FIVE ESTUARIES
OFFSHORE WIND FARM

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PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

VOLUME 2, CHAPTER 9: SHIPPING AND NAVIGATION

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DEFINITION OF ACRONYMS

Term	Definition
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
BEIS	Department for Business, Energy and Industrial Strategy
CAA	Civil Aviation Authority
CD	Chart Datum
CEA	Cumulative Effects Assessment
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
CTV	Crew Transfer Vessel
DECC	Department of Energy and Climate Change
DfT	Department for Transport
DW	Deep Water
ECC	Export Cable Corridor
ECR	Export Cable Route
EEA	European Economic Area
EIA	Environmental Impact Assessment
ERCoP	Emergency Response Cooperation Plan
ES	Environmental Statement
GLA	General Lighthouse Authority
GT	Gross Tonnage
HHA	Harwich Haven Authority
HM	Her Majesty's Government (2011)
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IMO	International Maritime Organization
LOA	Length Overall
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MDS	Maximum Design Scenario

Term	Definition
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MPCP	Marine Pollution Contingency Plan
MRCC	Maritime Rescue Coordination Centre
nm	Nautical mile
nm^2	Square nautical mile
NPS	National Policy Statement
NRA	Navigational Risk Assessment
NUC	Not Under Command
O&M	Operations and Maintenance
OREI	Offshore Renewable Energy Installation
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PIANC	World Association for Waterborne Transport Infrastructure
PLL	Potential Loss of Life
Radar	Radio Detection and Ranging
RAM	Restricted in her Ability to Manoeuvre
RNLI	Royal National Lifeboat Institution
Ro-Pax	Roll-on/ Roll-off Passenger
Ro-Ro	Roll-on/ Roll-off (Cargo)
RYA	Royal Yachting Association
SAR	Search and Rescue
SLoO	Single Line of Orientation
SOLAS	International Convention for the Safety of Life at Sea
TSS	Traffic Separation Scheme
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UN	United Nations

Term	Definition
UNCLOS	United Nations Convention on the Law of the Sea
VE	Five Estuaries Offshore Wind Farm
VE OWFL	Five Estuaries Offshore Wind Farm Limited
VHF	Very High Frequency
VTS	Vessel Traffic Service
WTG	Wind Turbine Generator

GLOSSARY OF TERMS

Term	Definition
Allision	The act of striking or collision of a moving vessel against a stationary object.
Automatic Identification System (AIS)	A system by which vessels automatically broadcast their identity, key statistics including location, destination, length, speed and current status, e.g., under power. Most commercial vessels and European Union (EU) fishing vessels over 15 m length are required to carry AIS.
Cable Burial Risk Assessment	Risk assessment to determine suitable burial depths for cables, based upon hazards such as anchor strike, fishing gear interaction and seabed mobility.
Collision	The act or process of colliding (crashing) between two moving objects.
Design envelope	A description of the range of possible elements that make up the Five Estuaries Offshore Wind Farm (VE) design options under consideration, as set out in detail in Volume 2, Chapter 1: Offshore Project Description. This envelope is used to define VE for Environmental Impact Assessment purposes when the exact engineering parameters are not yet known. This is also often referred to as the “Rochdale Envelope” approach.
Embedded mitigation	A commitment made by Five Estuaries Offshore Wind Farm Limited (VE OWFL) to reduce and/ or eliminate the potential for significant risks.
Environmental Statement (ES)	A document reporting the findings of the Environmental Impact Assessment (EIA) and produced in accordance with the EIA Directive as transposed into United Kingdom (UK) law by the EIA Regulations.
Formal Safety Assessment (FSA)	A structured and systematic process for assessing the risks and costs (if applicable) associated with shipping activity.
Future case	The assessment of risk based on the predicted growth in future shipping densities and traffic types as well as

Term	Definition
	foreseeable changes in the marine environment.
Impact	A potential threat to human life, health, property, or the environment.
International Maritime Organization (IMO) routeing	Predetermined shipping routes established by the IMO.
Main commercial route	Defined transit route (mean position) of commercial vessels identified within the specified shipping and navigation study area.
Marine Guidance Note (MGN)	A system of guidance notes issued by the Maritime and Coastguard Agency (MCA) which provide significant advice relating to the improvement of the safety of shipping at sea, and to prevent or minimise pollution from shipping.
Maximum Design Scenario (MDS)	The combination of realistic parameters for Five Estuaries Offshore Wind Farm (VE) anticipated to produce the worst-case consequences.
Navigational Risk Assessment (NRA)	A document which assesses the overall impact to shipping and navigation of a proposed Offshore Renewable Energy Installation (OREI) based upon Formal Risk Assessment (FSA).
Offshore Renewable Energy Installation (OREI)	As defined by Marine Guidance Note (MGN) 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (Maritime and Coastguard Agency (MCA), 2021). For the purposes of this report and in keeping with the consistency of the Environmental Impact Assessment, OREI can mean offshore wind turbines and the associated electrical infrastructure such as offshore substations.
Radio Detection and Ranging (Radar)	An object-detection system which uses radio waves to determine the range, altitude, direction or speed of objects.
Receptor	The sufferer of a risk arising from a hazard.

Term	Definition
Regular Operator	Commercial operator whose vessel(s) are observed to transit through a particular region on a regular basis.
Significance of effect	The combination of frequency of occurrence and severity of consequence of an impact.
Traffic Separation Scheme (TSS)	A traffic management route system ruled by the International Maritime Organization (IMO). The traffic lanes (or clearways) indicate the general direction of the vessels in that zone; vessels navigating within a TSS all sail in the same direction or they cross the lane at an angle as close to 90 degrees (°) as possible.
Unique vessel	An individual vessel identified on any particular calendar day, irrespective of how many tracks were recorded for that vessel on that day. This prevents vessels being over counted. Individual vessels are identified using their Maritime Mobile Service Identity (MMSI).
Vessel Traffic Service (VTS)	A service implemented by a Competent Authority designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.

9 SHIPPING AND NAVIGATION

9.1 INTRODUCTION

9.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the results of the assessment of the likely significant effects of the Five Estuaries Offshore Wind Farm (hereafter referred to as VE) with respect to shipping and navigation during the construction, Operations and Maintenance (O&M), and decommissioning phases.

9.1.2 This chapter has been informed by and should be read in conjunction with the following PEIR chapters:

- Volume 2, Chapter 1: Offshore Project Description;
- Volume 2, Chapter 8: Commercial Fisheries;
- Volume 2, Chapter 12: Infrastructure Other Marine Users ; and
- Volume 2, Chapter 13: Military and Civil Aviation.

9.1.3 Additionally, Volume 7, Report 6: Navigational Risk Assessment has informed this chapter and should be read in conjunction with this chapter.

9.2 STATUTORY AND POLICY CONTEXT

9.2.1 Table 9.1 outlines the legislation and policy relevant to the assessment of effects for shipping and navigation receptors, noting that in exact terms the United Nations Convention on the Law of the Sea (UNCLOS), Convention on the International Regulations for Preventing Collisions at Sea (COLREGs), and International Convention for the Safety of Life at Sea (SOLAS) are frameworks for legislation (incorporated into United Kingdom (UK) law through the likes of the Energy Act 2004 and the Merchant Shipping Act 1995).

Table 9.1: Legislation and policy context.

Legislation/ policy	Key provisions	Section where comment addressed
UNCLOS (United Nations (UN), 1982)	Article 60(7) states that structures and associated safety zones should not be established if interference is caused to sea lanes essential to international navigation.	International sea lanes and other identified routes are considered a key element of the existing environment for shipping and navigation and the potential for "interference" has been assessed directly as part of impacts relating to vessel displacement and port access (see Section 9.11).
COLREGs (International Maritime Organization (IMO), 1972/77)	Rule 8(a) advises that any collision avoidance should be taken in accordance with the COLREGs.	Rule 8 of the COLREGs is considered in the impact assessment of collision risk (see Section 9.11).
COLREGs (IMO, 1972/77)	Rule 9 advises navigation within a narrow channel or fairway including vessel priority.	Rule 9 of the COLREGs is considered as part of the safety case for the navigation corridor between VE and the East Anglia Two Offshore Wind Farm (OWF) (see Section 17 of Volume 7, Report 6: Navigational Risk Assessment).
COLREGs (IMO, 1972/77)	Rule 18(a)(ii) advises that powered vessels should keep out of the way of a vessel which is Restricted in her Ability to Manoeuvre (RAM).	Rule 18 of the COLREGs is considered in the impact assessment of third-party vessel to project vessel collision risk (see Section 9.11).
COLREGs (IMO, 1972/77)	Rule 19(b) advises that vessels should proceed at safe speeds based on the conditions including in restricted visibility.	Rule 19 of the COLREGs is considered in the impact assessment of collision risk and allision risk (see Section 9.11).
SOLAS (IMO, 1974)	Regulation 33 states that where able to do so, a vessel should assist persons in distress at sea.	Regulation 33 of SOLAS is considered in the impact assessment of emergency response capability (see Section 9.11).
SOLAS (IMO, 1974)	Regulation 34 states that passage planning should be	Regulation 34 of SOLAS is considered in the impact

Legislation/ policy	Key provisions	Section where comment addressed
	undertaken using the appropriate nautical charts and publications prior to the voyage.	assessment of (see Section 9.11).
National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate Change (DECC), 2011)	Paragraph 2.6.153 advises that consultation is undertaken from early in the development of an OWF and should continue throughout all phases, with the aim of ensuring co-existence of an OWF with navigation.	Consultation with relevant stakeholders has been a key input to the impact assessment and is summarised in Section 9.11.
NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011)	Paragraph 2.6.154 advises that consultation is undertaken with the Marine Management Organisation (MMO), Maritime and Coastguard Agency (MCA), the relevant General Lighthouse Authority (GLA), relevant industry bodies, and recreational representatives such as the Royal Yachting Association (RYA).	Consultation has been ongoing from an early stage (2020) and has included various engagement with relevant stakeholders including MCA, Trinity House, UK Chamber of Shipping, the Cruising Association, Sunk Vessel Traffic Services (VTS), Harwich Haven Authority (HHA), Port of London Authority (PLA), London Gateway, Port of Felixstowe, Brightlingsea Harbour Commissioners, Stena Line, DFDS Seaways, CLdN, and Hanson Aggregate Marine.
NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011)	Paragraph 2.6.155 advises that internationally recognised sea lanes are publicly available and should be considered.	IMO routeing measures are considered a key element of the existing environment for shipping and navigation and main commercial routes – which are international in nature – have been identified (see Section 9.11). Site refinement has been undertaken in consultation with stakeholders to address potential disruption to use of commercial vessel routes (see Section 6.1.1 of Volume 7, Report 6: Navigational Risk Assessment).

Legislation/ policy	Key provisions	Section where comment addressed
NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011)	Paragraph 2.6.156 advises that a Navigational Risk Assessment (NRA) should be prepared in consultation with the stakeholders outlined in paragraph 2.6.154.	The NRA has informed this chapter and has included consultation with MCA, Trinity House, UK Chamber of Shipping, the Cruising Association, and various other stakeholders.
NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011)	Paragraph 2.6.160 advises that potential effects on recreational craft should be considered.	Recreational vessels are considered as a receptor in the impact assessment (see Section 9.11).
NPS for Ports (Department for Transport (DfT), 2012)	Paragraph 5.14.2 advises that where likely to occur, socio-economic impacts should be incorporated.	Commercial risks due to reduced access to local ports and harbours and reduction in under keel clearance is considered in Section 9.11 and socioeconomic impacts are assessed in Volume 3, Chapter 3: Socioeconomics, Tourism and Recreation.
NPS for Ports (DfT, 2012)	Paragraph 5.14.4 advises that the existing socioeconomic conditions be described and the impact correlated with local planning policies.	
NPS for Ports (DfT, 2012)	Paragraph 5.14.5 advises that socio-economic impacts may be linked to other impacts.	
UK Marine Policy Statement (Her Majesty's Government (HM Government), 2011)	Paragraph 3.4.7 advises that decision makers account for and seek to minimise any negative impacts on navigational safety and freedom of navigation.	Navigational safety impacts have been assessed including vessel displacement (see Section 9.11).
East Marine Plans ((Department for Environment, Food and Rural Affairs (DEFRA), 2014)	Policy PS1: Proposals that require static sea surface infrastructure or that significantly reduce under-keel clearance should not be authorised in International Maritime Organization designated routes.	Reduction in under keel clearance is considered in Section 9.11.
East Marine Plans ((Department for Environment, Food and Rural Affairs (DEFRA), 2014)	Policy PS2: Proposals that require static sea surface infrastructure that encroaches upon important navigation routes should not be authorised unless there are exceptional	Navigational safety impacts have been assessed including vessel displacement (see Section 9.11).

Legislation/ policy	Key provisions	Section where comment addressed
	circumstances. Proposals should: a) be compatible with the need to maintain space for safe navigation, avoiding adverse economic impact. b) anticipate and provide for future safe navigational requirements where evidence and/or stakeholder input allows and c) account for impacts upon navigation in-combination with other existing and proposed activities.	
East Marine Plans ((Department for Environment, Food and Rural Affairs (DEFRA), 2014)	Policy PS3: Proposals should demonstrate, in order of preference: a) that they will not interfere with current activity and future opportunity for expansion of ports and harbours. b) how, if the proposal may interfere with current activity and future opportunities for expansion, they will minimise this. c) how, if the interference cannot be minimised, it will be mitigated d) the case for proceeding if it is not possible to minimise or mitigate the interference.	Commercial risks due to reduced access to local ports and harbours is considered in Section 9.11 and socioeconomic impacts are assessed in Volume 3, Chapter 3: Socioeconomics, Tourism and Recreation.

9.2.2 The draft version of a revised NPS for Renewable Energy Infrastructure (EN-3) (Department for Business, Energy and Industrial Strategy (BEIS), 2021) has also been considered, noting the key provisions relevant to shipping and navigation (Paragraphs 2.33.6 to 2.33.13) are unchanged from the existing NPS for Renewable Energy Infrastructure.

9.2.3 Although the overarching guidance principles set out in the Overarching NPS for Energy (EN-1) (DECC, 2011) do not specifically refer to shipping and navigation, they have been considered. Additionally, although the NPS for Ports does not relate directly to offshore wind, the NPS for Renewable Energy Infrastructure (EN-3) does refer to the potential effects on ports and therefore it is considered prudent to consider this policy.

9.3 CONSULTATION

9.3.1 The full list of stakeholders consulted during the Environmental Impact Assessment (EIA) process is provided in Volume 7, Report 6: Navigational Risk Assessment. A summary of the key issues raised during consultation is provided in Table 9.2, noting that consultation with key stakeholders has been ongoing since November 2019.

Table 9.2: Summary of consultation relating to shipping and navigation.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
18 January 2021 Pre scoping meeting with MCA and Trinity House	Agree with the proposed array traffic and routeing study areas.	Addressed in Section 3.4 of Volume 7, Report 6: Navigational Risk Assessment.
	Agreed with the winter vessel traffic survey being undertaken between late November 2021 and late February 2022 and the summer vessel traffic survey in July or August 2022.	MCA and Trinity House agreement on the approach to the vessel traffic surveys is acknowledged in Section 5.2 of Volume 7, Report 6: Navigational Risk Assessment.
30 March 2021 Pre scoping meeting with MCA and Trinity House	The alignment of the offshore Export Cable Corridor (ECC) through the south of the Sunk Traffic Separation Scheme (TSS) East appears feasible from a traffic management perspective, so long as cable installation does not coincide with the installation of NeuConnect.	Acknowledged in the environmental assessment in Section 9.11.
	Aids to navigation will need to be managed given the offshore ECC. There may be opportunities to lift and replace aids to navigation during installation works but	Acknowledged in the environmental assessment in Section 9.11.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	the preference would be to retain locations if possible.	
27 April 2021 Pre scoping meeting with HHA	There are concerns with development close to the Harwich Deep Water Channel based on the current water depth with the southern tip of the channel also a concern due to the types of activities undertaken by vessels (i.e., pilot boarding).	Acknowledged in the environmental assessment in Section 9.11, with the offshore ECC refined – based on consultation feedback – to pass as far south of the Harwich Deep Water Channel as possible and utilise the greatest water depths possible.
	All large vessels operating in/ out of Harwich Haven travel along the Sunk Deep Water Route and smaller vessels have the option to transit to the north.	Acknowledged in the environmental assessment in Section 9.11.
	Pilot vessels operate out of Harwich Haven for boarding and disembarking regardless of which port the arriving or departing vessel is headed to/ from.	Acknowledged in Section 10.2 of Volume 7, Report 6: Navigational Risk Assessment and acknowledged in the environmental assessment in Section 9.11.
21 May 2021 Pre scoping meeting with Tarmac Marine	There are no current plans to start exploiting the Longsand A509/1 marine aggregate area due to deep water vessel activity from the deep water routes in the area. Therefore, there are no concerns with the offshore ECC and even if there is a decision to exploit the area in the future the offshore ECC should not pose any concerns.	Acknowledged in the review of the existing environment in Section 9.7.
12 November 2021	The array routeing study area is welcomed but there is a preference for this to extend further west to full	A change to incorporate the UK Chamber of Shipping's preference is acknowledged in Section 3.4 of Volume 7,

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Scoping Opinion response from UK Chamber of Shipping	incorporate the Sunk TSS North and Sunk TSS South.	Report 6: Navigational Risk Assessment.
	There is strong value in examination of a full 20 years of Marine Accident Investigation Branch (MAIB) incident data.	A review of earlier MAIB incident data has been undertaken in Section 9.6 of Section 3.4 of Volume 7, Report 6: Navigational Risk Assessment.
	Two charted anchorages exist at Sunk Inner and Sunk Deep Water (DW) and general anchoring activity in the region should be considered in the vessel traffic data.	Anchoring activity associated with these designated anchorage areas has been identified in the vessel traffic data in Section 9.7 and is acknowledged in the environmental assessment in Section 9.11.
12 November 2021 Scoping Opinion response from Planning Inspectorate	The full rationale behind the choice of study areas should be provided and agreement with the MCA and Trinity House should be evidenced.	The choice of study areas is justified and acknowledgement given to agreement with MCA and Trinity House in Section 3.4 of Volume 7, Report 6: Navigational Risk Assessment.
12 November 2021 Scoping Opinion response from MCA	The region carries a significant volume of through traffic to major ports and attention needs to be paid to routeing, particularly in heavy weather. It should be ensured that shipping can continue to make safe passage without large-scale deviations.	Vessel displacement including in adverse weather conditions is assessed in the environmental assessment in Section 9.11.
	Cumulative risks for routes should be considered including the impact on nearby IMO routeing measures and the Sunk VTS.	Vessel displacement including in relation to approaching nearby IMO routeing measures is assessed in the environmental assessment in Section 9.11.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	An appropriate assessment of the distances between wind farm boundaries and routes should be included as per Marine Guidance Note (MGN) 654.	Consideration of post wind farm routeing including application of the Shipping Route Template from MGN 654 is given in Section 15.6 of Volume 7, Report 6: Navigational Risk Assessment.
	The additional analysis of vessel traffic within the array routeing study area is welcomed.	Acknowledged in Section 3.4 of Volume 7, Report 6: Navigational Risk Assessment.
	The NRA should be accompanied by a detailed MGN 654 Checklist.	The completed MGN 654 Checklist is provided in Appendix A of Volume 7, Report 6: Navigational Risk Assessment.
	If cable protection measures are required, the MCA would be willing to accept a 5% reduction in surrounding depths referenced to Chart Datum (CD).	Compliance with MGN 654 including in relation to reduction in under keel clearance is included as mitigation in Section 9.9 and this requirement is considered in the environmental assessment in Section 9.11.
	Particular consideration will need to be given to the implications due to the presence of VE on Search and Rescue (SAR) resources and Emergency Response Cooperation Plans (ERCoP). A SAR Checklist will also need to be completed in consultation with the MCA.	An assessment of the impact on emergency response capability is undertaken in the environmental assessment in Section 9.11 and compliance with MGN 654 including in relation to reduction in under keel clearance is included as mitigation in Section 9.9.
30 November 2021 Scoping response from Trinity House	VE will need to be marked with marine aids to navigation in accordance with the general principles outlined in International Association of Marine Aids	Lighting and marking as required by Trinity House, MCA and Civil Aviation Authority (CAA) is included as mitigation in Section 9.9 and use of IALA

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	to Navigation and Lighthouse Authorities (IALA) Recommendation O-139.	Recommendation O-139 (IALA, 2021) and G1162 (IALA, 2021) are acknowledged in Section 2.3 of Volume 7, Report 6: Navigational Risk Assessment.
	Additional aids to navigation such as buoys may be necessary to mitigate the risk posed, particularly during the construction phase. All marine navigational marking will need to be addressed and agreed with Trinity House.	Acknowledged in the environmental assessment in Section 9.11 and lighting and marking as required by Trinity House, MCA, and CAA is included as mitigation in Section 9.9.
	An assessment of how traffic patterns created by VE will interact with the North Hinder Junction and North Hinder TSS is expected. Major routes must abide by the COLREGs when joining or leaving these schemes.	Vessel displacement including in relation to approaching nearby IMO routeing measures is considered in the environmental assessment in Section 9.11.
	Trinity House have no plans to relocate existing aids to navigation although should any changes be required this should be explored.	Acknowledged in the environmental assessment in Section 9.11.
	The northern array area interacts with a major route between Harwich Haven/ Port of Felixstowe and the Port of Rotterdam. Traffic routeing changes should be assessed including alignment with the North Hinder Junction.	Vessel displacement including in relation to approaching nearby IMO routeing measures is considered in the environmental assessment in Section 9.11.
7 April 2022 Post scoping consultation meeting with UK Chamber	Bulk, cargo and tankers should be contacted in addition to commercial ferry operators.	Regular Operator consultation has included consideration of all commercial vessel types

