Array + 10nm**: 124 (8.9/day) **Array**: 29 (2.1/day)
Fishing	**Array + 10nm**: 124 (8.9/day) **Array**: 27 (1.9/day)	**Array + 10nm**: 18 (1.3/day) **Array**: 6 (0.4/day)
Passenger	**Array + 10nm**: 268 (19.1/day) **Array**: 81 (5.8/day)	**Array + 10nm**: 349 (24.9/day) **Array**: 82 (5.9/day)
Recreational	None	**Array + 10nm**: 10 (0.7/day) **Array**: 5 (0.4/day)
Tanker	**Array + 10nm**: 120 (8.6/day) **Array**: 19 (1.4/day)	**Array + 10nm**: 98 (7/day) **Array**: 19 (1.4/day)
Tug and Service	**Array + 10nm**: 134 (9.6/day) **Array**: 30 (2.1/day)	**Array + 10nm**: 160 (11.4/day) **Array**: 33 (2.4/day)

12.4.4.17 Annualised vessel traffic density from 2019 AIS data is shown in Figure 12.4, which presents the number of vessel transits through each grid cell. Figure 12.4 shows the Mona Array Area in relation to the general shipping routes within the Irish Sea. The key vessel traffic route in the shipping and navigation study area is determined by the Liverpool Bay TSS located approximately 1.8nm southeast of the Mona Array Area. A vessel traffic route also runs from Liverpool Port northwest through the Mona Array Area. Multiple ferry routes intersect the Mona Array Area, these include the routes between Liverpool-Belfast and Heysham-Dublin. Routes between Liverpool-Dublin and Liverpool-Douglas pass immediately adjacent to the Mona Array Area. Vessel traffic activity shows a seasonal trend that peaks over the summer months (May-Aug) and decreases in the winter months (Nov-Feb). This is primarily due to an increase in ferry service operations and recreational activity.

12.4.4.18 The majority of vessels crossing the Mona Offshore Cable Corridor are commercial cargo, tanker and passenger vessels of between 75m and 200m. Commercial traffic is largely concentrated where the route crosses the approaches to Liverpool and the associated ferry routes. The vessel traffic data suggests little recreational and fishing activity immediately adjacent to the Mona landfall. However, small boats operating inshore may not carry AIS and therefore the actual numbers could be under-represented. The most frequent vessel types are service vessels (including hydrographic survey work) and 90m general cargo vessels calling at Raynes Jetty. A small harbour at Rhos-on-Sea accounts for some small craft movements near to cable landfall.

12.4.4.19 Vessels of all draughts navigate within the shipping and navigation study area. Vessels with a draught over 10m largely navigate within the vessel traffic routes determined by Liverpool Bay TSS and transiting south of the Mona Array Area. Vessel traffic within the Mona Array Area largely comprises vessels with a draught under 7.5m.

12.4.4.20 Vessels of all length between 0 and 350m navigate within the shipping and navigation study area. Vessels over 200m are largely limited to the vessel traffic route determined by the Liverpool Bay TSS and transiting through the southwest portion of the Mona Array Area towards the south end of the Isle of Man and Belfast. There are distinct vessel traffic routes of vessels between 100m and 200m in length, due to the major ferry routes from Liverpool to Belfast. The largest vessels recorded in the shipping and navigation study area were the 345m cruise ship Queen Mary 2, the 319m cruise ship Celebrity Reflection and the 304m container ships MSC Michaela and MSC Antonia. All of these vessels were bound for Liverpool.

12.4.4.21 More than 1,000 cargo vessel transits passed through the Mona Array Area in 2019, an average of 2.7 per day. Liverpool is a major UK port and cargo vessels passing through the shipping and navigation study area can vary in size from 90m general cargo vessels to 300m container ships, bulk carriers and vehicle carriers. Tanker vessel movements are consistent with the shipping routes identified for cargo ships, albeit with less frequency with less than 500 movements in 2019 through the Mona Array Area, an average of 1.4 per day.

12.4.4.22 Ferry routes, including passenger and freight services, are shown in Figure 12.5. There are ten ferry routes that navigate through the shipping and navigation study area, split between four operators. Ferry vessel routes and annual crossings by operator are presented in Table 12.9. A total of 2,154 ferry transits passed through the Mona Array Area in 2019, a rate of six per day. The Isle of Man Steam Packet

Company operate between Douglas, Liverpool and Heysham. Seatruck operate between Heysham, Liverpool, Warrenpoint and Dublin. Stena operate between Liverpool, Heysham and Belfast. Finally, P&O operate between Liverpool and Dublin.

Table 12.9: Ferry routes and annual crossings by operator.

Operator	Route	Example vessels (2019-2022)	Approximate annual crossings (2019)
Isle of Man Steam Packet Company	HEY - DOUG	Ben-my-Chree	1,286
	LIV - DOUG	Manannan	628
	LIV - DOUG	Ben My Chree	46
Stena	LIV – BEL W IoM	Stena Edda Stena Embla Stena Mersey Stena Horizon Stena Lagan Stena Forecaster Stena Forerunner	1,442
	LIV – BEL E IoM West of CALDER		200
	LIV – BEL E IoM East of CALDER		153
	HEY - BEL	Stena Hibernia Stena Scotia	1,150
Seatruck	HEY - WAR	Seatruck Performance Seatruck Precision	967
	HEY - DUB	Seatruck Pace Seatruck Panorama	523
	LIV-DUB	Seatruck Pace Seatruck Power Seatruck Panorama Seatruck Progress	1,800
P&O	LIV-DUB	Mistral Norbay Norbank	1,600

12.4.4.23 A total of 66 cruise ship transits were recorded passing through the Mona Array Area during 2019, approximately one per week. Cruise vessel activity in the area is centred around the Ports of Liverpool and Douglas.

12.4.4.24 There is little recreational activity in the Mona Array Area, with most recreational activity occurring along the coast, particularly along the entrance to Liverpool Port, and around Holyhead, Douglas and Rhyl. Inshore cruising routes are clear of the Mona Array Area. Offshore cruising routes are evident between Liverpool and Douglas and between the Menai Straits and Douglas, passing adjacent to the Mona Array Area. Relatively few yachts were recorded during the 2021/2022 vessel traffic surveys, with less than one per day during the summer survey and none at all recorded during the winter survey indicating strong seasonality.

12.4.4.25 Commercial fishing in the east Irish Sea region has a wide spatial distribution and targets a number of valuable fisheries for demersal, pelagic and shellfish species. Fishing ports in the region with the highest fishing efforts are Amlwch, Conwy, Holyhead and Fleetwood. Fishing vessels are also active from Annan, Douglas, Kilkeel, Kirkudbright, Maryport and Peel. In addition, Belgian trawlers are known to operate throughout the shipping and navigation study area. There is considerable fishing activity within and near the Mona Array Area, including amongst vessels up to 40m in length engaged in mobile and static gear fishing. However, some fishing vessels are engaged in guard vessel duties or other survey works and account for some of the concentrations around oil and gas installations. During the vessel traffic surveys, between 0.5 and two fishing vessels per day were identified within the Mona Array Area. Additional data on fishing activity is contained within the Mona Offshore Wind Project fisheries chapter (volume 2, annex 11: Commercial fisheries).

12.4.4.26 Crew Transfer Vessels (CTVs) operating between operations and maintenance bases and the existing offshore wind farms are mostly clear of the Mona Array Area, except when relocating on less routine transits. Oil and gas associated supply ships and standby safety vessels have a high intensity to the east of the shipping and navigation study area where the platforms are located. The activities of dredgers and pilot vessels are concentrated to the southeast and southwest of the shipping and navigation study area. SAR vessels are dispersed throughout the shipping and navigation study area. Other vessel types, including survey vessels and tugs, are concentrated inshore, with relatively few intersecting the Mona Array Area compared to other vessel types.

12.4.4.27 Commercial shipping routes with more than one vessel movement per day are all to/from the Port of Liverpool. The route between the Liverpool Bay TSS and the Off Skerries TSS has the most vessel traffic with 4-6 vessel movements per day in either direction. Two vessel routes pass through the Mona Array Area with more than one vessel movement per day. Both of these routes are vessels transiting between the north Irish Sea to the west of the Isle of Man and the Liverpool Bay TSS. There are numerous commercial routes with less than one vessel per day passing through or adjacent to the Mona Array Area. These include routes into Heysham from the southwest and alternative routes to/from Liverpool that do not route via the TSS. Most of these routes have less than one commercial vessel transit per week. Analysis of vessel tracks during MetOffice named storm events did not identify any repeatable adverse weather routeing by commercial shipping. However, during strong southwesterlies, the anchorage to the east of Anglesey was in greater demand by vessels.

12.4.4.28 Figure 12.5 shows the non-typical routes taken by ferries, including during adverse weather conditions. Prevailing southwesterlies result in vessels taking a more southwesterly transit in order to both control the course relative to the conditions and take advantage of the lee from the shore. This minimises dangerous motions aboard the vessel and improves passenger comfort.

12.4.4.29 There is considerable anchored vessel activity shown off the east coast of Anglesey near the Point Lynas Pilot Boarding Station. Use of this area as an anchorage is not displayed on the navigational chart but is regularly used by crude oil tankers waiting to berth at the Tranmere oil jetty on the River Mersey. There is also anchoring activity shown at the designated anchorages to the north and south of the entrance to the River Mersey as well as at Douglas Bay. There are no evident anchorages from AIS data within the Mona Array Area.

12.4.4.30 There are extensive non-transit vessel tracks through the Mona Array Area shown between the Liverpool Bay TSS, Douglas Bay, the north Irish Sea and the anchorage off the east coast of Anglesey. During consultation, it was identified that during strong northwesterlies, it was common for vessels to undertake pilotage transfers in the lee of the Isle of Man at Douglas, rather than at Liverpool. Through analysis of 2019 AIS data, vessels considered to have conducted this behaviour include 42 tankers, two cruise ships and 32 cargo ships. It is notable that during significant adverse weather events, these transfers can result in convoys of vessels navigating between Liverpool and Douglas.

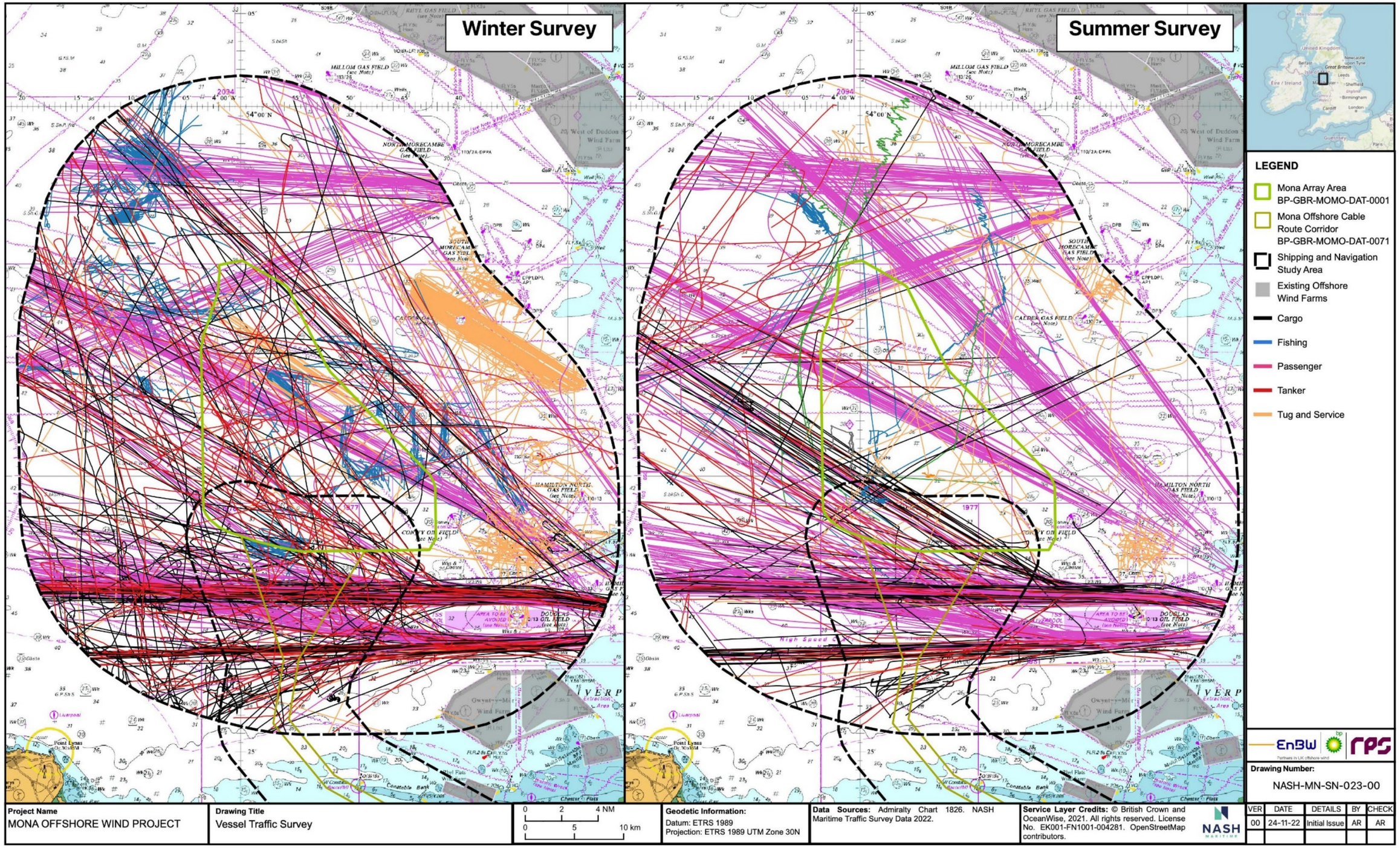


Figure 12.3: Vessel traffic survey data within the shipping and navigation study area (source: vessel traffic surveys).

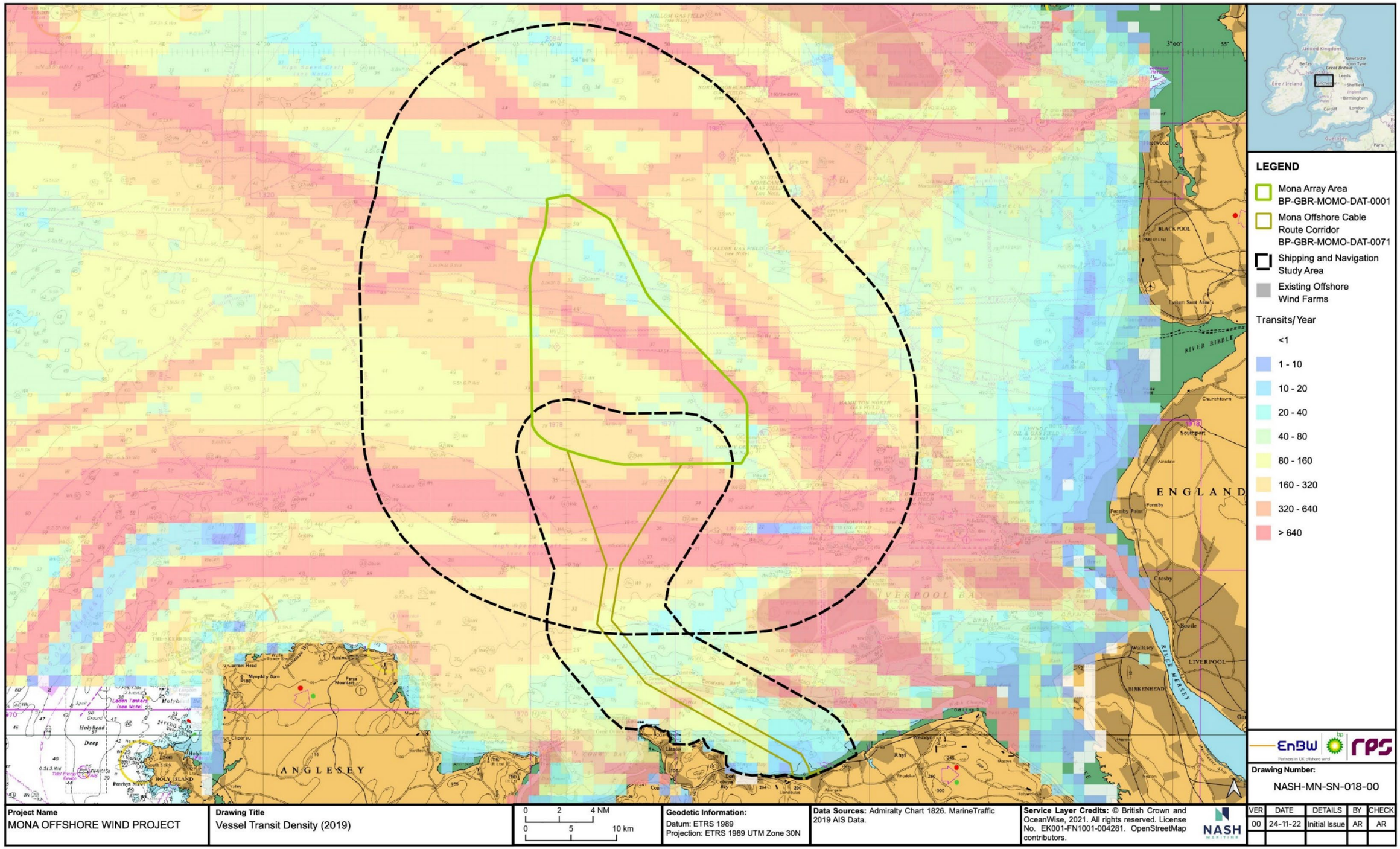


Figure 12.4: Annualised vessel traffic density within the shipping and navigation study area (source: MarineTraffic, 2019).

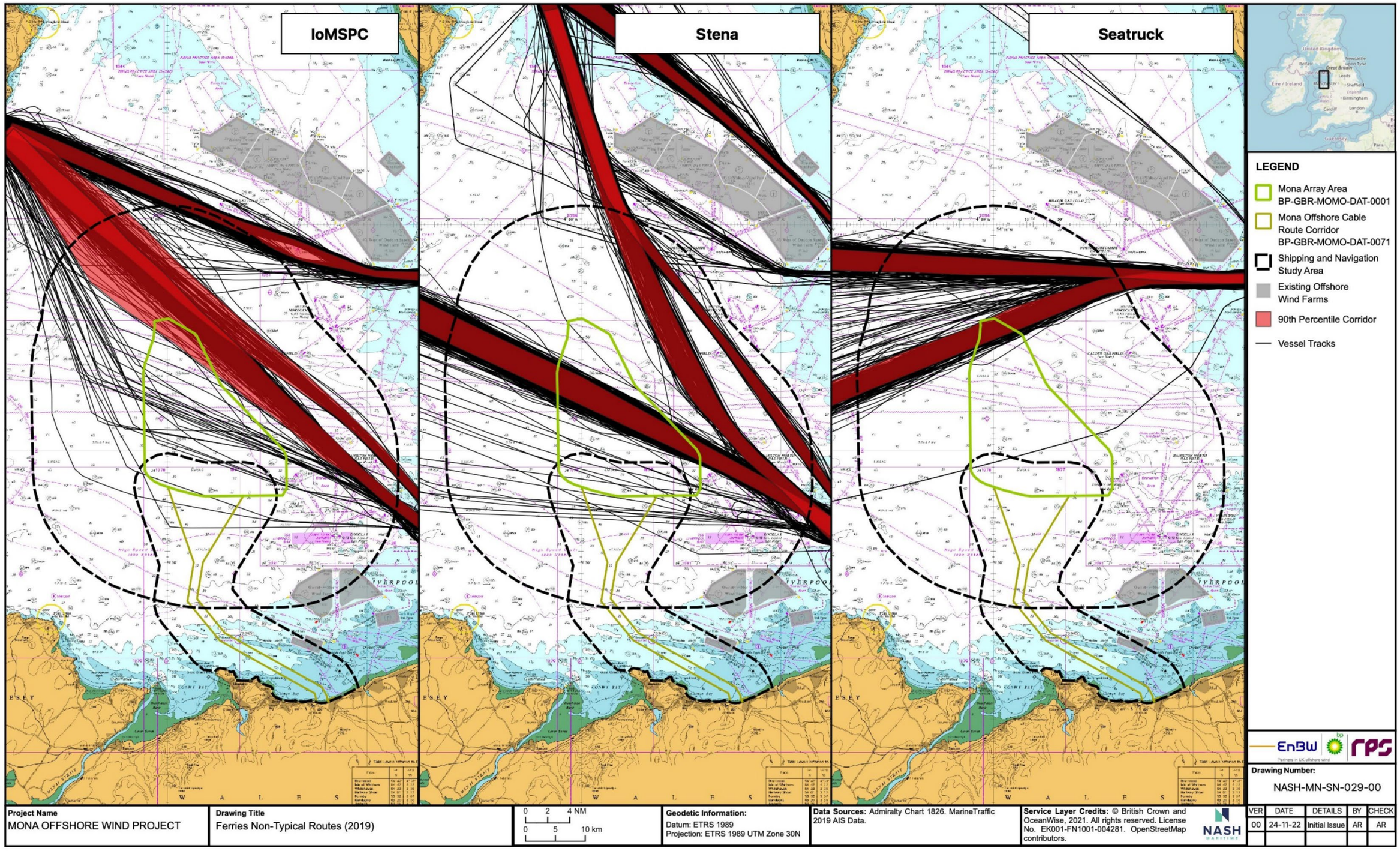


Figure 12.5: Ferry non-typical routes for Isle of Man Steam Packet Company, Stena and Seatruck from 2019 AIS data (source: MarineTraffic, 2019).

Historical Incidents

12.4.4.31 A baseline of historical maritime incidents within the shipping and navigation study area has been established through a review of Marine Accident Investigation Branch (MAIB) and RNLI databases, reports and news reports. These are presented within Volume 6, annex 12.1: Navigational risk assessment of the PEIR.

12.4.4.32 A total of 10 navigational incidents were recorded in the shipping and navigation study area between the MAIB (1992-2021) and RNLI (2008-2020) databases. These include two near misses, one flooding of a fishing vessel and seven mechanical failures across recreational and fishing boats. The majority of incidents were located to the south of the shipping and navigation study area, contained within the TSS or close inshore.

12.4.4.33 For the most recent years of data (2008-2020), accident rates per year for all vessels within 10nm of the Mona Array Area show very low incident rate of 5.46 per year (see Table 12.10). The incident rate for larger vessels is particularly low for larger commercial vessels, with 0.15 incidents per year involving passenger vessels and no incidents recorded involving tankers.

Table 12.10: MAIB/RNLI incident frequencies within 10nm per year (2008-2020).

Incident Type	Cargo	Fishing	Fixed Installation	Military	Not Classified	Passenger	Recreational	Tanker	Tug and Service	Total
Collision	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contact	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grounding	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.08
Other	0.31	1.38	0.00	0.00	0.08	0.15	2.54	0.00	0.92	5.38
Total	0.31	1.38	0.00	0.00	0.08	0.15	2.54	0.00	1.00	5.46

12.4.4.34 To better understand the types and frequency at which navigational incidents might occur with the proposed Mona Offshore Wind Project, analysis was conducted of historical accidents associated with UK operational offshore wind farms. Analysis was conducted of the MAIB database (2010-2019), RNLI databases (2008-2019), MAIB reports and news reports.

12.4.4.35 In total, 69 incidents were identified between 2010 and 2019. This includes six collisions between vessels, 29 allisions of a vessel with a fixed structure, 21 groundings and 13 near misses. Where the information is available, 36% occurred within the offshore wind farm array boundary, 43% occurred within ports or harbours and 20% occurred on-transit between the two. 82% of incidents involved project craft (such as CTVs or construction vessels). Few allisions are recorded by a non-project vessel, however, anecdotally there have been more allisions involving fishing and recreational vessels which are not reported in the dataset.

12.4.4.36 Incident rates for an average project are derived from the historical incident records and using an estimate of the number of years of operation for UK offshore wind farms, (Table 12.11) (Rawson and Brito, 2022). The accident return rates are generally low, between 10 and 45 operational years between incidents, the majority accounted for by project vessels and have a low consequence, without loss of life or serious pollution. Therefore, over a typical 25-35 year operational duration it would be expected that a typical project would experience three allisions, two groundings and one collision or near miss. It is notable that there are no recorded accidents involving large commercial shipping vessels and offshore wind farms in the UK. Nor did any of the recorded navigational incidents across the UK sector result in loss of life.

Table 12.11: Average incident rate per project between 2010-2019 in UK.

Incident Type	N	Rate	Return Period (Years)
Collision	6	0.022	45.4
Grounding	21	0.077	13.0
Near Miss	13	0.048	20.9
Total Allision	29	0.107	9.4
CTV Allisions	27	0.099	10.1
Fishing Allisions	2	0.007	136.9
Total	69	0.254	3.9

12.4.5 Future baseline scenario

12.4.5.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require a future baseline scenario to be presented within the Environmental Statement, defined as, "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge". In the event that Mona Offshore Wind Project does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

12.4.5.2 The future baseline scenario has been considered within the shipping and navigation study area for commercial, ferry, oil and gas, fishing and recreational vessel traffic.

12.4.5.3 In terms of commercial vessel routeing, analysis of DfT data on UK port trade show a decline in port freight in 2020 at both national and port level. 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 at the end of 2020. The DfT report a 9% decrease in tonnage handled by UK ports in 2020 compared to 2019. However, given the lifting of COVID-19 related restrictions, it is anticipated that port freight will continue to return to pre-pandemic levels.

12.4.5.4 In 2019, the DfT produced data for projected freight traffic into UK major ports. Overall, port traffic is forecast to remain relatively flat in the short term but grow in the long term, with tonnage 39% higher in 2050 compared to 2016. This equates to approximately a 15% increase in national freight tonnage by 2035. Additionally, the

Douglas Harbour Master Plan (2017) considers the potential for development of a day-call cruise ship berth, which might increase the number of cruise ship calls to the Isle of Man. Other future changes that might occur by 2035 could include the use of more autonomous vessels within UK waters.

12.4.5.5 Freight and passenger ferries account for a large proportion of vessel movements within the shipping and navigation study area. These routes are subject to change both in terms of schedule, vessels and the addition of new routes in order to meet market demand. Prior to COVID-19, passenger numbers on relevant Irish Sea routes were relatively stable across most routes. There has been a noted increase in Irish Sea freight movements during the same period. A modernisation programme is ongoing between different operators to replace vessels operating within the shipping and navigation study area.

12.4.5.6 In the absence of definitive information, an assumption is made that recreational activity, fishing activity and ferry routes and schedules will be similar in 2035 as to the existing baseline environment.

12.4.5.7 Irish Sea oil and gas platforms are reaching end of life and it is understood that some platforms may be decommissioned. Details of which platforms and when decommissioning will likely occur have not been fully ascertained by the project team. Consultation with oil and gas operators has indicated that Millom West (Harbour Energy) will be decommissioned between 2023 to 2025. It is likely that some platforms within the Morecambe Gas Field will also be decommissioned.

12.4.6 Data limitations

12.4.6.1 Since early 2020, the COVID-19 pandemic has substantially impacted recreational and commercial vessel movements both globally and locally. It is therefore likely that data collected between 2020 and 2022 may be influenced by the pandemic. As such, where appropriate, datasets have been used that precede the pandemic (including AIS data for 2019 for the whole Irish Sea) to benchmark those collected more recently and in order to provide a representative description of the baseline vessel traffic activity. It is considered that the data sets employed in the assessment are sufficient for the purposes presented.

12.4.6.2 AIS is not necessarily required on all recreational or fishing vessels, dependent on size. Therefore, AIS analysis alone would underestimate the extent of these activities. Therefore, the vessel traffic survey using visual and radar observations has been combined with secondary sources (such as VMS or the RYA Coastal Atlas) and consultation to complete the picture of small craft vessel movements.

12.5 Impact assessment methodology

12.5.1 Overview

12.5.1.1 The shipping and navigation impact assessment has followed the methodology set out in volume 1, chapter 5: EIA methodology of the PEIR. Specific to the shipping and navigation impact assessment, the following guidance documents have also been considered:

- MGN654 and its annexes (MCA, 2021)
- IMO FSA (IMO, 2018)
- IALA guidelines G1018/G1138 on risk management and the use of the Simplified IALA Risk Assessment Method (SIRA) respectively.

12.5.2 Impact assessment criteria

12.5.2.1 The criteria for determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. For the purposes of the shipping and navigation assessment, magnitude is equated to the likelihood of an incident or impact occurring, whilst sensitivity is equated to the consequence of that impact occurring.