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
of Shipping and DFDS Seaways		based on the vessel traffic data and is summarised in Section 4.1 and Appendix C of Volume 7, Report 6: Navigational Risk Assessment.
	Adverse weather routeing represents a very small proportion of all routeing in the region.	Acknowledged in the environmental assessment in Section 9.11.
8 April 2022 Post scoping consultation meeting with MCA and Trinity House	The refinement of the array areas [since the Scoping stage] reduces the probability of encounters given the lesser amalgamation of hotspots of vessel traffic. The refinement also allows vessels to maintain existing courses thus provisionally addressing concerns relating to approaches to the North Hinder Junction.	Acknowledged in the environmental assessment in Section 9.11.
16 June 2022 Post scoping consultation meeting with CLdN	The key concern is the potential for deviation of routes and additional mileage.	Acknowledged in the environmental assessment in Section 9.11.
	The presence of project vessels is not a notable concern and vessels can comfortably and safely operate around such activity.	Acknowledged in the environmental assessment in Section 9.11.
	Routeing differences observed in the vessel traffic data (including adverse weather transits) are likely due to Master preference, although the benefits of such routeing may be limited.	Acknowledged in the environmental assessment in Section 9.11.
1 September 2022	Preference to be informed via Notification to Mariners	Promulgation of information via Notifications to Mariners

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Regular Operator consultation response from Tarmac Marine	when cable installation works commence.	is included as mitigation in Section 9.9 and the preference is acknowledged in the environmental assessment in Section 9.11.
7 September 2022 Regular Operator consultation response from Hanson Aggregates Marine	A new marine aggregate dredging area is being developed to the west of the array areas which may lead to additional cumulative impacts.	The East Orford Ness 1809 marine aggregate area has been considered in the Cumulative Effects Assessment (CEA) screening in Section 9.10.
	Hanson Aggregates Marine operated vessels would provisionally not make passage internally within the operational arrays.	Acknowledged in the environmental assessment in Section 9.11.
8 September 2022 Regular Operator consultation response from Stena Line	The presence of VE will impact routeing including increases in passage length. Decreasing sea room (including cumulatively) reduces opportunity for potential changes in course due to other traffic or weather.	Acknowledged in the environmental assessment in Section 9.11.
	Stena Line operated vessels will never transit through the operational arrays although will continue to pass in close proximity.	Acknowledged in the environmental assessment in Section 9.11.
15 September 2022 Regular Operator consultation response from Intrada Ship Management (Scotline)	The presence of VE will remove navigable waters resulting in potential for deviations to existing passages.	Acknowledged in the environmental assessment in Section 9.11.
	The region is already busy in terms of vessel traffic and there is potential for a bottleneck to cause increases in encounters.	Acknowledged in the environmental assessment in Section 9.11.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
16 September 2022 Regular Operator consultation response from A2B-online	A2B-online operated vessels would not pass through the operational arrays.	Acknowledged in the environmental assessment in Section 9.11.
16 September 2022 Regular Operator consultation response from Mediterranean Shipping Company (MSC)	Suggest that Sunk TSS East should be extended and the arrays marked with cardinal buoys.	Acknowledged in the environmental assessment in Section 9.11.
20 October 2022 Hazard Workshop feedback from MCA	The MCA is not proposing to pursue an extension to the Sunk TSS East on the basis of VE.	Acknowledged in the environmental assessment in Section 9.11.
	It is important to consider deviations and 'squeeze' from the presence of East Anglia Two including use of the World Association for Waterborne Transport Infrastructure (PIANC) guidance.	Acknowledged in the safety case for the navigation corridor between VE and East Anglia Two in Section 17.11 of Volume 7, Report 6: Navigational Risk Assessment.
20 October 2022 Hazard Workshop feedback from UK Chamber of Shipping	Application of additional rules for entry and exit to/ from the array areas should be considered and has been applied elsewhere.	Marine coordination for project vessels is included as mitigation in Section 9.9 and this has been acknowledged in the environmental assessment in Section 9.11.
	The deviation and navigation corridor formed between the northern array area and East Anglia Two is highlighted.	Acknowledged in the safety case for the navigation corridor between VE and East Anglia Two in Section 17.11 of Volume 7, Report 6: Navigational Risk Assessment.
20 October 2022 Hazard Workshop feedback from Cruising Association	Sailing vessels would likely avoid the array areas but advice on how to transit the arrays would be useful.	Acknowledged in the environmental assessment in Section 9.11.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
20 October 2022 Hazard Workshop feedback from Sunk VTS	The array areas are outside the Sunk VTS area so present a problem for inbound traffic management.	Acknowledged in the environmental assessment in Section 9.11.
	Wind farm vessels already cross the Sunk TSS East for Galloper and Greater Gabbard. The presence of VE and North Falls would create further crossings with associated risk for vessels in emergency situations.	Acknowledged in the environmental assessment in Section 9.11.
	Wind farm vessels already cross the Sunk TSS East for Galloper and Greater Gabbard. The presence of VE and North Falls would create further crossings with associated risk.	Acknowledged in the environmental assessment in Section 9.11.
20 October 2022 Hazard Workshop feedback from Stena Line	The array areas create a natural corridor and therefore an extension of the Sunk TSS East will not be required. Instead, the placement of a buoy on the corners of the array areas is suggested.	Acknowledged in the environmental assessment in Section 9.11.
	The implementation of recommended routes for small boat owners to provide some segregation from larger commercial vessels in the Sunk TSS East is suggested.	Acknowledged in the environmental assessment in Section 9.11.
	Where the offshore ECC crosses the Sunk TSS East needs to be deeper than when following the TSS. The key area is the Sunk Outer Precautionary Area.	Acknowledged in the environmental assessment in Section 9.11.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	The depth of burial may be the key to resolving issues rather than the location.	Acknowledged in the environmental assessment in Section 9.11.
	A 400 metre (m) vessel may drag anchor and this could cause problems, particularly when the anchor is dropped to prevent drifting.	Acknowledged in the environmental assessment in Section 9.11.
20 October 2022 Hazard Workshop feedback from HHA	Subsea cables will need to be buried deeper where there is increased risk from anchorage areas.	Acknowledged in the environmental assessment in Section 9.11.
	The Sunk Inner light vessel may need to be moved westward.	Acknowledged in the environmental assessment in Section 9.11.
	The preferred offshore Export Cable Route (ECR) is the most desirable in the Sunk Inner Precautionary Area but a cumulative issue exists when North Falls and Sea Link are also considered.	Acknowledged in the environmental assessment in Section 9.11.
	The broad area covered by the offshore ECC is the main concern and if buried across the full width (including consideration of North Falls) then there would be a problem.	Acknowledged in the environmental assessment in Section 9.11.
	The depth required for export cable burial will likely need to be greater than 0.5 m in many areas.	A Cable Burial Risk Assessment is included as mitigation in Section 9.9 but this has been acknowledged in the environmental assessment in Section 9.11.
	The Harwich Deep Water Channel is currently being dredged down to 16 m.	Acknowledged in the outline of the baseline environment in Section 9.7 and acknowledged in the environmental assessment in Section 9.11.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	It is suggested to investigate how vessel draught has increased over the last 30 years and relate this to the lifespan of the export cables. A draught of 20 m may be a realistic maximum and would enable vessels to continue accessing the local ports.	Acknowledged in the outline of the evolution of the baseline in Section 9.7 and the analysis of future case vessel traffic in Section 15 of Volume 7, Report 6: Navigational Risk Assessment.
	Increased coordination between VE and North Falls to minimise the associated cumulative risks is recommended.	A traffic management strategy (including cumulative considerations) is identified as mitigation in Section 9.11.
	Reduced pilotage during export cable installation would not be tenable from a commercial perspective.	Acknowledged in the environmental assessment in Section 9.11.
	The shifting seabed needs to be considered in relation to export cable burial and there needs to be futureproofing without the need for scour/ cable protection or remedial burial works in sensitive locations.	Acknowledged in the environmental assessment in Section 9.11.
	There will be pinch points along the offshore ECC where traffic management is critical.	Acknowledged in the environmental assessment in Section 9.11.
20 October 2022 Hazard Workshop feedback from London Gateway	London Gateway is only 50% constructed and therefore port capacity could double over the next 10 years.	Acknowledged in the outline of the evolution of the baseline in Section 9.7 and the analysis of future case vessel traffic in Section 15 of Volume 7, Report 6: Navigational Risk Assessment.
	Depth of burial for export cables is the key issue and maintenance/ monitoring of	A Cable Burial Risk Assessment is included as mitigation in Section 9.9 but this has been acknowledged

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	the depth requires consideration.	in the environmental assessment in Section 9.11.
20 October 2022 Hazard Workshop feedback from Port of Felixstowe	There is potential for impeding traffic during cable installation and the greater the burial depth the longer the installation vessel may be located on-site.	Acknowledged in the environmental assessment in Section 9.11.
	The Port of Felixstowe has nine berths currently but plans are in place for the addition of smaller berths.	Acknowledged in the outline of the evolution of the baseline in Section 9.7 and the analysis of future case vessel traffic in Section 15 of Volume 7, Report 6: Navigational Risk Assessment.
20 October 2022 Hazard Workshop feedback from Hanson Aggregates Marine	From a small vessel perspective there are not the same draught issues relating to the export cables. However, the preference for futureproofing is shared with other stakeholders given the traffic volumes and additional cumulative pressure.	Acknowledged in the environmental assessment in Section 9.11.

9.4 SCOPE AND METHODOLOGY

SCOPE OF THE ASSESSMENT

IMPACTS SCOPED IN FOR ASSESSMENT

9.4.1 The following impacts have been scoped into this assessment:

- Construction:
  - Impact C1: Vessel displacement and increased collision risk (array areas);
  - Impact C2: Vessel displacement and increased collision risk (offshore ECC);
  - Impact C3: Third-party with project vessel collision risk (array areas);
  - Impact C4: Third-party with project vessel collision risk (offshore ECC);
  - Impact C5: Reduced access to local ports and harbours and reduction in under keel clearance (array areas); and

- Impact C6: Reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC).

- O&M:
  - Impact O1: Vessel displacement and increased collision risk (array areas);
  - Impact O2: Vessel displacement and increased collision risk (offshore ECC);
  - Impact O3: Third-party with project vessel collision risk (array areas);
  - Impact O4: Third-party with project vessel collision risk (offshore ECC);
  - Impact O5: Reduced access to local ports and harbours and reduction in under keel clearance (array areas);
  - Impact O6: Reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC);
  - Impact O7: Creation of allision risk (array areas);
  - Impact O8: Anchor interaction with subsea cables (array areas);
  - Impact O9: Anchor interaction with subsea cables (offshore ECC); and
  - Impact O10: Reduction of emergency response capability (including SAR access).
- Decommissioning:
  - Impact D1: Vessel displacement and increased collision risk (array areas);
  - Impact D2: Vessel displacement and increased collision risk (offshore ECC);
  - Impact D3: Third-party with project vessel collision risk (array areas);
  - Impact D4: Third-party with project vessel collision risk (offshore ECC);
  - Impact D5: Reduced access to local ports and harbours and reduction in under keel clearance (array areas); and
  - Impact D6: Reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC).

IMPACTS SCOPED OUT OF ASSESSMENT

9.4.2 On the basis of the preliminary desktop assessment undertaken in Section 15 of Volume 7, Report 6: Navigational Risk Assessment, the following impact has been scoped out:

- O&M:
  - Interference with marine navigation, communication and position fixing equipment.

STUDY AREA

ARRAY AREAS

9.4.3 Two distinct, but overlapping, study areas have been applied around the array areas, as shown in Figure 9.1.

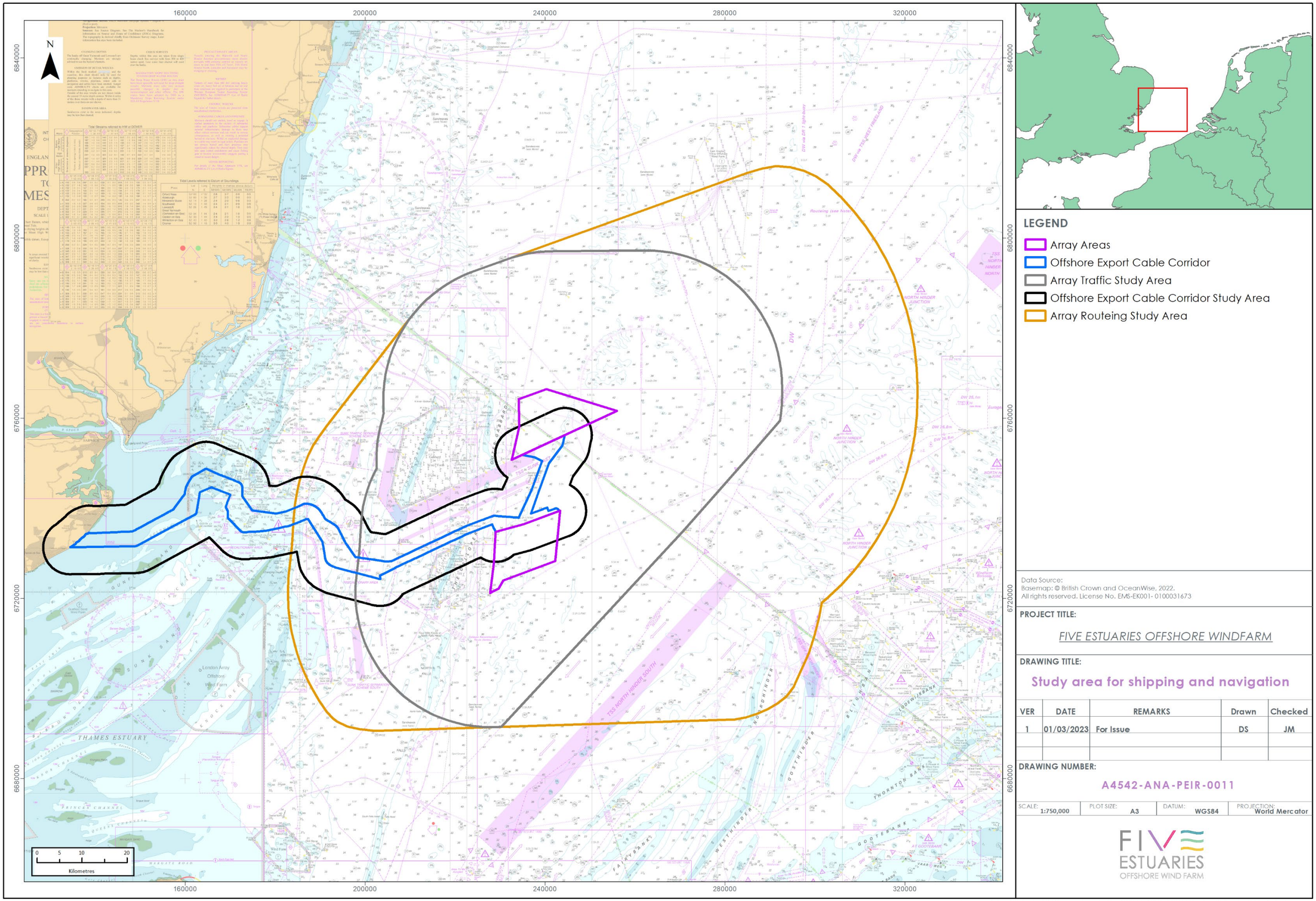
9.4.4 The first is a buffer generally of 10 nautical miles (nm) around the array areas (hereafter the 'array traffic study area') but with the portion of a complete 10 nm buffer intersecting the North Hinder Junction and North Hinder South TSS excluded. This study area has been defined to provide local context to the analysis of effects by capturing vessel traffic movements and historical incident data within and in proximity to the array areas. Exclusion of the areas incorporating the North Hinder Junction and North Hinder South TSS ensures that the high volume of vessel traffic known to utilise these areas do not skew the analysis. The 10 nm buffer otherwise applied is standard practice for shipping and navigation assessment and has been used in the majority of UK offshore wind farm NRAs.

9.4.5 The second is a buffer of up to around 20 nm around the array areas (hereafter the 'array routeing study area'), with the buffer particularly extended to the east and south-east. This study area has been defined for the purpose of establishing the main commercial routes operated in the region and is used for post wind farm collision and allision risk modelling. Use of this study area ensures that vessel traffic utilising the North Hinder Junction and North Hinder South TSS is adequately characterised in the existing environment and impact assessment, as appropriate.

9.4.6 The notion of two distinct study areas to cover the array areas was first developed at the Scoping stage and has been discussed and agreed with stakeholders during consultation, including the MCA and Trinity House. Additionally, an amendment to the array routeing study area was made following a request from the UK Chamber of Shipping during consultation, which involved an extension to the western extent to fully incorporate the Sunk TSS North and Sunk TSS South areas. Stakeholders have acknowledged that these study areas are suitable for the characterisation of the existing environment for shipping and navigation.

OFFSHORE EXPORT CABLE CORRIDOR

9.4.7 A 2 nm buffer has been applied around the offshore ECC (hereafter the 'offshore ECC study area') as shown in Figure 9.1. As with the array traffic study area, this study area has been defined to capture relevant receptors and their movements within, and nearby, the offshore ECC. The 2 nm buffer is standard practice for shipping and navigation assessment and has been used in the majority of UK offshore wind farm NRAs. Additionally, the 2 nm buffer is sufficient to ensure vessel traffic movements within potentially sensitive areas within and in proximity to the offshore ECC are suitably characterised, such as the Sunk TSS East and Sunk Outer and Inner Precautionary Areas.



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Array Traffic Study Area
- Offshore Export Cable Corridor Study Area
- Array Routeing Study Area

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Study area for shipping and navigation

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0011

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:750,000	A3	WGS84	World Mercator

FIVE ESTUARIES OFFSHORE WIND FARM

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DATA SOURCES

9.4.8 The main data sources used to inform the existing environment relative to VE are outlined in Table 9.3.

Table 9.3: Main Data Sources.

Data	Source(s)	Purpose
Vessel traffic	Winter vessel traffic survey data consisting of Automatic Identification System (AIS), Radio Detection and Ranging (Radar), and visual observations for the array traffic study area (14 days, 15 January 2022 – 29 January 2022) recorded from a dedicated survey vessel on-site.	Characterising vessel traffic movements within and in proximity to VE in line with MGN 654 (MCA, 2021) requirements.
	Summer vessel traffic survey data consisting of AIS, Radar, and visual observations for the array traffic study area (14 days, 15 June 2022 – 29 June 2022) recorded from a dedicated survey vessel on-site.	
	AIS data for the array traffic study area (12 months, 2019) (hereafter the 'long-term vessel traffic data') recorded from coastal receivers	Validation of the vessel traffic survey data and characterising seasonal variations.
	Anatec's ShipRoutes database (2022).	Secondary source for characterising vessel traffic movements including cumulatively within and in proximity to VE.
Maritime incidents	MAIB marine accidents database (2000 – 2019)	Review of maritime incidents within and in proximity to VE.
	Royal National Lifeboat Institution (RNLI) incident data (2010 – 2019).	
	DfT UK civilian SAR helicopter taskings (2015 – 2022).	
Other navigational features	Admiralty Charts 1183, 1610, 1630, and 2052 (United Kingdom Hydrographic Office (UKHO), 2022).	Characterising other navigational features within and in proximity to VE.
	Admiralty Sailing Directions Dover Strait Pilot NP28 (UKHO, 2020) and Admiralty Sailing Directions North	

Data	Source(s)	Purpose
	Sea (West) Pilot NP54 (UKHO, 2021).	
Weather	Wind direction data modelled by Vortex.	Characterising weather conditions in proximity to VE for use as input to the collision and allision risk modelling.
	Significant wave height data recorded by Fugro between December 2010 and May 2012.	
	Tidal data provided by Admiralty Charts 1610 and 1630 (UKHO, 2022).	
	Visibility data provided in Admiralty Sailing Directions North Sea (West) Pilot NP54 (UKHO, 2021).	
	Case Studies of Past Weather Events (Met Office, 2019).	Identifying periods of adverse weather in proximity to VE coinciding with the long-term vessel traffic data.

9.4.9 Further details pertaining to the collection of the vessel traffic survey data is provided in Section 5.2 of Volume 7, Report 6: Navigational Risk Assessment, noting that these datasets provide comprehensive coverage of the array traffic study area and is compliant with the requirements of MGN 654 (MCA, 2021).

ASSESSMENT METHODOLOGY

9.4.10 The primary guidance used when defining the assessment methodology for shipping and navigation includes:

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

9.4.11 The IMO FSA methodology is the internationally recognised approach for assessing impacts on shipping and navigation receptors, and is the approach required under MGN 654. This systematic methodology applies risk analysis to reduce impacts to As Low as Reasonably Practicable (ALARP) and requires consideration of each impact in terms of frequency of occurrence and severity of consequence. Inputs used to inform the assessment include:

- Established existing environment;
- Expert opinion;
- Outputs of collision and allision risk modelling;
- Outputs of the Hazard Workshop;
- Stakeholder concerns;

- Lessons learnt from existing offshore developments; and
- Mitigation.

9.5 ASSESSMENT CRITERIA AND ASSIGNMENT OF SIGNIFICANCE

9.5.1 The frequency of occurrence rankings used to assess impacts are defined in Table 9.4.

Table 9.4: Impact frequency of occurrence definitions.

Frequency of occurrence	Description
Frequent	Yearly.
Reasonably Probable	One occurrence per 1 to 10 years.
Remote	One occurrence per 10 to 100 years.
Extremely Unlikely	One occurrence per 100 to 10,000 years.
Negligible	Less than one occurrence per 10,000 years.

9.5.2 The severity of consequence rankings used to assess impacts are defined in Table 9.5.

Table 9.5: Impact severity of consequence definitions.

Severity of consequence	Description
Major	More than one fatality, total loss of property, tier 3 national assistance required and international reputational effects.
Serious	Multiple serious injuries or single fatality, damage resulting in critical impact on operations, tier 2 regional assistance required, and national reputational effects.
Moderate	Multiple minor or single serious injury, damage no critical to operations, tier 2 limited external assistance required, and local reputational effects.
Minor	Slight injury to people, minor damage to property, tier 1 local assistance required, and minor reputational effects limited to receptors.
Negligible	No perceptible impact on people, property, environment. And business.

9.5.3 Assessment of the significance of potential effects is described in Table 9.6.

Table 9.6: Matrix to determine effect significance.

Severity of consequence						
	Major	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
	Serious	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Moderate	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Minor	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
		Negligible	Extremely Unlikely	Remote	Reasonably Probable	Frequent
		Frequency of occurrence				

9.5.4 Effects determined to be of Broadly Acceptable significance are low risk and not significant in EIA terms. Effects determined to be of Tolerable significance are intermediate risk and not significant in EIA terms. Effects determined to be of Unacceptable significance are high risk and significant in EIA terms.

9.5.5 Additionally, differences in terminology between this chapter (which uses EIA terminology) and the NRA (which uses FSA terminology) are summarised in Table 9.7.

Table 9.7: Summary of differences in terminology between EIA and NRA.

EIA term	NRA term	Definition
Impact	Hazard	A potential threat to human life, health, property, or the environment.
Effect	Risk	The combination of frequency of occurrence and severity of consequence of an impact.
Receptor	User	Sufferer of effect.
Mitigation	Embedded mitigation measure	A commitment made by Five Estuaries Offshore Wind Farm Limited (VE OWFL) to reduce and/ or eliminate the potential for significance effects.

9.6 UNCERTAINTY AND TECHNICAL DIFFICULTIES ENCOUNTERED

9.6.1 Due to the design envelope approach, a number of assumptions have been made to allow an assessment of a realistic worst-case scenario for shipping and navigation. These assumptions have been made to ensure that the impact assessment is suitable irrespective of the combination of parameters from the design envelope taken forward.

9.6.2 Key assumptions include:

- Full build out of the array areas to maximise displacement and the reduction in available sea room;
- Deployment of the maximum possible number of wind turbine generators (WTG) to maximise exposure to allision risk;
- Use of four-legged pile jacket foundations to maximise the structure dimensions at the sea surface and therefore the exposure to allision risk;
- A single line of orientation (SLoO) layout for the northern array area (noting southern array area may also proceed with a SLoO) to maximise disruption to SAR access; and
- Offshore Substation Platforms (OSP) located near areas where exposure to allision risk is deemed to be greatest.

9.7 EXISTING ENVIRONMENT

NAVIGATIONAL FEATURES

9.7.1 A plot of the navigational features in proximity to the array areas and offshore ECC is presented in Figure 9.2.

9.7.2 It is noted that the navigational features in proximity to the Sunk TSS include a restricted area to the north, an anchorage area to the west, an explosive dumping ground and marine aggregate dredging area to the south-west, the Long Sand Head two-way route to the south-east and deep water routes running through the inner precautionary area.

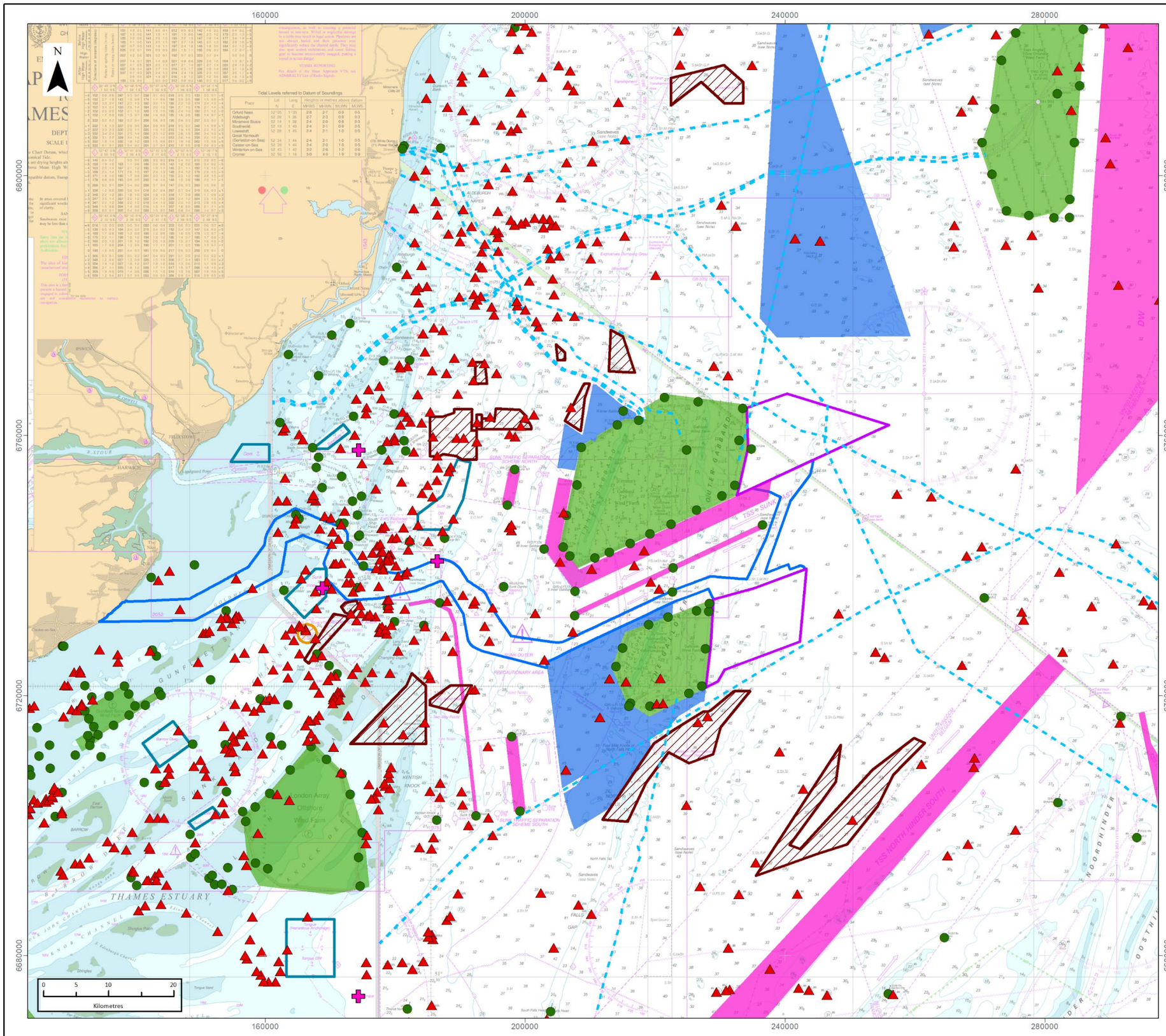
9.7.3 This subsection summarises the navigational features, with additional details provided in Volume 7, Report 6: Navigational Risk Assessment.

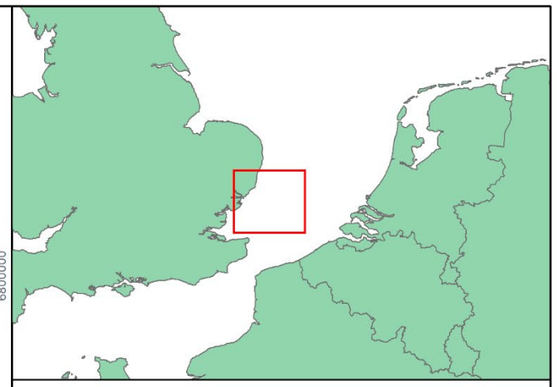
9.7.4 The closest OWF developments to the array areas are Galloper (operational, directly to the west), Greater Gabbard (operational, 1.9 nm to the west), and East Anglia Two (consented, 2.9 nm to the north). Other UK OWF developments in the region include (but are not limited to) North Falls (scoped), East Anglia Two (consented), East Anglia One (operational), and East Anglia One North (consented).

9.7.5 The Sunk routeing measure is located directly west of the array areas. This includes the Sunk TSS East, which ends between the array areas. The North Hinder South TSS – which connects to the North Hinder Junction – is located approximately 5.5 nm to the south-east of the array areas. The offshore ECC passes through the Sunk routeing measure; it passes directly south of the Sunk TSS East before crossing the Sunk Outer and Inner Precautionary Areas, and finally making landfall at Holland-on-Sea.

9.7.6 The closest port or harbour to the array areas is the Port of Felixstowe (UK), located approximately 28 nm to the west, on the Suffolk coast. Harwich Haven (UK) is located approximately 30 nm to the west on the Suffolk coast. The Sunk VTS is operated from Harwich Operations Centre, with participation *"mandatory for all vessels over 50 gross tonnage (GT) and vessels licensed to carry 12 or more passengers. These vessels should obtain permission before entering the area and maintain very high frequency (VHF) contact thereafter."* (UKHO, 2020).

9.7.7 There are two pilot boarding stations within or in proximity to the offshore ECC study area – the Rivers Colne & Crouch pilot station (located 0.5 nm south-west of the offshore ECC), and the Sunk pilot station (located within the offshore ECC itself).





LEGEND

- Array Areas
- Offshore Export Cable Corridor

Navigational Features

- Key Aid to Navigation
- Wreck or Obstruction
- Pilot Boarding Station
- Subsea Cable
- Anchorage Area
- Explosives Dumping Ground
- IMO Routeing Measure
- Marine Aggregate Dredging Area

Other OWFs

- In Planning
- Active/In Operation

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Study area for shipping and navigation

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0012

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:600,000	A3	WGS84	World Mercator

FIVE ESTUARIES
OFFSHORE WIND FARM

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9.7.8 There are three deep water routes located within the Sunk Inner Precautionary Area, with these are charted for use by deep-draught vessels entering or leaving the major ports in the region. Two of the deep water routes cross the offshore ECC (the Trinity and Sunk deep water routes) with minimum charted water depths of 18 m and 16 m below CD, respectively, where the crossing occurs. The London Gateway Port Harbour Empowerment Order 2008 gives approval for London Gateway Port to dredge to a maximum of 16.5 m within the Sunk and the Black Deep (which the Sunk and Trinity deep water routes pass through). The remaining deep water route curves north to direct traffic in/ out of the Harwich Deep Water Channel which HHA have confirmed during consultation is currently dredged to 16 m depth.

9.7.9 There are two key designated anchorage locations in proximity to VE; the Sunk Inner anchorage is located directly south of the offshore ECC and the Sunk DW anchorage is located approximately 1.5 nm north of the offshore ECC.

9.7.10 Several marine aggregate dredging areas are present within the area surrounding VE, with the closest located immediately south of the offshore ECC Longsand A509/1 and A509/2), operated by Tarmac Marine. However, Tarmac Marine have confirmed during consultation that Longsand A509/1 is not currently being exploited and there are no current plans to do so.

9.7.11 There are a number of existing subsea cables in proximity to the array areas, including three which pass through the northern array area: Atlantic Crossing 1, Concerto 1 North, and Farland. The BritNed subsea cable passes in close proximity to the south-eastern corner of the southern array area. Planned future subsea cable developments are considered in the cumulative effects assessment screening (see Section 9.10).

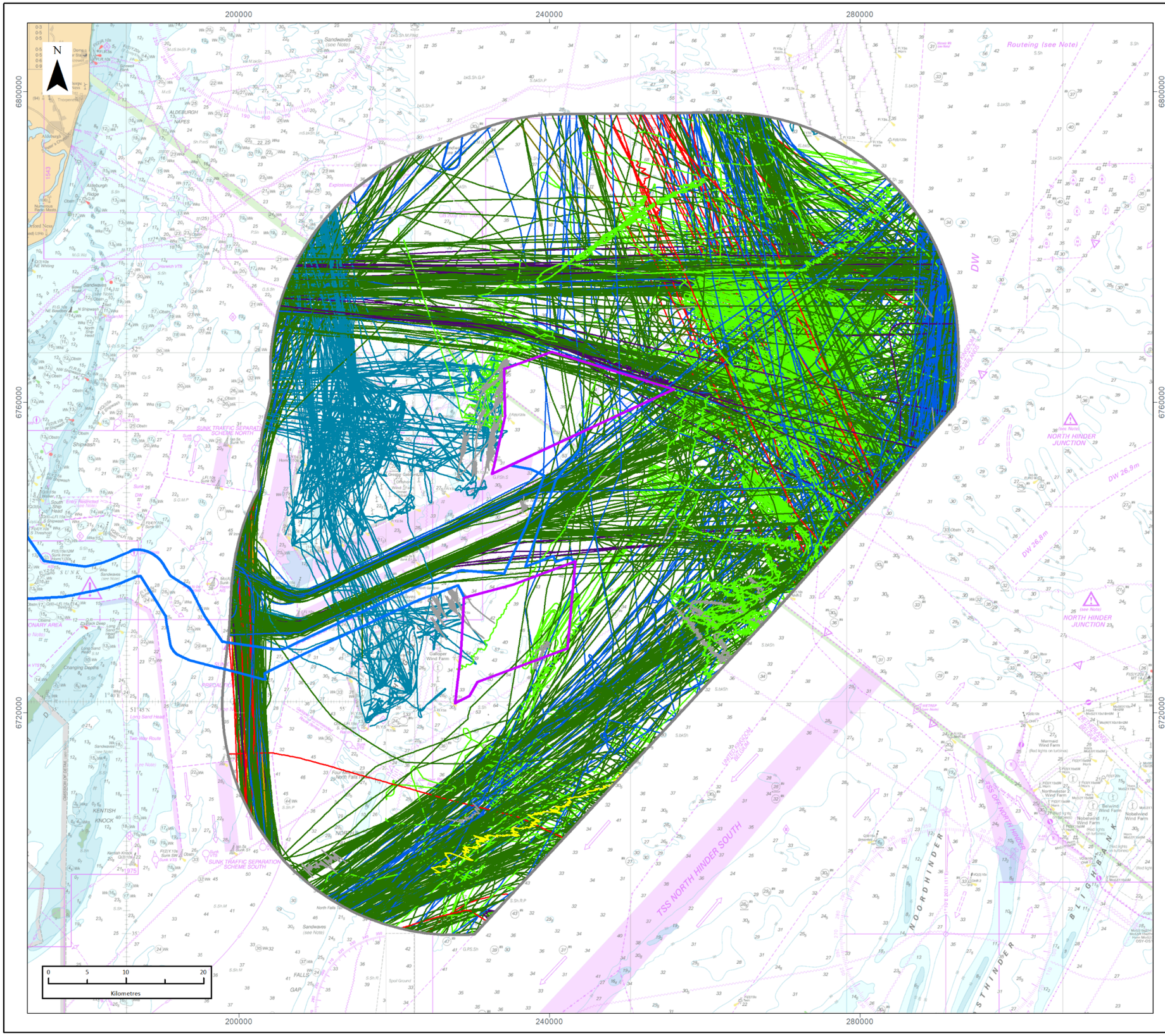
9.7.12 There are various aids to navigation located within the region, with the majority marking the Greater Gabbard and Galloper OWFs or the Sunk routeing measure. The North Galloper north cardinal mark, located on the edge of the eastbound lane of the Sunk TSS East, is within the offshore ECC. Moving further inshore, the offshore ECC avoids most aids to navigation within the Sunk Outer and Inner Precautionary Areas, including the Storm south cardinal buoy, Sunk Inner light vessel and South Threshold special mark.

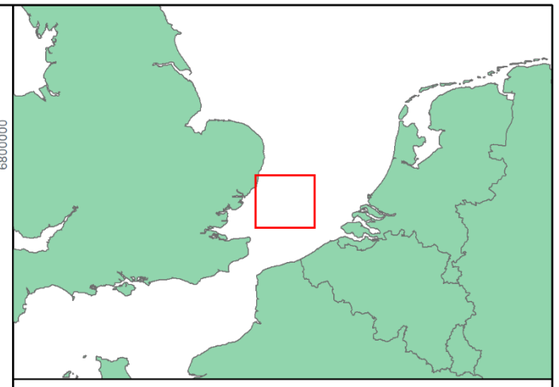
VESSEL TRAFFIC MOVEMENTS

ARRAY AREAS

9.7.13 A plot of vessel traffic recorded via AIS, Radar and visual observations over 14 full days in January 2022 (winter) within the array traffic study area, colour-coded by vessel type, is presented in Figure 9.3. Following this, a similar plot over 14 full days in June 2022 (summer) is presented in Figure 9.4.

9.7.14 A number of vessel tracks recorded during the two 14-day survey periods were classified as temporary (non-routine), such as those undertaking surveys or acting as guard vessels. These have therefore been excluded from the figures and the analysis that follows.





LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Array Traffic Study Area

Vessel Type

- Unspecified
- Fishing
- Military
- Dredger
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Oil and Gas
- Wind Farm

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

14 days winter 2022 AIS and Radar data by vessel type

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

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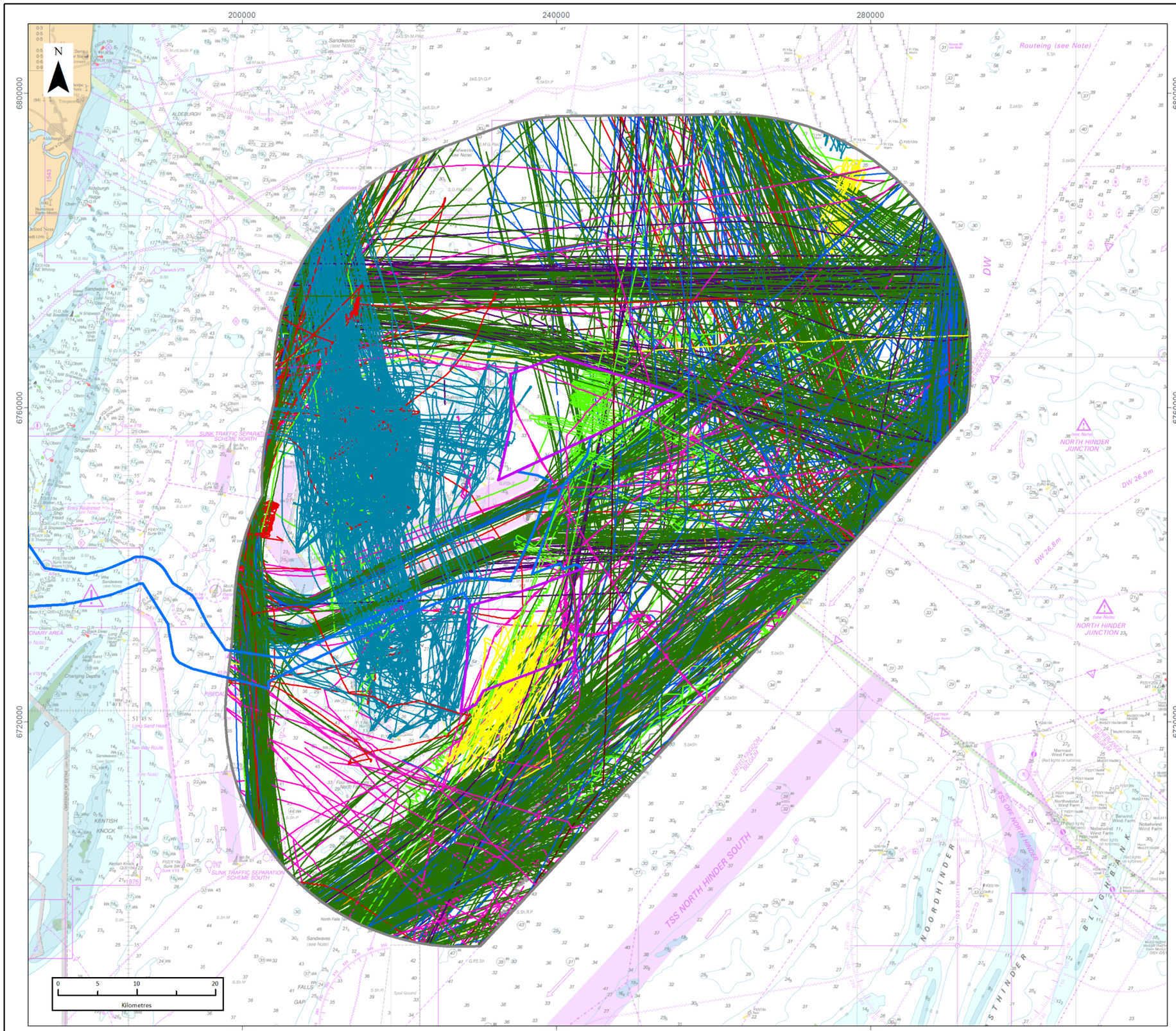
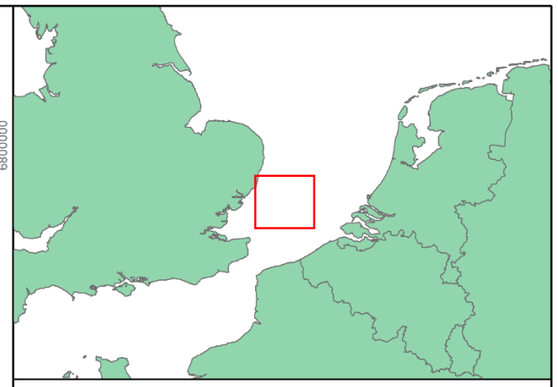
A4542-ANA-PEIR-0013

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:500,000	A3	WGS84	World Mercator

FIVE ESTUARIES
OFFSHORE WIND FARM





LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Array Traffic Study Area

Vessel Type

- Unspecified
- Fishing
- Military
- Dredger
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

14 days summer 2022 AIS and Radar data by vessel type

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0014

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:500,000	A3	WGS84	World Mercator

FIVE ESTUARIES
OFFSHORE WIND FARM

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9.7.15 Throughout the winter survey, approximately 94% of vessel tracks were recorded via AIS with the remaining 6% recorded via Radar. Throughout the summer survey, approximately 98% of vessel tracks were recorded via AIS with the remaining 2% recorded via Radar.