12.5.2.2 The criteria for defining magnitude/likelihood in this chapter are outlined in Table 12.12 below.

Table 12.12: Definition of terms relating to the magnitude/likelihood of an impact.

Magnitude of impact	Definition
High	Frequent hazard occurrence, multiple times during Mona Offshore Wind Project lifecycle (100%). Impact continuous throughout Mona Offshore Wind Project duration (daily).
Medium	Reasonably probable that hazard may occur once during Mona Offshore Wind Project lifecycle (50%). Impact would occur periodically under certain conditions throughout Mona Offshore Wind Project duration (multiple times per year).
Low	Unlikely that hazard occurs during Mona Offshore Wind Project lifecycle but has occurred at other offshore wind farms (10%). Impact would occur infrequently during uncommon conditions throughout Mona Offshore Wind Project duration (once per year).
Negligible	Extremely unlikely that hazard occurs at Mona Offshore Wind Project and has rarely occurred within industry (1%). Impact could occur during rare conditions throughout Mona Offshore Wind Project duration (less than once per year).
No change	Remote probability of hazard occurrence at Mona Offshore Wind Project and few examples within maritime industry (<1%). No impact on shipping and navigation receptors.

12.5.2.3 The criteria for defining sensitivity/consequence in this chapter are outlined in Table 12.13 below.

Table 12.13: Definition of terms relating to the sensitivity/consequence to the receptor.

Sensitivity	Definition
Very High	Major consequence - multiple loss of life, loss of vessel (>£10million), major pollution (Tier 3) and long-term disruption to operators/marine users.
High	Serious consequence - fatality/serious injuries, serious damage to vessel (<£10million), serious pollution (Tier 2) and prolonged disruption to operators/marine users.
Medium	Moderate consequence - Serious injuries, damage to vessel (<£1million), moderate pollution (Tier 2) and temporary disruption to operators/marine users.
Low	Minor consequence - Multiple minor injuries, minor damage (<£100k) to vessel, minor pollution (Tier 1) and short-term disruption to operators/marine users.
Negligible	Negligible consequence - Minor injury, minor damage (<£10k), minor spill and minimal disruption to operators/marine users.

12.5.2.4 The significance of the effect upon shipping and navigation is determined by correlating the magnitude/likelihood of the impact and the sensitivity/consequence of the receptor. The particular method employed for this assessment is presented in Table 12.14. Where a range of significance of effect is presented, the final assessment for each effect is based upon expert judgement.

12.5.2.5 For the purposes of this assessment, any effects with a significance level of Minor or less have been concluded to be not significant in terms of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

12.5.2.6 Where significance of effect is deemed to be 'negligible or minor' or 'minor or moderate' within Table 12.14, an expert judgement call has been made on whether it is deemed to be of minor or moderate significance in EIA terms based on the understanding of the receptor.

Table 12.14: Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major
Very High	No change	Minor	Moderate or Major	Major	Major

12.6 Key parameters for assessment

12.6.1 Maximum design scenario

12.6.1.1 The maximum design scenarios (MDS) identified in Table 12.15 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in volume 1, chapter 3: Project description of the PEIR. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

Table 12.15: MDS considered for the assessment of potential impacts on shipping and navigation.

[a] C=construction, O=operations and maintenance, D=decommissioning

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on recognised sea lanes essential to international navigation (NPS EN-3 2.6.161).	✓	✓	✓	**Construction phase** • Four years construction duration • Construction activities over the maximum extent of the Mona Array Area (450km^2) and a 90km long Offshore Cable Corridor. **Operations and maintenance phase** • Operational life of 35 years • Maximum extent of Mona Array Area at 450km^2 and a 90km long Offshore Cable Corridor. **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of the Mona Offshore Wind Project over the longest duration, therefore the greatest potential for impacts on recognised sea lanes essential to international navigation.
Impact to commercial operators including strategic routes and lifeline ferries (NPS EN-3 2.6.162/163).	✓	✓	✓	**Construction phase** • Four years construction duration • Construction activities over the maximum extent of the Mona Array Area (450km^2) and a 90km long Offshore Cable Corridor. **Operations and maintenance phase** • Operational life of 35 years • Maximum extent of Mona Array Area at 450km^2 and a 90km long Offshore Cable Corridor. **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of the Mona Offshore Wind Project over the longest duration, therefore the greatest potential for impacts on commercial operators and routes.
Impact to adverse weather routeing (NPS EN-3 2.6.162/163/165).	✓	✓	✓	**Construction phase** • Four years construction duration • Construction activities over the maximum extent of the Mona Array Area (450km^2) and a 90km long Offshore Cable Corridor. **Operations and maintenance phase** • Operational life of 35 years • Maximum extent of Mona Array Area at 450km^2 and a 90km long Offshore Cable Corridor. **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of the Mona Offshore Wind Project over the longest duration, therefore the greatest potential for impacts on adverse weather routing.

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on access to ports and harbours (NPS EN-3 2.6.162/163).	✓	✓	✓	**Construction phase** • Four years construction duration • Construction activities over the maximum extent of the Mona Array Area (450km^2) and a 90km long Offshore Cable Corridor • Up to a total of 74 construction vessels on site at any one time (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels) • Up to 1,857 installation vessel movements (return trips) during construction (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels) • Export cables: up to four cables with a length of 90km and minimum burial of 0.5m. Cable protection laid over a maximum of 72km of the cable with a height of up to 3m. Up to 24 cable crossings, each crossing has a length of up to 50m and a height of up to 3m. **Operations and maintenance phase** • Operational life of 35 years • Maximum extent of Mona Array Area at 450km^2 and a 90km long Offshore Cable Corridor • Export cables: up to four cables with a length of 90km and minimum burial of 0.5m. Cable protection laid over a maximum of 72km of the cable with a height of up to 3m. Up to 24 cable crossings, each crossing has a length of up to 50m and a height of up to 3m • Up to 2,351 operations and maintenance vessel movements (return trips) each year (including CTVs/workboats, jack-up vessels, cable repair vessels, service operation vessels or similar and excavators/backhoe dredger). **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • Export cables: up to four cables with a length of 90km and minimum burial of 0.5m. Cable protection laid over a maximum of 72km of the cable with a height of up to 3m. Up to 24 cable crossings, each crossing has a length of up to 50m and a height of up to 3m • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of the Mona Offshore Wind Project over the longest duration, therefore the greatest potential impact on access into ports and harbours.

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on emergency response capability due to increased incident rates and reduced access for SAR responders (NPS EN-3 2.6.164).	✓	✓	✓	**Construction phase** • Up to four years construction duration • Construction activities over the maximum extent of the Mona Array Area (450km^2) and a 90km long Offshore Cable Corridor • Maximum number of wind turbines (107) and four Offshore Substation Platforms (OSP) (45x65m) • Wind turbines: maximum rotor diameter of 280m, upper blade tip height above Lowest Astronomical Tide (LAT) of 324m and minimum wind turbine spacing of 875m between wind turbines in a row and 1000m between rows of wind turbines • Up to a total of 74 construction vessels on site at any one time (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels) • Up to 1,857 installation vessel movements (return trips) during construction (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels). **Operations and maintenance phase** • Operational life of 35 years • Wind turbine numbers, dimensions, area and supporting infrastructure as described for construction phase • Up to 2,351 operations and maintenance vessel movements (return trips) each year (including CTVs/workboats, jack-up vessels, cable repair vessels, service operation vessels or similar and excavators/backhoe dredger). **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	The largest array area with the minimum distance between the largest number of structures has the greatest potential to inhibit SAR response and access. Maximum number of vessels over the longest period has the greatest potential to increase the incident rate requiring more frequent SAR response.

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on vessel to vessel collision risk (NPS EN-3 2.6.165).	✓	✓	✓	• Construction phase • Four years construction duration • Construction activities over the maximum extent of the Mona Array Area (450km^2) and a 90km long Offshore Cable Corridor • Up to a total of 74 construction vessels on site at any one time (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels) • Up to 1,857 installation vessel movements (return trips) during construction (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels) • Construction base not yet identified at this stage in the pre-application processes but expected to be in the Irish Sea region. **Operations and maintenance phase** • Operational life of 35 years • Up to a total of 21 operations and maintenance vessels on site at any one time (CTVs/workboats, jack-up vessels, cable repair vessels, service operation vessels or similar and excavators/backhoe dredgers) • Up to 2,351 operations and maintenance vessel movements (return trips) each year (including CTVs/workboats, jack-up vessels, cable repair vessels, service operation vessels or similar and excavators/backhoe dredger) • Maximum extent of Mona Array Area at 450km^2 and a 90km long Offshore Cable Corridor. **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of the Mona Offshore Wind Project over the longest duration, with the maximum number of project vessel movements, therefore the highest potential for increases in the risk of collision.
Impact on allision (contact) risk to vessels (NPS EN-3 2.6.165).	✓	✓	✓	**Construction phase** • Up to four years construction duration • Construction activities over the maximum extent of the Mona Array Area (450km^2) • Maximum number of wind turbines (107) plus four OSP (45x65mm) • Lower blade tip height above LAT of 34m • Minimum spacing of 875m between wind turbines in a row and 1000m between rows of wind turbines • Up to 1,857 installation vessel movements (return trips) during construction (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels). **Operations and maintenance phase** • Operational life of 35 years • Wind turbine numbers, dimensions, area and supporting infrastructure as described for construction phase • Up to 2,351 operations and maintenance vessel movements (return trips) each year (including CTVs/workboats, jack-up vessels, cable repair vessels, service operation vessels or similar and excavators/backhoe dredger). **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of the Mona Offshore Wind Project with the maximum number of structures, the maximum number of project vessel movements, and over the longest duration, therefore the highest potential for increases in the risk of allision/contact.

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on marine navigation, communications and position fixing equipment (NPS EN-3 2.6.165).	✓	✓	✓	**All phases** • Operational life of 35 years • Maximum extent of Mona Array Area (450km^2) • Maximum number of wind turbines (107) plus four OSPs (45x65m) • Minimum wind turbine spacing of 875m between wind turbines in a row and 1000m between rows of wind turbines.	Greatest extent of the Mona Offshore Wind Project over the longest period with the most wind turbines and smallest spacing, therefore has the greatest potential to exacerbate the impacts on marine navigation, communications and positioning systems.
Impact on recreational craft passages and safety (NPS EN-3 2.6.166).	✓	✓	✓	**Construction phase** • Four years construction duration • Maximum number of wind turbines (107) plus four OSP (45x65mm) • Lower blade tip height above LAT of 34m • Construction activities over the maximum extent of the Mona Array Area (450km^2) and a 90km long Offshore Cable Corridor • Up to 1,857 installation vessel movements (return trips) during construction (including main installation/support vessels, tug/anchor handlers, cable lay vessels, guard vessels, survey vessels, seabed preparation vessels, CTVs, scour protection installation vessels and cable protection installation vessels). **Operations and maintenance phase** • Operational life of 35 years • Wind turbine numbers, dimensions, area and supporting infrastructure as described for construction phase • Maximum extent of Mona Array Area at 450km^2 and a 90km long Offshore Cable Corridor • Up to 2,351 operations and maintenance vessel movements (return trips) each year (including CTVs/workboats, jack-up vessels, cable repair vessels, service operation vessels or similar and excavators/backhoe dredger). **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of the Mona Offshore Wind Project over the longest period with the most wind turbines, smallest spacing and lowest air draught clearance, therefore, has the greatest potential to impact upon recreational vessel activities and safety.

Potential impact	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on snagging risk to vessel anchors and fishing gear (NPS EN-3 2.6.168).	✓	✓	✓	**Construction phase** • Up to four years construction duration • Inter-array cables: up to 500km in length, with a minimum burial depth of 0.5m. Cable protection laid over a maximum of 50km of the cable with a height of up to 3m. Up to 67 cable crossings, each cable crossing has a length of up to 60m and a height of up to 4m • Interconnector cables: up to three cables with a maximum total length of 50km and a minimum burial depth of 0.5m. Cable protection laid over a maximum of 10km with a height of up to 3m. Up to 10 cable crossings, each crossing has a length of up to 50m and a height of up to 3m • Export cables: up to four cables with a length of 90km and minimum burial of 0.5m. Cable protection laid over a maximum of 72km of the cable with a height of up to 3m. Up to 24 cable crossings, each crossing has a length of up to 50m and a height of up to 3m. **Operations and maintenance phase** • Operational life of 35 years • Lengths and dimensions of cables, cable protection and cable crossings as described for construction phase. **Decommissioning phase** • The duration of the decommissioning programme is anticipated to be the same as for construction, and thus, up to four years • Lengths and dimensions of cables, cable protection and cable crossings as described for construction phase • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Longest length of cables, minimum cable burial depth and maximum length/quantities of cable protection over the greatest duration of the Mona Offshore Wind Project, therefore the highest potential for increases in the risk of anchor and/or gear snagging.
Impact on under keel clearance (NPS EN-3 2.6.168).	✓	✓	✓	**All phases** • Wind turbines and OSPs: scour protection extending up to 21m from each structure to a height of 2.5m • Inter-array cables: up to 500km in length, with a minimum burial depth of 0.5m. Cable protection laid over a maximum of 50km of the cable with a height of up to 3m. Up to 67 cable crossings, each cable crossing has a length of up to 60m and a height of up to 4m • Interconnector cables: up to three cables with a maximum total length of 50km and a minimum burial depth of 0.5m. Cable protection laid over a maximum of 10km with a height of up to 3m. Up to 10 cable crossings, each crossing has a length of up to 50m and a height of up to 3m • Export cables: up to four cables with a length of 90km and minimum burial of 0.5m. Cable protection laid over a maximum of 72km of the cable with a height of up to 3m. Up to 24 cable crossings, each crossing has a length of up to 50m and a height of up to 3m • During the decommissioning phase the changes would gradually decrease from the operational MDS as the need for project-related vessels is reduced and structures are removed and cut below the seabed.	Greatest extent of cable protection and number of cable crossings will result in the greatest reduction of under keel clearance. Greatest number of structures with the greatest extent and height of scour protection will result in greatest reduction of under keel clearance.

12.6.2 Impacts scoped out of the assessment

12.6.2.1 On the basis of the baseline environment and the description of development outlined in volume 1, chapter 3: Project description of the PEIR, as well as consultation with stakeholders, no impacts are proposed to be scoped out of the assessment for shipping and navigation.

12.7 Measures adopted as part of the Mona Offshore Wind Project

12.7.1.1 For the purposes of the EIA process, the term 'measures adopted as part of the project' is used to include the following measures (adapted from IEMA, 2016):

- Measures included as part of the project design. These include modifications to the location or design of the Mona Offshore Wind Project which are integrated into the application for consent. These measures are secured through the consent itself through the description of the development and the parameters secured in the DCO and/or marine licences (referred to as primary mitigation in IEMA, 2016).
- Measures required to meet legislative requirements, or actions that are generally standard practice used to manage commonly occurring environmental effects and are secured through the DCO requirements and/or the conditions of the marine licences (referred to as tertiary mitigation in IEMA, 2016).

12.7.1.2 A number of measures (primary and tertiary) have been adopted as part of the Mona Offshore Wind Project to reduce the potential for impacts on shipping and navigation. These are outlined in Table 12.16 below. As there is a commitment to implementing these measures, they are considered inherently part of the design of the Mona Offshore Wind Project and have therefore been considered in the assessment presented in section 12.8 below (i.e. the determination of magnitude/likelihood and therefore significance assumes implementation of these measures).

12.7.1.3 Where significant effects have been identified, further mitigation measures (referred to as secondary mitigation in IEMA 2016) have been identified to reduce the significance of effect to acceptable levels following the initial assessment. These are measures that could further prevent, reduce and, where possible, offset any adverse effects on the environment. These measures are set out, where relevant, in section 12.8 below.

Table 12.16: Measures adopted as part of the Mona Offshore Wind Project.

Measures adopted as part of the Mona Offshore Wind Project	Justification	How the measure will be secured
Primary measures: Measures included as part of the project design		
Aids to Navigation (AtoN)	Suitable AtoN lighting and marking of the offshore wind farm site shall be undertaken complying with IALA Recommendations G1162 (IALA, 2021), to be finalised and approved in consultation with MCA and Trinity House through an AtoN Management Plan. Fog horns to alert vessels to the position of structures when visibility is poor. Note, planned update to O-139 to include painting reference from waterline (not HAT). Wind turbine informal naming/associated markings shall not interfere with formal AtoN's. AIS transponders to be placed on periphery corner wind turbines.	Proposed to be secured through a condition in the marine licence(s).
Air Draught Clearance	Wind turbine blades will have at least 22m clearance above MHWS.	Proposed to be secured through a condition in the marine licence(s).
Layout Plan and Lines of Orientation	Wind turbine layout plan to be agreed with MCA and Trinity House prior to construction and maintain at least one line of orientation for navigation and SAR access within the Mona Array Area.	Proposed to be secured through a condition in the marine licence(s).
Guard Vessels	Use of guard vessels as required.	Proposed to be secured through a condition in the marine licence(s).
Continuous Watch	Continuous watch by multi-channel VHF, including Digital Selective Calling.	Industry best practice.
Cable Burial Risk Assessment (CBRA) and periodic validation surveys	CBRA to be undertaken pre-construction, including consideration of under keel clearance. All subsea cables will be either fully buried to at least 0.5m (where ground conditions permit and burial tool performance allows), partially buried (buried but not to target depth) with rock protection, or surface laid with cable protection. Selected methods will be based on the risk assessment and the protection will be periodically monitored and maintained as practicable. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the cable route without prior written approval from the Licensing Authority.	Proposed to be secured through a condition in the marine licence(s).
Tertiary measures: Measures required to meet legislative requirements, or adopted standard industry practice		
Notice to Mariners	To ensure that the appropriate authorities are informed of works being carried out in waters adjacent to the Mona Offshore Wind Project. To include: • UK Hydrographic Organisation (UKHO) • MCA • Kingfisher • Trinity House • Northern Lighthouse Board • RYA • Local Ports and Harbours • Oil and Gas operators • MMO • NRW.	Proposed to be secured through a condition in the marine licence(s).
Site marking and charting	Site is marked on nautical charts including an appropriate chart note to facilitate safe passage planning around the Mona Offshore Wind Project.	Proposed to be secured through a condition in the marine licence(s).
Safety zones	Application and use of safety zones. These will consist of 500m from platform/wind turbines edge (at sea level) undergoing active construction or major maintenance. 50m safety zones will be applied for around wind turbines or platforms which are partially constructed, but not undergoing active construction activities.	Application under Electricity Regulations 2007
Fisheries Liaison and Co-existence Plan	Provision of detailed project information to fishermen to aid co-existence, such as site and export cable route location for upload into fish plotters.	Proposed to be secured through a condition in the marine licence(s).
Emergency Response and Cooperation Plan (ERCOP)	ERCOP, agreed with MCA prior to construction.	Proposed to be secured through a condition in the marine licence(s).

Measures adopted as part of the Mona Offshore Wind Project	Justification	How the measure will be secured
Marine Pollution Contingency Plan	Measures will be adopted to ensure that the potential for release of pollutants from construction, and operations and maintenance activities is minimised, which will include accidental spills planning, response and notification requirements.	Proposed to be secured through a condition in the marine licence(s).
Periodic exercises	Periodic emergency management and response exercises will be run by developer, in conjunction with SAR.	Industry best practice.
Incident investigation and reporting	Statutory incident reporting requirements and expectations, including: • MAIB (Merchant Shipping Act) • Health and Safety Executive (RIDDOR) • Harbour Authority under Port Marine Safety Code. Risk assessments to be reviewed following incidents, and additional risk controls identified if appropriate.	Statutory requirements
Buoyed Construction Area	Buoys deployed around construction work in array area in line with Trinity House requirements and may include a combination of cardinal and/or safe water marks. To be finalised and approved in consultation with MCA and Trinity House prior to construction through an AtoN Management Plan.	Proposed to be secured through a condition in the marine licence(s).
Hydrographic Surveys	MGN654 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager and the UKHO.	Proposed to be secured through a condition in the marine licence(s).
Electromagnetic interference minimisation	A Cable Specification and Installation Plan will be prepared. This will include the technical specification of offshore electrical circuits, and a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable burial depth in accordance with industry good practice.	Proposed to be secured through a condition in the marine licence(s).
Construction Method Statement and Programme	Construction method statement and programme to be submitted to MCA and Trinity House for consultation. Where possible, construction to follow linear progression avoiding disparate construction sites across development area.	Proposed to be secured through a condition in the marine licence(s).
Marine Co-ordination	Coordination of Mona Offshore Wind Project vessels during construction and operations and maintenance by the Project Marine Co-ordination Centre to ensure project vessels do not present unacceptable risks to each other or third parties. Mona Offshore Wind Project marine traffic coordination plans to be made available to all maritime users. Information and warnings will be distributed via Notices to Mariners and other appropriate media (e.g. Admiralty Charts and fishermen's awareness charts) to enable vessels and operators to effectively and safely navigate around the array area and activities during the offshore cable corridor construction.	Proposed to be secured through a condition in the marine licence(s)
Vessel Standards	All work vessels operating on behalf of the Mona Offshore Wind Project will have: • MCA Vessel Coding (e.g. Small Commercial Vessel Code) • Appropriate insurance • Crewed by suitably trained/qualified personnel • AIS (Class A/B) • Very High Frequency (VHF) (Ch16) • Appropriate mooring arrangements.	Statutory requirements/industry best practice.
Personal Protective Equipment (PPE)	All personnel to wear the correct PPE suitable for the location and role at all times, as defined by the relevant Quality, Health, Safety and Environment documentation. This will include the use of Personal Locator Beacons.	Industry best practice.
Inspection and Maintenance Programme	Regular maintenance regime by developer to check the project infrastructure, its fittings and any signs of wear and tear. This should identify any defects which might cause a failure.	Industry best practice.
Training	The Applicant is responsible for ensuring that all staff engaged on operations are competent to carry out the allocated work.	Industry best practice.
Compliance with International, UK and Flag State Regulations inc. IMO conventions	Compliance from all vessels associated with the proposed project with international maritime regulations as adopted by the relevant flag state such as COLREGS (IMO, 1972) and Safety of Life at Sea Convention (SOLAS) (IMO, 1974).	Industry best practice.

Measures adopted as part of the Mona Offshore Wind Project	Justification	How the measure will be secured
Vessel health and safety requirements	As industry standard mitigation, the Applicant will ensure that all project related vessels meet both IMO conventions for safe operation as well as Health, Safety and Environment requirements, where applicable. This shall include the following good practice: • Wind farm associated vessels will comply with International Maritime Regulations • All vessels, regardless of size, will be required to carry AIS equipment on board • All vessels engaged in activities will comply with relevant regulations for their size and class of operation and will be assessed on whether they are “fit for purpose” for activities they are required to carry out • All marine operations will be governed by operational limits, tidal conditions, weather conditions and vessel traffic information • Walk to work solutions will be utilised where possible.	Industry best practice.
Vessel Traffic Monitoring	Continuous monitoring during construction and immediate period post construction to MCA approval.	Proposed to be secured through a condition in the marine licence(s).

12.8 Assessment of significant effects

12.8.1.1 The impacts of the construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project have been assessed on shipping and navigation. The potential impacts are listed in Table 12.15, along with the MDS against which each impact has been assessed.

12.8.1.2 A description of the potential effect on shipping and navigation receptors caused by each identified impact is given below.

12.8.2 Impact on recognised sea lanes essential to international navigation

12.8.2.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to an impact on recognised sea lanes essential to international navigation. This would be in contravention to requirements set out in the United Nations Convention on the Law of the Sea (UNCLOS) Article 60 and the NPS EN-3 2.6.161. The MDS is represented by the maximum extent of the generation infrastructure and is summarised in Table 12.15.

12.8.2.2 The Mona Array Area is located less than 2nm northwest of the TSS in Liverpool Bay. This routes traffic into the Port of Liverpool, passing the existing oil and gas and offshore wind farms. As identified in section 12.4.4, the key commercial routes using this TSS approach from the west, and the Off Skerries TSS, or from the northwest having passed to the west of the Isle of Man. The presence of the Mona Array Area, whilst clear of the west route, intersects the direct route taken by vessels between the TSS and a waypoint to the southwest of the Isle of Man. More than 1,000 commercial ships per year pass through both the Mona Array Area and Liverpool TSS.

12.8.2.3 During consultation, several stakeholders asserted that historic routes between any two ports are necessarily "recognised sea lanes" and therefore should not be impacted. A review of UNCLOS Article 22 determines that: "*4. The coastal State shall clearly indicate such sea lanes and traffic separation schemes on charts to which due publicity shall be given*". Therefore, the onus is on the MCA to put forward a proposed sea lane to IMO who would formally designate it. Given that this has not occurred, and no such routes are indicated on charts, Article 60 and NPS EN-3 2.6.161 would not apply. These principles were set out in legal advice concerning the Thanet Extension offshore wind farm and were reaffirmed by the Examining Authority in their Recommendation Report (Thanet Extension, 2019).

Construction phase

Magnitude of impact

12.8.2.4 During construction, vessel traffic would be displaced from the Mona Array Area due to the presence of construction buoyage and safety zones around fixed structures which are under construction. It is anticipated that mariners would also maintain safe passing distance of at least one nautical mile from navigational hazards. Therefore, there is insufficient spacing between wind turbines for a commercial vessel to safely navigate the Mona Array Area and it is anticipated vessels approaching Liverpool TSS will deviate to the southwest.

12.8.2.5 Of the approximately 10,000 large commercial ships transiting through the Liverpool TSS per year, approximately 10% of those vessels approach from the northwest and through the Mona Array Area and would be directly impacted, requiring a deviation to the southwest. Therefore, 90% of vessels using the TSS would not be directly impacted by the presence of the Mona Array Area.

12.8.2.6 The installation of the export cable would pass through the approaches to the TSS but is likely to be installed in this area in a short timeframe and will have minimal disruption to passing vessels.

12.8.2.7 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.8.2.8 With construction in the southwest of the Mona Array Area, a route between the southwest tip of the Isle of Man and the eastbound lane of the Liverpool TSS would be deviated from a distance of 55.1nm to 55.7nm. This increase is minor considering the length of journeys taken by large commercial ships between international ports.

12.8.2.9 The approaches to the TSS from the west are clear of the Mona Array Area and there is adequate searoom for vessels approaching from the northwest to deviate to the southwest of the Mona Array Area. Given that the presence of the Mona Array Area does not prevent access into Liverpool through the TSS, it is not considered that the Mona Array Area would interfere with these sea lanes.

12.8.2.10 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.8.2.11 Overall, the magnitude of the impact is deemed to be **medium** and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance phase

12.8.2.12 The impacts to recognised sea lanes essential to international navigation during operations and maintenance are not anticipated to be substantially different to those during construction. During both the construction and the operational phases of the Mona Offshore Wind Project, large commercial ships will not be able to transit through the array area, whether through the presence of construction buoyage or structures and therefore the impact on vessel routeing will be the same, albeit for different durations.

12.8.2.13 Therefore, the magnitude of the impact is deemed to be **medium** and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

12.8.2.14 The impacts to recognised sea lanes essential to international navigation during decommissioning are not anticipated to be substantially different to those during construction. During both the construction and the decommissioning phases of the Mona Offshore Wind Project, large commercial ships will not be able to transit through the array area, whether through the presence of decommissioning buoyage or structures and therefore the impact on vessel routeing will be the same. However, it

should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.2.15 Therefore, the magnitude of the impact is deemed to be **medium** and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

12.8.3 Impact to commercial operators including strategic routes and lifeline ferries

12.8.3.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to impacts to commercial operators including strategic routes and lifeline ferries. The MDS is represented by the maximum extent of the generation infrastructure and is summarised in Table 12.15.

12.8.3.2 This impact is limited to routeing in normal weather conditions, section 12.8.4 assesses the impacts on vessel routeing in adverse weather situations.

Construction phase

Magnitude of impact

12.8.3.3 During construction, vessel traffic would be displaced from the Mona Array Area due to the presence of construction buoyage and safety zones around fixed structures which are under construction. It is anticipated that mariners would also maintain safe passing distance of at least one nautical mile from navigational hazards. It is anticipated vessels approaching the Liverpool TSS from the northwest, will deviate to the southwest to pass clear of the Mona Array Area.