9.7.16 For the 14 days analysed in winter, there was an average of 102 unique vessels per day recorded within the array traffic study area and 7-8 unique vessels per day intersecting the array areas. The main vessel types within the array traffic study area were cargo vessels (57%), tankers (23%), and fishing vessels (9%).

9.7.17 For the 14 days analysed in summer, there was an average of 116 unique vessels per day recorded within the array traffic study area and 12 unique vessels per day intersecting the array areas. The main vessel types within the array traffic study area were cargo vessels (49%), tankers (18%), and wind farm vessels (14%).

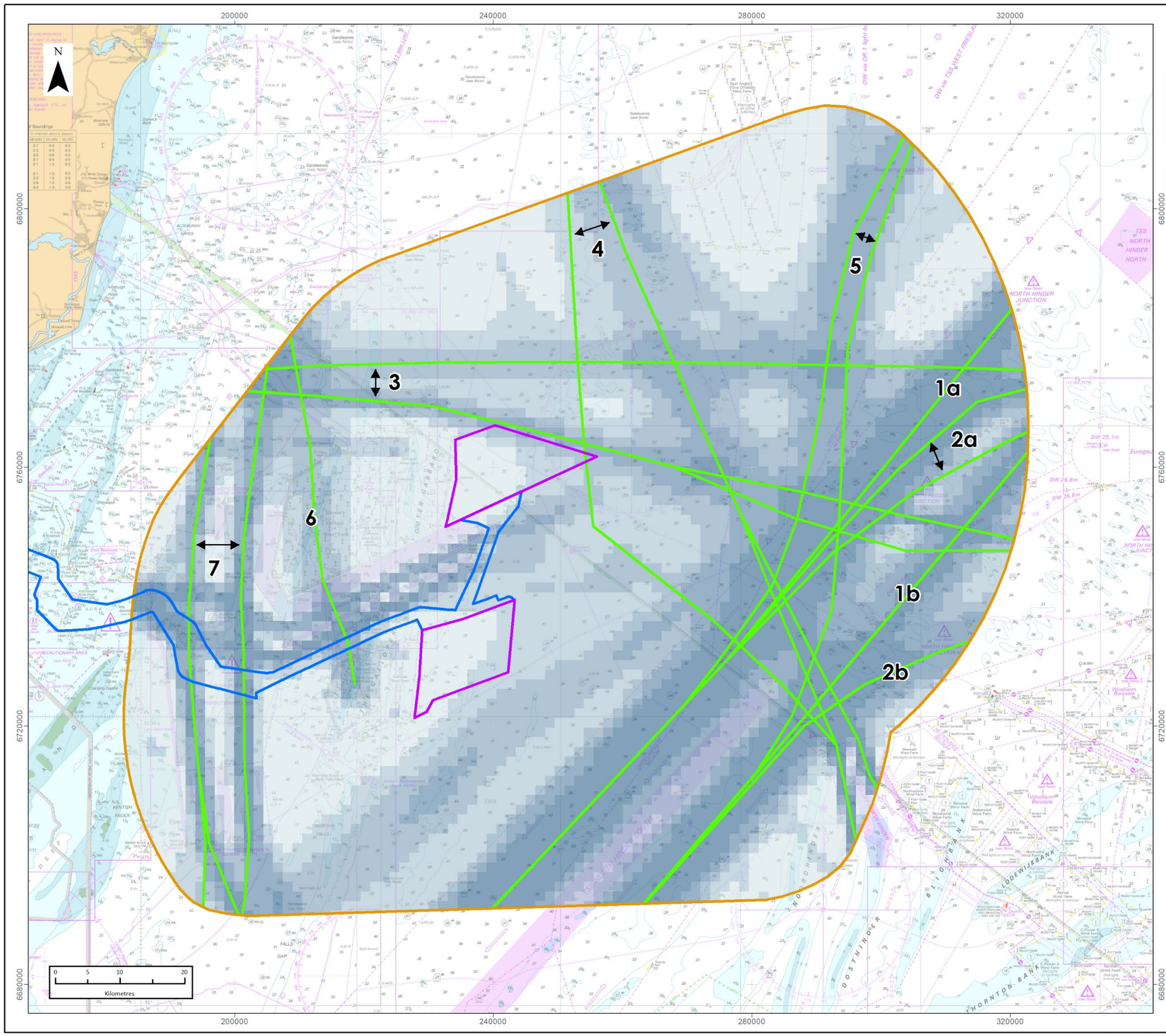
9.7.18 A number of Roll-on/ Roll-off (Ro-Ro) and Roll-on/ Roll-off Passenger (Ro-Pax) operators were recorded during the two 14-day survey periods, including CLdN, DFDS Seaways, P&O Ferries, and Stena Line. Details of some of these services are included in Table 9.8.

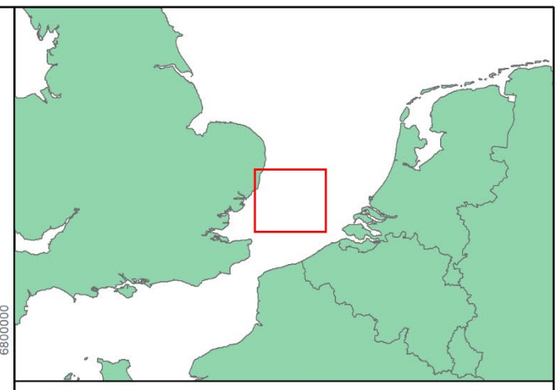
9.7.19 No recreational vessels were recorded during the winter survey period. Throughout the summer survey period an average of seven unique recreational vessels per day were recorded within the array traffic study area. Approximately 92% of recreational vessels were recorded on AIS, 6% on Radar, and 2% from visual observations.

9.7.20 Vessel length was available for approximately 97% of vessels recorded throughout the two 14-day survey periods and ranged from 8 m for a sailing vessel to 400 m for a container vessel. Excluding the proportion of vessels for which length was not available, the average length of vessels within the array traffic study area throughout the winter and summer survey periods was 154 m and 140 m, respectively.

9.7.21 Vessel draught was available for approximately 89% of vessels recorded throughout the two 14-day survey periods and ranged from 1.2 m for two wind farm support vessels to 21.5 m for an oil products tanker. Excluding the proportion of vessels for which draught was not available, the average draught of vessels within the array traffic study area throughout the winter and summer survey periods was 6.4 m and 5.6 m, respectively.

9.7.22 Main commercial routes have been identified using the principles set out in MGN 654 (MCA, 2021). Further details of the process for identifying main commercial routes is provided in Section 11.2 of Volume 7, Report 6: Navigational Risk Assessment. A total of 26 main commercial routes were identified within the array routeing study area. A plot of the high use routes is presented in Figure 9.5 alongside the vessel traffic density associated with all routeing within the array routeing study area.





LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Array Routeing Study Area

Vessel Routes

- Mean Position

Vessel Routes Density

- Highest
- Lowest

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

High use base case vessel routes

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0015

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
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FIVE ESTUARIES OFFSHORE WIND FARM

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9.7.23 Descriptions for each of the high use main commercial routes are provided in Table 9.8.

Table 9.8: Details of high use main commercial routes within array traffic study area.

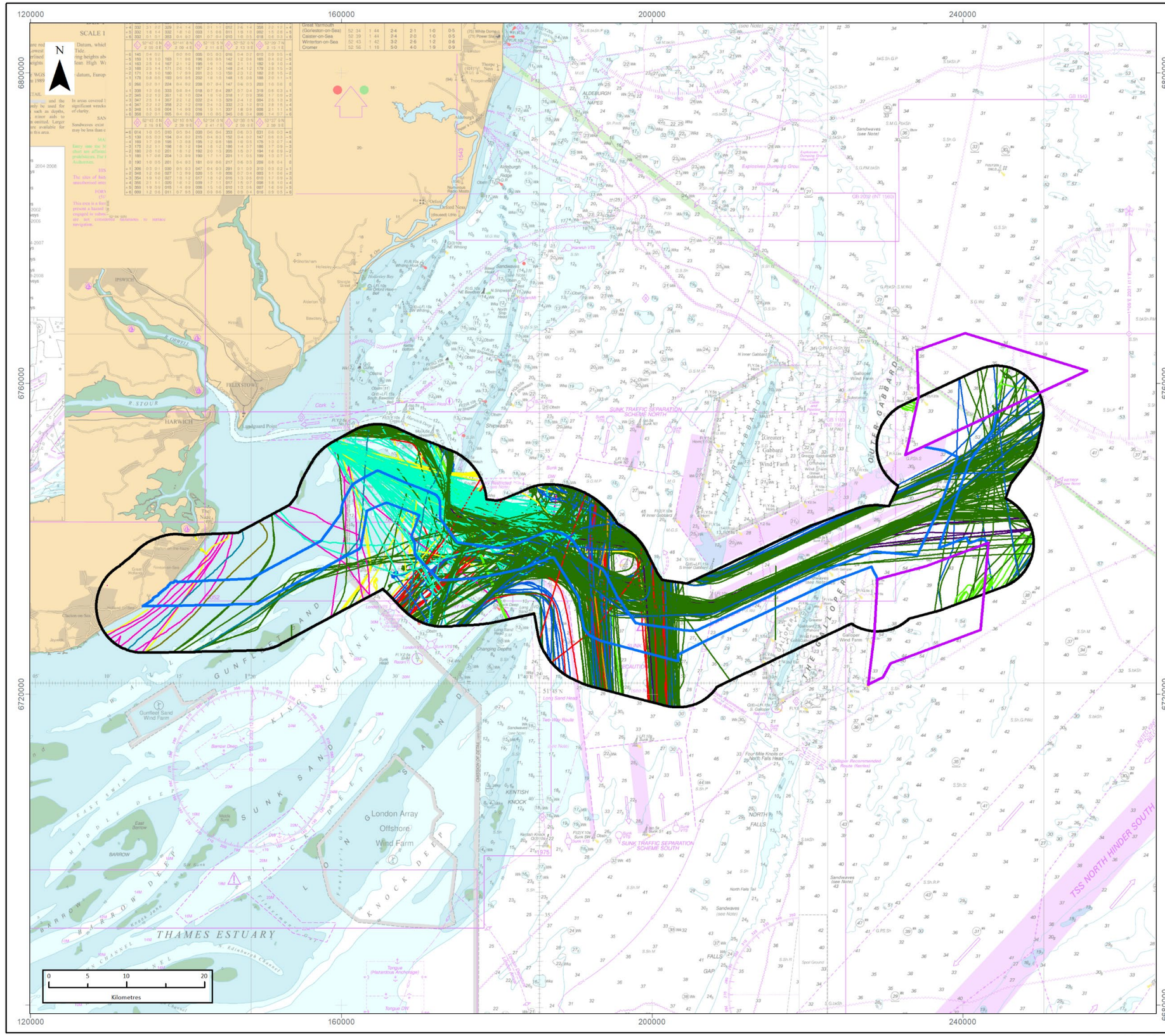
Route number	Average vessels per day	Description
1	30	**Port of Amsterdam (Netherlands) – Dover Strait.** Generally used by cargo vessels (74%). Route 1a is eastbound only and Route 1b is westbound only.
2	22	**Dover Strait – Port of Rotterdam (Netherlands).** Used by cargo vessels (59%) and tankers (38%). Route 2a is westbound only and Route 2b is eastbound only, with the latter passing north and south of the NHR buoy.
3	11	**Harwich Haven (UK) – Port of Rotterdam (Netherlands).** Generally used by cargo vessels (77%) including DFDS Seaways and Stena Line operated Ro-Ro services between Felixstowe and Rotterdam, and between Harwich and Rotterdam respectively. This route also includes a Stena Line operated Ro-Pax service between Harwich and Rotterdam.
4	9	**Port of Hull (UK) – Port of Zeebrugge (Belgium).** Used by cargo vessels (50%) and passenger vessels (43%), including a CLdN-operated Ro-Ro services between Killingholme and Zeebrugge, and P&O Ferries-operated Ro-Ro services between Tilbury and Zeebrugge, and between Tees and Zeebrugge. Route 4a is north and southbound whereas Route 4b is southbound only.
5	7	**Dover Strait – North Europe Ports.** Used by cargo vessels (44%) and tankers (53%).
6	7	**Port of Lowestoft (UK) – Greater Gabbard OWF.** Only used by wind farm vessels (100%).
7	6	**Dover Strait – Humber Ports (UK).** Generally used by cargo vessels (68%).

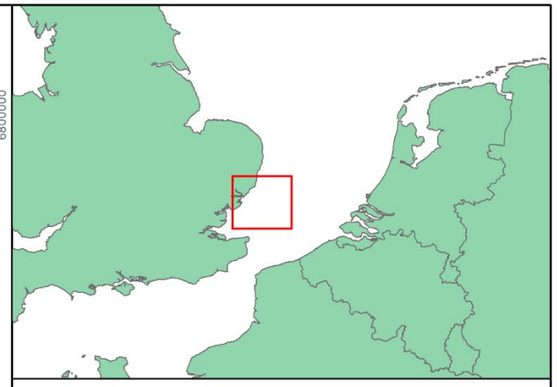
9.7.24 Medium use and low use main commercial routes are presented and described in Section 11.2 of Volume 7, Report 6: Navigational Risk Assessment.

OFFSHORE EXPORT CABLE CORRIDOR

9.7.25 A plot of vessel traffic recorded via AIS over 14 full days in January 2022 (winter) within the offshore ECC study area, colour-coded by vessel type, is presented in Figure 9.6. Following this, a similar plot over 14 full days in June 2022 (summer) is presented in Figure 9.7.

9.7.26 A number of vessel tracks recorded during the two 14-day survey periods were classified as temporary (non-routine), such as those undertaking surveys or acting as guard vessels. These have therefore been excluded from the analysis.





LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Offshore Export Cable Corridor Study Area

Vessel Type

- Fishing
- Dredger
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm
- Pilot

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

14 days winter 2022 AIS data by vessel type in the offshore ECC

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0017

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:500,000	A3	WGS84	World Mercator

FIVE ESTUARIES
OFFSHORE WIND FARM

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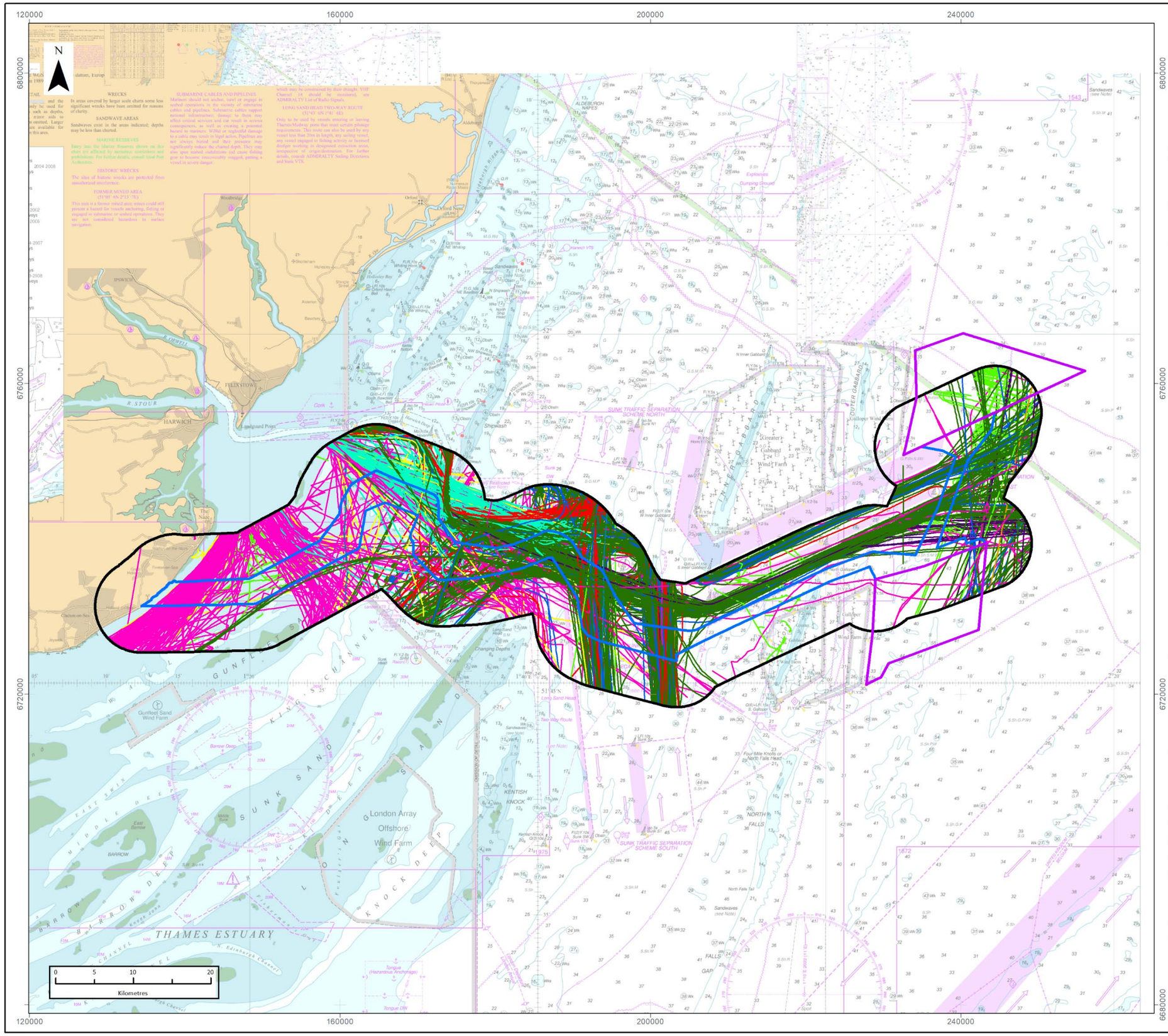

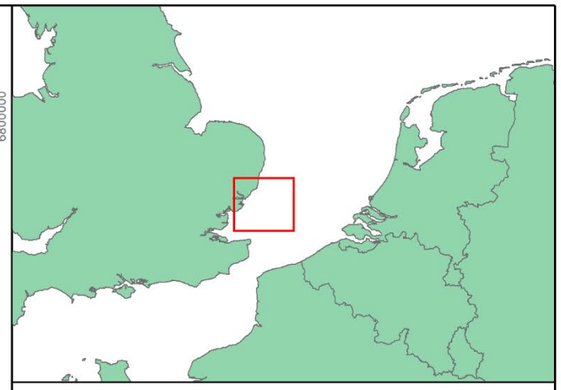

LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Offshore Export Cable Corridor Study Area

Vessel Type

- Fishing
- Military
- Dredger
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm
- Pilot

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

14 days summer 2022 AIS data by vessel type in the offshore ECC

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0018

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:500,000	A3	WGS84	World Mercator

FIVE ESTUARIES OFFSHORE WIND FARM

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9.7.27 For the 14 days analysed in winter, there was an average of 44 unique vessels per day recorded within the offshore ECC study area and 37 unique vessels per day intersecting the offshore ECC. The main vessel types within the offshore ECC study area were cargo vessels (66%), tankers (13%), and dredgers (6%).

9.7.28 For the 14 days analysed in summer, there was an average of 70 unique vessels per day recorded within the offshore ECC study area and 59 unique vessels per day intersecting the offshore ECC. The main vessel types within the offshore ECC study area were cargo vessels (40%), recreational vessels (32%), and dredgers (6%).

9.7.29 No recreational vessels were recorded during the winter survey period. Throughout the summer survey period an average of 12 unique recreational vessels per day were recorded within the ECC study area, primarily close to shore.

9.7.30 Vessel length was available for more than 99% of vessels recorded throughout the two 14-day survey periods and ranged from 5 m for a sailing vessel to 400 m for a container vessel. Excluding the proportion of vessels for which length was not available, the average length of vessels within the offshore ECC study area throughout the winter and summer survey periods was 162 m and 113 m, respectively.

9.7.31 Vessel draught was available for approximately 80% of vessels recorded throughout the two 14-day survey periods and ranged from 0.9 m for a wind farm vessel to 21 m for two container vessels. Excluding the proportion of vessels for which draught was not available, the average length of vessels within the array traffic study area throughout the winter and summer survey periods was 7.2 m and 7.5 m, respectively.

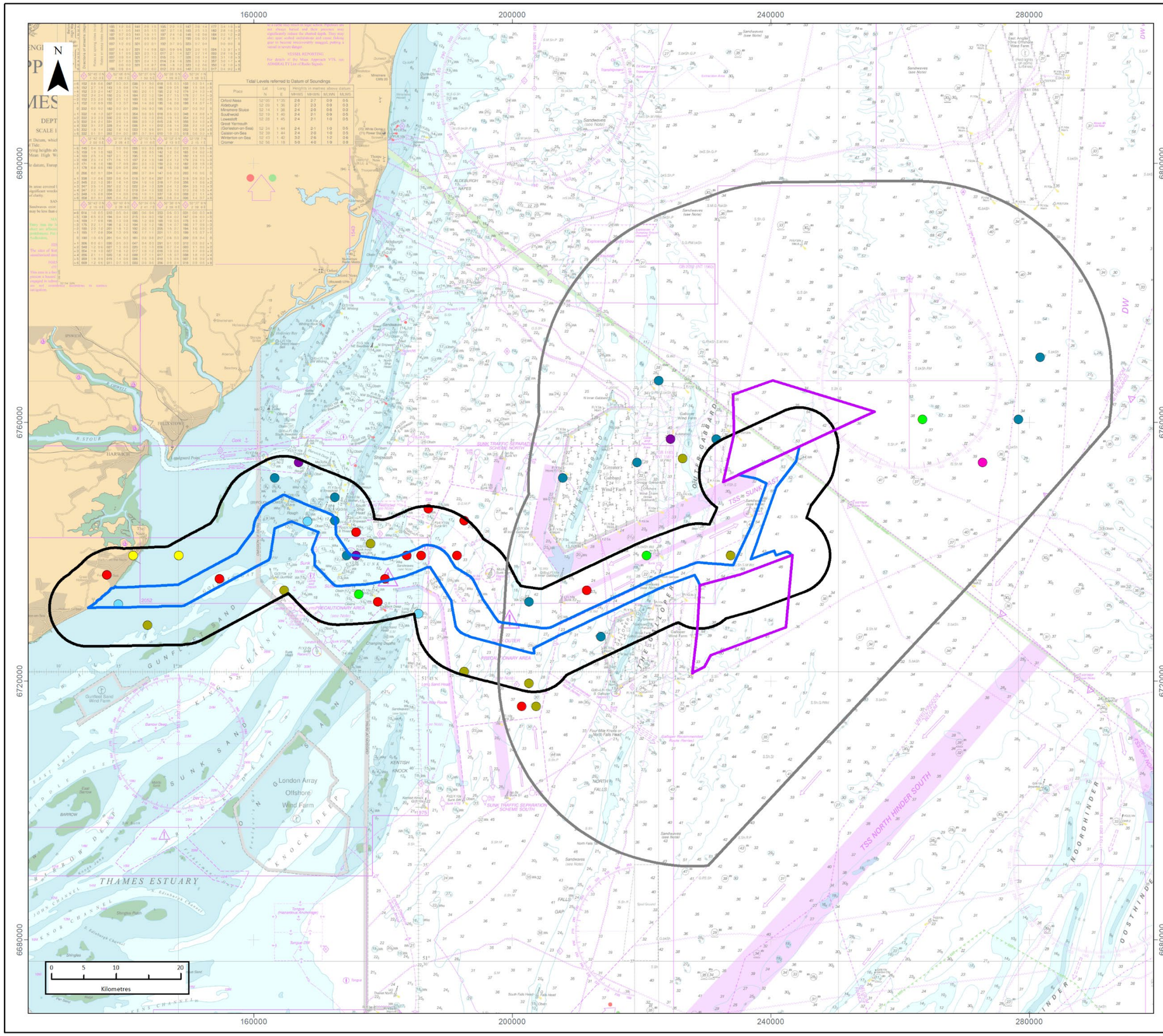
9.7.32 After applying the same criteria as for the analysis of vessel traffic within the array traffic study area, numerous instances of anchoring activity was identified, typically occurring within either of the two designated anchorages in proximity to the offshore ECC. Vessels anchoring in the Sunk DW anchorage were typically of greater length (on average 257 m) than those using the Sunk Inner anchorage (112 m).

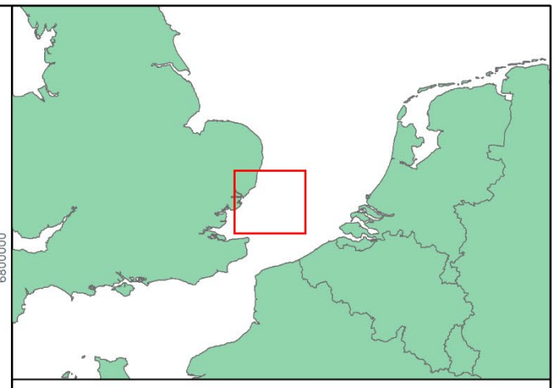
HISTORICAL MARITIME INCIDENTS

9.7.33 A plot of the locations of the incidents reported to the MAIB between 2010 and 2019 within the array traffic and offshore ECC study areas, colour-coded by incident type, is presented in Figure 9.8.

9.7.34 A total of 18 incidents were recorded by the MAIB within the array traffic study area between 2010 and 2019, which corresponds to an average of one to two incidents per year. Throughout the 10-year period, no incidents were recorded within the array areas. The most common incident types were accident to person (44%) and machinery failure (22%). The main vessel types involved in incidents were other commercial vessels (44%).

9.7.35 A total of 32 incidents were recorded by the MAIB within the offshore ECC study area between 2010 and 2019, which corresponds to an average of three to four incidents per year. Throughout the 10-year period, nine incidents were recorded within the offshore ECC itself. The most common incident types recorded within the offshore ECC study area were hazardous incident (34%), accident to person (19%), and machinery failure (19%). The main vessel types involved in incidents were dry cargo (38%) and other commercial (32%).





LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Array Traffic Study Area
- Offshore Export Cable Corridor Study Area

MAIB Incident Type

- Accident To Person
- Collision
- Contact
- Fire/Explosion
- Hazardous Incident
- Loss of control
- Machinery Failure
- Pollution

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

MAIB incident data (2010 -2019) by incident type

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0016

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:600,000	A3	WGS84	World Mercator

FIVE ESTUARIES OFFSHORE WIND FARM

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EVOLUTION OF THE BASELINE

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

9.7.37 During consultation, London Gateway noted that the port is only 50% constructed and therefore may double in capacity over the next 10 years. Additionally, Bathside Bay could be developed and the Port of Felixstowe has plans for the addition of some smaller berths. The size of vessels may increase including draughts, with HHA noting that draughts have increased markedly over the last 30 years and 20 m may be a realistic maximum enabling vessels to continue accessing the local ports.

9.7.38 Therefore, two independent scenarios of potential growth in commercial vessel movements of 10% and 20% have been estimated throughout the lifetime of VE. However, to suitably qualify and quantify future case vessel traffic VE OWFL intend to develop a detailed methodology for future case vessel traffic post PEIR in consultation with the relevant stakeholders.

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

9.7.40 Therefore, a conservative potential growth in commercial fishing vessel and recreational vessel movements of 10% and 20% has been estimated throughout the lifetime of VE. Changes in fishing activity are considered further in Volume 2, Chapter 8: Commercial Fisheries.

9.7.41 There are numerous marine aggregate dredging areas in the region, the majority of which are active. In the future production associated with these areas may be discontinued, thus reducing the volume of marine aggregate dredger movements. Likewise, new marine aggregate dredging areas may be designated, with two exploration areas screened into the CEA (see Section 9.10).

9.7.42 At this time, it is unclear how frequent marine aggregate dredging activities may be at new sites and therefore no specific changes are considered in the future baseline, noting that marine aggregate dredgers are included in the 10% and 20% growth of commercial vessel movements described in Paragraph 9.7.38.

DATA LIMITATIONS

AUTOMATIC IDENTIFICATION SYSTEM DATA

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

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

HISTORICAL INCIDENT DATA

9.7.45 Although all UK commercial vessels are required to report accidents to the MAIB, non-UK vessels do not have to report unless they are in a UK port or within 12 nm territorial waters (noting that the array traffic study area is not located entirely within 12 nm territorial waters) or carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report accidents to the MAIB.

9.7.46 The RNLI incident data cannot be considered comprehensive of all incidents in the array traffic study area. Although hoaxes and false alarms are excluded, any incident to which a RNLI resource was not mobilised has not been accounted for in this dataset.

UNITED KINGDOM HYDROGRAPHIC OFFICE ADMIRALTY CHARTS

9.7.47 The UKHO admiralty charts are updated periodically and therefore the information shown may not reflect the real time features within the region with total accuracy. However, during consultation input has been sought from relevant stakeholders regarding the navigational features in the existing environment.

9.8 KEY PARAMETERS FOR ASSESSMENT

9.8.1 The Maximum Design Scenario (MDS) for shipping and navigation has been identified based on parameters included in the project design envelope (see Volume 2, Chapter 1: Offshore Project Description). The MDS for each potential effect is provided in Table 9.9.

Table 9.9: Maximum design scenario for the project alone.

Potential effect	Maximum adverse scenario assessed	Justification
Construction		
Impact C1: Vessel displacement and increased collision risk (array areas)	> Single phase of construction of up to five years; > Full build out of the array areas; > Buoyed construction area encompassing the maximum extent of the array areas; > Presence of 500 m construction safety zones and 50 m pre commissioning safety zones; and > Up to 35 construction vessels on-site simultaneously.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel displacement and subsequent collision risk involving third-party vessels.
Impact C2: Vessel displacement and increased collision risk (offshore ECC)	> Single phase of construction of up to five years; > Up to four export cables each of 50 nm length;	

Potential effect	Maximum adverse scenario assessed	Justification
	> Maximum indicative separation of 50 m between export cables; and > Up to 35 construction vessels on-site simultaneously.	
Impact C3: Third-party with project vessel collision risk (array areas)	> Single phase of construction of up to five years; > Full build out of the array areas; > Buoyed construction area encompassing the maximum extent of the array areas; > Presence of 500 m construction safety zones and 50 m pre commissioning safety zones; and > Up to 35 construction vessels on-site simultaneously and up to 5,110round trips to port.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on third-party with vessel and a project vessel.
Impact C4: Third-party with project vessel collision risk (offshore ECC)	> Single phase of construction of up to five years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables; and > Up to 35 construction vessels on-site simultaneously and up to 5,110 round trips to port.	
Impact C5: Reduced access to local ports and harbours and reduction in under keel clearance (array areas)	> Single phase of construction of up to five years; > Full build out of the array areas; > Buoyed construction area encompassing the maximum extent of the array areas; > Presence of 500 m construction safety zones and 50 m pre commissioning safety zones; > Up to 108 nm of array cables; > Indicative maximum proportion of array cable protection requirement of 20%; > Up to 26 array cable crossings; and	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on access to local ports and harbours and reduction in under keel clearance.

Potential effect	Maximum adverse scenario assessed	Justification
	> Indicative height of protection for array cables (including crossings) of 1.0 m; and > Up to 35 construction vessels on-site simultaneously and up to 5,110 round trips to port.	
Impact C6: Reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC)	> Single phase of construction of up to five years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables; > Indicative maximum proportion of export cable protection requirement of 20%; > Up to 19 export cable crossings; > Indicative height of protection for export cables (including crossings) of 1.4 m; and > Up to 35 construction vessels on-site simultaneously and up to 5,110 round trips to port.	
O&M		
Impact O1: Vessel displacement and increased collision risk (array areas)	> Maximum operational life of up to 40 years; > Full build out of the array areas; > Presence of 500 m safety zones during major maintenance; and > Up to 27 O&M vessels on-site simultaneously and up to 1,776 annual round trips to port.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel displacement and subsequent collision risk involving third-party vessels.
Impact O2: Vessel displacement and increased collision risk (offshore ECC)	> Maximum operational life of up to 40 years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables; and > Up to 27 O&M vessels on-site simultaneously and up to 1,776 annual round trips to port.	

Potential effect	Maximum adverse scenario assessed	Justification
Impact O3: Third-party with project vessel collision risk (array areas)	> Maximum operational life of up to 40 years; > Full build out of the array areas; > Presence of 500 m safety zones during major maintenance; and > Up to 27 O&M vessels on-site simultaneously and up to 1,776 annual round trips to port.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel to vessel collision risk involving a third-party vessel and a project vessel.
Impact O4: Third-party with project vessel collision risk (offshore ECC)	> Maximum operational life up to 40 years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables; and > Up to 27 O&M vessels on-site simultaneously and up to 1,776 annual round trips to port.	
Impact O5: Reduced access to local port and harbours and reduction in under keel clearance (array areas)	> Maximum operational life of up to 40 years; > Full build out of the array areas; > Presence of 500 m safety zones during major maintenance; > Up to 108 nm of array cables; > Indicative maximum proportion of array cable protection requirement of 20%; > Up to 26 array cable crossings; and > Indicative height of protection for array cables (including crossings) of 1.0 m; and > Up to 27 O&M vessels on-site simultaneously and up to 1,776 annual round trips to port.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on access to local ports and harbours and reduction in under keel clearance.
Impact O6: Reduced access to local port and harbours and reduction in under keel	> Maximum operational life of up to 40 years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables;	

Potential effect	Maximum adverse scenario assessed	Justification
clearance (offshore ECC)	> Indicative maximum proportion of export cable protection requirement of 20%; > Up to 19 export cable crossings; > Indicative height of protection for export cables (including crossings) of 1.4 m; and > Up to 27 O&M vessels on-site simultaneously and up to 1,776 annual round trips to port.	
Impact O7: Creation of allision risk (array areas)	> Maximum operational life of up to 40 years; > Full build out of the array areas; > Minimum spacing of 830 m between array structures; > OSP locations as per Figure 6.4 of Volume 7, Report 6: Navigational Risk Assessment; > Up to 79 WTGs on four-legged suction bucket jackets with sea surface dimensions of 50×50 m; and > Up to two OSPs with topside dimensions of 125×110 m.	Largest possible extent of surface infrastructure, greatest number of surface structures and greatest duration resulting in the maximum spatial and temporal effect on vessel to structure allision risk.
Impact O8: Anchor interaction with subsea cables (array areas)	> Maximum operational life of up to 40 years; > Up to 108 nm of array cables; > Target burial depth for array cables of 0.5 m; > Indicative maximum proportion of array cable protection requirement of 20%; > Up to 26 array cable crossings; and > Indicative height of protection for array cables (including crossings) of 1.0 m.	Largest possible extent of subsea infrastructure and greatest duration resulting in the maximum spatial and temporal effect on anchor interaction with subsea cables.
Impact O9: Anchor interaction with subsea cables (offshore ECC)	> Maximum operational life of up to 40 years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables;	

Potential effect	Maximum adverse scenario assessed	Justification
	> Target burial depth for export cables of 0.5 m; > Indicative maximum proportion of export cable protection requirement of 20%; > Up to 19 export cable crossings; and > Indicative height of protection for export cables (including crossings) of 1.4 m.	
Impact O10: Reduction of emergency response capability (including SAR access)	> Maximum operational life of up to 40 years; > Full build out of the array areas; > Up to 79 WTGs; > Up to two OSPs; > Array layout as per Figure 6.4 of Volume 7, Report 6: Navigational Risk Assessment; and > Up to 27 O&M vessels on-site simultaneously and up to 1,776 annual round trips to port.	Largest possible extent, greatest number of surface structures, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on emergency response capability.
Decommissioning		
Impact D1: Vessel displacement and increased collision risk (array areas)	> Single phase of decommissioning of up to three years; > Full build out of the array areas; > Buoyed decommissioning area encompassing the maximum extent of the array areas; > Presence of 500 m decommissioning safety zones and 50 m pre decommissioning safety zones; and > Up to 35 decommissioning vessels on-site simultaneously.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on vessel displacement and subsequent collision risk involving third-party vessels.
Impact D2: Vessel displacement and increased collision risk (offshore ECC)	> Single phase of decommissioning of up to three years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables; and	

Potential effect	Maximum adverse scenario assessed	Justification
	> Up to 35 decommissioning vessels on-site simultaneously.	
Impact D3: Third-party with project vessel collision risk (array areas)	> Single phase of decommissioning of up to three years; > Full build out of the array areas; > Buoyed decommissioning area encompassing the maximum extent of the array areas; > Presence of 500 m decommissioning safety zones and 50 m pre decommissioning safety zones; and > Up to 35 decommissioning vessels on-site simultaneously and up to 5,110 round trips to port.	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on third-party with vessel and a project vessel.
Impact D4: Third-party with project vessel collision risk (offshore ECC)	> Single phase of decommissioning of up to three years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables; and > Up to 35 decommissioning vessels on-site simultaneously and up to 5,110 round trips to port.	
Impact D5: Reduced access to local ports and harbours and reduction in under keel clearance (array areas)	> Single phase of decommissioning of up to three years; > Full build out of the array areas; > Buoyed decommissioning area encompassing the maximum extent of the array areas; > Presence of 500 m decommissioning safety zones and 50 m pre decommissioning safety zones; > Up to 108 nm of array cables; > Indicative maximum proportion of array cable protection requirement of 20%; > Up to 26 array cable crossings; and	Largest possible extent of infrastructure, greatest number of simultaneous vessel activities and greatest duration resulting in the maximum spatial and temporal effect on access to local ports and harbours and reduction in under keel clearance.

Potential effect	Maximum adverse scenario assessed	Justification
	> Indicative height of protection for array cables (including crossings) of 1.0 m; and > Up to 35 decommissioning vessels on-site simultaneously and up to 5,110 round trips to port.	
Impact D6: Reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC)	> Single phase of decommissioning of up to three years; > Up to four export cables each of 50 nm length; > Maximum indicative separation of 50 m between export cables; > Indicative maximum proportion of export cable protection requirement of 20%; > Up to 19 export cable crossings; > Indicative height of protection for export cables (including crossings) of 1.4 m; and > Up to 35 decommissioning vessels on-site simultaneously and up to 5,110 round trips to port.	

9.9 EMBEDDED MITIGATION

9.9.1 Mitigation measures that were identified and adopted as part of the evolution of the project design (embedded into the project design) and that are relevant to shipping and navigation are listed in Table 9.10. General mitigation measures, which would apply to all parts of the project, are set out first. Thereafter mitigation measures that would apply specifically to shipping and navigation issues associated with the array and offshore ECC are described separately.

9.9.2 The embedded mitigation contained in Table 9.10 are mitigation measures or commitments that have been identified and adopted as part of the evolution of the project design of relevance to shipping and navigation; these include project design measures, compliance with elements of good practice and use of standard protocols. Where the assessment determined significance effects accounting for embedded mitigation, further measures may be required, which are presented as additional mitigation. Table 9.11 presents additional mitigation measures. These have typically been put forward where:

- An effect is significant in EIA terms, even with embedded mitigation, but additional mitigation measures are available to reduce the level of effect; or
- Mitigation has been proposed but has not yet been agreed with regulators, stakeholders, etc. or it is unproven.

Table 9.10: Embedded mitigation relating to shipping and navigation.

Project phase	Mitigation measures embedded into the project design
General	
Cable Burial Risk Assessment	Cables will typically be buried at a target burial depth to be determined by a Cable Burial Risk Assessment. Where cable burial is not possible, cable protection will be applied, ensuring use of the deep water routes by deep draught vessels is not compromised due to underwater allision risk.
Charting of infrastructure	All infrastructure associated with VE (including subsea cables) will be shown on appropriately scaled UKHO admiralty charts.
Compliance with MGN 654	VE will be compliant with MGN 654 and its annexes including in relation to reductions of no more than 5% in under keel clearance and the SAR Checklist.
Guard vessel(s)	A guard vessel(s) will be deployed where deemed appropriate by risk assessment.
Lighting and marking	Lights, marks, sounds, signals, and other aids to navigation will be exhibited as required by Trinity House, MCA and CAA.
Marine coordination for project vessels	Marine coordination will be implemented to manage project vessels including a Traffic Management Plan.
Marine Pollution planning	A Marine Pollution Contingency Plan (MPCP) will be developed outlining procedures to protect personnel working and to safeguard the marine environment in the event of a pollution event.
Project vessel compliance with international marine regulations	Project vessels will comply with international marine regulations as adopted by the Flag State, including COLREGs and SOLAS.
Construction	
Application for Safety Zones	An application will be made for safety zones post consent including up to 500 m around ongoing activities during construction and up to 50 m for installed structures pre commissioning.
Buoyed construction area	The array construction area will be marked by buoyage as required by Trinity House.
Cable Specification and Installation Plan (CSIP)	Development of, and adherence to, a Cable Specification and Installation Plan (CSIP) post consent. The CSIP will set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure. The CSIP will also ensure that cable crossings are appropriately designed to mitigate environmental effects, these crossings will be agreed with relevant parties in advance of CSIP submission. The CSIP will include a

Project phase	Mitigation measures embedded into the project design
	detailed Cable Burial Risk Assessment (CBRA) to enable informed judgements regarding burial depth to maximise the chance of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary. The CSIP will be conditioned in the deemed Marine Licence.
Promulgation of information	Local Notifications to Mariners and Kingfisher Bulletins will be updated and reissued at weekly intervals during construction.
Traffic monitoring	Monitoring of vessel traffic will be undertaken for the duration of the construction phase.
Operation	
Application for Safety Zones	An application will be made for safety zones post consent including up to 500 m around ongoing activities during major maintenance.
Minimum blade clearance	There will be a minimum blade tip clearance of at least 28 m above Mean High Water Springs (MHWS).
Promulgation of information	Local Notifications to Mariners and Kingfisher Bulletins will be updated and reissued at least five days prior to planned maintenance works.
Traffic monitoring	Monitoring of vessel traffic will be undertaken for three consecutive years following the completion of construction.
Decommissioning	
Application for Safety Zones	An application will be made for safety zones prior to decommissioning including up to 500 m around ongoing activities during decommissioning and up to 50 m for installed structures pre decommissioning.
Buoyed decommissioning area	The array decommissioning area will be marked by buoyage as required by Trinity House.
Promulgation of information	Local Notifications to Mariners and Kingfisher Bulletins will be updated and reissued at weekly intervals during decommissioning.