12.8.3.4 The analysis of vessel routes in section 12.4.4 shows that several ferry and commercial shipping routes would necessitate deviation around the Mona Array Area (see Table 12.17 and Table 12.18, and Figure 12.6 and Figure 12.7 respectively). The revised passage plans were developed by the NASH project team, including master mariners, and account for existing decision-making principles (such as passing at least 1.5nm from a wind turbine) that were obtained during consultation with operators and during the navigation simulation sessions (see volume 6, annex 12.1: Navigational risk assessment of the PEIR).

12.8.3.5 Of the three ferry routes directly impacted by the Mona Array Area:

- The Isle of Man Steam Packet Company route between Douglas and Liverpool with approximately 625 movements per year passing across the northwest boundary of the Mona Array Area. This would require a negligible deviation of 0.01nm to the east to increase the passing distance from the Mona Array Area.
- The Stena route between Liverpool and Belfast to the west of the Isle of Man with approximately 1,400 movements per year directly intersects the Mona Array Area. A revised passage plan was developed that passes to the east of the Mona Array Area, avoiding congestion within the TSS. Vessels would depart Liverpool as they currently do before heading more north northwest than at present, passing 1.5nm from the Hamilton North Gas Field and single buoy mooring, before turning to port 1.5nm from the northeast boundary of Mona in order to clear Chicken Rock on the Isle of Man at their existing waypoint. This would necessitate an additional 2.6nm/7.4 minutes of steaming time per trip.
- The Seatruck route between Heysham and Dublin with approximately 600 movements per year passes through the north boundary of the Mona Array Area. Vessels would depart Heysham as they currently do, passing north of the South Morecambe Gas Field but continue further west to clear the north boundary of the Mona Array Area by 1.5nm, before turning southwest towards Dublin. This would necessitate an additional 0.4nm/1.6 minutes of steaming time per trip.

12.8.3.6 Three commercial routes with more than one movement per day would be directly impacted by the Mona Array Area, all of which are routes into the Liverpool TSS from the west or northwest. The required deviation to pass clear of the Mona Array Area is less than one nautical mile for each route.

12.8.3.7 A further ten routes were identified which would be deviated around the Mona Array Area, including routes into Douglas, Heysham and Barrow. The majority of these minor routes have less than one vessel transit per week.

12.8.3.8 The installation of cables will impose temporary and localised impacts which would also displace vessel traffic. This will necessitate cable laying across the approaches to the Liverpool TSS, which is used by more than 10,000 vessels per year. However, given the short term transient nature of these impacts, they can be more easily managed.

12.8.3.9 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation of activities through the use of Notice to Mariners will ensure approaching vessels can safely avoid the construction area
- Marking and charting of the Array Area on nautical charts to facilitate safe passage planning
- Construction method statement and programme to manage traffic.

12.8.3.10 As daily services across several operators will be impacted, the magnitude is therefore, considered to be **high**.

Table 12.17: Impact on ferry Routeing.

Parameter	Stena LIV-BEL-W	Seatruck HEY-DUB	Isle of Man Steam Packet Company LIV-DOUG
Example Vessels (2019-2022)	Stena Edda Stena Embla Stena Mersey Stena Horizon Stena Lagan Stena Forecaster Stena Forerunner	Seatruck Pace Seatruck Panorama	Manannan
Approximate Annual Crossings (2019)	1,442	610	628
Baseline Distance (nm)	142.3	107.0	71.49
Baseline Time (Minutes)	480	480	165

Parameter	Stena LIV-BEL-W	Seatruck HEY-DUB	Isle of Man Steam Packet Company LIV-DOUG
Service Speed (Knots)	18.7	15	28.8
Deviated Distance	144.6	107.4	71.5
Additional Project Time (Minutes)	+7.4	+1.6	Negligible

Table 12.18: Increase in distance for impacted commercial routes.

Route	Approximate Annual Crossings (2019)	Baseline Distance (nm)	Deviated Distance (nm)	Additional Deviated Distance (nm)	Total Additional Distance/Year
W IoM to Liverpool TSS (E)	525	55.1	55.7	0.6	332.5
Off Skerries TSS to Heysham (E)	21	71.2	76.3	5.1	107.1
Off Skerries TSS to Barrow (W) – North	10	69.0	70.4	1.9	19.5
Off Skerries TSS to Barrow (W) - South	17	69.4	70.7	1.1	19.1
Heysham to Off Skerries TSS (W)	18	73.9	76.4	2.5	45.0
Liverpool TSS to Irish Sea (W)	45	49.2	49.3	0.1	3.1
Liverpool TSS to Irish Sea (W)	410	50.08	50.13	0.0	19.9
Liverpool TSS to W IoM (W)	704	53.0	54.0	1.0	704.1
Liverpool to E IoM - West	17	77.6	72.8	-4.8	-81.4
Liverpool to W IoM	128	61.0	64.1	3.0	386.6
Douglas to Liverpool TSS (E)	16	51.7	57.6	5.9	94.2
Douglas to Liverpool TSS	20	51.1	51.0	-0.1	-2.3
Off Skerries TSS to Barrow (E)	23	66.9	71.6	1.5	35.5

Sensitivity of the receptor

12.8.3.11 For commercial routes, the principal routes with more than one vessel per day would necessitate less than one nautical mile of deviation to the southwest to pass clear of the Mona Array Area. This increase is minor considering the length of journeys taken by commercial vessels between international ports. Therefore, it is not anticipated to have any material impact upon the viability of these routes into Liverpool.

12.8.3.12 Less trafficked commercial routes are more widely dispersed within the shipping and navigation study area, and whilst have greater impacts, have far fewer vessel transits. The greatest impacted routes are between the Off Skerries TSS and Heysham, and the Douglas to Liverpool TSS routes, both of which would necessitate an additional five nautical miles of transit. Given the length of the journeys and the speed of transit, this is not anticipated to have any significant impacts upon the viability of these routes.

12.8.3.13 Timetabled ferry services are more sensitive to impacts associated with increased transit time due to constraints on their schedules, berthing or crewing requirements (see volume 6, annex 12.1: Navigational risk assessment of the PEIR). Three routes would require deviation around the Mona Array Area:

- The Isle of Man Steam Packet Company route between Douglas and Liverpool, with approximately 625 movements per year, passes across the northwest boundary of the Mona Array Area and will require a negligible deviation to the east. On a three hour service, with greater existing operational variation in transit duration and turn around time, the deviation is not anticipated to impose significant operational impacts.
- The Stena route between Liverpool and Belfast to the west of the Isle of Man, with approximately 1,400 movements per year, directly intersects the Mona Array Area. To pass to the north this would necessitate an additional 7.4 minutes of steaming time per trip. On an eight hour service, with greater existing operational variation in transit duration and turn around time, the deviation is not anticipated to impose significant operational impacts.
- The Seatruck route between Heysham and Dublin, with approximately 600 movements per year, passes through the north boundary of the Mona Array Area. To pass clear to the north, this would necessitate an additional 1.6 minutes of steaming time per trip. On an eight hour service, with greater existing operational variation in transit duration and turn around time, the deviation is not anticipated to impose significant operational impacts.

12.8.3.14 As the additional impact on these routes is less than existing operational constraints, the sensitivity of the receptor is, therefore, considered to be **low**.

Significance of the effect

12.8.3.15 Overall, the magnitude of the impact is deemed to be **high** and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than moderate effect has been determined given the minimal increase in journey times which are within the existing natural variation of operator schedules.

Operation and maintenance phase

12.8.3.16 The impacts to commercial operators including strategic routes and lifeline ferries during operations and maintenance are not anticipated to be substantially different to those during construction. During both the construction and the operational phases of the Mona Offshore Wind Project, large commercial ships will not be able to transit

through the Mona Array Area, whether through the presence of construction buoyage or structures and therefore the impact on vessel routeing will be the same, albeit for different durations.

12.8.3.17 Therefore, the magnitude of the impact is deemed to be **high** and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than moderate effect has been determined given the minimal increase in journey times which are within the existing natural variation of operator schedules.

Decommissioning phase

12.8.3.18 The impacts to commercial operators including strategic routes and lifeline ferries during decommissioning are not anticipated to be substantially different to those during construction. During both the construction and the decommissioning phases of the Mona Offshore Wind Project, large commercial ships will not be able to transit through the Array Area, whether through the presence of decommissioning buoyage or structures and therefore the impact on vessel routeing will be the same. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.3.19 Therefore, the magnitude of the impact is deemed to be **high** and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than moderate effect has been determined given the minimal increase in journey times which are within the existing natural variation of operator schedules.

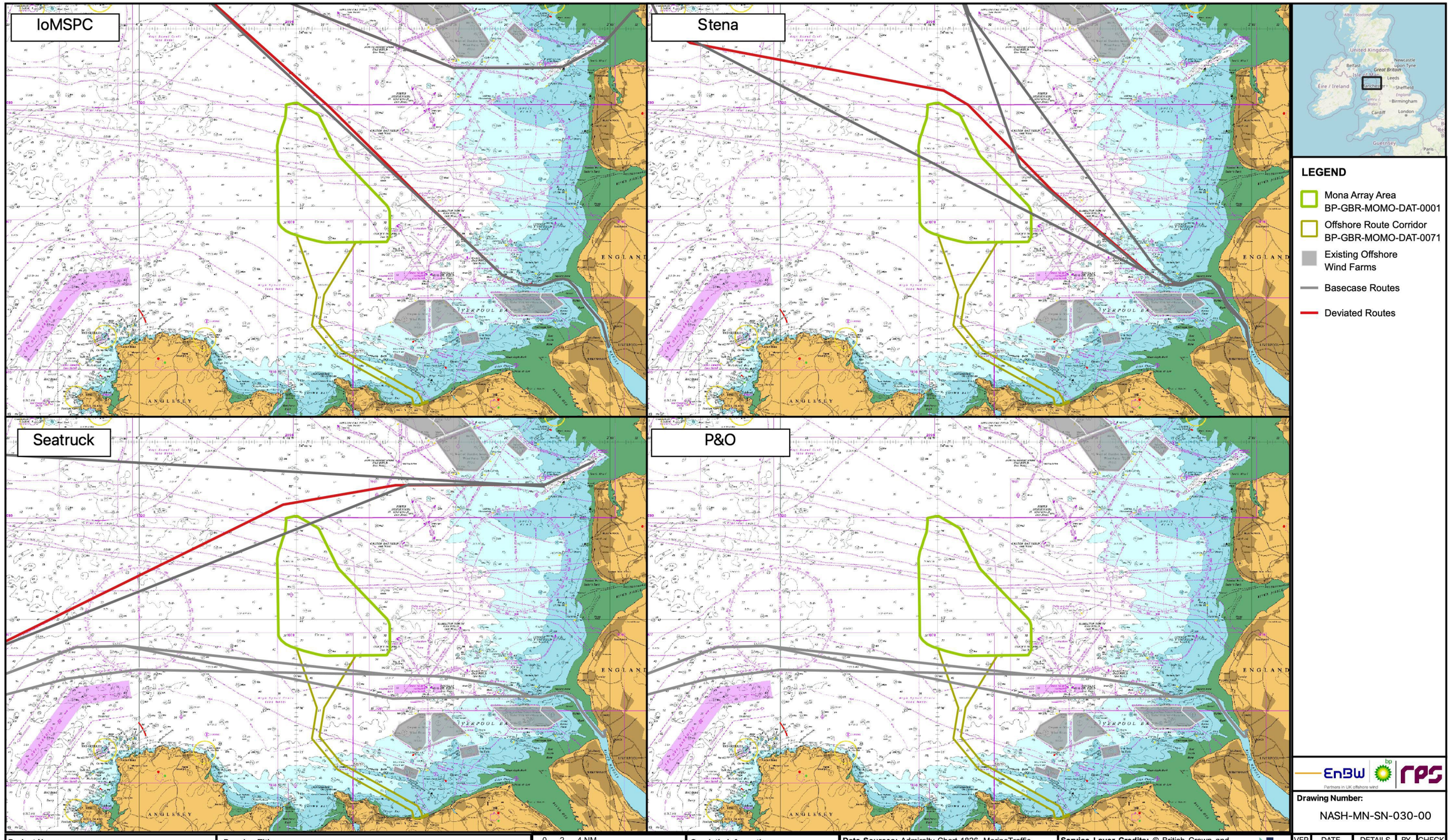


Figure 12.6: Deviations to ferry routes.

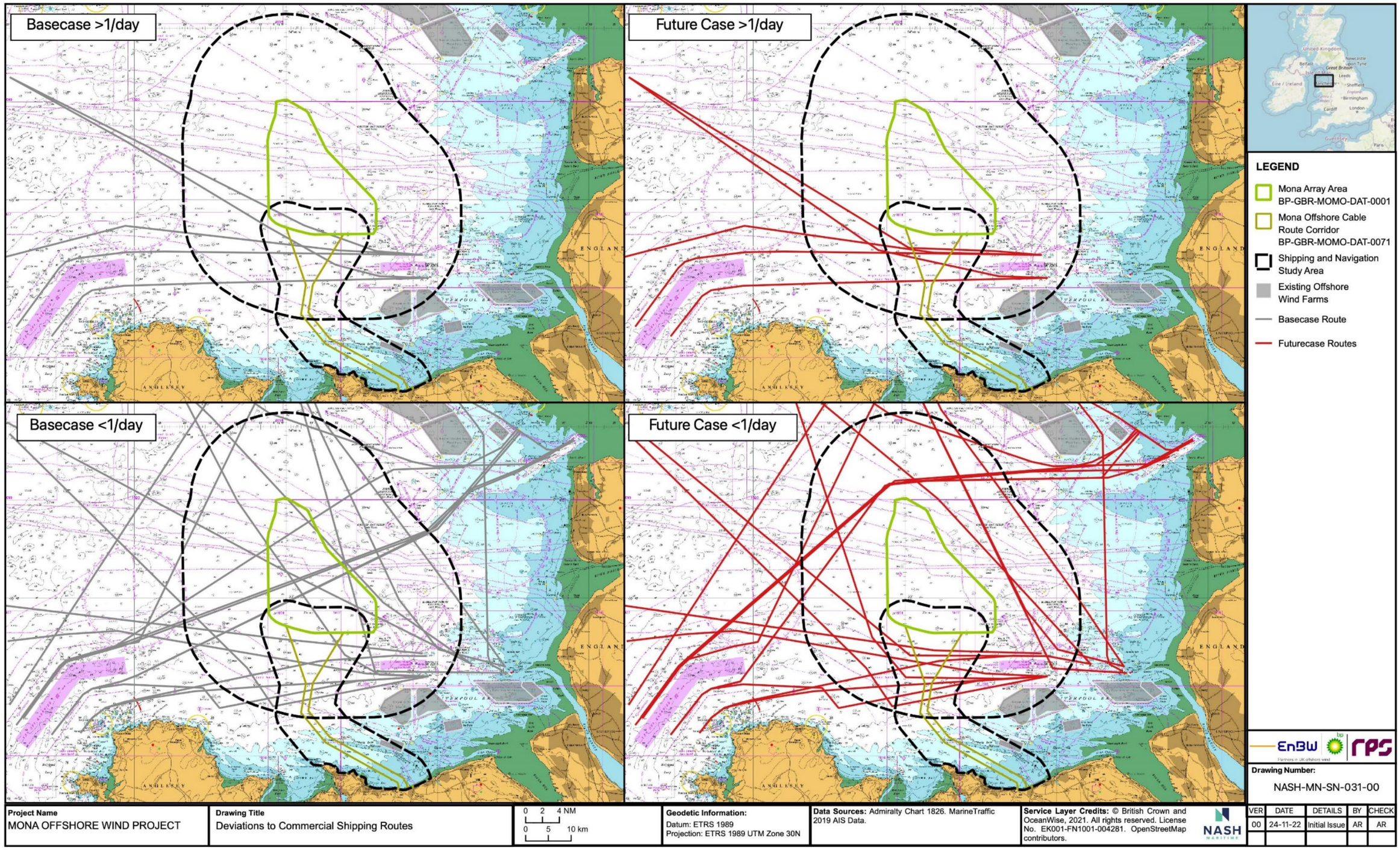


Figure 12.7: Deviations to commercial shipping routes.

12.8.4 Impact on adverse weather routeing

12.8.4.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to impacts to adverse weather routeing. The MDS is represented by the maximum extent of the generation infrastructure and is summarised in Table 12.15.

12.8.4.2 Where significant adverse weather is encountered, vessels may take less direct routes to take advantage of lees from land masses, avoid dangerous sea states or minimise the motions onboard. The navigation simulations (see volume 6, annex 12.1: Navigational risk assessment of the PEIR) demonstrated that without being able to adequately weather route, excessive roll was experienced that posed a hazard to the vessel which could reduce control and be uncomfortable to passengers.

Construction phase

Magnitude of impact

12.8.4.3 During construction, vessel traffic would be displaced from the Mona Array Area due to the presence of construction buoyage and safety zones around fixed structures which are under construction. It is anticipated that mariners would also maintain safe passing distance of at least one nautical mile from navigational hazards, likely greater in adverse weather. It is anticipated vessels approaching the Liverpool TSS from the northwest will deviate to the southwest to pass clear of the Mona Array Area.

12.8.4.4 During adverse weather, some sailings are delayed or inevitably cancelled irrespective of the presence of the Mona Array Area. However, with the presence of the Mona Array Area, sailings may be required to route a greater distance and duration. Over the course of a day, the aggregation of these delays would result in the potential for additional sailings to be cancelled where constraints such as hours of rest are exceeded. Such effects are already experienced by operators, but the presence of the Mona Offshore Wind Project may exacerbate this.

12.8.4.5 During consultation and navigational simulations, the conditions in which adverse weather routes would be taken, or services cancelled, was shown to be dependent on many different factors including route, vessel, wind/wave directions, wind speed and wave height. However, it was estimated that the Isle of Man Steam Packet Company service between Liverpool and Douglas (Manannan) would be impacted at a significant wave height (Hs) of 1.6m and cancelled at 2m Hs. The Stena route between Liverpool and Belfast would be impacted at 2.4m Hs and cancelled at 3.4m Hs. These thresholds are noted to be conservative given the frequency of occurrence for historical transits in 2019 (see Table 12.19).

12.8.4.6 Given these thresholds and analysis of the Met Office's 1988-2021 North West Shelf Model, the frequency at which these conditions would be exceeded in a typical year can be given:

- Isle of Man Steam Packet Company Liverpool to Douglas: Between 4.8% and 13.4% of sailings would require some weather routeing (average of 9.6%). Between 1.5% and 7.3% of sailings could be cancelled due to adverse weather (average of 4%)
- Stena Liverpool to Belfast: Between 1.2% and 10% of sailings would require some weather routeing (average of 4.8%). Between 0% and 1.5% of sailings could be cancelled due to adverse weather (average of 0.6%).

12.8.4.7 Given the estimated percentages of impacts, and a review of operator schedules and constraints, an estimate can be made for the number of additional services cancelled due to navigating a longer route around the Mona Array Area:

- Isle of Man Steam Packet Company Liverpool to Douglas: A basecase estimate of 26 sailings cancelled would increase to 35 sailings cancelled with the Mona Offshore Wind Project
- Stena Liverpool to Belfast: A basecase estimate of 14 sailings cancelled would increase to 21 sailings cancelled with the Mona Offshore Wind Project.

12.8.4.8 Analysis of commercial vessel traffic in adverse weather events did not identify any appreciable changes in vessel routes. During MetOffice named storm events, with gale/storm force winds, there was a greater use of the anchorage to the east of Anglesey.

12.8.4.9 The installation of export cables will impose temporary and localised impacts which would also displace vessel traffic. However, cable laying is unlikely to occur during adverse weather scenarios.

12.8.4.10 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the construction area
- Marking and charting of the Array Area on nautical charts to facilitate safe passage planning
- Construction method statement and programme to manage traffic.

12.8.4.11 Given that adverse weather routeing is anticipated to be impacted infrequently but multiple times per year, the magnitude is considered to be **Medium**.

Sensitivity of the receptor

12.8.4.12 Figure 12.8 shows anticipated adverse weather routeing with and without the Mona Offshore Wind Project in situ. The 2019 AIS data has been used to estimate the impact on vessel routes in adverse weather. Each revised passage plan was developed by the NASH project team, including master mariners. These passage plans are based on existing passage plans provided by operators during consultation (such as passing at least 1.5nm from a wind turbine) and informed by the results of the navigation simulation sessions (volume 6, annex 12.1: Navigational risk assessment of the PEIR).

Table 12.19: Impact on ferry routeing in adverse weather.

Parameter	Stena LIV-BEL-W	IOMSPC LIV-DOUG
Principal Vessels (2019-2022)	Stena Edda Stena Embla Stena Mersey Stena Horizon Stena Lagan Stena Forecaster Stena Forerunner	Manannan
Approximate Annual Crossings with Significant Deviation (2019)	20	34
Baseline Distance (nm)	144.4	73.5
Baseline Time (Minutes)	418-495	168-191
Total Delay Basecase (Minutes)	+13 to +68	+10 to +33
Additional Distance due to Mona	145.9	79.4
Additional Time due to Mona (Minutes)	+24	+27

12.8.4.13 The Isle of Man Steam Packet Company Liverpool and Douglas adverse weather routeing accounts for an additional 10 to 33 minutes of journey time on a 158 minute journey, as identified within the 2019 AIS data. These transits tend to trend to the southwest and therefore it has been assumed that vessels would pass to the south and west of the Mona Array Area. This would necessitate a further 27 minutes in journey times to transit around the Mona Array Area, a total delay of at least 37 minutes to the typical route of a 158 minute journey. It should be noted during the bridge navigation simulation it was verified that the Manannan is more sensitive to adverse weather conditions than conventional ro-ro ferries and therefore may be more likely to take adverse weather routes and be impacted by the presence of the Mona Array Area.

12.8.4.14 The Stena Liverpool to Belfast routes in adverse weather for transits to the west of Isle of Man tend to trend to the southwest, towards the prevailing conditions. Within the 2019 data, this accounted for an additional 13-68 minutes in additional distance and reduced speed to the typical route of a 418-495 minute journey time. The revised passage plan assuming the presence of the Mona array would assume that these vessels would pass south of the Mona Array Area and continue towards Anglesey to take the greatest lee and improve their angle when turning north. Given this passage plan, in order to fully clear the Mona Array Area further to the southwest, this would require a further increase in transit times by 24 minutes, a total delay of at least 38 minutes relative to the typical route of 418-495 minutes.

12.8.4.15 The median adverse weather routes used by Seatruck pass clear to the north of the Mona Array Area and therefore do not require deviation. The most extreme passage plans to the southwest provided by Seatruck would necessitate a deviation to the north around the Mona Array Area, but relatively few transits were identified taking these routes in 2019.

12.8.4.16 In addition to the impact on vessel routeing, the presence of the Mona Array Area reduces the optionality of vessels to maintain a safe and comfortable heading to the adverse conditions. A passage to the east of the Mona Array Area would require vessels to navigate beam on to the prevailing conditions, which is not considered seamanlike in adverse weather and could result in cargo shift. The navigation simulations noted excessive roll was experienced during adverse weather for ferries if routed to the east of Mona, without the capability to turn west into the prevailing conditions.

12.8.4.17 Ferry services in the shipping and navigation study area are important for facilitating trade, tourism and other important functions. In particular, consultees emphasised that services between the Isle of Man and the UK are lifeline services which carry food and goods which are crucial in a just-in-time economy. The socio-economics approach for considering potential impacts of the Mona Offshore Wind Project on the IoM is set out within volume 4, chapter 29: Socio-economics of the PEIR.

12.8.4.18 During adverse weather, cargo shift as a result of reduced optionality on vessel heading could cause minor injuries and property damage.

12.8.4.19 Due to the potential loss of services to the Isle of Man, the sensitivity of the receptor is therefore, considered to be **medium**.

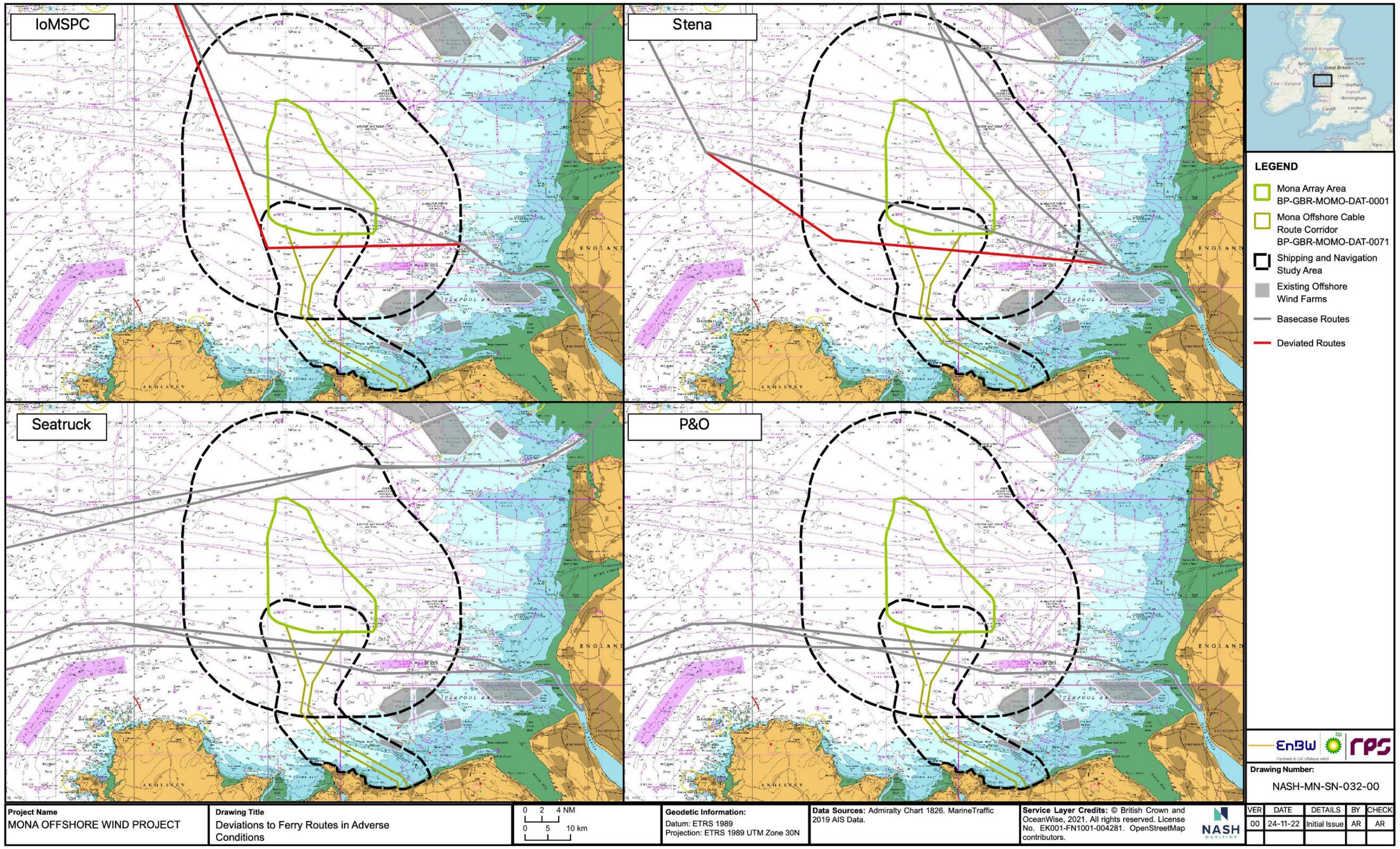


Figure 12.8 Deviations to ferry routes in adverse conditions

Significance of the effect

12.8.4.20 Overall, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **medium**. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effect

12.8.4.21 The Mona Offshore Wind Project has committed to exploring additional risk controls through further studies and engagement with stakeholders to ensure they are appropriate and adequate for reducing risks to ALARP prior to submission of the DCO application. Appropriate risk controls will then be secured through the DCO or marine licence(s) (see section 12.14).

Operations and maintenance phase

12.8.4.22 The impacts to adverse weather routeing during operations and maintenance are not anticipated to be substantially different to those during construction. During both the construction and the operational phases of the Mona Offshore Wind Project, large commercial ships will not be able to transit through the Array Area, whether through the presence of construction buoyage or structures and therefore the impact on vessel routeing will be the same, albeit for different durations.

12.8.4.23 Therefore, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **medium**. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

12.8.4.24 Appropriate further mitigation listed for the construction phase will apply to the operations and maintenance phase of the Mona Offshore Wind Project.

Decommissioning phase

12.8.4.25 The impacts to adverse weather routeing during decommissioning are not anticipated to be substantially different to those during construction. During both the construction and the decommissioning phases of the Mona Offshore Wind Project, large commercial ships will not be able to transit through the Mona Array Area, whether through the presence of decommissioning buoyage or structures and therefore the impact on vessel routeing will be the same. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.4.26 Therefore, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **medium**. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms

12.8.4.27 Appropriate further mitigation listed for the construction phase will apply to the decommissioning phase of the Mona Offshore Wind Project.

12.8.5 Impact on access to ports and harbours

12.8.5.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project could lead to reduced access to ports and harbours. These include the key ports of Liverpool, Heysham and Douglas, and small harbours along the Welsh, English and Isle of Man coast.

12.8.5.2 The MDS is represented by the maximum extent of the generation infrastructure, the longest duration of construction and the maximum cable protection for the export cable and is summarised in Table 12.15.

12.8.5.3 Following determination of the construction base for the Mona Offshore Wind Project, this impact should be reviewed to ensure that appropriate risk controls are in place.

Construction phase

Magnitude of impact

12.8.5.4 The location of the Mona Array Area is well clear of the Statutory or Competent Harbour Authority Areas of any port or harbour in the Irish Sea.

12.8.5.5 The Mona Array Area would result in deviation of both ferry and commercial shipping routes, particularly to Liverpool, Douglas and Heysham. These impacts are assessed in section 12.8.2, 12.8.3 and 12.8.4.

12.8.5.6 During construction, there could be up to 91 construction vessels on site at any one time, with up to 1,857 vessel movements. These additional movements could lead to congestion or operational challenges in ports and harbours through which they transit. The construction base or bases for the Mona Offshore Wind Project is not yet determined, but previous offshore wind projects elsewhere in the UK have successfully mitigated these operational challenges, particularly through marine coordination of construction activities and liaison with ports and harbours.

12.8.5.7 The laying of the export cable will necessitate an advisory exclusion area around the cable laying vessel of up to 500m could impede navigation of other vessels. In particular, this may cause disruption to activities at Raynes Jetty which is serviced by small general cargo vessels of approximately 90m in length. However, cable laying operations in this area will have a short duration, reducing the extent of impact. Limited impact upon the harbour of Rhos-on-Sea is anticipated.

12.8.5.8 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.8.5.9 Any impacts during cable laying are likely to be short term and localised and therefore would have limited consequence. Given the infrequent calls to Raynes Jetty and unrestricted searoom either side of the Mona Offshore Cable Route, promulgation of information and notices, as committed to in section 12.7, and coordination between parties, if required, during construction can deconflict these operations.

12.8.5.10 Given the impacts to ports and harbours during construction are assumed to be manageable, the sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.8.5.11 Overall, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance phase

Magnitude of impact

12.8.5.12 During operations and maintenance, there could be up to 2,351 vessel movements per year associated with the Mona Offshore Wind Project. These additional movements could lead to congestion or operational challenges in ports and harbours through which they transit. The operations and maintenance base or bases for the Mona Offshore Wind Project are not yet determined, but previous offshore wind projects elsewhere in the UK have successfully mitigated these operational challenges, particularly through marine coordination of operations and maintenance activities and liaison with ports and harbours.

12.8.5.13 Given the completion of all major construction activities, direct impacts of the Mona Offshore Wind Project on other ports and harbours is limited.

12.8.5.14 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.8.5.15 Given the impacts to ports and harbours during operations and maintenance are assumed to be manageable, the sensitivity of the receptor is therefore, considered to be **low**.

Significance of effect

12.8.5.16 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms. A negligible rather than minor effect has been determined given that the Mona Offshore Wind Project is not anticipated to adversely impact port/harbour operations.

Decommissioning phase

12.8.5.17 The impacts to reduced access to ports and harbours during decommissioning are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.5.18 Therefore, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

12.8.6 Impact on emergency response capability due to increased incident rates and reduced access for SAR responders

12.8.6.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to an impact on emergency response capability due to increased incident rates and reduced access for SAR responders. The MDS is represented by the greatest extent of the Mona Offshore Wind Project, the maximum duration, the greatest number of vessel movements and the minimum spacing between structures and is summarised in Table 12.15.

Construction phase

Magnitude of impact

12.8.6.2 Historical incident data presented in section 12.4.4 shows relatively few incidents have occurred within the Mona Array Area. As demonstrated within volume 6, annex 12.1: Navigational risk assessment of the PEIR, the construction activities of offshore wind farms can lead to an increase in incidents involving construction vessels, but these are usually both of low frequency and consequence.

12.8.6.3 It should be noted that often incidents within or adjacent to offshore wind farms are responded to by CTVs before conventional SAR assets (such as helicopters or lifeboats) are able to reach the casualty, providing a beneficial effect.

12.8.6.4 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, the design of the wind farm will be such to enable helicopter access and therefore safeguard HMCG obligations to SAR within the UK SAR Region. Several trials have been conducted by HMCG and MCA in SAR at offshore wind farms (see MCA, 2005; 2019) to establish best practice.

12.8.6.5 Emergencies on board, particularly fire or a man overboard, require immediate action by the bridge teams. For example, during fire, it may be necessary to turn the vessel into the wind such that the smoke does not blow across the passenger decks. Consultation has identified that these incidents do infrequently occur on board ferries in the eastern Irish Sea (in the order of less than once a year).

12.8.6.6 Whilst the Mona Offshore Wind Project does not necessarily impact upon the likelihood that fire may occur, its presence would constrict the searoom to perform these manoeuvres and may increase the resulting consequences. However the likelihood of these incidents occurring is low and there would still exist several nautical miles of searoom to undertake emergency manoeuvres if required.

12.8.6.7 Several key risk controls are committed to reduce the impact on emergency response during construction:

- An Emergency Response and Cooperation Plan will be developed to facilitate information sharing regarding the offshore wind farm and SAR organisations
- Periodic exercises will be undertaken at the site to prepare for incident response
- At least one line of orientation and a regular layout of structures
- Wind Turbine spacing will be at least 875 metres with commitment to a minimum of 1,000m between wind turbine rows, exceeding SAR minimum requirements of 500m
- A Design Plan, including a plan of the Mona Array Area will be prepared and submitted to the MCA and Trinity House post-consent but before construction commences
- Furthermore, a buoyed construction area, aids to navigation and promulgation measures will reduce the likelihood of third party vessels being involving in an incident within the shipping and navigation study area.

12.8.6.8 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.8.6.9 Whilst reduction in SAR capability could impact the likelihood of a successful rescue and could therefore have potentially high consequences, compliance with guidance and best practice would mitigate this impact.

12.8.6.10 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.8.6.11 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that the presence of the structures will have an adverse impact on SAR capability as opposed to open sea, albeit the Mona Offshore Wind Project will follow best practice to minimise this impact.

Operations and maintenance phase

12.8.6.12 The presence of infrastructure within the Mona Array Area, whether during construction or operations and maintenance, will have a similar effect on SAR. During construction, there may be partially constructed wind turbines, an irregular development site or the presence of jack ups which pose additional hazards. There would however be a greater duration of impact during the operational phase than the construction phase. Therefore, the impacts to emergency response during operations and maintenance are not anticipated to be substantially different to those during construction.

12.8.6.13 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that the presence of the structures will have an adverse impact on SAR capability as opposed to open sea, albeit the Mona Offshore Wind Project will follow best practice to minimise this impact.

Decommissioning phase

12.8.6.14 The impacts to emergency response during decommissioning are not anticipated to be substantially different to those during construction. However, it should be noted

that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.6.15 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that the presence of the structures will have an adverse impact on SAR capability as opposed to open sea, albeit the Mona Offshore Wind Project will follow best practice to minimise this impact.

12.8.7 Impact on vessel to vessel collision risk

12.8.7.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to increased vessel to vessel collision risk. The MDS is represented by the maximum extent of the Mona Array Area, the greatest number of vessel movements and the maximum duration of the Mona Offshore Wind Project and is summarised in Table 12.15.

12.8.7.2 The assessment of collision risk has assumed that all vessels will comply with their obligations under the COLREGs, SOLAS and undertake prudent passage planning.

Construction phase

Magnitude of impact

12.8.7.3 During construction, vessel traffic would be displaced from the Mona Array Area due to the presence of construction buoyage and safety zones around fixed structures which are under construction. It is anticipated that mariners would also maintain safe passing distance of at least one nautical mile from navigational hazards. Furthermore, there is insufficient spacing between wind turbines for a commercial vessel to safely navigate. Therefore, section 12.8.3 identifies that both commercial and ferry vessel routes will be deviated around the array which will result in a convergence of vessel routes to the southwest of the Mona Array Area, and to the north of the Mona Array Area.

12.8.7.4 The construction base or bases for the Mona Offshore Wind Project are not yet determined, but there is potential for construction vessels in transit to the Mona Array Area to be involved in a collision with other navigating vessels.

12.8.7.5 The hazard workshop and volume 6, annex 12.1: Navigational risk assessment of the PEIR highlighted that several collision hazards were likely to occur within the shipping and navigation study area during the Mona Offshore Wind Project duration, involving ferries, cargo/tanker, fishing, recreational craft and project vessels.

12.8.7.6 The confluence of traffic in these regions will inevitably increase vessel encounters and therefore potential collision situations. Whilst it is unlikely that most of these situations will result in a collision, there will be some residual increase in risk. Analysis of historical incident data in section 12.4.4 demonstrates that the greatest traffic density is to the south of the Mona Array Area, within the approaches to Liverpool. The presence of the Mona Array Area constricts this traffic further, increasing interactions.

12.8.7.7 During full bridge simulations with ferry operators, collision situations were tested in normal and adverse weather conditions around the Mona Array Area. There were no instances of collision occurrence between two vessels. However, adequate Closest Point of Approach (CPA) was not maintained between vessels during some specific situations. This typically occurred during adverse weather runs with relatively high traffic density, including other commercial ships and small craft such as fishing boats.

12.8.7.8 The full bridge simulations and traffic modelling identified that crossing situations can develop between SE bound traffic to the Liverpool Bay TSS and westbound vessels departing the TSS. Given the volume of traffic concentrated in this area, it would be expected that such situations may also occur with multiple vessels. In such situations, the westbound vessel is the Give-Way vessel under the Collision Regulations and should turn to starboard to avoid a collision. The presence of the Mona Array Area could prevent westbound vessels (particularly when in the north portion of the lane and are heading NW) having sufficient sea room to turn to starboard. Therefore, vessels may have to slow down significantly to enable SE bound vessels to cross.

12.8.7.9 During construction, it is likely that recreational craft on passage will avoid the Mona Array Area. This will offset their transits into adjacent waters. However, analysis of recreational activity in section 12.4.4 demonstrated relatively few movements through the Mona Array Area, and therefore would be unlikely to be involved in a collision.

12.8.7.10 Large parts of the Irish Sea are fished and during construction, fishing may be displaced into adjacent waters which increases the risk of collision. This is referred to as Spatial Squeeze, for which the National Federation of Fishermen's Organisations and Scottish Fishermen's Federation recently published a report (NFFO, 2022).

12.8.7.11 The majority of large construction vessels will be travelling at low speed within the Mona Array Area. Whilst the route taken by construction vessels is not known, it is likely that they would infrequently cross shipping routes. There is, therefore, limited risk of collision by navigating vessels.

12.8.7.12 The presence of the wind turbines may block or hinder the view of other vessels, resulting in "blind spots" which could increase the risk of collision by reducing the capability for early and effective collision avoidance. Vessels may be visually less distinct amongst the wind turbines and less prominent through radar, particularly at night and in poor visibility.

12.8.7.13 Most commercial ships would transit at least one nautical mile from the Mona Array Area. For a fishing boat or recreational craft emerging from the wind turbines boundary at six knots, it would take 10 minutes to intersect the commercial ships path. For a CTV at 25 knots, this is reduced to 2.4 minutes, albeit these vessels would carry AIS so would be more prominent. Such challenges currently exist for the established Irish Sea offshore wind farms but are being successfully managed by maintaining safe passing distances with no reported collisions as a direct result of reduced visibility of emerging vessels.

12.8.7.14 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the construction area
- Marking and charting of the Array Area on nautical charts to facilitate safe passage planning
- A buoyed construction area and safety zones will offset third party traffic and construction vessels

- Fisheries liaison and co-existence planning to reduce interactions between fishing vessels and construction vessels
- Marine co-ordination will promote best practice during construction activities within the site
- Construction method statement and programme will manage traffic and reduce impacts.

12.8.7.15 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.8.7.16 Analysis of MAIB incident data suggests that approximately 1% of collisions would result in loss of life. Collisions between commercial vessels, even at speed, often result in only damage and no pollution or injuries (MAIB 7/2018, 28/2015, 3/2017, 15/2013).

12.8.7.17 Several consultees noted that a collision between a large commercial ship or ferry with a small craft such as fishing boat would likely result in the loss of the small craft and multiple fatalities (7/2007, 10/2015). However, the data indicates a more likely outcome would be serious damage to the small craft and either no or minor injuries or pollution (MAIB 4/2019, 16/2015, 20/2011, 17/2011).

12.8.7.18 During the hazard workshop, some consultees made reference to the highly fragile structural integrity of the Manannan high speed ferry. These vessels, having been designed for high-speed transit, are of aluminium construction and any collision involving this vessel could, therefore, have a higher potential consequence.

12.8.7.19 The NRA concluded that a most likely outcome for a ferry or passenger ship would be multiple injuries, moderate damage, minor pollution and widespread adverse publicity, with a worst credible outcome resulting in multiple loss of life. The most likely outcome for small craft was minor injuries, minor damage and no pollution. Less numerous loss of life as compared to ferry collisions was identified as a worst credible outcome for all other large vessel types. Stakeholders requested that the worst credible outcome for a large vessel in collision with a small vessel was for multiple loss of life and the risk assessment was amended to reflect this.

12.8.7.20 The consequences of a collision during construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Emergency Response and Cooperation Plan to effectively respond to an incident
- Marine Pollution Contingency Plan
- Periodic exercises and training.

12.8.7.21 The sensitivity of the receptor is therefore, considered to be **high**.

Significance of the effect

12.8.7.22 Volume 6, annex 12.1: Navigational risk assessment of the PEIR assessed four collision hazards which occurred during the construction phase of the Mona Offshore Wind Project. Of these two were scored as High Risk – Unacceptable. Firstly, the risk of collision between a ferry/passenger vessel and a cargo/tanker or other ferry/passenger vessel. Secondly, the risk of collision between a ferry/passenger vessel or cargo/tanker and a small craft (such as fishing, recreational or project vessel). The remaining two hazards were scored as Medium Risk – Tolerable if ALARP.

12.8.7.23 Overall, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms. A moderate rather than major effect has been determined given that the increase in collision risk, whilst unacceptable, was assessed within the NRA as within the High Risk rather than Extreme Risk categories.

Further mitigation and residual effect

12.8.7.24 The Mona Offshore Wind Project has committed to exploring additional risk controls through further studies and engagement with stakeholders to ensure they are appropriate and adequate for reducing risks to ALARP prior to submission of the DCO application. Appropriate risk controls will then be secured through the DCO or marine licence(s) (see section 12.14).

Operations and maintenance phase

Magnitude of impact

12.8.7.25 During the operations and maintenance phase of the Mona Offshore Wind Project, vessels will be deviated around the Array Area, potentially increasing encounters between vessels.

12.8.7.26 Modelling of the change in vessel encounters as a result of the Mona Array Area was undertaken within volume 6, annex 12.1: Navigational risk assessment of the PEIR. The absolute number of historical collisions and encounters in the shipping and navigation study area was relatively low, however, the modelling determined that:

- Ferry in collision with ferry/cargo/tanker exhibited a 32% increase
- Cargo/tanker in collision with cargo/tanker exhibited a 20% increase
- Ferry/cargo/tanker in collision with a small craft exhibited a 44% decrease(due to the assumption that small craft would continue to navigate within the Array Area and therefore there would be increased separation from large commercial vessels)
- Small craft in collision with small craft exhibited a 6% increase.

12.8.7.27 A large proportion of the existing number of encounters were concentrated within the approaches to Liverpool and around the existing offshore wind farms, where traffic routinely comes into close quarters. Risk controls have been adopted (such as TSS/pilotage) to manage this risk. An increase in encounters is evident to the southwest and northeast of the Mona Array Area, where traffic is compressed, and ferry route passage plans converge.

12.8.7.28 Quantitative risk modelling using the IALA Waterway Risk Assessment Program (IWRAP) was undertaken within the NRA for large commercial vessels (volume 6, annex 12.1: Navigational risk assessment of the PEIR). The modelling results were that the risk of collision with the Mona Array Area in place, accounting for a 15%

increase in traffic, would be once in 61 years for commercial shipping and once in 68 years for ferries.

12.8.7.29 The hazard workshop and volume 6, annex 12.1: Navigational risk assessment of the PEIR highlighted that several collision hazards could occur within the shipping and navigation study area during the Mona Offshore Wind Project duration, involving ferries, cargo/tanker, fishing, recreational craft and project vessels. These impacts were considered similar to those expected during the construction phase of the Mona Offshore Wind Project.

12.8.7.30 In addition, there may be up to 2,351 project vessel movements per year which could increase the risk of collision with other vessels. The operations and maintenance base or bases for the Mona Offshore Wind Project has not yet been determined, but it is likely that the route taken by these vessels would need to cross busy shipping lanes and therefore regularly interact with other passing vessels.

12.8.7.31 As noted above, fishing and recreational vessel movements occur throughout the shipping and navigation study area, and it is likely that these vessels will navigate through the Mona Array Area given the spacing between wind turbines and lack of any restrictions. These vessels may encounter one another, and with Mona Offshore Wind Project operations and maintenance vessels, within the corridors between wind turbines.

12.8.7.32 The operations and maintenance phase will be managed through adopted risk controls listed in Table 12.16:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the Array Area
- At least one line of orientation and a regular layout of structures
- Marking and charting of the Array Area on nautical charts to facilitate safe passage planning
- Fisheries liaison and co-existence planning to reduce interactions between fishing vessels and Mona Offshore Wind Project vessels
- Marine co-ordination will promote best practice during maintenance activities within the site.

12.8.7.33 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.8.7.34 The consequences of collision would not be substantially different to those described during construction. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of effect

12.8.7.35 Volume 6, annex 12.1: Navigational risk assessment of the PEIR assessed four collision hazards which occurred during the operations and maintenance phase of the Mona Offshore Wind Project. Of these two were scored as High Risk – Unacceptable. Firstly, the risk of collision between a ferry/passenger vessel and a cargo/tanker or other ferry/passenger vessel. Secondly, the risk of collision between a ferry/passenger vessel or cargo/tanker and a small craft (such as fishing, recreational or project vessel). The remaining two hazards were scored as Medium Risk – Tolerable if ALARP.

12.8.7.36 Overall, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms. A moderate rather than major effect has been determined given that the increase in collision risk, whilst unacceptable, was assessed within the NRA as within the High Risk rather than Extreme Risk categories.

Further mitigation and residual effects

12.8.7.37 Further mitigation as highlighted for the construction phase would be appropriate for reducing impacts during the operation and maintenance phase.

Decommissioning phase

12.8.7.38 The impacts to vessel to vessel collision risk are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.7.39 Therefore, the magnitude of the impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms. A moderate rather than major effect has been determined given that the increase in collision risk, whilst unacceptable, was assessed within the NRA as within the High Risk rather than Extreme Risk categories.

12.8.7.40 Appropriate further mitigation listed for the construction phase will be considered for further phases of the Mona Offshore Wind Project.

12.8.8 Impact on allision (contact) risk to vessels

12.8.8.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to increased allision risk between navigating vessels and structures. The MDS is represented by the maximum extent of the Mona Array Area, the greatest number of structures, the greatest size of structures, the minimum spacing between structures and the greatest number of vessel movements and is summarised in Table 12.15.

Construction phase

Magnitude of impact

12.8.8.2 The construction of additional structures within the shipping and navigation study area increases the likelihood that contact occurrences will materialise, such instances are likely to occur through human error or mechanical failure. During construction, this is exacerbated by the partially constructed nature of the site.

12.8.8.3 For vessels navigating adjacent to the Mona Array Area, engine failure could cause them to drift and allide with a structure, or human error or steering failure could lead to a powered allision with a wind turbine or offshore substation. The Mona Array Area is adjacent to several major shipping routes with approximately 7,000 commercial vessel movements and 8,800 ferry movements per year within the shipping and navigation study area. In particular, the south boundary of the Mona Array Area is within two nautical miles of the main approaches to the Port of Liverpool. However, it is notable that there have been no reported incidents with respect to a commercial vessel allision with any of the existing offshore wind farms in the Irish Sea.

12.8.8.4 During navigation simulation sessions (see volume 6, annex 12.1: Navigational risk assessment of the PEIR) several runs tested the safety of navigating adjacent to the Mona Array Area. In none of the simulation runs did an allision between a ferry and a wind turbine occur, although in certain situations inadequate CPA was maintained, such as when action was taken to avoid a collision with another vessel. Furthermore, it was noted that emergency manoeuvres necessitated vessels approaching wind turbines to maintain specific bearing to the prevailing conditions.

12.8.8.5 Allision risks with existing oil and gas infrastructure as a result of the presence of the Mona Offshore Wind Project were also highlighted during the hazard workshop. The NRA identified that the relative locations of the Mona Array Area, shipping routes and oil and gas infrastructure was unlikely to have an appreciable effect on this hazard.

12.8.8.6 During construction activities there will be up to 1,857 installation vessel movements. Construction vessels within the Mona Array Area are inherently operating in close proximity to structures and therefore allisions are potentially more likely to occur. Historical incident analysis at other offshore wind farms within the UK demonstrates that these incidents do occur, and that they are more likely during construction than decommissioning (see section 12.4.4).

12.8.8.7 Analysis of vessel traffic in the shipping and navigation study area (section 12.4.4) demonstrates that there are fishing and recreational movements. During the construction phase, additional risk controls are proposed to manage navigating within the construction area. These include the use of guard boats and safety zones which will deter smaller craft such as fishing and recreational vessels from navigating through construction areas. However, given the size of the construction site, it would still be credible that a small craft enters the Mona Array Area and contacts a partially constructed structure.

12.8.8.8 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the construction area
- Application for safety zones to separate construction activities from vessel traffic
- Guard vessels to manage vessel safety
- Blade clearance of at least 22m from MHWS to avoid mastheads
- Marking and charting of the Mona Array Area on nautical charts to facilitate safe passage planning
- A buoyed construction area and safety zones will offset third party traffic and construction vessels
- Fisheries liaison and co-existence planning to reduce interactions between fishing vessels and structures
- Marine co-ordination will promote best practice during construction activities within the site
- Construction method statement and programme will manage traffic and reduce impacts.

12.8.8.9 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.8.8.10 There have been few reported allisions between navigating vessels and offshore wind farm structures. Analysis of case studies and academic research within volume 6, annex 12.1: Navigational risk assessment of the PEIR reached the following conclusions. Firstly, most allisions within offshore wind farms occur at slow speed, involving project vessels, and result in minor damage to the vessel, the wind turbine and rarely result in injuries or pollution. Secondly, were a large ship to collide with a wind turbine, this would typically be at low speed due to drifting and there would be minimal damage. However, there is the potential for catastrophic wind turbine collapse or holing of the commercial ship below the waterline that results in flooding.

12.8.8.11 During the hazard workshop it was agreed amongst stakeholders that an allision event would carry a lower potential consequence than that of collision. However, there was a difference of opinion on the most likely and worst credible outcomes amongst the stakeholders. The NRA concluded that a most likely outcome for a ferry or passenger ship would be multiple injuries, moderate damage, minor pollution and widespread adverse publicity, with a worst credible outcome resulting in multiple loss of life. The most likely outcome for small craft was minor injuries, minor damage and no pollution. Less numerous loss of life as compared to ferry allisions was identified as a worst credible outcome for all other vessel types, including small craft. Allision risk involving oil and gas infrastructure was scored more highly than with wind turbines given the greater potential loss of life and pollution.

12.8.8.12 The consequences of a collision during construction activities will be managed through adopted risk controls listed in Table 12.16:

- Emergency Response and Cooperation Plan to effectively respond to an incident
- Marine Pollution Contingency Plan
- Periodic exercises and training.

12.8.8.13 The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

12.8.8.14 Volume 6, annex 12.1: Navigational risk assessment of the PEIR assessed six allision hazards which occurred during the construction phase of the Mona Offshore Wind Project. All of these hazards were scored as Medium Risk – Tolerable if ALARP. The two highest scoring allision hazards were allisions between navigating ferry/passenger vessels, and cargo/tanker vessels with wind turbines or Mona offshore substations. Allisions of smaller craft such as fishing, recreational and small Mona Offshore Wind Project vessels were scored as potentially more likely but had a lower consequence.

12.8.8.15 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **medium**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance phase

Magnitude of impact

12.8.8.16 During the operations and maintenance phase of the Mona Offshore Wind Project, the presence of the fully constructed Mona Array Area exposes large commercial vessels to similar impacts as during the construction phase. However, it is likely that operators will be more familiar to the layout and presence of the Mona Array Area following four years of construction.

12.8.8.17 Quantitative risk modelling using IWRAP was undertaken within the NRA for large commercial vessels (volume 6, annex 12.1: Navigational risk assessment of the PEIR). The modelling results were that the risk of allision with the Mona Array Area, accounting for a 15% increase in traffic, would be once in 152 years for commercial shipping and once in 200 years for ferries.

12.8.8.18 The geographic distribution of risk is highly concentrated within the approaches to Liverpool and the TSS. The route to the south of Mona including the TSS, approaches to Liverpool and up to the Off Skerries TSS contains the majority of modelled allision risk with both existing offshore wind farms (i.e. with Burbo Bank and Gwent-y-Mor) but also the southern wind turbines of the Mona Array Area. This is accounted for by the high density of traffic in these areas and the proximity of transit to existing offshore wind farms.

12.8.8.19 During the operational phase of the Mona Offshore Wind Project, there is likely to be greater small craft traffic navigating through the Mona Array Area than during the construction phase, during which time navigation is more restricted. It is anticipated that some fishing vessels will continue to fish within the Mona Array Area, given at least 875 metres between turbines with commitment to a minimum of 1,000 metres between rows of wind turbines and a regular layout. This spacing is anticipated to facilitate fishing by small craft without unacceptable increases in risk of allision. However, whilst recreational craft are able to navigate through an operational offshore wind farm, consultation with the RYA suggests that only a minority are choosing to do so at other sites.

12.8.8.20 The most likely allision with a structure is anticipated to involve a Mona Offshore Wind Project maintenance vessel. There may be up to 2,351 project vessel movements per year which due to proximity in which vessels of this type navigate to structures, and their greater numbers, increases the risk of allision as compared to other vessel types.

12.8.8.21 The construction activities will be managed through adopted risk controls listed in Table 12.16:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the Mona Array Area
- Blade clearance of at least 22m from MHWS to avoid mastheads
- Marking and charting of the Mona Array Area on nautical charts to facilitate safe passage planning
- Fisheries liaison and co-existence planning to reduce interactions between fishing vessels and structures
- Marine co-ordination will promote best practice during operations and maintenance activities within the site.

12.8.8.22 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.8.8.23 The consequences of allision would not be substantially different to those described during construction. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of effect

12.8.8.24 The NRA (volume 6, annex 12.1) assessed six allision hazards which occurred during the operations and maintenance phase of the Mona Offshore Wind Project. All of these hazards were scored as Medium Risk – Tolerable if ALARP. The two highest scoring allision hazards were allisions between navigating ferry/passenger vessels, and cargo/tanker vessels with wind turbines or Mona offshore substations. Allisions of smaller craft such as fishing, recreational and small Mona Offshore Wind Project vessels were scored as potentially more likely but had a lower consequence.

12.8.8.25 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **medium**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

12.8.8.26 The impacts to allision risk are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as

decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.8.27 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **medium**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

12.8.9 Impact on marine navigation, communications and position fixing equipment

12.8.9.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to impacts on marine navigation, communications and position fixing equipment. The MDS is represented by the maximum extent of the Mona Array Area, the greatest number of structures, the greatest size of structures and the minimum spacing between structures and is summarised in Table 12.15.

Construction phase

Magnitude of impact

12.8.9.2 Offshore wind farms can have adverse effects on shipboard equipment necessary for navigation, communications and position fixing. Several studies have sought to better understand this impact including by QinetiQ (2004) the British Wind Energy Association (BWEA, 2007) and Ocean Studies Board's Division on Earth and Life Studies (2022). These impacts are also recognised in MGN654.