Table 9.11: Additional mitigation relating to shipping and navigation.

Additional mitigation measure	Description
Additional aids to navigation	Trinity House have indicated during consultation that additional aids to navigation (such as buoys) may be necessary to mitigate effects during the construction phase; this will be discussed as part of lighting and marking discussions for the final array layout post consent.
OSP locations	Discussions to identify suitable locations for OSPs.
Marine coordination (project vessel movements)	Marine coordination should include consideration of day-to-day project vessel movements including designated entry/ exit points to and from the arrays and defined routes to and from construction/ decommissioning and O&M ports.
Traffic management strategy	Traffic management strategy (including cumulative considerations) should be discussed with local ports and the Sunk VTS.

9.10 CUMULATIVE EFFECTS ASSESSMENT SCREENING

9.10.1 The CEA for shipping and navigation including the tiering of projects has been undertaken in accordance with the methodology provided in Volume 1, Annex 3.1: Cumulative Effects Assessment Methodology and Section 3.3 of Volume 7, Report 6: Navigational Risk Assessment.

9.10.2 The projects and plans selected as relevant to the assessment of impacts to shipping and navigation are based upon an initial screening exercise undertaken on a long list. Each project, plan or activity has been considered and scoped in or out on the basis of effect-receptor pathway, data confidence and the temporal and spatial scales involved. An aggregate of these criteria is used to determine the tier of each project, outlined in Table 9.12. For the purposes of assessing the impact of VE on shipping and navigation in the region, the CEA technical note submitted through the EIA Evidence Plan and forming Technical Annex Volume 1, Annex 3.1: Cumulative Effects Assessment Methodology of this PEIR screened in a number of projects and plans as presented in Table 9.13.

Table 9.12: Description of Tiers of other developments considered for cumulative effect assessment.

Tiers	Development Stage
Tier 1	Projects under construction.
	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented.
	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted.
	Projects under the Planning Act 2008 where a PEIR has been submitted for consultation.
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted.
	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/ approvals, where such development is reasonably likely to come forward.

9.10.3 It is noted that projects which are operational, in production or active have been screened out of the CEA on the basis that they are included as part of the shipping and navigation baseline[1]. Nautilus has been screened out on the basis of insufficient information being available but will be reconsidered at the ES stage.

Table 9.13: Projects considered within the shipping and navigation CEA.

Development type	Project	Status	Data confidence assessment/ phase	Tier
OWF	East Anglia One North	Consented	High	Tier 2
OWF	East Anglia Three	Consented	High	Tier 3
OWF	East Anglia Two	Consented	High	Tier 1
Marine aggregate area	East Orford Ness 1809	Exploration	High	Tier 1

[1] In the case of offshore wind farms, a development is considered active at the point where construction buoyage is installed.

Development type	Project	Status	Data confidence assessment/ phase	Tier
OWF	Hollandse Kust (West)	Area of search	Low	Tier 3
OWF	Hollandse Kust F	Area of search	Low	Tier 3
Subsea cable	NeuConnect	Proposed	Medium	Tier 1
OWF	Norfolk Vanguard East	Consented	High	Tier 3
OWF	Norfolk Vanguard West	Consented	High	Tier 3
OWF/ subsea cable	North Falls	Scoped	High	Tier 1
Marine aggregate area	Outer OTE 528/2	Exploration	High	Tier 2
Subsea cable	Sea Link	Scoped	Medium	Tier 1

9.10.4 The cumulative MDS for shipping and navigation has been identified based on parameters included in the project design envelope (see Volume 2, Chapter 1: Offshore Project Description). The MDS for each potential cumulative effect is provided in Table 9.13.

Table 9.14: Cumulative MDS.

Impact	Scenario	Justification
Impact 1: Vessel displacement and increased collision risk (array areas)	VE together with East Anglia Two, East Orford Ness 1809, and Norfolk Vanguard West.	Main commercial route(s) identified for the in-isolation scenario interact with these cumulative projects.
Impact 2: Vessel displacement and increased collision risk (offshore ECC)	VE together with all screened in subsea cable projects.	Simultaneous installation/ removal or maintenance activities with VE will increase the spatial extent and exposure of the impact.
Impact 3: Third-party with project vessel collision risk (array areas)	VE together with NeuConnect and all screened in OWFs.	Simultaneous installation/ removal or maintenance activities for NeuConnect with VE will increase the spatial

Impact	Scenario	Justification
		extent and exposure of the impact. Common base ports for VE, North Falls, and/ or East Anglia Two may increase collision risk.
Impact 4: Third-party with project vessel collision risk (offshore ECC)	VE together with North Falls and all screened in subsea cable projects.	Simultaneous installation/ removal or maintenance activities for subsea cable projects with VE will increase the spatial extent and exposure of the impact. Project vessels associated with North Falls may cross the Sunk TSS East and increase collision risk.
Impact 5: Reduced access to local port and harbours and reduction in under keel clearance (array areas)	VE together with East Anglia Two.	The combined north-south extent of VE and East Anglia Two may affect port schedules for commercial vessels headed to/ from the numerous ports and harbours on the UK east coast.
Impact 6: Reduced access to local port and harbours and reduction in under keel clearance (offshore ECC)	VE together with all screened in subsea cable projects.	Simultaneous installation/ removal or maintenance activities for subsea cable projects with VE may affect port schedules and pilot boarding operations.
Impact 7: Creation of allision risk (array areas)	VE together with East Anglia Two.	The navigational corridor between VE and East Anglia Two may create additional allision risk.
Impact 8: Anchor interaction with subsea cables (array areas)	VE together with NeuConnect.	Should NeuConnect be installed in close proximity to the array cables then the spatial extent of the impact will be increased.
Impact 9: Anchor interaction with subsea cables (offshore ECC)	VE together with all screened in subsea cable projects.	Should subsea cable projects be installed in close proximity to the export cables then the spatial extent of the impact will be increased.
Impact 10: Reduction of emergency	VE together with all screened in projects.	Activities associated with cumulative projects will further increase the likelihood of an

Impact	Scenario	Justification
response capability (including SAR access)		incident requiring an emergency response and subsequently increase the likelihood of multiple incidents occurring simultaneously.

9.11 ENVIRONMENTAL ASSESSMENT

IMPACT 1: VESSEL DISPLACEMENT AND INCREASED COLLISION RISK (ARRAY AREAS)

9.11.1 Construction/ decommissioning activities and the presence of surface structures within the array areas may result in the displacement of vessels from their existing routes and activities. This displacement may result in an increased risk of a collision between third-party vessels.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.2 The potential for displacement of vessels due to the presence of the array areas and associated construction activities has been raised by stakeholders during consultation including Stena Line, CLdN, and Intrada Ship Management.

9.11.3 The potential for increased collision risk for third-party vessels as a consequence of displacement has also been raised by multiple stakeholders during consultation including the MCA, Trinity House, UK Chamber of Shipping, Stena Line and Intrada Ship Management. The MCA and Trinity House also highlighted the need for consideration of IMO routeing measures and the ability for vessels to abide by the COLREGs when navigating within and in proximity to such routeing measures.

MAIN COMMERCIAL ROUTE DISPLACEMENT

9.11.4 During the construction and decommissioning phases, a buoyed construction/ decommissioning area will be deployed around each array area accounting for the presence of the traffic routeing between the two array areas. No restrictions on entry will be enforced for the buoyed construction/ decommissioning areas or the arrays during the O&M phase outside of any statutory safety zones. However, based on experience at previously under construction and existing operational OWFs (including the neighbouring Greater Gabbard and Galloper), it is anticipated that commercial vessels will choose not to navigate internally within the buoyed construction/ decommissioning areas or the operational arrays. These assumptions have been supported during consultation with Regular Operators including Stena Line, A2B-online and Tarmac Marine. Therefore, some displacement of main commercial routes is expected during all phases, with less available sea room for navigation, as highlighted by CLdN and Intrada Ship Management during consultation.

9.11.5 Main commercial routes have been identified in line with the principles set out in MGN 654 (MCA, 2021) based primarily on vessel traffic data collected during dedicated surveys (28 days in winter and summer 2022) and from coastal receivers (12 months in 2019) but also Anatec's ShipRoutes database. Further details of the methodology for main commercial route identification is provided in Section 11.1 of Volume 7, Report 6: Navigational Risk Assessment, noting that the vessel traffic data has been agreed as appropriate by the MCA and Trinity House, as well as being discussed within the Hazard Workshop. As part of the future case considerations, increases of 10% and 20% of all commercial traffic is assumed, with a detailed methodology for future case vessel traffic to be developed post PEIR where these values will be re-evaluated.

9.11.6 The full methodology for main commercial route deviations is provided in Section 15.6 of Volume 7, Report 6: Navigational Risk Assessment, with deviations established in line with MGN 654. A deviation may be required for six main commercial routes, as illustrated in Figure 15.1 of Volume 7, Report 6: Navigational Risk Assessment. The level of deviation varies between a decrease of 1 nm for Route 4 and an increase of 2.7 nm for Route 26, with the maximum percentage change in total route length being 1.4% (for Route 26).

9.11.7 The size of these deviations is small, particularly when considered relative to the length of the routes overall which range from 104 to 338 nm within the North Sea alone[2]. Effects on vessel approaches to IMO routeing measures in the region (such as the Sunk and North Hinder routeing measures) are therefore considered negligible. In some instances, these small deviations are resultant of the refinement of the array areas undertaken between the Scoping and PEIR stages which minimises the displacement to heavily trafficked commercial ferry routes, i.e., without this refinement the deviations would have been larger. This refinement has been well received by stakeholders including MCA, Trinity House, the Chamber of Shipping, Stena Line and DFDS Seaways (two of the key commercial ferry operators in the region).

9.11.8 Whilst vessel traffic on the deviated routes is regular the associated deviations are small. This aligns with consultation feedback from the MCA noting that the region features a number of regularly used routes and through traffic to major ports.

9.11.9 The most likely consequences of vessel displacement will be increased journey times and distances for affected third-party vessels, as indicated by Stena Line and CLdN during consultation. The impact will occur over a local spatial extent given that the buoyed construction/ decommissioning areas will be deployed around the maximum extent of the array areas.

9.11.10 As a worst case, there could be disruption to schedules, particularly for commercial ferry operators in the region. However, given the anticipated size of the deviations outlined above and the international nature of routeing in the region alongside the ability to passage plan, disruptions to schedule are expected to be minimal.

[2] Some main commercial routes in the region extend beyond the North Sea, such as into the English Channel and the Baltic Sea. Such routes have a wide variety of potential destinations and therefore determining an overall route length (to/from a specific port) beyond the North Sea is not feasible.

COLLISION RISK

9.11.11 Post wind farm modelling using the main commercial route deviations as input gives an estimated collision return period of one in 5.20 years for base case traffic levels, rising to one in 3.60 years for the higher tier of future case traffic levels (20%). The high level of collision risk is due to the high volume of vessel traffic in the area, particularly within the North Hinder routeing measures. However, the base case collision result represents a 0.32% increase compared to the pre wind farm base case result indicating that the influence of the array areas on the overall collision risk for commercial traffic is very low. This reflects historical incident data which indicates that no collision incidents between third-party vessels have occurred directly as a result of a UK OWF.

9.11.12 In poor visibility, third-party vessels may experience limitations regarding visual identification of other third-party vessels, either when passing on another side of the buoyed construction/ decommissioning areas and operational arrays, or when navigating internally within the operational arrays (small craft only). These limitations may increase the potential for an encounter. However, this will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions. Moreover, the minimum spacing between structures (830 m) will be sufficient to ensure any visual hindrance is very short-term in nature.

9.11.13 The extension of the Sunk TSS East has been considered as possible additional mitigation for reducing the likelihood of a collision risk. However, given the refinement of the array areas since the Scoping stage, and the subsequent positive effect on hotspots of collision risk (for further details see Section 16.4 of Volume 7, Report 6: Navigational Risk Assessment), the MCA have confirmed that they do not propose to pursue an extension to the Sunk TSS East, with this stance widely supported at the Hazard Workshop. Additionally, Stena Line suggested that the arrays form a natural corridor, thus mitigating any need for an extension to the Sunk TSS East. Only MSC have indicated any preference during consultation for an extension to the Sunk TSS East, although MSC also raised the option of using cardinal buoys to mark the array areas.

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

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

9.11.16 It is acknowledged that vessel traffic monitoring will be undertaken throughout the construction phase to characterise changes to routeing patterns. These will be compared against the anticipated deviations determined in the NRA to allow a comprehensive review of the mitigation applied at the time.

ADVERSE WEATHER ROUTEING

9.11.17 The need to consider commercial routeing in adverse weather conditions was highlighted by the MCA, Hanson Aggregates, and Intrada Ship Management during consultation.

9.11.18 From the long-term vessel traffic data, two cases of alternative routeing characteristic of possible adverse weather routeing were observed, featuring navigation between Grimsby/ Hull and Zeebrugge which passes through the northern array area. These cases are analysed further in Section 12.2 of Volume 7, Report 6: Navigational Risk Assessment, noting that neither of the vessels featured remain present in the region. During consultation CLdN acknowledged that the alternative routeing is likely a result of Master preference but may have limited benefits.

9.11.19 As with displacement to standard routeing, the refinement of the array areas undertaken between the Scoping and PEIR stages has increased the available sea room for such adverse weather routeing, such that it is anticipated that this routeing may safely continue during all phases.

9.11.20 In terms of frequency, during consultation the UK Chamber of Shipping and DFDS Seaways noted that adverse weather routeing represents a very small portion of all routeing in the region.

9.11.21 The most likely consequences of displacement of adverse weather routeing are similar to that of displacement of standard weather routeing, i.e., slightly increased journey times and distances for affected third-party vessels with the impact occurring over a local spatial extent given that the buoyed construction/ decommissioning areas and infrastructure will be deployed around the maximum extent of the array areas.

9.11.22 As a worst case, the deviated route may be considered unsafe for navigation in adverse weather conditions resulting in the vessel being unable to make the transit. It is considered highly unlikely that the vessel would proceed on an unsafe transit and therefore the effect on the vessel and/ or crew is negligible due to the frequency of occurrence.

PROMULGATION OF INFORMATION AND PASSAGE PLANNING

9.11.23 All vessels operating in the area are expected to comply with international flag state regulations (including the COLREGs and SOLAS) and will have a raised level of awareness of construction and decommissioning activities given the promulgation of information relating to VE including the charting of the construction/ decommissioning areas on relevant nautical charts and the use of safety zones. The buoyed construction/ decommissioning areas will also serve to maximise awareness. Likewise, during the O&M phase, infrastructure will be appropriately marked on relevant nautical charts and awareness of the operational arrays will be very high and continue to increase with the longevity of VE.

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

SMALL CRAFT DISPLACEMENT

9.11.25 From the vessel traffic survey data (which incorporates Radar and visual observations in addition to AIS) regular transits by commercial fishing vessels and recreational vessels through the northern array area are infrequent (noting that displacement of commercial fishing vessels engaged in fishing activity is assessed in Volume 2, Chapter 8: Commercial Fisheries). However, sailing vessels participating in the annual RORC North Sea Race do pass through the northern array area. There are more regular transits in a north-east – south-west direction through the southern array area, with the course of the RORC North Sea Race also passing through. It is anticipated that sailing vessels participating in the RORC North Sea Race will be displaced by the array areas, although the RORC have not engaged in consultation to date. The RORC will be approached again as part of post PEIR consultation.

9.11.26 Based on experience at previously under construction OWFs it is anticipated that commercial fishing vessels and recreational vessels will choose not to navigate internally within the buoyed construction/ decommissioning areas. Therefore, some displacement of transits by small craft will be required during the construction and decommissioning phases.

9.11.27 For regular transits through the southern array area, there is again sufficient sea room available for deviations to the south-east. The distance between the southern array area and the North Hinder South TSS is approximately 5.4 nm and therefore it is not anticipated that this displacement will result in any substantial increase in interaction between small craft and larger commercial vessels utilising this routeing measure.

9.11.28 For the O&M phase, based on experience at existing operational OWFs, it is anticipated that commercial fishing vessels and recreational vessels may choose to navigate internally within the operational arrays, particularly in favourable weather conditions and as awareness of the array increases throughout the O&M phase. However, the Cruising Association indicated during consultation that sailing vessels would likely avoid the array areas. In situations where small craft do navigate internally, the level of displacement is considered negligible.

COLLISION RISK INVOLVING SMALL CRAFT

9.11.29 From the vessel traffic survey data (which incorporates Radar and visual observations in addition to AIS) regular transits by commercial fishing vessels and recreational vessels through the northern array area are infrequent.

9.11.30 Since the changes in highest collision risk areas for commercial vessels are minor there is not anticipated to be a substantial shift in the interaction of small craft with commercial vessels. The annual RORC North Sea Race, which may be displaced east of the northern array area, may be subject to greater exposure, although race participants are familiar navigating in busy areas and information relating to the race itself is highly promulgated.

9.11.31 In relation to the Sunk TSS East, Stena Line recommended during consultation that the implementation of a recommended route for small craft to offer segregation from larger commercial vessels would be beneficial. The vessel traffic survey data indicates that small craft movements typically occur directly south of the eastbound lane, resulting in a natural segregation between small craft and commercial vessels. Therefore, it is not considered necessary to implement a recommended route for small craft.

9.11.32 In the event of a collision incident involving a small craft with comparatively weaker structural integrity (due to hull materials) compared to a larger commercial vessel, the likelihood of a worst case outcome (the small craft foundering with PLL and pollution) will be greater.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.33 Four of the main commercial routes identified for the in isolation scenario interact with East Anglia Two (and will be permanently displaced) and one with East Orford Ness 1809 (and could be temporarily displaced due to the presence of a marine aggregate dredger). The level of permanent cumulative deviation varies between a decrease of 1.3 nm for Route 4 and an increase of 2.3 nm for Route 19, with the maximum percentage change in total route length being 1.1% (for Route 19). All four routes are also displaced by the array areas.

9.11.34 As with the in isolation scenario, the size of these deviations is small, particularly when considered relative to the length of the routes overall. Again, effects on vessel approaches to IMO routeing measures in the region (such as the Sunk and North Hinder routeing measures) are therefore considered negligible. Although the size of the deviations is small, vessel traffic volumes associated with the deviated routes are high, with the busiest route requiring a deviation featuring an average of 11 vessels per day (Route 3).

9.11.35 Noting the size of the deviations, additional increases in collision risk due to the presence of East Anglia Two and East Orford Ness 1809 will be limited, i.e., comparable with the in isolation scenario. For routeing through the navigational corridor between VE and East Anglia Two (Route 3), a safety case has been undertaken in Section 17 of Volume 7, Report 6: Navigational Risk Assessment and includes consideration of vessels overtaking, collision avoidance, crossing commercial traffic, and the effect of non-transit receptors (including marine aggregate dredgers associated with East Orford Ness 1809. The safety case concluded that the corridor's design (including width) meets safety of navigation expectations.

TIER 2

9.11.36 For this impact there is no direct link between the array areas and any Tier 2 developments and therefore no additional assessment of effects has been undertaken.

TIER 3

9.11.37 One of the main commercial routes identified for the in isolation scenario interacts with Norfolk Vanguard West and will be permanently displaced (Route 10). However, this route is not displaced by the array areas; the minimum passing distance of this route from the array areas is approximately 7.8 nm which is great enough that the presence of the array areas is not anticipated to have any additional effects in terms of vessel displacement and subsequent collision risk.

MITIGATION

9.11.38 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Application for safety zones;
- Buoyed construction areas;
- Charting of infrastructure;
- Compliance with MGN 654;
- Guard vessels as required;
- Lighting and marking;
- Promulgation of information;
- Pollution planning; and
- Vessel traffic monitoring.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.39 The frequency of occurrence and severity of consequence due to vessel displacement and increased collision risk associated with the array areas for each phase of VE is presented in Table 9.15 alongside the resulting significance of effect.

Table 9.15: Significance of effect for vessel displacement and increased collision risk (array areas).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	Construction	Displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/ or pollution.	Extremely Unlikely	Moderate	Broadly Acceptable
	O&M		Negligible	Moderate	Broadly Acceptable
	Decommissioning		Extremely Unlikely	Moderate	Broadly Acceptable
Cumulative	Construction		Remote	Moderate	Tolerable
	O&M		Extremely Unlikely	Moderate	Broadly Acceptable
	Decommissioning		Remote	Moderate	Tolerable

9.11.40 An additional mitigation has been identified relevant to this impact: a traffic management strategy should be developed and implemented by VE OWFL (including cumulative considerations) and will be discussed with local ports and the Sunk VTS. Also, Trinity House have indicated during consultation that additional aids to navigation (such as buoys) may be necessary to mitigate effects during the construction phase; this will be discussed as part of lighting and marking discussions for the final array layout post consent.

IMPACT 2: VESSEL DISPLACEMENT AND INCREASED COLLISION RISK (OFFSHORE EXPORT CABLE CORRIDOR)

9.11.41 Construction, maintenance, and decommissioning activities associated with the offshore ECC may result in the displacement of vessels from their existing routes and activities. Vessel displacement may subsequently result in an increased risk of a collision between third-party vessels.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.42 Up to four export cables each of 50 nm length may be installed with an indicative separation between cables of 50 m[3]. Once installed the presence of the export cables will not directly result in vessel displacement (noting that impacts associated with port/ harbour access and under keel clearance are assessed separately). Therefore, this impact is considered only in relation to export cable installation and maintenance activities.