12.8.9.3 No discernible impact to passing vessels was identified to VHF, AIS, Global Navigation Satellite System or compasses. Nor was the sound generated by wind turbines likely to mask the navigational sound signals made by vessels as per the COLREGs.

12.8.9.4 These studies have identified that wind turbines, like other structures, can result in spurious radar returns such as side lobes, echoes, reflections and blanketing. This can reduce the capability of tracking small vessels when navigating near to offshore wind farms. Given that vessels would pass adjacent to the Mona Array Area, these effects could be experienced.

12.8.9.5 The Mona Offshore Wind Project is outside of any harbour areas and the region is not monitored by Vessel Traffic Services (VTS), and therefore the impacts to shore radar are low.

12.8.9.6 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.8.9.7 Interference with radar could reduce the effectiveness of collision avoidance, increasing the risk of an incident. MGN654 recognises that these effects are greatest within 0.5nm of an offshore wind farm but could be experienced up to 1.5nm from the wind farm boundary. This is closer than most large vessels would pass based on prudent passage planning and therefore minimal effects should be experienced. There may be some reduction in the ability to track small craft within the Mona Array Area, which is discussed in section 12.8.7.

12.8.9.8 Furthermore, these effects are routinely experienced by operators passing the existing Irish Sea offshore wind farms and therefore mariners should be experienced in mitigating their effects.

12.8.9.9 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.8.9.10 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given the proximity of large numbers of vessel transits to the Mona Array Area, but the low likelihood that this would result in an incident.

Operation and maintenance phase

12.8.9.11 The impacts to marine navigation, communications and position fixing equipment are not anticipated to be substantially different to those during construction, albeit for a longer duration. The greater extent of structures across the Mona Array Area for a fully constructed offshore wind farm as opposed to a partially constructed one may widen these effects. However, it is not considered that this would increase the significance of this impact.

12.8.9.12 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given the proximity of large numbers of vessel transits to the Mona Array Area, but the low likelihood that this would result in an incident.

Decommissioning phase

12.8.9.13 The impacts to marine navigation, communications and position fixing equipment are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.9.14 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given the proximity of large numbers of vessel transits to the Mona Array Area, but the low likelihood that this would result in an incident.

12.8.10 Impact on recreational craft passages and safety

12.8.10.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to impacts to recreational craft passages and safety. The MDS is represented by the maximum extent of the Mona Array Area, the greatest number of structures, the lowest air draught of structures and the minimum spacing between structures and is summarised in Table 12.15.

Construction phase

Magnitude of impact

12.8.10.2 During the construction phase, additional risk controls are proposed to manage navigating within the construction area. These include the use of guard boats and safety zones which will deter recreational vessels from navigating through the Mona Array Area construction areas.

12.8.10.3 Analysis of vessel traffic (section 12.4.4) demonstrates that there are few recreational movements through the shipping and navigation study area. During the winter vessel traffic surveys, no recreational craft were detected, and during the summer survey, on average, less than one per day was detected by either AIS or Radar. This suggests that relatively few recreational users would be adversely impacted. It is known that there are occasional regattas or rallies that cross between the UK and the Isle of Man.

12.8.10.4 Inshore, and near to cable landfall, there is a greater density of recreational traffic, between Conwy and Rhyl. During cable laying operations, there may be short term and localised impacts on recreational movements, however there is clear searoom for recreational craft to avoid the cable lay vessel.

12.8.10.5 The construction activities will be managed through adopted risk controls listed in Table 12.16:

- Promulgation of activities through the use of Notice to Mariners will ensure approaching vessels can safely avoid the Mona Array Area
- Blade clearance of at least 22m from MHWS to avoid mastheads
- Commitments to layout including wind turbine and spacing and lines of orientation to facilitate internal navigation where safe to do so
- Marking and charting of Mona Array Area on nautical charts to facilitate safe passage planning.

12.8.10.6 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.8.10.7 The two most prominent cruising routes identified through analysis of the AIS data and the RYA Coastal Atlas which intersect the Mona Array Area are between Liverpool and Douglas, and between Conwy/Menai Straits and Douglas. Both of these routes would require a minor deviation to pass clear of the Mona Array Area, should the skipper decide not to navigate between the wind turbines.

12.8.10.8 This additional distance would be in the order of less than two nautical miles and given the slower speed that yachts travel as compared to commercial vessels, may necessitate an additional 30 minutes of cruising. During consultation, potential impacts on vessel routeing due to tidal gates were discussed which might make any deviations more costly for cruising vessels or else encounter adverse tidal conditions or insufficient water depths., Given the spacing of wind turbines which would support navigation through the Mona Array Area, this could be factored into the cruising passage plan to mitigate its effects.

12.8.10.9 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.8.10.10 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given the that whilst the presence of the Mona Offshore Wind Project is not anticipated to have an impact on inshore recreational activity, there will be some effect on offshore recreational cruising.

Operations and maintenance phase

12.8.10.11 During the operational phase of the Mona Offshore Wind Project, there is likely to be greater small craft traffic navigating through the Mona Array Area than during the construction phase, during which time navigation is more restricted. Given at least 875m between wind turbines and 1,000m between rows of wind turbines and a regular layout, recreational craft could navigate through the Mona Array Area without unacceptable increases in the risk of allision. However, consultation with the RYA suggests that only a minority are choosing to do so at other sites. This may result in greater numbers of recreational craft navigating around the Mona Array Area, increasing transit durations.

12.8.10.12 As a result, these impacts are not anticipated to be substantially different to those during construction, and likely have a lower adverse impact.

12.8.10.13 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given the that whilst the presence of the Mona Offshore Wind Project is not anticipated to have an impact on inshore recreational activity, there will be some effect on offshore recreational cruising.

Decommissioning phase

12.8.10.14 The impacts to recreational craft are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.10.15 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given the that whilst the presence of the Mona Offshore Wind Project is not anticipated to have an impact on inshore recreational activity, there will be some effect on offshore recreational cruising.

12.8.11 Impact on snagging risk to vessel anchors and fishing gear

12.8.11.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to an increased risk of snagging of fishing gear and ship anchors. The MDS is represented by the longest length of cables, minimum cable burial depth and maximum length of cable protection over the greatest duration and is summarised in Table 12.15.

Construction phase

Magnitude of impact

12.8.11.2 The Mona Offshore Cable Corridor route passes south across the TSS before turning southeast towards landfall on the north Welsh coast. The cable is intended to be buried, to a depth of at least 0.5m. Where burial is not possible, cable protection may be required up to a height of 3m. A Cable Burial Risk Assessment will be undertaken to determine the appropriate level of protection.

12.8.11.3 Subsea cables are both at risk of anchor or fishing gear strikes and can pose a hazard to navigating vessels were gear attached to the vessel to become snagged. Within the Mona Array Area, with inter array and interconnector cables, the use of Safety Zones and Guard vessels will reduce the risk of snagging during the construction phase.

12.8.11.4 An anchorage used by commercial ships is located approximately four nautical miles to the west of the Mona Offshore Cable Route. During adverse weather with prevailing westerlies it is feasible that ships could drag their anchor across the cable route, albeit there is sufficient separation between the anchorage and cable route to enable remedial action by the ship to take place.

12.8.11.5 Commercial ships may choose to deploy an anchor in an emergency, and whilst uncommon, this could result in cable snagging. The greater ship density across the Mona Offshore Cable Route to the west of the Liverpool TSS, would increase the likelihood of occurrence in comparison to the Mona Array Area.

12.8.11.6 Small recreational and fishing boats may choose to anchor near to cable landfall, however, there is limited evidence that this is commonplace. Given adequate protection, it is unlikely that a yacht's anchor would either snag or damage the cable. Limited evidence of fishing activity was identified along the Mona Offshore Cable Route.

12.8.11.7 Cable burial would mitigate the risk of snagging, and a Cable Burial Risk Assessment has been committed by the Mona Offshore Wind Project to ensure these risks are adequately addressed for the types of gear used within the shipping and navigation study area. Where the cable is buried, it will be periodically inspected and where necessary remedial action taken. A Fisheries Liaison and Coexistence Plan will be developed to minimise the risk of gear snagging along the cable route.

12.8.11.8 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation such as Notice to Mariners and site marking and charting issued to warn vessels of the presence of the Mona Offshore Wind Project
- Application for safety zones to separate construction activities and vessel navigation
- Guard Vessels to manage vessel safety
- Fisheries Liaison and Co-existence Plan for the export cable corridor
- Emergency response capabilities including an Emergency Response and Cooperation Plan, Marine Pollution Contingency Plan, periodic exercises to minimise the consequences of any incident
- A Cable Burial Risk Assessment will ensure adequate cable burial or protection
- Cable protection shall be designed to minimise snagging hazards, for example by minimising height above seabed, and or using smooth or shallower profiles.

12.8.11.9 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.8.11.10 Were a fishing vessel to snag the cable, the most likely outcome is loss of gear and potentially minor damage to the cable. A worst credible outcome however is the loss of the fishing vessel as it capsizes, which may also result in potential fatalities.

12.8.11.11 Snagging of commercial vessel anchors is unlikely to result in serious consequences such as fatalities, pollution or serious damage to the vessel but would result in significant damage to the cable or cables. There is the potential for the presence of the cables to influence a master's decision making not to anchor to avoid an incident such as a collision, allision or grounding. However, this is not considered credible as the master would likely act to minimise any risk to the vessel.

12.8.11.12 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.8.11.13 Volume 6, annex 12.1: Navigational risk assessment of the PEIR assessed four snagging hazards which occurred during the construction phase of the Mona Offshore Wind Project. Of these two were scored as Medium Risk – Tolerable if ALARP. Firstly, the risk of snagging of fishing gear and secondly the risk of snagging a commercial ship anchor. The two remaining snagging hazards, for Mona Offshore Wind Project vessels and recreational/tug and service vessels were scored as Low Risk – Broadly Acceptable.

12.8.11.14 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that whilst the Mona Offshore Wind Project cables will be buried, there is fishing and anchoring activity adjacent to the site.

Operations and maintenance phase

12.8.11.15 The impacts due to the risk of snagging are not anticipated to be substantially different to those during construction, albeit for a longer duration. However, given the removal of restrictions on navigation that are in place during construction, and the wind turbine spacing in excess of 875m with 1,000m between rows of wind turbines, there may be greater fishing activity within the Mona Array Area posing a risk of snagging of inter array cables.

12.8.11.16 Conversely, during the operations and maintenance phase, there should be no partially buried or unprotected infrastructure as might occur temporarily during the construction phase. Furthermore, local fishermen will be more familiar with the site layout and able to avoid fishing in a manner which could lead to a risk of snagging.

12.8.11.17 The risk of snagging during the operations and maintenance phase will be managed through adopted risk controls listed in Table 12.16:

- Promulgation such as Notice to Mariners and site marking and charting issued to warn vessels of the presence of the Mona Offshore Wind Project
- Fisheries Liaison and Co-existence Plan for the export cable corridor
- Emergency response capabilities including an Emergency Response and Cooperation Plan, Marine Pollution Contingency Plan, periodic exercises to minimise the consequences of any incident
- A cable burial risk assessment will ensure adequate cable burial or protection.

12.8.11.18 Overall, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that whilst the Mona Offshore Wind Project cables will be buried, there is fishing and anchoring activity adjacent to the site.

Decommissioning phase

12.8.11.19 The impacts due to the risk of snagging are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.11.20 All cables will be removed during decommissioning so as not to leave any snagging hazards on the seabed.

12.8.11.21 Therefore, the magnitude of the impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that whilst the Mona Offshore Wind Project cables will be buried, there is fishing and anchoring activity adjacent to the site.

12.8.12 Impact on under keel clearance

12.8.12.1 The construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project may lead to an increased risk of grounding due to reduced under keel clearance. The MDS is represented by the longest length of cables, minimum cable burial depth and maximum length of cable protection over the greatest duration and is summarised in Table 12.15.

Construction phase

Magnitude of impact

12.8.12.2 The Mona Offshore Cable Corridor routes to the north Welsh coast and crosses several routes used by both large shipping and small craft. It may be necessary in some locations to use cable protection rather than burial and this may reduce the depth of navigable water that increases the risk of grounding. Given the depths of water, this is likely to occur south of the main shipping routes into Liverpool.

12.8.12.3 Most vessels near to landfall are small and have a shallow draught making them less susceptible to a reduction in depth. However, the approaches to Raynes Jetty are used by deeper draught general cargo vessels up to 100m in length and therefore an assessment any impact on this route will be required once a detailed cable protection strategy is developed.

12.8.12.4 MGN654 recommends that water depths are not reduced by more than 5% (referenced to chart datum) as a result of any cable protection.

12.8.12.5 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation such as Notice to Mariners and site marking and charting issued to warn vessels of the presence of the Mona Offshore Wind Project
- Application for safety zones to separate construction activities and vessel navigation
- Guard Vessels to manage vessel safety
- Fisheries Liaison and Co-existence Plan for the export cable corridor
- A cable burial risk assessment will ensure adequate cable burial or protection.

12.8.12.6 The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

12.8.12.7 Groundings often result in minor damage to the vessel, with minimal pollution, with the most likely outcome being the vessel re-floating on the next high tide. However, were the vessel to be significantly grounded, during adverse weather which can cause more significant damage, there is the potential for loss of life and the loss of the vessel as it breaks up. Given the proximity to shore that these incidents occur, rescue of any casualty would be easier than were it to occur within the Mona Array Area as is the case for other hazards, and so may have a lower consequence.

12.8.12.8 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.8.12.9 Volume 6, annex 12.1: Navigational risk assessment of the PEIR assessed three grounding hazards which occurred during the construction phase of the Mona Offshore Wind Project. These included commercial vessels, fishing and recreational craft. All three of which resulted in Negligible Risk – Broadly Acceptable risk scores.

12.8.12.10 Overall, the magnitude of the impact is deemed to be **negligible**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms. A negligible rather than low effect has been determined given that suitable mitigations have been identified to ensure under keel clearance is maintained across the Mona Offshore Wind Project.

Operation and maintenance phase

12.8.12.11 The impacts due to the reduced under keel clearance are not anticipated to be substantially different to those during construction, albeit for a longer duration.

12.8.12.12 The risk of grounding during the operations and maintenance phase will be managed through adopted risk controls listed in Table 12.16:

- Promulgation such as Notice to Mariners and site marking and charting issued to warn vessels of the presence of the Mona Offshore Wind Project
- Fisheries Liaison and Co-existence Plan for the export cable corridor
- Emergency response capabilities including an Emergency Response and Cooperation Plan, Marine Pollution Contingency Plan, periodic exercises to minimise the consequences of any incident
- A cable burial risk assessment will ensure adequate cable burial or protection.

12.8.12.13 Overall, the magnitude of the impact is deemed to be **negligible**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms. A negligible rather than low effect has been determined given that suitable mitigations have been identified to ensure under keel clearance is maintained across the Mona Offshore Wind Project.

Decommissioning phase

12.8.12.14 The impacts due to the reduced under keel clearance are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.8.12.15 Therefore, the magnitude of the impact is deemed to be **negligible**, and the sensitivity of the receptor is considered to be **low**. The effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms. A negligible rather than low effect has been determined given that suitable mitigations have been identified to ensure under keel clearance is maintained across the Mona Offshore Wind Project.

12.8.13 Future monitoring

12.8.13.1 Table 12.20 below outlines the proposed monitoring commitments for shipping and navigation. These monitoring commitments are accepted, industry standard methods by which the impacts to shipping and navigation can be scrutinised and ensure the predictions of the NRA are consistent with the realised impacts and therefore that the risk control options are appropriate and proportionate.

Table 12.20: Monitoring commitments.

Environmental effect	Monitoring commitment	Means of implementation
All impacts on vessel routeing and safety	Construction and post-construction monitoring of marine traffic (by AIS) with a report submitted annually to MMO, MCA and Trinity House. The report will assess the extent to which the impacts predicted in the NRA are accurate to ensure adopted risk controls are fit for purpose.	Secured through relevant conditions as part of the marine licence(s).
Impact on allision (contact) risk to vessels	AtoN monitoring to ensure constant functionality through the lifetime of the Mona Offshore Wind Project. Trinity House to be informed of any defects.	Secured through relevant conditions as part of the marine licence(s).
Impact on snagging risk to vessel anchor and fishing gear	Periodic validation surveys of cable burial and protection to ensure specified requirements are met.	Secured through relevant conditions as part of the marine licence(s).
Impact on under keel clearance	Bathymetric survey to IHO Order 1a of site and cable corridor, including post-decommissioning. Data to be provided to MCA and UKHO.	Secured through relevant conditions as part of the marine licence(s).

12.9 Cumulative effect assessment methodology

12.9.1 Methodology

12.9.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Mona Offshore Wind Project together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see volume 5, annex 5.3: CEA screening matrix). Each project has been considered on a case by case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

12.9.1.2 The shipping and navigation CEA methodology has followed the methodology set out in volume 1, chapter 5: EIA methodology of the PEIR. As part of the assessment, all projects and plans considered alongside the Mona Offshore Wind Project have been allocated into 'tiers' reflecting their current stage within the planning and development process, these are listed below.

12.9.1.3 A tiered approach to the assessment has been adopted, as follows:

- Tier 1
  - Under construction
  - Permitted application
  - Submitted application.
- Tier 2
  - Scoping report has been submitted and is within the public domain.
- Tier 3
  - Scoping report has not been submitted
  - Identified in the relevant Development Plan
  - Identified in other plans and programmes.

12.9.1.4 This tiered approach is adopted to provide a clear assessment of the Mona Offshore Wind Project alongside other projects, plans and activities.

12.9.1.5 The specific projects, plans and activities scoped into the CEA, are outlined in Table 12.21 and Figure 12.9.

12.9.1.6 Existing navigational activities, such as anchorages, pilot boarding stations and ferry routes are included within the baseline assessment. The baseline assessment also includes the ongoing effect of the existing Irish Sea offshore wind farms on shipping and navigation receptors. There is a recognised cumulative impact of the Mona Offshore Wind Project, with existing offshore wind farms in the Irish Sea, and the proposed Morgan Array Area, Morecambe Array Area and Awel-y-Mor array areas. In particular, the development of all of these projects will result in navigational corridors between them which was raised as a concern by many shipping and navigation consultees.

12.9.1.7 The assessment on shipping and navigation with Tier 1 projects, principally the Awel-y-Mor Offshore Wind Farm, did not result in levels of significance that were above those of the Mona Offshore Wind Project individual assessment. The Awel-y-Mor Project is clear of major shipping routes and there are no routes which intersect both the Mona and Awel-y-Mor Array Areas. Furthermore, cumulative effects on routes into Liverpool between the Mona and Awel-y-Mor Array Areas are similar to the cumulative effects on routes into Liverpool between the Mona and Gwynt-y-Mor Array Areas. The CEA for shipping and navigation has therefore taken an approach to assessment which considers the cumulative effects with both Tier 1 and Tier 2 projects together.

Table 12.21: List of other projects, plans and activities considered within the CEA.

Project/Plan	Status	Distance from the Mona array area (km)	Distance from the Mona offshore/onshore cable corridor (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Mona Offshore Wind Project
Tier 1-							
Awel-y-Mor	Submitted application	12.2	0	Proposed offshore wind farm to the west of Gwynt-y-Mor.	2025 to 2029	2030	Yes
Tier 2-							
Morecambe Offshore Wind Generation Assets	Pre-application	8.9	21.5	Proposed offshore wind farm. Maximum of 40 wind turbines and indicative minimum spacing between wind turbines of 990m. Area: 125km^2.	2026	2028	Yes
Morgan Offshore Wind Generation Assets	Pre-application	5.5	33.0	Proposed offshore wind farm. Maximum of 107 wind turbines and four OSPs, with indicative minimum spacing between wind turbines of 875m. Area: 322km^2.	2026	2030	Yes
Morgan and Morecambe Offshore Wind Transmission Assets	Pre-application	8.92	21.53	Coordinated transmission assets for the Morgan Offshore Wind Project and the Morecambe offshore wind farm.	2026	2030	Yes

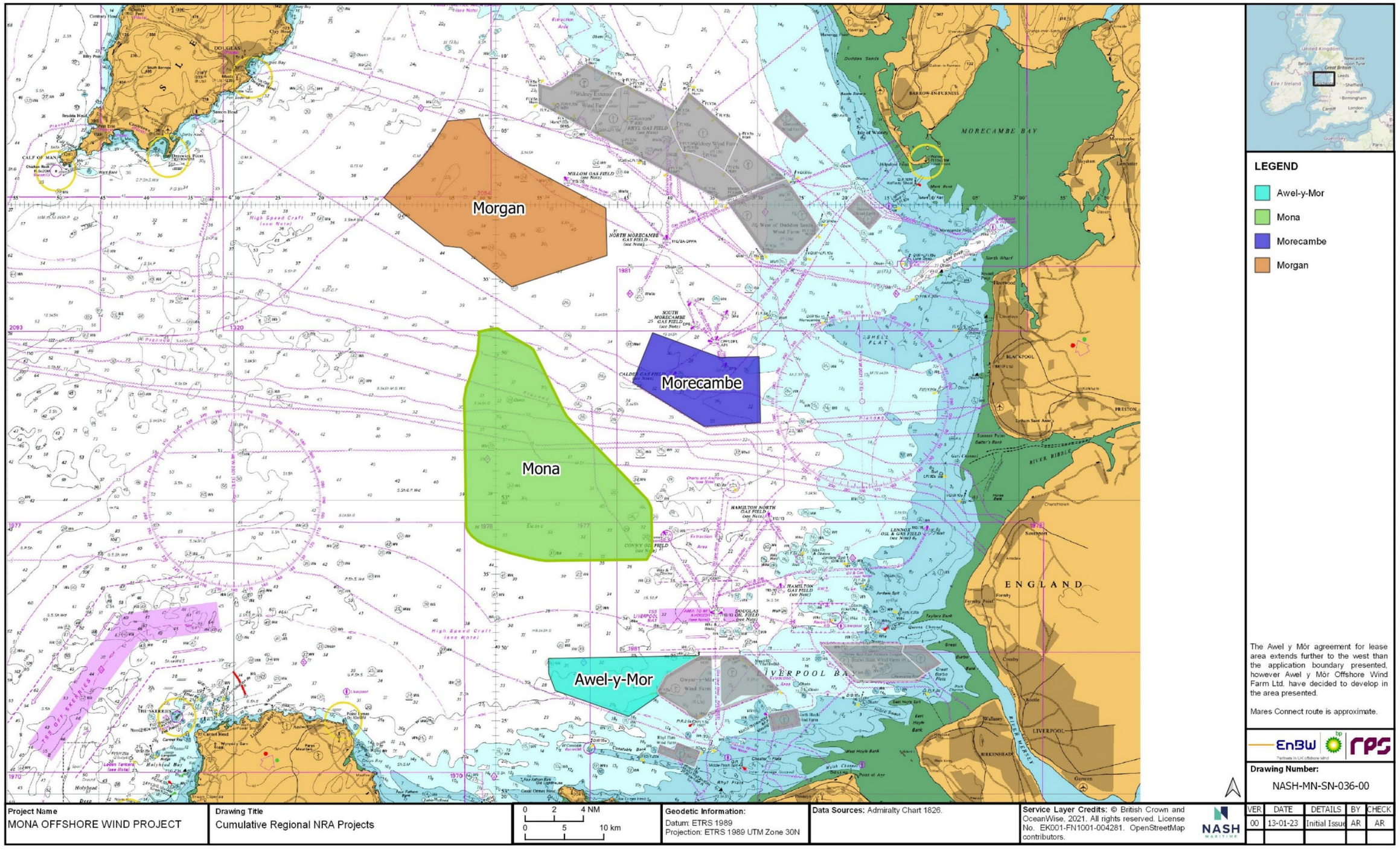


Figure 12.9: Key projects, plans and activities screened into the cumulative effects assessment.

12.9.2 Maximum design scenario

12.9.2.1 The MDSs identified in Table 12.22 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the Project Design Envelope provided in volume 1, chapter 5: Project Description, of the PEIR as well as the information available on other projects and plans, in order to inform a 'maximum design scenario'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different wind turbine layout), to that assessed here, be taken forward in the final design scheme.

Table 12.22: Maximum design scenario considered for the assessment of potential cumulative effects on shipping and navigation.

[a] C=construction, O=operation and maintenance, D=decommissioning

Potential cumulative effect	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on recognised sea lanes essential to international navigation (NPS EN-3 2.6.161)	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on recognised sea lanes essential to international navigation.
Impact to commercial operators including strategic routes and lifeline ferries (NPS EN-3 2.6.162/163).	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on commercial operator routes.
Impact to adverse weather routeing (NPS EN-3 2.6.162/163/165).	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on adverse weather routeing.
Impact on access to ports and harbours (NPS EN-3 2.6.162/163).	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on access to ports and harbours.

Potential cumulative effect	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on emergency response capability due to increased incident rates and reduced access for SAR responders (NPS EN-3 2.6.164)	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on emergency response capability.
Impact on vessel to vessel collision risk (NPS EN-3 2.6.165)	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on collision risk.
Impact on allision (contact) risk to vessels (NPS EN-3 2.6.165).	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on allision risk.
Impact on marine navigation, communications and position fixing equipment (NPS EN-3 2.6.165).	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on marine navigation, communications and position fixing equipment.

Potential cumulative effect	Phase[a]			Maximum Design Scenario	Justification
	C	O	D		
Impact on recreational craft passages and safety (NPS EN-3 2.6.166)	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on recreational craft.
Impact on snagging risk to vessel anchor and fishing gear (NPS EN-3 2.6.168)	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 12.15) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel-y-Mor Offshore Wind Farm. **Tier 2** • Morgan Offshore Wind Generation Assets • Morecambe Offshore Wind Generation Assets • Morgan and Morecambe Transmission Assets.	Outcome of the CEA will be greatest when the greatest number of other schemes are considered which result in the greatest impact on snagging of fishing gear or ship anchors.

12.10 Cumulative effects assessment

12.10.1.1 A description of the significance of cumulative effects upon shipping and navigation receptors arising from each identified cumulative impact is given below.

12.10.2 Impact on recognised sea lanes essential to international navigation

Construction phase

12.10.2.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets, Morecambe Offshore Wind Farm generation assets and existing operational windfarms could have a cumulative impact on recognised sea lanes essential to international navigation.

Magnitude of impact

12.10.2.2 The location of the Morgan Array Area and Morecambe Offshore Wind Farm array areas are clear of key routes into the Liverpool Bay TSS. Therefore, the principal cumulative impacts upon ship routeing schemes are the Mona Array Area and Awel-y-Mor array area.

12.10.2.3 The Mona and Awel-y-Mor/Gwynt-y-Mor array areas are located six nautical miles apart with the Liverpool Bay TSS located directly between them. Within this corridor, approximately 10,000 commercial ships would pass each year in addition to the potential for construction vessel movements associated with the offshore wind farms.

12.10.2.4 The majority of vessel traffic using the TSS passes directly east-west to the Off Skerries TSS or the wider Irish Sea and therefore passes clear of the wind farms. Vessel traffic approaching from the northwest can continue to do so having deviated to pass to the southwest of the Mona Array Area. Vessel traffic approaching from the anchorage to the east of Anglesey can continue to do so having deviated to pass to the northwest of the Awel-y-Mor array area.

12.10.2.5 The installation of the export cable would pass through the approaches to the TSS, but there is no anticipated cumulative impact above that of the Mona Offshore Wind Project in isolation.

12.10.2.6 The magnitude of the cumulative effect of Tier 1 and Tier 2 projects is similar to that of the Mona individual assessment and is considered to be **medium**.

Sensitivity of the receptor

12.10.2.7 Given that the presence of these projects does not prevent access into Liverpool through the TSS, it is considered that the requirements of safeguarding sea lanes essential to international navigation would not be breached.

12.10.2.8 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of effect

12.10.2.9 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance phase

12.10.2.10 The cumulative impacts to recognised sea lanes essential to international navigation during operations and maintenance are not anticipated to be substantially different to those during construction. During both the construction and the operational phases of the cumulative projects, large commercial ships will not be able to transit through the array areas, whether through the presence of construction buoyage or structures. The cumulative impact on vessel routeing will, therefore, be the same, albeit for different durations.

12.10.2.11 Therefore, the magnitude of the cumulative impact is deemed to be **medium** and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

12.10.2.12 The cumulative impacts to recognised sea lanes essential to international navigation during decommissioning are not anticipated to be substantially different to those during construction. During both the construction and the decommissioning phases of the cumulative projects, large commercial ships will not be able to transit through the array areas, whether through the presence of decommissioning buoyage or structures and therefore the cumulative impact on vessel routeing will be the same. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.10.2.13 The magnitude of the cumulative impact is, therefore, deemed to be **medium** and the sensitivity of the receptor is considered to be **low**. The cumulative effect will be of **minor adverse** significance, which is not significant in EIA terms.

12.10.3 Impact to commercial operators including strategic routes and lifeline ferries

Construction phase

12.10.3.1 The construction of the Mona Offshore Wind Project, in combination with the construction and operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets and Morecambe Offshore Wind Farm generation assets has the potential for a cumulative impact to commercial operators including strategic routes and lifeline ferries.

Magnitude of impact

12.10.3.2 During construction, vessel traffic would be displaced from the Mona Array Area and other cumulative projects due to the presence of construction buoyage and safety zones around fixed structures which are under construction. It is anticipated that mariners would also maintain a safe passing distance of at least one nautical mile from navigational hazards.

12.10.3.3 The analysis of vessel routes in section 12.4.4 shows that several ferry and commercial shipping routes would need to deviate around existing offshore wind farms, the Mona Array Area, the Morgan Array Area and the Morecambe Offshore Wind Farm array area (see Table 12.23 and Table 12.24, and Figure 12.10 and Figure 12.11 respectively). The revised passage plans were developed by the NASH project

team, including master mariners, and account for existing decision-making principles that were obtained during consultation with operators and during the navigation simulation sessions (for example, passing at least 1.5nm from a wind turbine).

12.10.3.4 Each of these routes are potentially impacted by one or more array areas. Where vessel routes do not directly intersect the Mona Array Area, but do intersect the Morgan or Morecambe array areas, they have been included within the cumulative assessment as there are cumulative impacts upon operators/ports with multiple routes. Furthermore, the presence of all cumulative projects will indirectly affect the master decision making and passage planning.

12.10.3.5 Six ferry routes were identified as being directly impacted by the cumulative schemes:

- The Isle of Man Steam Packet Company route between Douglas and Liverpool with approximately 625 movements per year would need to deviate to the east of the Mona Array Area and to the west of the Morgan Array Area. The additional distance and service speed would result in approximately 0.4nm/0.8 minutes of additional transit time
- The Isle of Man Steam Packet Company route between Heysham and Douglas with approximately 1,300 movements per year would need to deviate around the Morgan Array Area and pass west of the Walney Offshore Wind Farm. The additional distance and service speed would result in approximately 1.0nm/3.5 minutes of additional transit time
- The Stena route between Liverpool and Belfast to the west of the Isle of Man with approximately 1,400 movements per year directly intersects the Mona Array Area. A revised passage plan was developed which assumed these vessels would navigate between the Morecambe Offshore Wind Farm array area and the Mona Array Area, pass between the Mona and Morgan Array Areas and alter course to pass to the southwest of the Isle of Man. The additional distance and service speed would result in approximately 2.1nm/6.7 minutes of additional transit time
- The Stena route between Liverpool and Belfast to the east of the Isle of Man with approximately 350 movements per year intersects the Morecambe Offshore Wind Farm and Morgan Offshore Wind Farm array areas. The revised passage plan passes to the west of the Morecambe Offshore Wind Farm array area, before turning north and then west between the Morgan Array Area and Walney Offshore Wind Farm. The additional distance and service speed would result in approximately 3nm to 4.6nm/10 to 16 minutes of additional transit time dependent on which route through the Morecambe gas field was taken
- The Seatruck route between Heysham and Warrenpoint with approximately 1,000 movements per year passes through the south boundary of the Morgan Array Area. Vessels would depart Heysham as they currently do, passing north of the South Morecambe Gas Field but deviating southwest to pass between the Mona and Morgan array areas before turning westward towards Carlingford Lough. This would necessitate an additional 0.5nm/1.9 minutes of steaming time per trip
- The Seatruck route between Heysham and Dublin with approximately 600 movements per year passes through the north boundary of the Mona Array Area. Vessels would depart Heysham as they currently do, passing north of the South Morecambe Gas Field but deviating to pass between the Mona and Morgan Array Areas, before turning southwest towards Dublin. This would necessitate an additional 0.4nm/1.6 minutes of steaming time per trip
- There are no direct impacts on P&O ferry routes.

12.10.3.6 Three commercial routes with more than one movement per day would be directly impacted by the Mona Array Area, all of which are routes into the Liverpool TSS from the west or northwest. The required deviation to pass clear of the Mona Array Area is less than one nautical mile. None of these routes would be impacted by other cumulative projects.

12.10.3.7 A further 17 commercial shipping routes were identified which would be deviated around the cumulative projects, including routes into Douglas, Heysham and Barrow. The majority of these minor routes have less than one vessel transit per week but have relatively greater deviations.

12.10.3.8 The most impacted route is between Douglas and Liverpool TSS with an additional 5.9nm of steaming above 51.7nm. However, less than one vessel per week utilises this route. The majority of other deviated routes have relatively few transits and are anticipated to pass through the Mona and Morgan corridor or deviate to the southwest of Mona Array Area. Some routes have minor reductions in distance where less direct routes, which are routinely used to avoid traffic or weather, are no longer possible. This necessitates greater course changes to pass between the array areas, or in some cases, necessitates not utilising the Liverpool TSS when previously this would have been used.

12.10.3.9 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the construction area
- Marking and charting of the Mona Array Area on nautical charts to facilitate safe passage planning
- Construction method statement and to manage traffic.

12.10.3.10 Given the extent to which multiple routes across multiple operators will be impacted, the magnitude is, therefore, considered to be **high**.

Table 12.23: Impact on ferry routeing with Tier 1 and Tier 2 cumulative projects.

Parameter	Stena LIV-BEL-W	Stena LIV-BEL-E	Isle of Man Steam Packet Company LIV-DOUG
Example Vessels (2019-2022)	Stena Edda Stena Embla Stena Mersey Stena Horizon Stena Lagan Stena Forecaster Stena Forerunner		Manannan
Approximate Annual Crossings (2019)	1,442	353	628
Baseline Distance (nm)	142.3	141.7 (E of Calder) 143.6 (W of Calder)	71.49
Baseline Time (Minutes)	480	480	165
Service Speed (Knots)	18.7	18.7	28.8
Deviated Distance	144.4	146.6	71.9
Additional Deviated Time (Minutes)	+6.7	+15.7 (E of Calder) +9.6 (W of Calder)	+0.8
Parameter	**Seatruck HEY-DUB**	**Seatruck HEY-WAR**	**Isle of Man Steam Packet Company HEY-DOUG**
Example Vessels (2019-2022)	Seatruck Pace Seatruck Panorama	Seatruck Performance Seatruck Precision	Ben-my-Chree
Approximate Annual Crossings (2019)	610	967	1,286
Baseline Distance (nm)	107.0	100.2	60.1
Baseline Time (Minutes)	480	480	225
Service Speed (Knots)	15	15.4	17.2
Deviated Distance	107.4	100.7	61.1
Additional Deviated Time (Minutes)	+1.6	+1.9	+3.5

Table 12.24: Increase in distance for impacted commercial routes with Tier 1 and Tier 2 cumulative projects.

Route	Approximate Annual Crossings (2019)	Baseline Distance (nm)	Deviated Distance	Additional Deviated Distance (nm)	Total Additional Distance/Year
W IoM to Liverpool TSS (east)	525	55.1	55.7	0.6	332.5
Off Skerries TSS to Heysham (east)	23	71.2	76.3	5.1	117.3
Off Skerries TSS to Barrow (west) – North	10	69.0	70.3	1.3	13.0
Off Skerries TSS to Barrow (west) – South	17	69.4	70.9	1.5	25.5
Heysham to Off Skerries TSS (west)	18	73.9	77.5	3.6	64.8
Liverpool TSS to Irish Sea (west)	45	49.2	49.3	0.1	3.1
Liverpool TSS to Irish Sea (west)	410	50.08	50.13	0.05	19.9
Liverpool TSS to W IoM (west)	704	53.0	54.0	1.0	704.1
Liverpool to E IoM – west	17	77.6	75.8	-1.8	-30.3
Liverpool to E IoM – central	113	70.5	74.7	4.1	465.7
Liverpool to E IoM – east	20	68.0	70.4	2.4	48.7
Douglas to Heysham	93	48.7	48.9	0.2	20.8
Liverpool to west IoM	128	61.0	64.1	3.0	386.6
Douglas to Liverpool TSS (east)	16	51.7	57.6	5.9	94.2
Off Skerries TSS to Solway Firth	48	74.6	71.4	-3.2	-154.1
Douglas to Liverpool TSS	20	51.1	51.8	0.6	12.4
Off Skerries TSS to Barrow (east)	23	66.9	71.6	4.7	108.1

Sensitivity of the receptor

12.10.3.11 For commercial routes, the principal routes with more than one vessel transit per day would need less than one nautical mile of deviation to pass clear of the Mona Array Area and would be unaffected by the addition of the other cumulative projects. This increase is minor considering the length of journeys taken by commercial vessels between international ports. It is, therefore, not anticipated to have any material impact upon the viability of these routes into Liverpool.

12.10.3.12 The majority of minor routes have less than one vessel transit per week but would require greater deviations to their routes. The routes which are most impacted are between the Off Skerries TSS and Heysham (5.1nm)/Barrow (4.7nm), and the Douglas to Liverpool TSS (5.9nm). Given the length of the journeys and the speed of transit, this is not anticipated to have any significant impacts upon the viability of these routes.

12.10.3.13 Timetabled ferry services are more sensitive to impacts due to increased transit time due to constraints on schedules, berthing or crewing requirements (see volume 6, annex 12.1: Navigational risk assessment of the PEIR). Of the six ferry routes directly impacted by the cumulative schemes:

- The Isle of Man Steam Packet Company route between Douglas and Liverpool with approximately 625 movements per year will require less than one minute of additional transit duration. On a three hour service, which has greater existing variation in transit duration and turn around time, this is not anticipated to impose significant operational impacts
- The Isle of Man Steam Packet Company route between Douglas and Heysham with approximately 1,300 movements per year will require less than four minutes of additional transit duration. On a four hour service, which has greater existing variation in transit duration and turn around time, this is not anticipated to impose significant operational impacts
- The Stena route between Liverpool and Belfast to the west of the Isle of Man with approximately 1,400 movements per year would necessitate an additional 6.7 minutes of steaming time per trip. The route to the east of the Isle of Man would necessitate between a 10 and 16 minutes increase in steaming time per trip. On an eight hour service, which has greater existing variation in transit duration and turn around time, this is not anticipated to impose significant operational impacts
- Both Seatruck routes between Heysham and Ireland will require less than two minutes of steaming time per trip. On an eight hour service, which has greater existing variation in transit duration and turn around time, this is not anticipated to impose significant operational impacts
- There are no direct impacts on P&O ferry routes.

12.10.3.14 Given the extent to which multiple routes across multiple operators will be impacted, the sensitivity of the receptor is considered to be **medium**.

Significance of the effect

12.10.3.15 Overall, the magnitude of the cumulative impact is deemed to be **high** and the sensitivity of the receptor is considered to be **medium**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms. A moderate rather than major effect has been determined given the magnitude or routes impact but the relatively minor increase in journey times which are within the existing natural variation of operator schedules.

Further mitigation and residual effect

12.10.3.16 The Mona Offshore Wind Project has committed to exploring additional risk controls through further studies and engagement with stakeholders to ensure that they are appropriate and adequate for reducing risks to ALARP prior to submission of the DCO application. Appropriate risk controls will then be secured through the DCO or the marine licence(s). These will be explored in collaboration with other developers of cumulative projects (see section 12.14).

Operations and maintenance phase

12.10.3.17 The cumulative impacts to commercial operators including strategic routes and lifeline ferries during operations and maintenance are not anticipated to be substantially different to those during construction. During both the construction and the operational phases of the cumulative projects, large commercial ship will not be able to transit through the array areas, whether through the presence of construction buoyage or structures. The cumulative impact on vessel routeing will, therefore, be the same, albeit for different durations.

12.10.3.18 The magnitude of the cumulative impact is, therefore, deemed to be **high** and the sensitivity of the receptor is considered to be **medium**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms. A moderate rather than major effect has been determined given the magnitude or routes impact but the relatively minor increase in journey times which are within the existing natural variation of operator schedules.

Decommissioning phase

12.10.3.19 The cumulative impacts to commercial operators including strategic routes and lifeline ferries during decommissioning are not anticipated to be substantially different to those during construction. During both the construction and the decommissioning phases of the cumulative projects, large commercial ships will not be able to transit through the array areas, whether through the presence of decommissioning buoyage or structures. The cumulative impact on vessel routeing will, therefore, be the same. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the number of structures within the Mona Array Area reduces.

12.10.3.20 The magnitude of the cumulative impact is, therefore, deemed to be **high** and the sensitivity of the receptor is considered to be **medium**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms. A moderate rather than major effect has been determined given the magnitude or routes impact but the relatively minor increase in journey times which are within the existing natural variation of operator schedules.

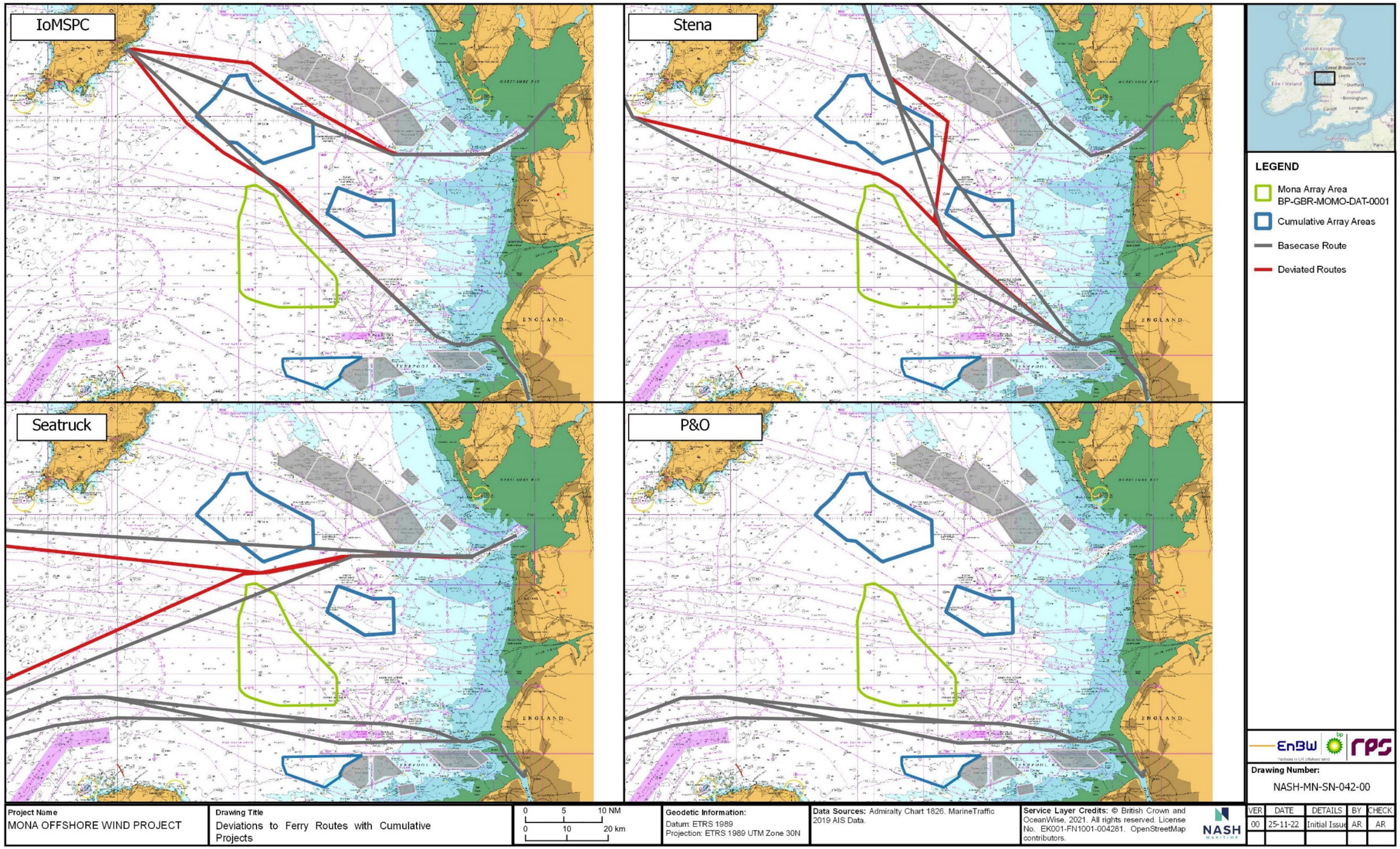


Figure 12.10: Deviations to ferry routes with Tier 1 and Tier 2 cumulative projects.

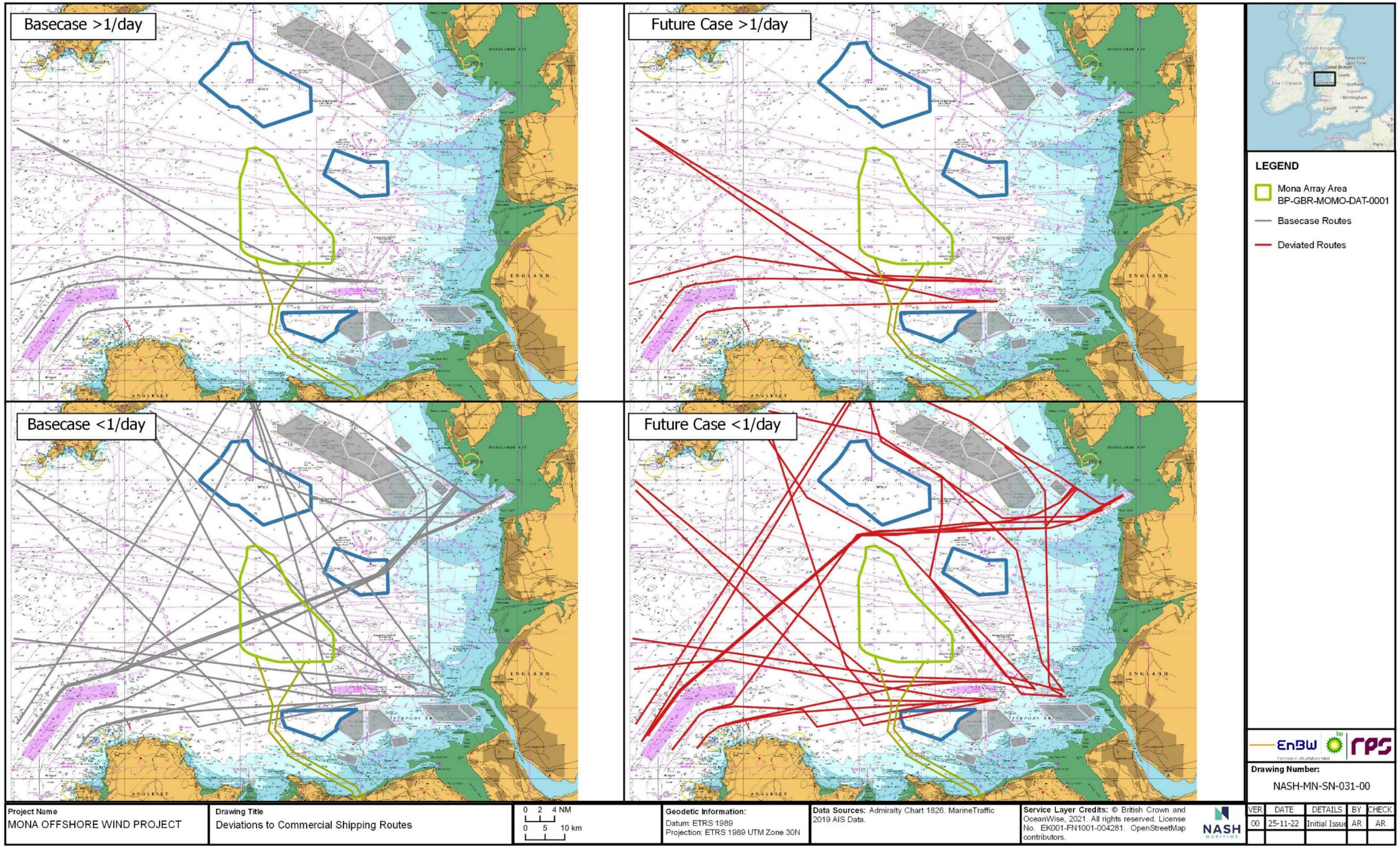


Figure 12.11: Deviations to commercial shipping routes with Tier 1 and Tier 2 cumulative projects.

12.10.4 Impact on adverse weather routeing

Construction phase

12.10.4.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets and Morecambe Offshore Wind Farm generation assets have a cumulative impact on adverse weather routes. Where significant adverse weather is encountered, vessels may take less direct routes to take advantage of lees from land masses, avoiding dangerous sea states or minimising the motions onboard. The navigation simulations (see volume 6, annex 12.1: Navigational risk assessment of the PEIR) demonstrated that without being able to adequately weather route, excessive roll was experienced which could pose a hazard to the vessel, reduce control and be uncomfortable to passengers.

Magnitude of impact

12.10.4.2 During construction, vessel traffic would be displaced from the Mona Array Area due to the presence of construction buoyage and safety zones around fixed structures which are under construction. It is anticipated that mariners would also maintain safe passing distance of at least one nautical mile from navigational hazards, likely greater in adverse weather.

12.10.4.3 Each of these routes are impacted by one or more array areas. Where vessel routes do not directly intersect the Mona Array Area, but do intersect the Morgan or Morecambe array areas, they have been included within the cumulative assessment as there are cumulative impacts upon operators/ports with multiple routes. Furthermore, the presence of all cumulative projects will indirectly affect the master decision making and passage planning.

12.10.4.4 During adverse weather, some sailings are delayed or inevitably cancelled irrespective of the presence of the cumulative projects. However, with the presence of the cumulative projects, where sailings are safe to take place, they may be required to route a greater distance and duration. Over the course of a day, the aggregation of these delays would result in the potential for additional sailings to be cancelled where constraints such as hours of rest are exceeded. Such effects are already experienced by operators, but the presence of the cumulative projects may exacerbate this.

12.10.4.5 During consultation and through the navigation simulations the conditions in which adverse weather routes would be taken, or services cancelled, was shown to be dependent on many different factors including route, vessel, wind/wave directions, wind speed and wave height. However, it was estimated that the Isle of Man Steam Packet Company service between Liverpool and Douglas would be impacted at wave heights of 1.6m Hs and cancelled at 2m Hs. The Stena route between Liverpool and Belfast would be impacted at wave heights of 2.4m Hs and cancelled at 3.4m Hs. These thresholds are noted to be conservative given the frequency of occurrence for historical transits in 2019.

12.10.4.6 Given these thresholds and analysis of the Met Office's 1988-2021 North West Shelf Model, the frequency at which these conditions would be exceeded in a typical year can be given as:

- Isle of Man Steam Packet route between Liverpool to Douglas: Between 4.8% and 18.3% of sailings would require some weather routeing (average of 9.6%). Between 1.5% and 7.3% of sailings could be cancelled due to adverse weather (average of 4%)
- Isle of Man Steam Packet route between Heysham to Douglas: Between 3.7% and 13.4% of sailings would require some weather routeing (average of 9.6%). Between 0.3% and 3.7% of sailings could be cancelled due to adverse weather (average of 1.5%)
- Stena route between Heysham and Belfast: Between 1.2% and 10% of sailings would require some weather routeing (average of 4.8%). Between 0% and 1.5% of sailings could be cancelled due to adverse weather (average of 0.6%)
- Stena Liverpool to Belfast: Between 1.2% and 10% of sailings would require some weather routeing (average of 4.8%). Between 0% and 1.5% of sailings could be cancelled due to adverse weather (average of 0.6%).

12.10.4.7 Given these percentages, and a review of operator schedules and constraints, an estimate can be made for the number of additional services cancelled due to navigating a longer route around the Mona Array Area and other cumulative projects:

- Isle of Man Steam Packet route between Liverpool to Douglas: A base case estimate of 26 sailings cancelled would increase to 35 sailings cancelled with the cumulative projects
- Isle of Man Steam Packet route between Heysham to Douglas: A base case estimate of 23 sailings cancelled would increase to 30 sailings cancelled with the cumulative projects
- Stena route between Heysham and Belfast: A base case estimate of 10 sailings cancelled would increase to 15 sailings cancelled with the cumulative projects
- Stena Liverpool to Belfast: A base case estimate of 14 sailings cancelled would increase to 21 sailings cancelled with the cumulative projects.

12.10.4.8 In addition to the cumulative impact on vessel routeing, the presence of the array areas reduces the optionality of vessels to maintain a safe and comfortable heading under adverse weather conditions. For example, a passage within the corridors formed by the array areas would require vessels to navigate beam on to the prevailing conditions. This is not considered seamanlike in adverse weather and could result in a cargo shift. The navigation simulations (volume 6, annex 12.1: Navigational risk assessment of the PEIR) noted that ferries experienced excessive roll during adverse weather conditions in several of the corridors during prevailing conditions.

12.10.4.9 Analysis of commercial vessel traffic in adverse weather events did not identify any appreciable changes in vessel routes. During Met Office named storm events, with gale/storm force winds, there was a greater use of the anchorage to the east of Anglesey.

12.10.4.10 The construction activities will be managed through adopted risk controls listed in Table 12.16:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the construction area

- Marking and charting of the Mona Array Area on nautical charts to facilitate safe passage planning
- Construction method statement and programme to manage traffic and reduce impacts.

12.10.4.11 Given that adverse weather routeing is anticipated to be impacted infrequently but multiple times per year, the magnitude is considered to be **medium**.

Table 12.25: Impact on ferry routeing in adverse weather with Tier 1 and Tier 2 cumulative projects.

Parameter	Stena LIV-BEL-W	Stena HEY-BEL	Isle of Man Steam Packet Company LIV-DOUG
Example Vessels (2019-2022)	Stena Edda Stena Embla Stena Mersey Stena Horizon Stena Lagan Stena Forecaster Stena Forerunner	Stena Hibernia Stena Scotia	Manannan
Approximate Annual Crossings (2019)	20	27	34
Baseline Distance (nm)	144.4	135.3	+73.5
Baseline Time (Minutes)	418-495	511	168-191
Basecase Delay (Minutes)	+13 to +68	+67	+10 to +33
Deviated Distance (nm)	145.9	149.1	79.4
Additional Delays (Minutes)	+24	+52	+27
Total Delays Will Be At Least (Minutes)	+37	+119	+37
Parameter	**Seatruck HEY-DUB**	**Seatruck HEY-WAR**	**Isle of Man Steam Packet Company HEY-DOUG**
Example Vessels (2019-2022)	Seatruck Pace Seatruck Panorama	Seatruck Performance Seatruck Precision	Ben-my-Chree
Approximate Annual Crossings (2019)	27	44	17
Baseline Distance (nm)	128	124.6	63.5
Baseline Time (Minutes)	505	476	213-226
Basecase Delay (Minutes)	+28	+27	+10 to +23
Deviated Distance (nm)	127.9	124.4	66.9
Additional Deviated Time (Minutes)	+0	+0	+17
Total Delays Will Be At Least (Minutes)	+28	+27	+27

Sensitivity of the receptor

12.10.4.12 Figure 12.8 shows anticipated adverse weather routeing with and without the cumulative projects. The 2019 AIS data has been used to estimate the cumulative impact on vessel routes in adverse weather. Each revised passage plan was developed by the NASH project team, including master mariners. These passage plans are based on existing passage plans provided by operators during consultation (such as passing at least 1.5nm from a wind turbine) and informed by the results of the navigation simulation sessions (volume 6, annex 12.1: Navigational risk assessment of the PEIR). The 2019 AIS data has been used to estimate the transit speeds.

12.10.4.13 Crews operating the Stena Heysham to Belfast route may choose not to transit between Barrow and the West of Duddon Sands offshore wind farm and instead pass to the west of the offshore wind farm. Within the 2019 data, vessels choosing to take this route incurred an additional 67 minutes of transit time. With the cumulative array areas in place, (and should the corridor between Morgan and Walney be deemed unnavigable in adverse weather) vessels would pass to the west of the Morgan Array Area before proceeding north (to the east of the Isle of Man). This is estimated to incur a further increase in transit times of 52 minutes, giving a total delay of at least 119 minutes when compared with the normal route. Alternatively, vessels may elect to continue further west and pass to the west of the Isle of Man.