9.11.43 Up to two vessel spreads may undertake export cable installation/ removal simultaneously, with an overall peak of up to 12 vessels on-site at any one time. An indicative maximum of 16 export cable repairs are anticipated over the O&M phase, with up to two cable maintenance vessels undertaking works simultaneously.

9.11.44 The spatial extent of the impact will be limited to where installation/ removal or maintenance activities are ongoing, with routeing vessels required to make small deviations to pass around installation/ removal or maintenance works. Although the offshore ECC passes through the Sunk routeing measure, disruption is anticipated to be minimal given the size of deviations and the short-term nature. Additionally, commercial vessels in the region are already familiar with navigating around active operations (such as dredgers undertaking maintenance works within the Sunk routeing measure).

9.11.45 Mariners navigating in proximity to the offshore ECC will have a raised level of awareness given the complexity of the region in terms of navigational features. This will be heightened further by the promulgation of information relating to VE including the publication of Notifications to Mariners as export cable installation progresses and maintenance activities are required. Tarmac Marine indicated during consultation that they have a preference to be informed via a Notification to Mariners when installation works commence.

[3]Noting spacing between individual cables may range between 5 and 200 m and the maximum overall width of the cable corridor is expected to be approximately 300 m, but will be influenced by the seabed constraints encountered.

9.11.46 The most likely and worst case consequences of vessel displacement due to installation/ removal or maintenance activities for the offshore ECC are generally analogous to those outlined for the array area, although the likelihood of disruption to vessel schedules is likely to be lower given the operation of the Sunk VTS. However, as a worst case there is also potential for increased encounters and congestion at areas of the offshore ECC with less available sea room (i.e., within the Sunk Inner Precautionary Area) and subsequently a risk of collision with PLL, pollution and vessel damage as outcomes.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.47 North Falls (export cables), NeuConnect, and Sea Link are expected to intersect the offshore ECC with Sea Link crossing and North Falls and NeuConnect potentially installed alongside portions of the export cables. Should installation/ removal or maintenance activities for VE and these subsea cable developments occur simultaneously then the spatial extent of the impact will be increased, although the likelihood of this is very low.

9.11.48 In the highly unlikely event that there is simultaneous installation/ removal or maintenance activities, the size of deviations will be larger than for the in isolation scenario although will still be short-term in nature. The consequences will be most substantial where there is limited sea room available for vessels to alter their passage, such as within the Sunk Inner Precautionary Area where navigational features constrain movements.

9.11.49 It is assumed that other developments will suitably promulgate information including via Notifications to Mariners as cable installation progresses and maintenance activities are required. Therefore, mariners may have an even greater level of awareness of ongoing activities than for the in isolation scenario.

TIER 2

9.11.50 For this impact there is no direct link between the offshore ECC and any Tier 2 developments and therefore no additional assessment of effects has been undertaken.

TIER 3

9.11.51 For this impact there is no direct link between the offshore ECC and any Tier 3 developments and therefore no additional assessment of effects has been undertaken.

MITIGATION

9.11.52 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Charting of infrastructure;
- Compliance with MGN 654;
- Guard vessels as required;
- Pollution planning; and
- Promulgation of information.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.53 The frequency of occurrence and severity of consequence due to vessel displacement and increased collision risk associated with the offshore ECC for each phase of VE is presented in Table 9.16 alongside the resulting significance of effect.

Table 9.16: Significance of effect for vessel displacement and increased collision risk (offshore ECC).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	Construction	Displacement with effects on schedule and collision incident occurs with vessel damage, PLL, and/ or pollution	Remote	Moderate	Tolerable
	O&M		Extremely Unlikely	Moderate	Broadly Acceptable
	Decommissioning		Remote	Moderate	Tolerable
Cumulative	Construction		Reasonably Probable	Moderate	Tolerable
	O&M		Negligible	Moderate	Broadly Acceptable
	Decommissioning		Reasonably Probable	Moderate	Tolerable

9.11.54 An additional mitigation has been identified relevant to this impact: a traffic management strategy should be developed and implemented by VE OWFL (including cumulative considerations) and should be discussed with local ports and the Sunk VTS.

IMPACT 3: THIRD-PARTY WITH PROJECT VESSELS COLLISION RISK (ARRAY AREAS)

9.11.55 The presence of vessels associated with construction, O&M, and decommissioning activities for the array areas may result in increased risk of a collision between a third-party vessel and a project vessel.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.56 The construction phase may last for up to five years and the decommissioning phase up to three years. For both phases, up to 35 construction/ decommissioning vessels may be located on-site simultaneously, in turn making a maximum of 5,110 round trips to port. The O&M phase may last for up to 40 years with up to 27 O&M vessels located on-site simultaneously, in turn making a maximum of 1,776 annual round trips to port. Some project vessels may be RAM and it is anticipated that project vessels will generally undertake construction/ decommissioning or O&M works associated with the array areas within the buoyed construction/ decommissioning areas or operational arrays, both of which third-party vessels are generally expected to avoid.

9.11.57 From historical incident data, there have been two instances of a third-party vessels colliding with a project vessel associated with a UK OWF. In both incidents moderate vessel damage was reported with no harm to persons. It is noted that the two incidents occurred in 2011 and 2012, and awareness of OWF developments and the application of the measures outlined below has improved or been refined considerably in the interim, with no further collision incidents reported since. This was reflected in feedback from CLdN during consultation that the presence of project vessels does not represent a notable concern since third-party vessels can comfortably and safely operate around construction activities.

9.11.58 Project vessels will be managed by a marine coordination facility. This will account for those areas where collision risk may be elevated including where heavily trafficked routes pass in close proximity to the array areas and cross between the array areas, as highlighted during consultation by the Sunk VTS. This has been suggested by the UK Chamber of Shipping and Stena Line as suitable mitigation. This mitigation will be particularly important given that, as highlighted by the Sunk VTS during consultation – the array areas are outside the Sunk VTS area. Project vessels will also carry AIS and be compliant with Flag State regulations including the COLREGs.

9.11.59 Authorised safety zones around active construction/ decommissioning and major maintenance works will also serve to protect third party and project vessels. These will be particularly effective in the event of smaller craft such as commercial fishing vessels and recreational vessels choosing to navigate internally within the operational arrays, where a project vessel may be undertaking major maintenance at a structure. Details of authorised safety zones will be promulgated alongside details of ongoing activities, this maximising awareness for all third-party receptors, including in both day and night conditions.

9.11.60 In poor visibility, third-party vessels may experience limitations regarding visual identification of project vessels entering and exiting the buoyed construction/ decommissioning areas and operational arrays. However, this will be mitigated by the application of the COLREGs (reduced speeds) in adverse weather conditions and project vessel compulsory AIS carriage.

9.11.61 The most likely consequences (during any phase) in the event of an encounter between a third-party and project vessel is the implementation of avoidance action in line with the COLREGs, with the vessels involved able to resume their respective passages with no long-term consequences.

9.11.62 Should an encounter develop into a collision incident, it is most likely to involve minor contact resulting in minor damage to the vessels with no harm to people (as noted in incidents occurred to date) and no substantial reputational effects. As a worst case, one of the vessels could founder with PLL and pollution, with this outcome more likely where one of the vessels is a small craft (e.g., fishing vessel, recreational vessel, or CTV) with comparatively weaker structural integrity give hull materials.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.63 NeuConnect is expected to be intersect the northern array area. Should installation/ removal or maintenance activities for VE and NeuConnect occur simultaneously then there is potential for additional project vessels associated with both developments to be located within or in proximity to the array areas. However, this is considered highly unlikely.

9.11.64 In the unlikely event that there is simultaneous installation/ removal or maintenance activities, the likelihood of an encounter between a third-party vessel and a project vessel will be greater.

9.11.65 On-site project vessel activities associated with North Falls and East Anglia Two are not expected to create a cumulative effect with VE. However, at the time of writing, the base ports for VE and these developments (for construction/ decommissioning and O&M) are not known. If the developments have a common base port, there may be an increased collision risk when vessels are entering/ exiting the port and enroute to/ from the arrays. However, the marine coordination facility will take account of this, and it is assumed that a similar facility will be in place for East Anglia Two and North Falls.

TIER 2

9.11.66 Again, on-site activities associated with East Anglia One North are not expected to create a cumulative effect with VE. However, at the time of writing, the base ports for VE and East Anglia One North (for construction/ decommissioning and O&M) are not known and therefore the same points raised for Tier 1 developments are again applicable.

TIER 3

9.11.67 Again, on-site activities associated with East Anglia Three, Norfolk Vanguard East, and Norfolk Vanguard West are not expected to create a cumulative effect with VE. However, at the time of writing, the base ports for VE and these developments (for construction/ decommissioning and O&M) are not known and therefore the same points raised for Tier 1 developments are again applicable.

MITIGATION

9.11.68 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Application for safety zones;
- Buoyed construction areas;
- Guard vessels as required;
- Marine coordination for project vessels;
- Pollution planning;
- Project vessel compliance with international marine regulations; and
- Promulgation of information.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.69 The frequency of occurrence and severity of consequence due to third-party with project vessel collision risk associated with the array areas for each phase of VE is presented in Table 9.17 alongside the resulting significance of effect.

Table 9.17: Significance of effect for third-party with project vessel collision risk (array areas).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	Construction	Collision incident occurs with vessel damage, PLL, and/ or pollution.	Extremely Unlikely	Moderate	Broadly Acceptable
	O&M		Negligible	Moderate	Broadly Acceptable
	Decommissioning		Extremely Unlikely	Moderate	Broadly Acceptable
Cumulative	Construction		Reasonably Probable	Moderate	Tolerable
	O&M		Extremely Unlikely	Moderate	Broadly Acceptable
	Decommissioning		Reasonably Probable	Moderate	Tolerable

9.11.70 An additional mitigation has been identified relevant to this impact: a traffic management strategy should be developed and implemented by VE OWFL (including cumulative considerations) and should be discussed with local ports and the Sunk VTS. Additionally, marine coordination should include consideration of day-to-day project vessel movements including designated entry/ exit points to and from the arrays and defined routes to and from construction/ decommissioning and O&M ports.

IMPACT 4: THIRD-PARTY WITH PROJECT VESSELS COLLISION RISK (OFFSHORE EXPORT CABLE CORRIDOR)

9.11.71 The presence of vessels associated with construction, maintenance, and decommissioning activities for the offshore ECC may result in increased risk of a collision between a third-party vessel and a project vessel.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.72 Up to four export cables each of 50 nm length may be installed with an indicative separation between cables of 50 m[4]. Once installed the presence of the export cables will not directly result in third-party with project vessel collision risk. Therefore, this impact is considered only in relation to export cable installation/ removal and maintenance activities.

9.11.73 Up to two vessel spreads may undertake export cable installation/ removal simultaneously, with an overall peak of up to 12 vessels on-site at any one time. An indicative maximum of 16 export cable repairs are anticipated over the O&M phase, with up to two cable maintenance vessels undertaking works simultaneously. The spatial extent of the impact will be limited to where installation/ removal and maintenance activities are ongoing, and the temporal extent will be limited to the duration of these activities.

9.11.74 The level of exposure to this impact for third-party vessels will depend upon the location of export cable installation/ removal or maintenance at any given time, with the PLA confirming during consultation that there are 'pinch points' along the offshore ECC where effective traffic management will be critical. Portions of the offshore ECC considered to have higher exposure include at the exit of the Sunk TSS East, along the Sunk TSS East (directly south) and within the Sunk Inner and Outer Precautionary Areas. It is noted that this activity is comparable to maintenance dredging and other works which currently occurs within the Thames Estuary area and is mitigated through effective traffic management procedures, including local management and promulgation of information.

9.11.75 For installation/ removal and maintenance activities along the Sunk TSS East (directly south), Trinity House noted during consultation that the alignment with the TSS should allow feasible application of traffic management. For the other higher exposure areas, interaction between third-party vessels and project vessels may be expected, although interaction at higher exposure areas will be short-term in nature. The Port of Felixstowe noted during consultation that the greater the target burial depth the longer the duration of export cable installation may be, noting this may depend on the type of installation method used.

9.11.76 It is assumed that third-party vessels will comply with the COLREGs, and in particular Rule 18(b)(ii) which states that *"a sailing vessel underway shall keep out of the way of a vessel restricted in her ability to manoeuvre"* (IMO, 1972/77) thus minimising the likelihood of an encounter between a third-party vessel and project vessel. Furthermore, details of ongoing installation/ removal and maintenance activities will be promulgated, thus maximising awareness for third-party receptors, including in both day and night conditions. A guard vessel may also be deployed based on a risk assessment, particularly during the O&M phase where there is a cable exposure requiring reburial.

[4] Noting spacing between individual cables may range between 5 and 200 m and the maximum overall width of the cable corridor is expected to be approximately 300 m, but will be influenced by the seabed constraints encountered.

9.11.77 The most likely and worst case consequences of third party to project vessel collision risk will be due to installation/ removal and maintenance activities for the offshore ECC are generally analogous to those outlined for the array area, although the presence of larger commercial vessels accessing local ports via the Sunk routeing measure is noted, with these vessels likely to have less manoeuvrability to take collision avoidance action in the event of an encounter.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.78 North Falls OWF, NeuConnect, and Sea Link are expected to intersect the offshore ECC with Sea Link crossing and North Falls (export cables) and NeuConnect potentially installed alongside portions of the export cables. Should installation/ removal or maintenance activities for VE and these subsea cable developments occur simultaneously then the spatial extent of the impact will be increased, although the likelihood of this is very low.

9.11.79 In the highly unlikely event that there is simultaneous installation/ removal or maintenance activities, the likelihood of an encounter between a third-party vessel and a project vessel will be greater, especially where works are occurring at similar locations and at the 'pinch points' highlighted for the in isolation scenario.

9.11.80 Additionally – and as highlighted by the Sunk VTS during consultation – project vessels associated with North Falls may cross the Sunk TSS East, adding to existing crossing project vessel traffic from Greater Gabbard and Galloper and future crossing project vessel traffic from VE. Where installation/ removal or maintenance activities are ongoing for the export cables this additional crossing traffic may further exacerbate collision risk, although it is assumed that marine coordination for project vessels associated with North Falls will be in place, including consideration of crossing the Sunk TSS East.

TIER 2

9.11.81 For this impact there is no direct link between the offshore ECC and any Tier 2 developments and therefore no additional assessment of effect has been undertaken.

TIER 3

9.11.82 For this impact there is no direct link between the offshore ECC and any Tier 3 developments and therefore no additional assessment of effect has been undertaken.

MITIGATION

9.11.83 Mitigation identified as relevant to reducing the significance of risk are as follows:

- Guard vessels as required;
- Marine coordination for project vessels;
- Pollution planning;
- Project vessel compliance with international marine regulations; and
- Promulgation of information.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.84 The frequency of occurrence and severity of consequence due to third-party with project vessel collision risk associated with the offshore ECC for each phase of VE is presented in Table 9.18 alongside the resulting significance of effect.

Table 9.18: Significance of effect for third-party with project vessel collision risk (offshore ECC).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	Construction	Collision incident occurs with vessel damage, PLL, and/ or pollution.	Negligible	Moderate	Broadly Acceptable
	O&M		Negligible	Moderate	Broadly Acceptable
	Decommissioning		Negligible	Moderate	Broadly Acceptable
Cumulative	Construction		Extremely Unlikely	Moderate	Broadly Acceptable
	O&M		Negligible	Moderate	Broadly Acceptable
	Decommissioning		Extremely Unlikely	Moderate	Broadly Acceptable

9.11.85 An additional mitigation has been identified relevant to this impact: a traffic management strategy should be developed and implemented by VE OWFL (including cumulative considerations) and should be discussed with local ports and the Sunk VTS.

IMPACT 5: REDUCED ACCESS TO LOCAL PORTS AND HARBOURS AND REDUCTION IN UNDER KEEL CLEARANCE (ARRAY AREAS)

9.11.86 Construction/ decommissioning activities and the presence of surface structures within the array areas may result in reduced access to local ports and harbours for vessels. The presence of cable protection associated with the array cables may result in reductions to water depth and the creation of an under keel clearance risk for vessels, again limiting access to ports, harbours, terminals, and marinas.

9.11.87 These two impacts (reduced access to local ports and harbours/ reduction in under keel clearance) are considered in unison given the links between reduced under keel clearance and access to local ports, etc.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.88 There are numerous ports and harbours located west of the array areas, on the UK east coast. However, given the distance of the array areas offshore, the presence of the buoyed construction/ decommissioning areas and operational arrays is not anticipated to directly interfere with mariners from their preferred approach to local ports and harbours. Furthermore, given that the size of main commercial route deviations due to the presence of the buoyed construction/ decommissioning areas and operational arrays (as outlined for the vessel displacement impact) are small, the effects on any port/ pilot arrivals times are expected to be limited and therefore schedules will not be impacted.

9.11.89 The construction phase for the array area may last for up to five years and the decommissioning phase up to three years. For both phases, up to 35 construction/ decommissioning vessels may be located on-site simultaneously, in turn making a maximum of 1,776 round trips to port. The O&M phase may last for up to 40 years with up to 27 O&M vessels located on-site simultaneously, in turn making a maximum of 1,775 annual round trips to port. Some project vessels may be RAM and it is anticipated that project vessels will generally undertake construction/ decommissioning or O&M works associated with the array areas within the buoyed construction/ decommissioning areas or operational arrays, both of which third-party vessels are generally expected to avoid. Given that the volume of project vessel movements will be substantially lower during the O&M phase than the construction/ decommissioning phases, the likelihood of disruption is lower for the O&M phase.

9.11.90 Project vessels will also be managed by a marine coordination facility which may include traffic management procedures such as defined routes to and from construction/ decommissioning and O&M ports. Project vessels will also carry AIS and be compliant with all Flag State regulations including the COLREGs. Given the presence of Greater Gabbard and Galloper OWF, whose O&M vessels are operated out of Harwich Haven and Port of Lowestoft, respectively, there is relevant experience of managing project vessel movements in and out of local ports which will be drawn upon.

9.11.91 Up to 108 nm of array cables will be located within the array areas including up to 26 crossings. Where available, the primary means of cable protection will be by seabed burial, with no material effect on under keel clearance. Indicatively, up to 20% of array cables may require alternative cable protection with a height (including for crossings) of 1.0 m. This will be fully determined by the Cable Burial Risk Assessment, noting that deep-draughted commercial vessels are not expected to navigate internally within the arrays.

9.11.92 In relation to under keel clearance VE OWFL intends to follow the guidance contained in MGN 654 in relation to cable protection, namely that cable protection will not change the charted water depth by more than 5%. This was reaffirmed by the MCA during consultation.

9.11.93 This aligns with the RYA's recommendation that the *"minimum safe under keel clearance over submerged structures and associated infrastructure should be determined in accordance with the methodology set out in MGN 543 [since superseded by MGN 654]"* (RYA, 2019). Noting that water depths within the array areas vary between 31 and 57 m below CD, this should be achievable throughout and therefore the likelihood of an underwater allision incident is very low.

9.11.94 The most likely consequences of reduced port access in relation to the array areas will be limited effects on port schedules. As a worst case, there could be disruption to port schedules, but with no safety issues.

9.11.95 If the restrictions are related to under keel clearance within the array area the most likely consequence is that no contact occurs and the vessel's passage is able to continue unaffected. As a worst case, the vessel could ground on the cable protection with pollution and vessel damage as potential outcomes.

COMMERCIAL EFFECT

9.11.96 There are not anticipated to be any commercial effects associated with the array areas.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.97 The presence of East Anglia Two in addition to VE may interfere with mariners planning their preferred approach to local ports and harbours. The northern array area and East Anglia Two span a north-south extent of approximately 24 nm, and therefore together may affect port schedules for commercial vessels headed to/ from the numerous ports and harbours on the UK east coast. Only one main commercial route (Route 3) is expected to be affected, although features high vessel traffic volumes.

9.11.98 However, a navigational corridor with minimum width of 2.86 nm separates the two arrays and provides a means of access to the aforementioned ports and harbours. As previously noted, a safety case has been undertaken in Section 17 of Volume 7, Report 6: Navigational Risk Assessment for the navigational corridor and concluded that the corridor's design (including width) meets safety of navigation expectations. Therefore, this corridor will minimise the cumulative effect for vessels heading to/ from ports on the UK east coast, including on Route 3.

TIER 2

9.11.99 For this impact there is no direct link between the array areas and any Tier 2 developments and therefore no additional assessment of effects has been undertaken.

TIER 3

9.11.100 For this impact there is no direct link between the array areas and any Tier 3 developments and therefore no additional assessment of effects has been undertaken.

MITIGATION

9.11.101 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Marine coordination for project vessels;
- Project vessel compliance with international marine regulations;
- Promulgation of information;
- Vessel traffic monitoring;
- Cable Burial Risk Assessment;
- Compliance with MGN 654; and
- Pollution planning.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.102 The frequency of occurrence and severity of consequence due to reduced port and harbour access and reduction in under keel clearance associated with the array areas for each phase of VE is presented in Table 9.19 alongside the resulting significance of effect.