12.10.4.14 Stena's Liverpool to Belfast adverse weather routes tend to trend to the southwest of their typical passage plans, towards the prevailing conditions. Within the 2019 data, this accounted for an additional 13 to 68 minutes of transit time. In order to fully clear the Mona Array Area to the southwest, this would require a further increase in transit times of 24 minutes, giving a total delay of at least 37 minutes when compared to the normal route. Whilst distances are provided in Table 12.25 for increased transit distance for an east of Isle of Man route, the use of narrow corridors and frequent course changes may make this unattractive.

12.10.4.15 The 2019 AIS data shows that the Isle of Man Steam Packet Company Heysham to Douglas adverse weather routeing accounts for an additional 10 to 23 minutes of journey time. Whilst the corridor between the Walney offshore wind farm and Morgan Array Areas may be sufficient for safe transit, a conservative assumption (informed by the bridge navigation simulations) has been made that vessel crews would choose to pass between Mona and Morgan Array Areas, before transiting to the west of the Morgan Array Area. This would lead to a further increase in transit time of 17 minutes, giving a total delay of at least 27 minutes when compared to the normal route.

12.10.4.16 The 2019 AIS data shows that the Isle of Man Steam Packet Company Liverpool to Douglas adverse weather routeing accounts for an additional 10 to 33 minutes of journey time, on a 158 minute journey. These transits tend to trend to the southwest of their typical passage plans and therefore it has been assumed that vessels would pass to the south and west of the Mona Array Area. This would lead to a further

increase in transit times of 27 minutes, giving a total delay of at least 37 minutes when compared to the normal route. During the bridge navigation simulation it was verified that the Manannan ferry is more sensitive to adverse weather conditions than conventional ro-ro ferries and may be more likely to transit via adverse weather routes. Impacts associated with adverse weather routing may, therefore, be greater for the Manannan ferry than other ferries operating this route. This cumulative impact would be the same as it is for the individual Mona Offshore Wind Project assessment.

12.10.4.17 Seatruck adverse weather routeing was generally limited to within the vicinity of the array areas. Within the 2019 AIS data, tracks diverged approximately where the Mona and Morgan corridors are located and therefore the cumulative impact on adverse weather routeing is negligible.

12.10.4.18 Ferry services in the shipping and navigation study area are important for facilitating trade, tourism and other important functions. In particular, consultees emphasised that services between the Isle of Man and the UK are lifeline services which carry food and goods which are crucial in a just-in-time economy. The socio-economics approach for considering potential impacts of the Mona Offshore Wind Project on the IoM is set out within volume 4, chapter 29: Socio-economics of the PEIR.

12.10.4.19 During adverse weather, cargo shift as a result of reduced optionality on vessel heading could cause minor injuries and property damage.

12.10.4.20 Due to the potential impact to services to the Isle of Man, the sensitivity of the receptor is therefore, considered to be **high**.

Significance of the effect

12.10.4.21 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effect

12.10.4.22 The Mona Offshore Wind Project has committed to exploring additional risk controls through further studies and engagement with stakeholders to ensure that they are appropriate and adequate for reducing risks to ALARP prior to submission of the DCO application. Appropriate risk controls will then be secured through the DCO or marine licence(s). These will be explored in collaboration with other developers of cumulative projects (see section 12.14).

Operations and maintenance phase

12.10.4.23 The cumulative impacts to adverse weather routeing during operations and maintenance are not anticipated to be substantially different to those during construction. During both the construction and the operational phases of the cumulative projects, large commercial ships will not be able to transit through the array areas, whether through the presence of construction buoyage or structures. The cumulative impact on vessel routeing will, therefore, be the same for the operations and maintenance phase, albeit for different durations.

12.10.4.24 The magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

12.10.4.25 Appropriate further mitigation listed for the construction phase of the Mona Offshore Wind Project will be considered for the operations and maintenance phase.

Decommissioning phase

12.10.4.26 The cumulative impacts to adverse weather routeing during decommissioning are not anticipated to be substantially different to those during construction. During both the construction and the decommissioning phases of the cumulative projects, large commercial ships will not be able to transit through the array areas, whether through the presence of decommissioning buoyage or structures. The cumulative impact on vessel routeing will, therefore, be the same for the decommissioning phase. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the number of structures within the Mona Array Area reduces.

12.10.4.27 The magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

12.10.4.28 Appropriate further mitigation listed for the construction phase of the Mona Offshore Wind Project will be considered for the decommissioning phase.

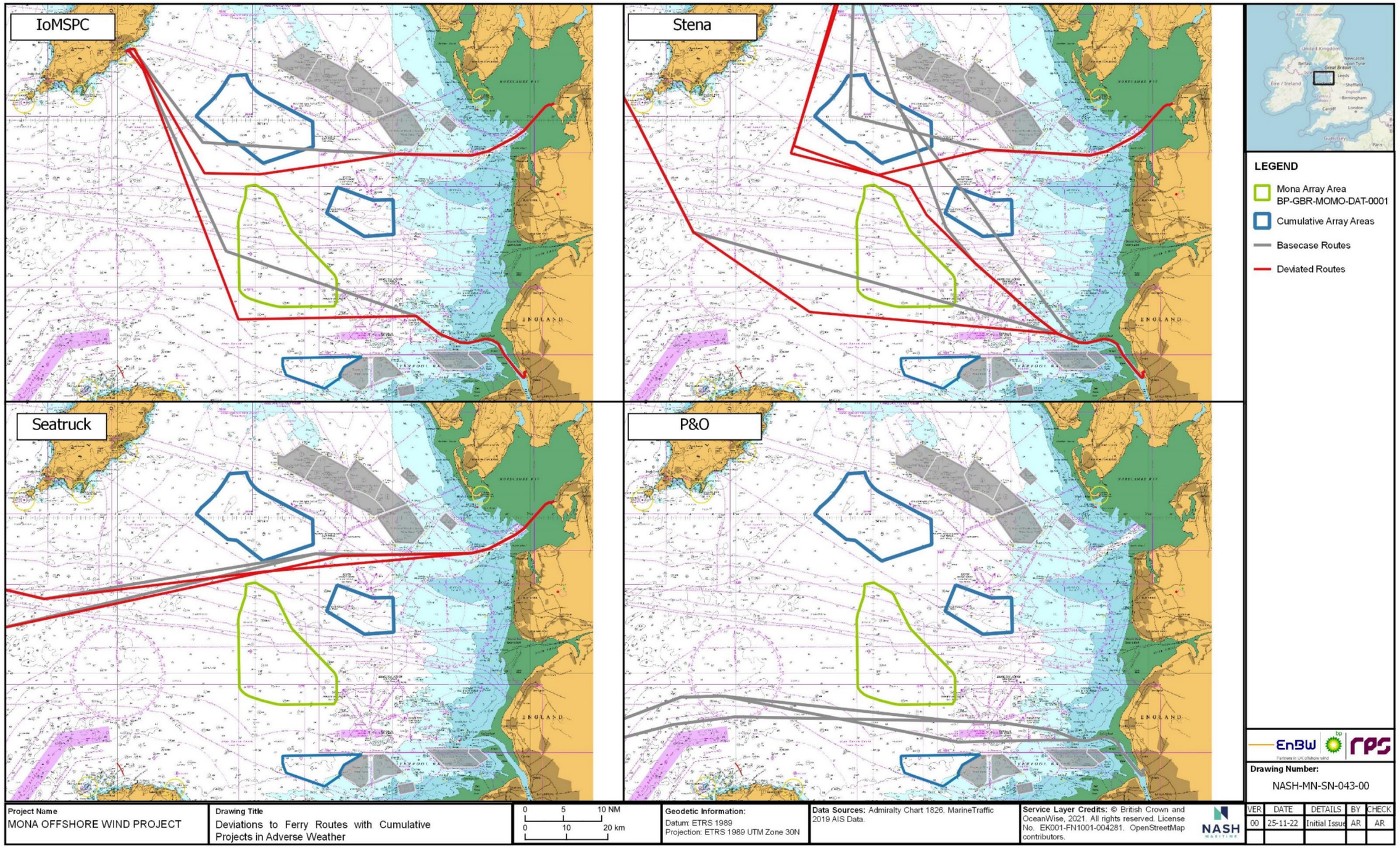


Figure 12.12: Deviations to ferry routes in adverse weather with Tier 1 and 2 cumulative projects.

12.10.5 Impact on access to ports and harbours

Construction phase

12.10.5.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets, Morecambe Offshore Wind Farm generation assets and existing projects could have a cumulative impact on access to ports and harbours

12.10.5.2 Following determination of the construction bases for all cumulative projects, this cumulative impact should be reviewed to ensure that appropriate risk controls are in place.

Magnitude of impact

12.10.5.3 The location of all Tier 1 and 2 project array areas are outside of the Statutory or Competent Harbour Authority Areas of any port or harbour in the Irish Sea.

12.10.5.4 The array areas would result in deviation of both ferry and commercial shipping routes, particularly to Liverpool, Douglas and Heysham. These cumulative impacts are assessed in sections 12.10.2, 12.10.3 and 12.10.4, but are not anticipated to have substantial cumulative impacts on any of the ports or harbours in the shipping and navigation study area.

12.10.5.5 There could be overlap of Tier 1 and Tier 2 project construction schedules that would require a significant number of additional movements each year in the Irish Sea between ports/harbours and construction sites.

12.10.5.6 The construction base, or bases, for Awel y Mor and Tier 2 projects are not yet determined. There is the potential for cumulative impacts on port access where the same port or harbour is used to support both projects. This could result in congestion and additional risks in navigational channels and greater burden on port operations due to the increase in movements. Previous offshore wind projects elsewhere in the UK have successfully mitigated these operational challenges, particularly through marine coordination of construction activities and liaison with ports and harbours.

12.10.5.7 The laying of offshore export cables will necessitate an advisory exclusion area around the cable laying vessel of up to 500m could impede navigation of other vessels. In particular, this may cause disruption to port and harbour approach channels, however landfalls between the respective offshore wind farms are far apart and there would be limited cumulative impact.

12.10.5.8 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.5.9 Any potential cumulative impacts during cable laying are likely to be short term and localised and are not expected to be any greater than for the Mona project alone.

12.10.5.10 Given the cumulative impacts to ports and harbours during construction are assumed to be manageable, the sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.10.5.11 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance phase

Magnitude of impact

12.10.5.12 During operations and maintenance of the Mona Offshore Wind Project, there could be overlap with the operations and maintenance of other Tier 1 and Tier 2 projects which would a significant number of additional movements each year in the Irish Sea between ports/harbours and construction sites.

12.10.5.13 These additional movements could lead to congestion or operational challenges in ports and harbours through which they transit. The operations and maintenance base or bases for all Tier 1 and Tier 2 projects are not yet determined, but previous offshore wind projects elsewhere in the UK have successfully mitigated these operational challenges, particularly through marine coordination of operations and maintenance activities and liaison with ports and harbours.

12.10.5.14 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.5.15 Given the cumulative impacts to ports and harbours during operations and maintenance are assumed to be manageable, the sensitivity of the receptor is therefore, considered to be **low**.

Significance of effect

12.10.5.16 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

12.10.5.17 The cumulative impacts to reduced access to ports and harbours during decommissioning are not anticipated to be substantially different to those during construction. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the number of structures within the Mona Array Area reduce.

12.10.5.18 Therefore, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

12.10.6 Impact on emergency response capability due to increased incident rates and reduced access for SAR responders

Construction phase

12.10.6.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets, Morecambe Offshore Wind Farm generation assets and existing projects could have a cumulative impact on emergency response capability due to increased incident rates and reduced access for SAR responders.

Magnitude of impact

12.10.6.2 Historical incident data within the Irish Sea suggests that most incidents occur inshore or in the approaches to ports and harbours. As demonstrated within volume 6, annex 12.1: Navigational risk assessment of the PEIR, the construction activities of offshore wind farms can lead to an increase in incidents involving construction vessels, but this is infrequent.

12.10.6.3 It should be noted that often incidents within or adjacent to offshore wind farms are responded to by CTVs before conventional SAR assets (such as helicopters or lifeboats) are able to reach the incident, which can be a beneficial effect.

12.10.6.4 In the unlikely event of an incident, SAR assets are required to access a site or surrounding area without risk to themselves. In particular, wind turbines can pose a hazard to SAR helicopters and the wind farm should be designed to enable helicopter access and therefore safeguard HMCG obligations to SAR within the UK SAR Region. Several trials have been conducted by HMCG and MCA in SAR at offshore wind farms (see MCA, 2005; 2019) to establish best practice.

12.10.6.5 Emergencies on board, particularly fire or a man overboard, require immediate action by the bridge teams. For example, during fire, it may be necessary to turn the vessel into the wind so that any smoke does not blow across the passenger decks. Consultation has identified that these incidents infrequently occur on board ferries in the eastern Irish Sea (in the order of less than once a year).

12.10.6.6 Whilst the presence of Tier 1 and Tier 2 projects does not necessarily impact upon the likelihood that fire may occur, its presence constricts the searoom to perform these manoeuvres and may increase the risk of resulting consequences. The likelihood of these incidents occurring is unlikely and there would still be several nautical miles of searoom to undertake emergency manoeuvres if required.

12.10.6.7 Incidents within the shipping and navigation study area are relatively infrequent and therefore the risk of occurrence cumulatively with Tier 1 and Tier 2 projects is considered to be low. As noted above, the increased presence of CTVs and construction vessels increases the SAR capability that enables a more timely incident response.

12.10.6.8 All Tier 1 and Tier 2 offshore wind farms have committed to at least one line of orientation with wind turbine spacing that is in excess of the minimum guidance in MGN654. Therefore, SAR access to any of the array areas should be maintained.

12.10.6.9 MGN654 Annex 5 (MCA, 2021) notes that windfarms which are adjacent or constructed close to one another should have harmonised layouts with the same general orientation. All Tier 1 and Tier 2 array areas are more than three nautical miles from one another and there is the option to realign SAR search patterns if required. Furthermore, there is sufficient space to meet requirements for helicopter refuge areas between the array areas of more than one nautical mile.

12.10.6.10 Several key risk controls are committed to in order to reduce the impact on emergency response during construction:

- An Emergency Response and Cooperation Plan will be developed to facilitate information sharing regarding the offshore wind farm and SAR organisations
- Periodic exercises will be undertaken at the site to prepare for incident response
- All Tier 1 and Tier 2 projects have committed to at least one line of orientation to facilitate SAR access
- Wind turbine spacing will exceed SAR requirements of 500m
- A layout plan will be prepared and submitted to the MCA and Trinity House post-consent but before construction commences
- Furthermore, a buoyed construction area, aids to navigation and promulgation measures will reduce the likelihood of third party vessels being involving in an incident within the shipping and navigation study area.

12.10.6.11 The magnitude is therefore, considered to be **low**.

Sensitivity of the receptor

12.10.6.12 Whilst reduction in SAR capability could impact the likelihood of a successful rescue, and could therefore have potentially high consequences, compliance with guidance and best practice would mitigate this impact.

12.10.6.13 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.10.6.14 Overall, the magnitude of the cumulative impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that the presence of the structures will have an adverse impact on SAR capability as opposed to open sea, albeit projects will follow best practice to minimise this impact.

Operations and maintenance phase

12.10.6.15 The presence of infrastructure within the array areas, whether under construction or operational, will have a similar cumulative effect on SAR. During construction, there may be partially constructed wind turbines, an irregular development site or the presence of jack ups which pose additional hazards. There would however be a greater duration of cumulative impacts during the operational phase than the construction phase. Therefore, the cumulative impacts to emergency response during operations and maintenance phase are not anticipated to be substantially different to those during construction.

12.10.6.16 The magnitude of the cumulative impact is, therefore, deemed to be **low** and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A Minor rather than negligible effect has been determined given that the presence of the structures will have an adverse impact on SAR capability as opposed to open sea, albeit projects will follow best practice to minimise this impact.

Decommissioning phase

12.10.6.17 The cumulative impacts to emergency response during decommissioning are not anticipated to be substantially different to those during construction. However, it should be noted that the impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.10.6.18 Therefore, the magnitude of the cumulative impact is deemed to be **low**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms. A minor rather than negligible effect has been determined given that the presence of the structures will have an adverse impact on SAR capability as opposed to open sea, albeit projects will follow best practice to minimise this impact.

12.10.7 Impact on vessel to vessel collision risk

12.10.7.1 The assessment of collision risk has assumed that all vessels will comply with their obligations under the COLREGs, SOLAS and undertake prudent passage planning.

Construction phase

12.10.7.2 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets and Morecambe Offshore Wind Farm generation assets could have a cumulative impact on vessel to vessel collision risk.

Magnitude of impact

12.10.7.3 During construction, vessel traffic would be displaced from the Tier 1 and Tier 2 offshore wind farm project array areas due to the presence of construction buoyage and safety zones around fixed structures which are under construction. It is anticipated that mariners would also maintain a safe passing distance of at least one nautical mile from navigational hazards. Section 12.10.3 identifies that both commercial and ferry vessel routes will be deviated which could result in a convergence of vessels within corridors between Tier 1 and Tier 2 projects.

12.10.7.4 The Awel-y-Mor Array Area is located south of the approaches to the Liverpool Bay TSS and there would, therefore, be limited impact on vessel transits. The majority of vessels approaching the corridor between the Mona and Awel y Mor offshore wind farms would originate from the west and transited via the Off Skerries TSS. A minority of vessels approaching the TSS from the anchorage to the east of Anglesey would have a minor deviation to the north and there would be some increase in density and vessel interactions, potentially increasing collision risk.

12.10.7.5 The impacts described in section 12.8.7 which relate to collision risk to the south and southwest of the Mona Array Area would also occur with the Tier 1 and Tier 2 offshore wind farm project array areas. As a result of Tier 1 and Tier 2 projects, additional navigational corridors would be formed which are described below (see Figure 12.9) with characteristics described below and identified in volume 6, annex 12.1: Navigational risk assessment of the PEIR. Vessel traffic projections are based on a review of both 2019 AIS data and 2021/2022 vessel traffic surveys.

12.10.7.6 Each of these routes are impacted by one or more array areas. Where vessel routes do not directly intersect the Mona Array Area, but do intersect the Morgan or Morecambe array areas, they have been included within the cumulative assessment as there are cumulative impacts upon operators/ports with multiple routes. Furthermore, the presence of all cumulative projects will indirectly affect the master decision making and passage planning.

12.10.7.7 The corridor between the Mona and Morgan Array Areas has the following characteristics:

- Corridor width of three nautical miles with 4,000 vessel movements per year. An average vessel size of 149m and a maximum vessel size of 296m
- 10-16 ferry and 0.6 commercial ship movements anticipated per day through the corridor. There is potential for up to one recreational craft, two fishing boats and one service vessel in the corridor per day
- The corridor meets MGN654 20-degree rule guidance and PIANC WG161 width guidance, albeit any increase in vessel numbers or size would make this corridor width not fit for purpose under PIANC guidance
- Modelling suggests that it is unlikely that two large commercial ships would meet in the Mona to Morgan Array Area corridor (probability of 6%).

12.10.7.8 The corridor between Mona and Morecambe Offshore Wind Farm array areas has the following characteristics:

- Corridor width of 4.9 nautical miles and a corridor length of 8.2nm with 2,800 vessel movements per year. An average vessel size of 157m and a maximum vessel size of 296m
- 7-11 ferry and 0.8 commercial ship movements are anticipated per day through the corridor. Potential for up to two recreational craft, two fishing boats and one service vessel in corridor per day
- Corridor meets MGN654 20-degree rule guidance and PIANC WG161 width guidance
- Modelling suggests that it is unlikely that two large commercial ships would meet in the corridor between the Mona Array Area and the Morecambe Offshore Wind Farm array area (probability of <1.5%).

12.10.7.9 The corridor between Morgan Array Area and Walney Offshore Wind Farm has the following characteristics:

- Corridor width of 4.1 nautical miles and a corridor length of 10.4nm with 2,000 vessel movements per year. An average vessel size of 120m and a maximum vessel size of 195m
- Anticipated 5-8 ferry and 0.6 commercial ship movements per day through corridor. Potential for up to two recreational craft, two fishing boats and one service vessel in corridor per day
- Corridor meets MGN654 20-degree rule guidance and PIANC WG161 width guidance
- Modelling suggests that it is unlikely that two large commercial ships would meet in the Morgan Array Area to Walney Offshore Wind Farm corridor (probability <3.7%). The majority of meeting situations would involve the Ben-my-Chree and a Stena vessel, both of which would have good familiarity with passage and good redundancy.

12.10.7.10 In addition to commercial vessel meeting situations, it is anticipated that fishing, recreational and tug/service vessels may be encountered within the corridors between the Tier 1 and Tier 2 offshore wind farm project array areas.

12.10.7.11 During construction it is likely that recreational craft on passage will avoid the Mona Array Area. This will offset their transits into adjacent waters. However, analysis of recreational activity in section 12.4.4 demonstrated relatively few movements through the Mona Array Area and therefore are unlikely to be involved in a collision.

12.10.7.12 Large parts of the Irish Sea are fished and during construction there is potential that fishing activity might be displaced into adjacent waters. This is referred to as Spatial Squeeze, for which the National Federation of Fishermen's Organisations and Scottish Fishermen's Federation recently published a report (NFFO, 2022), and has

the potential to increase the risk of collision. This would be greater with Tier 1 and Tier 2 projects given the greater extent of obstructions which could concentrate vessels in narrow corridors with an increased collision risk. The presence of fishing vessels in a narrow corridor makes collision avoidance more challenging due to the reduced manoeuvring space.

12.10.7.13 Realistic multiple meeting situations between large commercial ships and small craft are likely within each of the corridors formed between cumulative Tier 1 and Tier 2 projects.

12.10.7.14 During full bridge simulations with ferry operators, collision situations were tested in normal and adverse weather conditions within each corridor. In none of the runs did a collision between two vessels occur, however, adequate CPA was not maintained between vessels during some specific situations. This typically occurred during adverse weather runs with relatively high traffic density, including other commercial ships and small craft such as fishing boats.

12.10.7.15 The cumulative hazard workshop and CRNRA (volume 6, annex 12.1: Navigational risk assessment of the PEIR) highlighted that several collision hazards were likely to occur within the CRNRA study area during the construction and operation of the Mona Offshore Wind Project, involving ferries, cargo/tanker, fishing, recreational craft and project vessels. It was agreed amongst stakeholders that the corridors between the Mona and Morgan Array Areas did not have sufficient width for effective collision avoidance given the volume of traffic, multiple directions and size of vessels which would navigate it. Consultees stated that the presence of small craft, and in particular fishing vessels, within the Morgan Array Area to Walney Offshore Wind Farm corridor was considered to drive unacceptably high collision risk.

12.10.7.16 The construction base or bases for the Tier 1 and Tier 2 projects are not yet determined, but there is potential for construction vessels in transit to Tier 1 and Tier 2 projects to be involved in a collision. The cumulative risks to construction vessels operating within Tier 1 and Tier 2 project sites would not be greater than each project in isolation (section 12.8.7).

12.10.7.17 The presence of the wind turbines may block or hinder the view of other vessels, resulting in “blind spots” which could increase the risk of collision by reducing the capability for early and effective collision avoidance. Vessels may be visually less distinct amongst the wind turbines and less prominent through radar, particularly at night and in poor visibility.

12.10.7.18 Most commercial ships would transit at least one nautical mile from an offshore wind farm. For a fishing boat or recreational craft emerging from the boundary of a wind farm array area at six knots, it would take 10 minutes to intersect the commercial ships path. For a CTV at 25 knots, this is reduced to 2.4 minutes, albeit these vessels would carry AIS so would be more identifiable to passing vessels. Such challenges currently exist for the established Irish Sea offshore wind farms but are being successfully managed with no reported collisions as a direct result of reduced visibility of emerging vessels.

12.10.7.19 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the construction area
- Marking and charting of Mona Array Area on nautical charts to facilitate safe passage planning
- A buoyed construction area and safety zones will offset third party traffic and construction vessels
- Fisheries Liaison and Co-existence Plan to reduce interactions between fishing vessels and construction vessels
- Marine co-ordination will promote best practice during construction activities within the site
- Construction method statement and programme will manage traffic and reduce impacts.

12.10.7.20 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.7.21 The sensitivity of collisions as a result of the cumulative impacts of Tier 1 and Tier 2 projects would not be substantially different to those described for the impact of the Mona Offshore Wind Project in isolation (section 12.8.7). Based on the evidence, literature and consultation, the NRA concluded that a most likely outcome for a ferry or passenger ship would be multiple injuries, moderate damage, minor pollution and widespread adverse publicity, with a worst credible outcome resulting in multiple loss of life. The most likely outcome for small craft was minor injuries, minor damage and no pollution. Loss of life was identified as a worst credible outcome for all other vessel types. Stakeholders advised that the worst credible outcome for a large vessel in collision with a small vessel would be multiple loss of life and the risk assessment was amended to reflect this.

12.10.7.22 The consequences of a collision during construction activities will be managed through adopted risk controls listed in Table 12.16:

- Emergency Response and Cooperation Plan to effectively respond to an incident
- Marine Pollution Contingency Plan
- Periodic exercises and training.

12.10.7.23 The sensitivity of the receptor is therefore, considered to be **high**.

Significance of the effect

12.10.7.24 The CRNRA (volume 6, annex 12.1: Navigational risk assessment of the PEIR) assessed 20 collision hazards which occurred during the construction or operations and maintenance phase of the projects cumulatively. Of these, five were scored as High Risk – Unacceptable both of which are relevant to Tier 1 and Tier 2 projects. Firstly, the risk of collision between a ferry/passenger vessel and a cargo/tanker or other ferry/passenger vessel to the south of the Mona Array Area and between the Mona and Morgan Array Areas. Secondly, the risk of collision between a ferry/passenger vessel or cargo/tanker and a small craft (such as fishing, recreational or project vessel) to the south of the Mona Array Area, between the Mona and Morgan Array Areas and Morgan Array Area and Walney Offshore Wind Farm array area. All other collision hazards were scored as Medium Risk – Tolerable if ALARP.

12.10.7.25 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The cumulative effect will, therefore, be of **major adverse** significance, which is significant in EIA terms. A major rather than moderate effect has been determined given that that there would be multiple significant increases in collision risk across multiple routes and areas.

Further mitigation and residual effect

12.10.7.26 The Mona Offshore Wind Project has committed to exploring additional risk controls through further studies and engagement with stakeholders to ensure that they are appropriate and adequate for reducing risks to ALARP prior to submission of the DCO application. Appropriate risk controls will then be secured through the DCO or marine licence(s). These will be explored in collaboration with other developers of cumulative projects (see section 12.14).

Operations and maintenance phase

12.10.7.27 The operations and maintenance phase will be managed through adopted risk controls listed in Table 12.16:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the Array Area
- At least one line of orientation and a regular layout of structures
- Marking and charting of the Mona Array Area on nautical charts to facilitate safe passage planning
- Fisheries Liaison and Co-existence Plan to reduce interactions between fishing vessels and Mona Offshore Wind Project vessels
- Marine co-ordination will promote best practice during maintenance activities within the site.

12.10.7.28 The cumulative impacts to vessel to vessel collision risk during operations and maintenance of Tier 1 and Tier 2 projects are not anticipated to be substantially different to those during construction. During both the construction and the operational phases of the cumulative projects, large commercial ships will not be able to transit through the array areas, and there may be small craft emerging from the construction site or operational array area, posing similar collision risks. The magnitude is therefore, considered to be **medium**.

12.10.7.29 The consequences of collision would not be substantially different to those described during construction. The sensitivity of the receptor is therefore, considered to be **high**.

12.10.7.30 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The cumulative effect will, therefore, be of **major adverse** significance, which is significant in EIA terms. A major rather than moderate effect has been determined given that that there would be multiple significant increases in collision risk across multiple routes and areas.

Further mitigation and residual effects

12.10.7.31 Appropriate further mitigation listed for the construction phase will be considered for further phases of the Mona Offshore Wind Project.

Decommissioning phase

12.10.7.32 The cumulative impacts to vessel to vessel collision risk are not anticipated to be substantially different to those during construction. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the number of structures within the Mona Array Area reduce.

12.10.7.33 Therefore, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **high**. The cumulative effect will, therefore, be of **major adverse** significance, which is significant in EIA terms. A major rather than moderate effect has been determined given that that there would be multiple significant increases in collision risk across multiple routes and areas.

12.10.7.34 Appropriate further mitigation listed for the construction phase will be considered for further phases of the Mona Offshore Wind Project.

12.10.8 Impact on allision (contact) risk to vessels

Construction phase

12.10.8.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets and Morecambe Offshore Wind Farm generation assets could have a cumulative impact on allision (contact) risk.

Magnitude of impact

12.10.8.2 The construction of additional structures within the shipping and navigation study area increases the likelihood that navigating vessels will have a contact with them, with contact most likely to occur through human error or mechanical failure. During construction, this is exacerbated by the partially constructed nature of the sites.

12.10.8.3 As noted in section 12.10.7, Tier 1 and Tier 2 projects would create corridors between the array areas which reduce the navigable width available to vessels. Firstly, the Mona to Morgan Array Area at 3nm in width with 4,000 vessel movements per year. Secondly, the Mona Array Area to Morecambe Offshore Wind Farm array area at 4.9nm in width with 2,800 movements per year. Thirdly, the Morgan Array Area to Walney Offshore Wind Farm array area at 4.2nm in width with 2,000 vessel movements per year. Fourthly, the Mona Array Area to the Awel-y-Mor Offshore Wind Farm array area at 6.6nm and 10,000 vessel transits per year.

12.10.8.4 When navigating these corridors, engine failure could cause vessels to drift and allide with a structure, or human error or steering failure could lead to a powered allision with a wind turbine or offshore substation.

12.10.8.5 Furthermore, given the increased vessel encounters within the corridor, as described in section 12.10.7, the likelihood of collision avoidance actions being taken by vessels forcing them out of the centre of the corridors and closer to wind turbines is increased. This potentially increases the risk of allision.

12.10.8.6 Where conditions are extreme, vessels may choose to avoid navigating through the corridors or services may be cancelled (section 12.10.4). However, in less severe adverse weather conditions vessels may be required to navigate through some of the corridors between the Tier 1 and Tier 2 array areas. With prevailing conditions beam-on to the vessel, a vessel may be offset from its track and manoeuvring may be more challenging. Furthermore, action to avoid cargo shift due to excessive roll may take vessels closer to wind turbines than they would otherwise choose. This would increase the risk of allision.

12.10.8.7 During navigation simulation sessions (see volume 6, annex 12.1) several runs tested the safety of navigating adjacent to and within these corridors. In none of the simulation runs did an allision between a ferry and a wind turbine occur, although in certain situations inadequate CPA was maintained, such as due to collision avoidance of another vessel. Furthermore, it was noted that emergency manoeuvres necessitated vessels approaching wind turbines to maintain a specific bearing to the prevailing conditions.

12.10.8.8 Other risks of allision for vessels navigating elsewhere in the shipping and navigation study area, and for small craft including construction vessels, would be consistent as assessed for the Mona Offshore Wind Project in isolation (see section 12.8.8).

12.10.8.9 The construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the construction area
- Application for safety zones to separate construction activities and vessel navigation
- Guard vessels to manage vessel safety
- Blade clearance of at least 22m from MHWS to avoid mastheads
- Marking and charting of the Mona Array Area on nautical charts to facilitate safe passage planning
- A buoyed construction area and safety zones will offset third party traffic and construction vessels
- Fisheries Liaison and Co-existence Plan to reduce interactions between fishing vessels and structures
- Marine co-ordination will promote best practice during construction activities within the site
- Construction method statement and programme will manage traffic and reduce impacts.

12.10.8.10 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.8.11 The sensitivity of allisions as a result of the cumulative impacts of Tier 1 and Tier 2 projects would not be substantially different to those described for the impact of the Mona Offshore Wind Project in isolation as described in section 12.8.8. Based on the evidence, literature and consultation, the NRA concluded that a most likely outcome for a ferry or passenger ship would be multiple injuries, moderate damage, minor pollution and widespread adverse publicity, with a worst credible outcome resulting in multiple loss of life. The most likely outcome for small craft was minor injuries, minor damage and no pollution. Less numerous losses of life as compared to ferry allisions was identified as a worst credible outcome for all other vessel types, including small craft.

12.10.8.12 The consequences of a collision during construction activities will be managed through adopted risk controls listed in Table 12.16, specifically:

- Emergency Response and Cooperation Plan to effectively respond to an incident
- Marine Pollution Contingency Plan
- Periodic exercises and training.

12.10.8.13 The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of the effect

12.10.8.14 The CRNRA (volume 6, annex 12.1: Navigational risk assessment of the PEIR) assessed 28 allision hazards which occurred during the construction or operations

and maintenance phase of cumulative projects. All of which were scored as Medium Risk – Tolerable if ALARP or less. The highest scoring cumulative allision hazards that are relevant to Tier 1 and Tier 2 projects are an allision of a ferry/passenger vessel south of the Mona Array Area, between the Mona and Morgan Array Areas and between the Mona Array Area and Morecambe Offshore Wind Farm array areas. Allisions involving cargo/tanker or small craft were generally scored less, but still within the Medium Risk category.

12.10.8.15 Given the greater number of corridors, the aggregate risks of allision for Tier 1 and Tier 2 projects are greater than for the Mona Offshore Wind Project in isolation.

12.10.8.16 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **medium**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effect

12.10.8.17 The Mona Offshore Wind Project has committed to exploring additional risk controls through further studies and engagement with stakeholders to ensure that they are appropriate and adequate for reducing risks to ALARP prior to submission of the DCO application. Appropriate risk controls will then be secured through the DCO or marine licence(s). These will be explored in collaboration with other developers of cumulative projects. Potential risk controls will include:

- Array boundary design of the Mona Offshore Wind Project to increase manoeuvring space and reduce impact to operators. Specifically, this will increase the offset between the Mona Array Area and the approaches to the Liverpool Bay TSS, and a reduction in the northern extent of the Mona Array Area
- Commitment to two lines of orientation
- Passage planning for Mona Offshore Wind Project CTVs
- Continued engagement with stakeholders
- Construction scheduling.

Operations and maintenance phase

Magnitude of impact

12.10.8.18 During the operations and maintenance phase of the Tier 1 and Tier 2 projects, the presence of the fully constructed array areas exposes large commercial vessels to similar cumulative impacts as during the construction phase, albeit for a longer duration. However, it is likely that operators will be more familiar to the layout and presence of the Mona Array Area following four years of construction.

12.10.8.19 Other risks of allision for vessels navigating elsewhere in the shipping and navigation study area, and for small craft including construction vessels, would be consistent as assessed for the Mona Offshore Wind Project in isolation (see section 12.8.8).

12.10.8.20 The construction activities will be managed through adopted risk controls listed in Table 12.16:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the Mona Array Area
- Blade clearance of at least 22m from MHWS
- Marking and charting of Array Area on nautical charts to facilitate safe passage planning
- Fisheries Liaison and Co-existence Plan to reduce interactions between fishing vessels and structures
- Marine co-ordination will promote best practice during operations and maintenance activities within the site.

12.10.8.21 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.8.22 The consequences of allision would not be substantially different to those described during construction. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of effect

12.10.8.23 The cumulative impacts to allision risk are not anticipated to be substantially different to those during construction.

12.10.8.24 Given the greater number of corridors, the aggregate risks of allision for Tier 1 and Tier 2 projects are greater than for the Mona Offshore Wind Project in isolation.

12.10.8.25 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **medium**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

Further mitigation and residual effects

12.10.8.26 Appropriate further mitigation listed for the construction phase will be considered for further phases of the Mona Offshore Wind Project.

Decommissioning phase

12.10.8.27 The cumulative impacts to allision risk are not anticipated to be substantially different to those during construction. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.10.8.28 Given the greater number of corridors, the aggregate risks of allision for Tier 1 and Tier 2 projects are greater than for the Mona Offshore Wind Project in isolation.

12.10.8.29 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **medium**. The cumulative effect will, therefore, be of **moderate adverse** significance, which is significant in EIA terms.

12.10.8.30 Appropriate further mitigation listed for the construction phase will be considered for further phases of the Mona Offshore Wind Project.

12.10.9 Impact on marine navigation, communications and position fixing equipment

Construction phase

12.10.9.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets and Morecambe Offshore Wind Farm generation assets could have a cumulative impact on marine navigation, communications and position fixing equipment.

Magnitude of impact

12.10.9.2 Section 12.8.9 demonstrates that previous studies have shown that offshore wind farms have no discernible impact to VHF, AIS, GNSS or compasses used by passing ships. Nor was the sound generated by wind turbines likely to mask the navigational sound signals made by vessels as per the COLREGs. An impact on marine radars could be experienced when navigating in close proximity to wind turbines.

12.10.9.3 The combination of Tier 1 and Tier 2 projects greatly increases the area through which these cumulative effects might be experienced when navigating in the Irish Sea. In particular, when navigating through narrow corridors between the Mona Array Area, Morgan Array Area and Morecambe Offshore Wind Farm array area, the width of corridor could result in adverse radar effects to be experienced.

12.10.9.4 The Tier 1 and Tier 2 array areas are outside of any harbour areas and the region is not monitored by VTS. The cumulative impacts to shore radar are, therefore, considered to be low.

12.10.9.5 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.9.6 Interference with radar could reduce the effectiveness of collision avoidance, increasing the risk of an incident. MGN654 recognises that these effects are greatest within 0.5nm of an offshore wind farm but could be experienced up to 1.5nm from the wind farm boundary. This is closer than most large vessels would pass based on prudent passage planning and, therefore, minimal effects should be experienced. There may be some reduction in the ability to track small craft within Tier 1 and Tier 2 array areas.

12.10.9.7 Furthermore, these effects are routinely experienced by operators passing the existing Irish Sea offshore wind farms and therefore mariners should be experienced in mitigating their effects.

12.10.9.8 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.10.9.9 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance phase

12.10.9.10 The cumulative impacts to marine navigation, communications and position fixing equipment are not anticipated to be substantially different to those during construction. The greater extent of structures across the Tier 1 and Tier 2 projects for a fully constructed offshore wind farms as opposed to a partially constructed one may widen these cumulative effects. However, it is not considered that this would increase the significance of this cumulative impact.

12.10.9.11 Therefore, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

12.10.9.12 The cumulative impacts to marine navigation, communications and position fixing equipment are not anticipated to be substantially different to those during construction. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the extent of structures within the Mona Array Area reduces.

12.10.9.13 Therefore, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

12.10.10 Impact on recreational craft passages and safety

Construction phase

12.10.10.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets and Morecambe Offshore Wind Farm generation assets could have a cumulative impact on recreational craft passages and safety.

Magnitude of impact

12.10.10.2 The presence of multiple offshore wind farms within the Irish Sea has a greater impact on recreational passages than each project in isolation.

12.10.10.3 Analysis of vessel traffic in the shipping and navigation study area (section 12.4.4) demonstrates that there are few recreational movements through the shipping and navigation study area. During the winter vessel traffic surveys, no recreational craft were detected, and on average, less than one per day was detected by either AIS or Radar. This suggests that relatively few recreational users would be adversely impacted. It is known that there are occasional regattas or rallies that cross between the UK and the Isle of Man.

12.10.10.4 The Awel-y-Mor offshore wind farm array area might impact upon recreational navigation to the south of the shipping routes into Liverpool, however, the existing presence of the Gwynt-y-Mor offshore wind farm already impacts these routes.

12.10.10.5 During the construction phase of an offshore wind farm, additional risk controls are used to manage navigating within the construction area. These include the use of guard boats and safety zones which will deter recreational vessels from navigating through the offshore wind farm. These controls will be adopted by the Mona Offshore Wind Project.

12.10.10.6 The construction activities will be managed through adopted risk controls listed in Table 12.16:

- Promulgation of activities through the use of Notice to Mariners to ensure approaching vessels can safely avoid the Mona Array Area
- Blade clearance of at least 22m from MHWS to avoid mastheads
- Commitments to layout including wind turbine and spacing and lines of orientation to facilitate internal navigation where safe to do so
- Marking and charting of the Mona Array Area on nautical charts to facilitate safe passage planning.

12.10.10.7 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.10.8 The cumulative impacts to offshore cruising routes between the UK and Isle of Man would not be substantially adversely impacted as opposed to the Mona Offshore Wind Project in isolation.

12.10.10.9 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.10.10.10 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance phase

12.10.10.11 During the operational phase of the Tier 1 and Tier 2 offshore wind farms, there is likely to be greater small craft traffic navigating through the array areas than during the construction phase, during which time navigation is more restricted. Given spacing between wind turbines in excess of SAR requirements of 500mand a regular layout, recreational craft could navigate through the Mona Array Area without unacceptable increases in the risk of allision. However, consultation with the RYA suggests that only a minority are choosing to do so at other sites. This may result in greater numbers of recreational craft navigating around the Mona Array Area, increasing transit durations.

12.10.10.12 As a result, these cumulative impacts are not anticipated to be substantially different to those during construction, and likely have a lower adverse impact.

12.10.10.13 Therefore, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

12.10.10.14 The cumulative impacts to recreational craft are not anticipated to be substantially different to those during construction. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the number of structures within the Mona Array Area reduces.

12.10.10.15 Therefore, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

12.10.11 Impact on snagging risk to vessel anchors and fishing gear

Construction phase

12.10.11.1 The construction of the Mona Offshore Wind Project, in combination with the construction or operation of the Awel-y-Mor Offshore Wind Farm, Morgan Generation Assets, Morecambe Offshore Wind Farm generation assets and Morgan and Morecambe Offshore Wind Farms Transmission Assets could have a cumulative impact on the risk of anchor and gear snagging for fishing vessels.

Magnitude of impact

12.10.11.2 Subsea cables are both at risk of anchor or fishing gear strikes and can pose a hazard to navigating vessels if gear attached to the vessel becomes snagged. Whilst snagging risks are localised to individual projects, the assessment of cumulative effects considers a greater extent of subsea infrastructure across the Irish Sea.

12.10.11.3 Both the Mona Offshore Wind Project and Awel-y-Mor Offshore Wind Farm offshore cable corridors route to the south, making landfall on the Welsh coast. During construction, controls will be in place to minimise the risk of snagging within the project array areas.

12.10.11.4 The construction activities will be managed through adopted risk controls listed in Table 12.16:

- Promulgation such as Notice to Mariners and site marking and charting issued to warn vessels of the presence of the Mona Offshore Wind Project
- Application for safety zones to separate construction activities and vessel navigation
- Guard Vessels to manage vessel safety
- Fisheries Liaison and Co-existence Plan for the export cable corridor
- Emergency response capabilities including an Emergency Response and Cooperation Plan, Marine Pollution Contingency Plan, periodic exercises to minimise the consequences of any incident
- A cable burial risk assessment
- Cable protection shall be designed to minimise snagging hazards, for example by minimising height above seabed, and or using smooth or shallower profiles.

12.10.11.5 The magnitude is therefore, considered to be **medium**.

Sensitivity of the receptor

12.10.11.6 Were a fishing vessel to snag the cable, the most likely outcome is loss of gear and potentially minor damage to the cable. A worst case outcome, however, is the loss of the fishing vessel if it capsizes, and potential fatalities, but this is very unlikely.

12.10.11.7 Snagging of commercial vessel anchors is unlikely to result in serious consequences such as fatalities or pollution from the vessel but could result in significant damage to the cable or cables. There is the potential for the presence of the cables to influence a master's decision making on whether to anchor to avoid an incident such as a collision, allision or grounding; however, this is not considered a likely option as the master would more likely act to minimise any risk to the vessel.

12.10.11.8 The sensitivity of the receptor is therefore, considered to be **low**.

Significance of the effect

12.10.11.9 Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operation and maintenance phase

12.10.11.10 The cumulative impacts due to the risk of snagging are not anticipated to be substantially different to those during construction, albeit for a longer duration. However, given the removal of restrictions on navigation that are in place during construction, and the wind turbine spacing in excess of 500m SAR requirements, there may be greater fishing activity within the Tier 1 and Tier 2 array areas posing a risk of snagging of inter array cables.

12.10.11.11 Conversely, during the operations and maintenance phase, there should be no partially buried or unprotected infrastructure as might occur temporarily during the construction phase. Furthermore, local fishermen will be more familiar with the site layout and able to avoid fishing in a manner which could lead to a risk of snagging.

12.10.11.12 The risk of snagging during the operations and maintenance phase will be managed through adopted risk controls listed in Table 12.16:

- Promulgation such as Notice to Mariners and site marking and charting issued to warn vessels of the presence of the Mona Offshore Wind Project
- Fisheries Liaison and Co-existence Plan for the export cable corridor
- Emergency response capabilities including an Emergency Response and Cooperation Plan, Marine Pollution Contingency Plan, periodic exercises to minimise the consequences of any incident

12.10.11.13 A cable burial risk assessment Overall, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Decommissioning phase

12.10.11.14 The cumulative impacts due to the risk of snagging are not anticipated to be substantially different to those during construction. However, it should be noted that the cumulative impacts will reduce as decommissioning progresses and the number of structures within the Mona Array Area reduces.

12.10.11.15 All cables will be removed during decommissioning so as not to leave any snagging hazards on the seabed.

12.10.11.16 Therefore, the magnitude of the cumulative impact is deemed to be **medium**, and the sensitivity of the receptor is considered to be **low**. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

12.10.12 Future monitoring

12.10.12.1 Table 12.20 below outlines the proposed monitoring commitments for shipping and navigation to address cumulative effects. These monitoring commitments are accepted, industry standard methods by which the cumulative impacts to shipping and navigation can be monitored and ensure the predictions of the NRA are consistent with the realised impacts and therefore that the risk control options are appropriate.

Table 12.26: Monitoring commitments.

Environmental effect	Monitoring commitment	Means of implementation
All impacts on vessel routeing and safety	Construction and post-construction monitoring of marine traffic (by AIS) with a report submitted annually to MMO, MCA and Trinity House. The report will assess the extent to which the impacts predicted in the NRA are accurate to ensure adopted risk controls are fit for purpose.	Secured through relevant conditions as part of the marine licence(s).
Impact on allision (contact) risk to vessels	AtoN monitoring to ensure constant functionality through the lifetime of the Mona Offshore Wind Project. Trinity House to be informed of any defects.	Secured through relevant conditions as part of the marine licence(s).
Impact on snagging risk to vessel anchors and fishing gear	Periodic validation surveys of cable burial and protection to ensure specified requirements are met.	Secured through relevant conditions as part of the marine licence(s).

12.11 Transboundary effects

12.11.1.1 A screening of transboundary impacts has been carried out and any potential for significant transboundary effects with regard to shipping and navigation from the Mona Offshore Wind Project upon the interests of other states has been assessed as part of this PEIR. Each individual vessel may be internationally owned or operating between ports in different states. These impacts have been captured and assessed within this shipping and navigation chapter, NRA and CRNRA. Therefore, no additional transboundary impacts are anticipated.

12.12 Inter-related effects

12.12.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Mona Offshore Wind Project (construction, operations and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g. subsea noise effects from piling, operational wind turbines, vessels and decommissioning)
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on shipping and navigation such as impact on ferry routes may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

12.12.1.2 A description of the likely interactive effects arising from the Mona Offshore Wind Project on shipping and navigation is provided in volume 2, chapter 15: Inter-related effects of the PEIR.

12.13 Summary of impacts, mitigation measures and monitoring

12.13.1.1 Information on shipping and navigation within the shipping and navigation study area was collected through consultation with stakeholders, analysis of historical vessel traffic and incident data, a hazard workshop and full bridge simulations.

- Table 12.27 presents a summary of the potential impacts, measures adopted as part of the project and residual effects in respect to shipping and navigation. The impacts assessed include: impacts to vessel routeing, impacts to port operations, impacts to navigational safety and impacts to emergency response. Overall it is concluded that there will be the following significant effects arising from the Mona Offshore Wind Project during the construction, operations and maintenance or decommissioning phases:
  - Impact on adverse weather routeing
  - Impacts on vessel to vessel collision risk.
- Table 12.28 presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed include: impacts to vessel routeing, impacts to port operations, impacts to navigational safety and impacts to emergency response. Overall it is concluded that there will be the following significant cumulative effects from the Mona Offshore Wind Project alongside other projects/plans:
  - Impact to commercial operators including strategic routes and lifeline ferries
  - Impact on adverse weather routeing
  - Impacts on vessel to vessel collision risk
  - Impact on allision (contact) risk to vessels.
- No potential transboundary impacts have been identified in regard to effects of the Mona Offshore Wind Project.

Table 12.27: Summary of potential effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase[a]			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Impact on recognised sea lanes essential to international navigation (NPS EN-3 2.6.161)	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement.	C: Medium O: Medium D: Medium	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact to commercial operators including strategic routes and lifeline ferries (NPS EN-3 2.6.162/163).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement.	C: High O: High D: High	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact to adverse weather routeing (NPS EN-3 2.6.162/163/165).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement.	C: Medium O: Medium D: Medium	C: Medium O: Medium D: Medium	C: Moderate O: Moderate D: Moderate	Array boundary changes. Site layout design. Continued engagement.	Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on access to ports and harbours (NPS EN-3 2.6.162/163).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement. Cable burial risk assessment.	C: Medium O: Low D: Medium	C: Low O: Low D: Low	C: Minor O: Negligible D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on emergency response capability due to increased incident rates and reduced access for SAR responders (NPS EN-3 2.6.164)	✓	✓	✓	ERCOP/Marine Pollution Plan/exercices. Line of orientation. Wind turbine spacing. Layout plan. Buoyed construction area.	C: Low O: Low D: Low	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on vessel to vessel collision risk (NPS EN-3 2.6.165)	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Buoyed construction area. Safety zones. Guard vessels. Fisheries liaison. ERCOP/Marine Pollution Plan/exercises. Line of orientation. Wind turbine spacing.	C: Medium O: Medium D: Medium	C: High O: High D: High	C: Moderate O: Moderate D: Moderate	Array boundary changes. Site layout design. Passage planning for CTVs. Continued engagement. Construction scheduling.	Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.

Description of impact	Phase[a] C	O	D	Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
				Construction method statement.						
Impact on allision (contact) risk to vessels (NPS EN-3 2.6.165).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Buoyed construction area. Blade clearance. Safety zones. Fisheries liaison. ERCOP/Marine Pollution Plan/exercises. Line of orientation. Wind turbine spacing. Construction method statement.	C: Low O: Low D: Low	C: Medium O: Medium D: Medium	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on marine navigation, communications and position fixing equipment (NPS EN-3 2.6.165).	✓	✓	✓	Line of orientation. Wind turbine spacing. Buoyed construction area.	C: Low O: Low D: Low	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on recreational craft passages and safety (NPS EN-3 2.6.166)	✓	✓	✓	Promulgation (including Notice to Mariners). Blade clearance. Line of orientation. Wind turbine spacing.	C: Low O: Low D: Low	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on snagging risk to vessel anchors and fishing gear (NPS EN-3 2.6.168)	✓	✓	✓	Promulgation (including Notice to Mariners). Safety zones. Guard vessels. Fisheries liaison. ERCOP/Marine Pollution Plan/exercises. CBRA.	C: Low O: Low D: Low	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Periodic validation surveys of cables.
Impact on under keel clearance (NPS EN-3 2.6.168).	✓	✓	✓	Promulgation (including Notice to Mariners). Fisheries liaison. ERCOP/Marine Pollution Plan/exercises. CBRA.	C: Negligible O: Negligible D: Negligible	C: Low O: Low D: Low	C: Negligible O: Negligible D: Negligible		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Bathymetric surveys.

Table 12.28: Summary of potential cumulative effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of effect	Phase[a]			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Tier 1 and 2										
Impact on recognised sea lanes essential to international navigation (NPS EN-3 2.6.161)	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement.	C: Medium O: Medium D: Medium	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact to commercial operators including strategic routes and lifeline ferries (NPS EN-3 2.6.162/163).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement.	C: High O: High D: High	C: Medium O: Medium D: Medium	C: Moderate O: Moderate D: Moderate	Array boundary changes. Site layout design. Passage planning for CTVs. Continued engagement. Construction scheduling.	Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact to adverse weather routeing (NPS EN-3 2.6.162/163/165).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement.	C: Medium O: Medium D: Medium	C: High O: High D: High	C: Moderate O: Moderate D: Moderate	Array boundary changes. Site layout design. Continued engagement.	Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on access to ports and harbours (NPS EN-3 2.6.162/163).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Construction method statement. Cable burial risk assessment.	C: Medium O: Medium D: Medium	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on emergency response capability due to increased incident rates and reduced access for SAR responders (NPS EN-3 2.6.164)	✓	✓	✓	ERCOP/Marine Pollution Plan/exercises. Line of orientation. Wind turbine spacing. Layout plan. Buoyed construction area.	C: Low O: Low D: Low	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on vessel to vessel collision risk (NPS EN-3 2.6.165)	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Buoyed construction area. Safety zones. Guard vessels. Fisheries liaison. ERCOP/Marine Pollution Plan/exercises.	C: Medium O: Medium D: Medium	C: High O: High D: High	C: Major O: Major D: Major	Array boundary changes. Site layout design. Passage planning for CTVs.	Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.

Description of effect	Phase[a]			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
				Line of orientation. Wind turbine spacing. Construction method statement.				Continued engagement. Construction scheduling.		
Impact on allision (contact) risk to vessels (NPS EN-3 2.6.165).	✓	✓	✓	Promulgation (including Notice to Mariners). Marking and charting. Buoyed construction area. Blade clearance. Guard vessels. Safety zones. Fisheries liaison. ERCOP/Marine Pollution Plan/exercises. Line of orientation. Wind turbine spacing. Construction method statement.	C: Medium O: Medium D: Medium	C: Medium O: Medium D: Medium	C: Moderate O: Moderate D: Moderate	Array boundary changes. Site layout design. Passage planning for CTVs. Continued engagement. Construction scheduling.	Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on marine navigation, communications and position fixing equipment (NPS EN-3 2.6.165).	✓	✓	✓	Line of orientation. Wind turbine spacing. Buoyed construction area.	C: Medium O: Medium D: Medium	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on recreational craft passages and safety (NPS EN-3 2.6.166)	✓	✓	✓	Promulgation (including Notice to Mariners). Blade clearance. Line of orientation. Wind turbine spacing.	C: Medium O: Medium D: Medium	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Construction/post-construction monitoring.
Impact on snagging risk to vessel anchors and fishing gear (NPS EN-3 2.6.168)	✓	✓	✓	Promulgation (including Notice to Mariners). Safety zones. Guard vessels. Fisheries liaison. ERCOP/Marine Pollution Plan/exercises. CBRA.	C: Medium O: Medium D: Medium	C: Low O: Low D: Low	C: Minor O: Minor D: Minor		Not assessed for PEIR as additional risk controls are to be further considered and included as part of the DCO application (see section 12.14).	Periodic validation surveys of cables.

12.14 Next steps

12.14.1.1 Significant effects on shipping and navigation receptors for the individual and cumulative assessments were identified. Therefore, additional mitigation is required to reduce impacts and reduce risks to ALARP.

12.14.1.2 The Mona Offshore Wind Project has committed to a number of further measures to reduce impacts on shipping and navigation which are described within this document. These include:

- Amendments to the Mona Array Area Boundary to maintain a 2nm offset between the Mona Array Area and the approaches to the Liverpool Bay TSS
- Amendments to the Mona Array Area Boundary to reduce the northern extent of the Mona Array Area by approximately 3nm to increase the gap between the Mona and Morgan Array Areas
- Commitment to two lines of orientation

12.14.1.3 These commitments will be tested with stakeholders through a programme of further work, which will include:

- Further bridge navigation simulations with key stakeholder groups
- Further NRA workshops
- Continued stakeholder engagement through the MNEF

12.14.1.4 During the hazard workshop, several possible additional risk control options were identified which might reduce the risk scores further. These will continue to be investigated and include:

- Site Layout
- CTV Passage Planning
- Reporting Notification
- Master Training
- Construction Scheduling.

12.14.1.5 Possible additional risk control options were identified to reduce these risks to Broadly Acceptable or Tolerable if ALARP. These additional controls are conceptual only at this stage and have not been implemented. Therefore, it is not possible to state that those hazards scored as Medium Risk are Tolerable as they cannot be considered ALARP until all appropriate risk control options are tested. It is noted that significant additional work is ongoing to define these additional controls to address the risks highlighted within the NRA and PEIR.

12.14.1.6 The Applicant has committed to exploring these additional risk controls through further studies and engagement with stakeholders to ensure they are appropriate and adequate for reducing risks to ALARP prior to submission of the DCO application. Appropriate risk controls will then be secured through the DCO or marine licences.

12.15 References

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