Table 9.19: Significance of effect for reduced access to local ports and harbours and reduction in under keel clearance (array areas).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	Construction	Disruption to port schedules and vessel grounding on cable protection with vessel damage and/ or pollution.	Remote	Minor	Broadly Acceptable
	O&M		Remote	Moderate	Tolerable
	Decommissioning		Remote	Minor	Broadly Acceptable
Cumulative	Construction		Remote	Minor	Broadly Acceptable
	O&M		Remote	Moderate	Tolerable
	Decommissioning		Remote	Minor	Broadly Acceptable

IMPACT 6: REDUCED ACCESS TO LOCAL PORTS AND HARBOURS AND REDUCTION IN UNDER KEEL CLEARANCE (OFFSHORE EXPORT CABLE CORRIDOR)

9.11.103 Construction, maintenance, and decommissioning activities associated with the offshore ECC may result in some reduced access to local ports and harbours for vessels. The presence of cable protection associated with the export cables may result in reductions to water depth and the creation of an under keel clearance risk for vessels again limiting access to ports, harbours, terminals, and marinas.

9.11.104 These two impacts (reduced access to local ports and harbours/ reduction in under keel clearance) are again considered in unison given the links between reduced under keel clearance and access to local ports, etc.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.105 Up to four export cables each of 50 nm length may be installed with an indicative separation between cables of 50 m[5] and up to 19 crossings. Up to two vessel spreads may undertake export cable installation/ removal simultaneously, with an overall peak of up to 12 vessels on-site at any one time. An indicative maximum of 16 export cable repairs are anticipated over the O&M phase, with up to two cable maintenance vessels undertaking works simultaneously. The cable protection methodology for array cables is again applicable, although the indicative cable protection height (including for crossings) is 1.4 m.

UNDER KEEL CLEARANCE

9.11.106 The offshore ECC crosses the exit of the Sunk TSS East, passes alongside the eastbound lane of the Sunk TSS East and crosses the Sunk Outer and Inner Precautionary Areas before making landfall east of Holland-on-Sea (see Figure 9.2). At the Hazard Workshop, stakeholders generally agreed that the final portion of the offshore ECC inshore of the Rough Sands did not raise any concerns for shipping and navigation receptors, noting that from the vessel traffic survey data, crossing vessels in this area were primarily recreational vessels with shallower draughts.

9.11.107 The other portions of the offshore ECC have been the subject of detailed consultation throughout the Scoping and PEIR stages given that deep draught vessels do cross the offshore ECC, particularly when accessing local ports through the Sunk Inner Precautionary Area. For smaller craft impacts on water depth are not as substantial, as indicated by the Cruising Association during consultation.

9.11.108 The offshore ECC crosses the Trinity and Sunk deep water routes and passes in proximity to the Harwich Deep Water Channel. These are key navigational routes for vessels accessing ports in the region, including at Harwich Haven, the Port of Felixstowe, and Thames and Medway ports. These routes are required to give deep water access for the deeper draught vessels (up to 17.5 m) to avoid shallower areas within the Sunk Inner Precautionary Area (minimum depth on the deep water routes of 13 m below CD) and provide reassurance as to depth maintained channels. There is no alternative approach available for these larger vessels to access such ports.

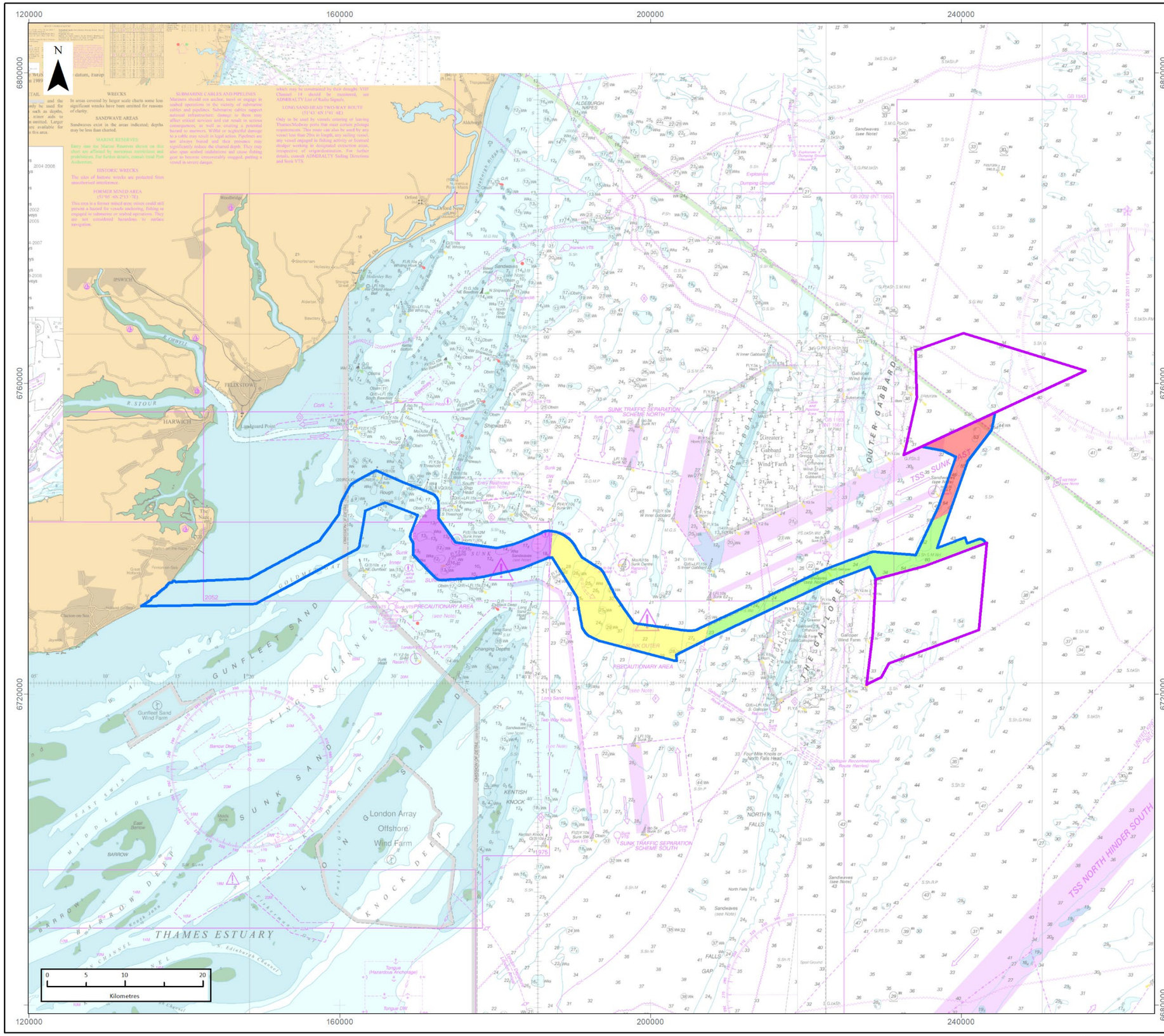
9.11.109 The guidance contained in MGN 654 in relation to cable protection is again applicable. The charted water depths vary between:

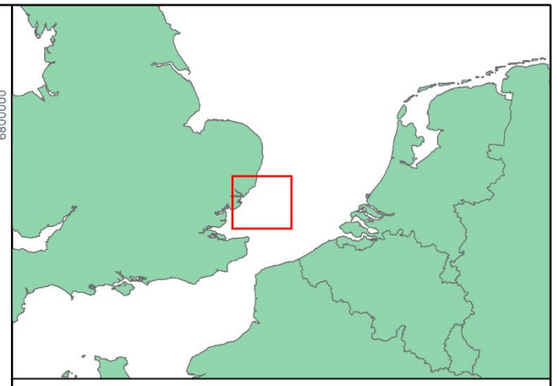
- 46 and 55 m below CD when crossing the exit of the Sunk TSS East;
- 10 and 27 m below CD when passing alongside the eastbound lane of the Sunk TSS East;
- 25 and 39 m below CD when crossing the Sunk Outer Precautionary Area; and
- 10 and 18 m below CD when crossing the Sunk Inner Precautionary Area[6].

9.11.110 These distinct portions of the offshore ECC are illustrated in Figure 9.9.

[5] Noting spacing between individual cables may range between 5 and 200 m and the maximum overall width of the cable corridor is expected to be approximately 300 m, but will be influenced by the seabed constraints encountered.

[6] HHA have confirmed during consultation that the deepest areas within the Sunk Inner Precautionary Area may change in the future given the dynamic nature of the seabed.





LEGEND

- Array Areas
- Offshore Export Cable Corridor

Offshore Export Cable Corridor Depth Sections

- 46m to 55m below CD
- 25m to 39m below CD
- 10m to 27m below CD
- 10m to 18m below CD

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Offshore ECC by Depth Sections

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2023	For Issue	DS	JM

DRAWING NUMBER:

A4542-ANA-PEIR-0019

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:500,000	A3	WGS84	World Mercator

FIVE ESTUARIES
OFFSHORE WIND FARM

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9.11.111 In terms of MGN 654 compliance, the areas where the offshore ECC crosses the exit of the Sunk TSS East and crosses the Sunk Outer Precautionary Area are the least likely to have difficulty satisfying the 5% reduction requirement against an indicative cable protection height of 1.4 m. For when passing alongside the eastbound lane of the Sunk TSS East and crossing the Sunk Inner Precautionary Area, further assessment is required including the Cable Burial Risk Assessment alongside consultation with the MCA, Trinity House and other relevant consultees on any additional mitigation necessary to ensure the safety of navigation.

9.11.112 In terms of specific vessel draughts, the long-term vessel traffic data indicates that movements directly south of the eastbound lane of the Sunk TSS East are generally made by small craft which have minimal exposure to under keel clearance risks. The Cruising Association have acknowledged during consultation that draught related issues are a lesser concern for recreational vessels.

9.11.113 Within the Sunk Inner Precautionary Area, HHA have confirmed during consultation that the Harwich Deep Water Channel is consented for dredging up to 16 m charted depth and this could increase in the future, potentially leading to larger vessels. Therefore, against the charted water depths, the indicative cable protection of 1.4 m height has the potential to give rise to an underwater allision risk.

9.11.114 The vessel traffic survey data indicates that the deepest draught vessels (up to 15.7 m) utilise the deep water routes within the Sunk Inner Precautionary Area. However, since the offshore ECC avoids running parallel to the deep water routes, the areas exposed to an underwater allision risk will be limited, noting this will be managed through the Cable Burial Risk Assessment process.

9.11.115 A CSIP (which will include a CBRA) will set out the proposed burial depths and installation methods, taking into account areas where deep draught vessels transit and therefore areas where water depth cannot be compromised by >=5%. This will ensure that the use of the area by the largest vessels will not be compromised by underwater allision risk created by rock protection . The CSIP will be conditioned in the deemed Marine Licence.

9.11.116 It is acknowledged that further assessment is needed in terms of future case vessel traffic, noting the uncertainty associated with long-term predictions of vessel traffic growth.

INSTALLATION AND MAINTENANCE ACTIVITIES

9.11.117 The offshore ECC may interact with mariners' preferred approach to local ports and harbours during periods of installation and maintenance. This element of the impact will apply when export cable installation/ removal activities are ongoing.

9.11.118 There could be a number of vessels affected by this impact given the prominence of Harwich Haven, the Port of Felixstowe, and Thames and Medway ports. Additionally, capacity at these ports may increase in the future including up to double the existing capacity at London Gateway. Further qualitative and quantitative analysis of future vessel traffic trends will be undertaken post PEIR to inform this impact (see Section 9.7).

9.11.119 Given that the indicative minimum rate of export cable installation/ removal is 45 m per hour, works ongoing within the Sunk Inner Precautionary Area will be short-term in duration.

9.11.120 In terms of reduced port access for vessels in relation to the offshore ECC the most likely consequences will be limited effects on port schedules. As a worst case, there could be disruption to port schedules, with congestion caused and subsequent potential for safety issues including collision and grounding (influenced by tidal streams).

9.11.121 Should under keel clearance be impacted the most likely and worst case consequences are generally analogous to those outlined for the array areas. However, there is also potential for impacts on future access to the area for deeper draught vessels. This will be assessed in further detail at the ES stage.

PORT OPERATIONS

9.11.122 A key element of port access in the region is pilotage services and therefore any disruption to pilotage operations may reduce access to local ports.

9.11.123 From the vessel traffic survey data, all pilot vessels operating in the Sunk Inner Precautionary Area do so out of Harwich Haven, with this confirmed by HHA during consultation. Only a small portion of the offshore ECC is crossed enroute to the Sunk pilot boarding station, which is the primary boarding location for pilots.

9.11.124 Pilot vessels are small and have greater flexibility than large commercial vessels. This is evidenced in the vessel traffic survey data which indicates that pilot vessels are not as constrained by the navigational features in the region such as the Harwich Deep Water Channel. Therefore, the presence of installation/ removal and maintenance activities associated with the offshore ECC are unlikely to create a substantial access constraint for pilot vessels but could see minor disruption to pilot boarding operations due to the temporary location of project vessels.

9.11.125 In the unlikely event that pilotage activities are affected, HHA have noted during consultation that a temporary reduction in the number of pilot vessels operating would not be tenable commercially.

SUNK VESSEL TRAFFIC SERVICE

9.11.126 The MCA requested during consultation that effects upon operation of the Sunk VTS are considered, i.e., man power. Given the rate of export cable installation, the short-term duration of the works are unlikely to have any substantial effect upon the operation of the Sunk VTS.

9.11.127 The movements of project vessels to/ from construction ports (if located within the Sunk VTS area) is another potential cause of impacting Sunk VTS resources. However, project vessels will be managed by a marine coordination facility which may include traffic management procedures such as defined routes to and from construction ports. Such procedures will ensure effects on the operation of the Sunk VTS is minimised.

EXISTING AIDS TO NAVIGATION

9.11.128 The offshore ECC avoids most aids to navigation but does overlap with the North Galloper north cardinal mark and Dynamo special mark. The Sunk Inner Light vessel is not impacted directly although HHA noted during consultation that it may nevertheless need to be moved.

9.11.129 For those overlapping aids to navigation there is potential that their movement may be required. Trinity House have indicated a preference during consultation to avoid moving existing aids to navigation but acknowledged that during installation there may be opportunities to do so. Any movements during export cable installation/ removal and maintenance works would be of short-term duration given the nature of the works and have limited effect on a vessel's ability to safely navigate to/ from port, especially when a pilot with local knowledge is on board.

COMMERCIAL EFFECT

9.11.130 Based on consultation with local port and harbour operators, there is a potential commercial effect posed by the presence of the offshore ECC due to reduced under keel clearance and installation/ removal and maintenance activities. This is specifically related to deep-draught vessels (container vessels) that visit several ports, terminals, and harbours through the Sunk VTS. This subsection considers this element of the impact, separate from elements relating to navigational safety, and will be assessed in further detail at the ES stage following additional work relating to future case vessel traffic trends.

9.11.131 As already noted, the key restricting factor to vessel access is under keel clearance reduction caused by cable crossings, cable burial, and cable protection. However, this is currently acceptable within base case traffic levels given current dredged limits and vessel sizes. However, stakeholders have raised concerns about limitations within the future case whereby cable crossings, cable burial, and cable protection may restrict the size of vessels that are able to use these facilities and therefore meaning vessels choose or have to use other ports, i.e., in mainland Europe. As noted, additional future case work will be undertaken post PEIR to ascertain likely trends in future vessel sizes noting there are restrictions already created by consented maintained depths, physical width of navigation channels, turning circles, port/ harbour entrances, and air draught restrictions (which also limit draught) caused by container cranes. In addition, a CSIP (which will include a CBRA) will set out the proposed burial depths and installation methods, taking into account areas where deep draught vessels transit and therefore areas where water depth cannot be compromised by >=5%. This will ensure that the use of the area by the largest vessels will not be compromised by underwater allision risk created by rock protection . The CSIP will be conditioned in the deemed Marine Licence.

9.11.132 Installation activities may also have impacts on vessel access, but it is considered that these can be mitigated by effective traffic management and liaison between VE OWFL, Sunk VTS and the port/ harbour operators noting the limited temporal duration of this impact.

9.11.133 The commercial effect posed during the O&M phase by the presence of the offshore ECC is largely aligned with the equivalent construction phase impact, noting that during the O&M phase maintenance activities is again expected to be limited in terms of spatial and temporal extent.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.134 This impact has been highlighted by stakeholders during consultation, with MCA, Trinity House, HHA, and PLA raising concerns relating to the cumulative presence of activities for VE and other subsea cable developments.

9.11.135 North Falls (export cables), NeuConnect, and Sea Link are expected to intersect the offshore ECC with Sea Link crossing and North Falls and NeuConnect potentially installed alongside portions of the export cables. Should installation/ removal or maintenance activities for VE and these subsea cable developments occur simultaneously then the spatial extent of the impact will be increased, although the likelihood of this is very low.

9.11.136 In the highly unlikely event that there is simultaneous installation/ removal or maintenance activities, the likelihood of an effect on port schedules for a commercial vessel may be greater, although this will depend upon the location of the simultaneous activities. In particular, simultaneous activities within the Sunk Inner Precautionary Area could involve all three subsea developments. This may create a relatively larger footprint than for the in isolation scenario which may be detrimental to vessel access, including for the Trinity and Sunk deep water routes and the Harwich Deep Water Channel. The ability to safely undertake pilot boarding operations may also be compromised. Consequences would be similar (but heightened) compared to those outlined for the in isolation scenario, although the impact remains short-term in nature on the basis that activities associated with the subsea cable developments would also be relatively short.

9.11.137 Since the indicative cable protection height of 1.4 m for VE is also applicable to crossings, the reduction in under keel clearance associated with VE together with the subsea cable developments is analogous to that assessed for the in isolation scenario.

TIER 2

9.11.138 For this impact there is no direct link between the offshore ECC and any Tier 2 developments and therefore no additional assessment of effects has been undertaken.

TIER 3

9.11.139 For this impact there is no direct link between the offshore ECC and any Tier 3 developments and therefore no additional assessment of effects has been undertaken.

MITIGATION

9.11.140 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Cable Burial Risk Assessment;
- Marine coordination for project vessels;
- Pollution planning;
- Compliance with MGN 654;
- Promulgation of information; and

- Vessel traffic monitoring.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.141 The frequency of occurrence and severity of consequence due to reduced access to local ports and harbours and reduction in under keel clearance associated with the offshore ECC for each phase of VE is presented in Table 9.20 alongside the resulting significance of effect.

Table 9.20: Significance of effect for reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	Construction	Disruption to port schedules and vessel grounding on cable protection with vessel damage and/ or pollution.	Reasonably Probable	Moderate	Tolerable
	O&M		Reasonably Probable	Moderate	Tolerable
	Decommissioning		Reasonably Probable	Moderate	Tolerable
Cumulative	Construction		Reasonably Probable	Moderate	Tolerable
	O&M		Reasonably Probable	Moderate	Tolerable
	Decommissioning		Reasonably Probable	Moderate	Tolerable

9.11.142 An additional mitigation has been identified relevant to this impact: a traffic management strategy should be developed and implemented by VE OWFL (including cumulative considerations) and should be discussed with local ports and the Sunk VTS.

9.11.143 Further assessment will be undertaken post PEIR in relation to future case vessel traffic (in consultation with stakeholders) and will help inform the significance of effect at the Environmental Statement (ES) stage, noting that the significance of effect determined at the PEIR stage is considered a preliminary finding. Moreover, it is again highlighted that the Cable Burial Risk Assessment (inclusive of protection monitoring) will help inform this impact.

IMPACT 7: CREATION OF ALLISION RISK (ARRAY AREAS)

9.11.144 The presence of surface structures within the array areas may result in the creation of a risk of allision for vessels.

9.11.145 This impact is considered only in relation to the array areas since there are no surface structures associated with the offshore ECC (underwater allision risk due to reduction in under keel clearance is considered in a separate impact).

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.146 The main commercial route deviations and future case considerations described for the vessel displacement impact have also been assumed for this impact, noting that a full build out of the array areas is assumed and internal navigation by commercial vessels is not anticipated. However, commercial fishing vessels and recreational vessels may choose to navigate internally within the arrays, particularly in favourable weather conditions.

9.11.147 Vessels operating in the region will be familiar with navigating in proximity to OWF, including Greater Gabbard, Galloper, East Anglia One, and various developments within Belgian waters. However, the presence of new surface structures does introduce new allision risk which can be considered across three forms, all of which are localised in nature given that a vessel must be in close proximity to a structure for an allision incident to occur:

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

POWERED ALLISION RISK

9.11.148 Post wind farm modelling using the main commercial route deviations as input gives an estimated powered allision return period of one in 746 years for base case traffic levels, rising to one in 621 years for future case traffic levels (20%). This is a low to moderate return period compared to that estimated for other UK OWF developments and is reflective of the shape of the array areas (following site refinement) being sympathetic to the most heavily trafficked routes as well as the comparatively low number of surface structures. The greatest allision risk was associated with:

- Structures at the south-eastern extent of the southern array area where a high volume of traffic from multiple main commercial routes associated with the North Hinder TSS pass; and
- Structures at the northern extent of the northern array area where a heavily trafficked commercial ferry route between Harwich and Rotterdam passes in close proximity (1nm), noting that this includes an indicative OSP location.

9.11.149 From historical incident data, there have been three instances of a third-party vessel alliding with an operational wind farm structure in the UK. These incidents all involved a fishing vessel, with a RNLI lifeboat attending on each occasion and a helicopter deployed in one case. Given the navigational measures present in the region (including the Sunk TSS East) and subsequent heightened mariner alertness, it is unlikely that such an incident will occur at VE.

9.11.150 Additionally, vessels are expected to comply with international flag state regulations (including the COLREGs and SOLAS) and will be able to effectively passage plan a route which minimises effects given the promulgation of information relating to VE including the charting of infrastructure on relevant nautical charts and the use of safety zones (for major maintenance). On approach, the operational lighting and marking of the arrays will also assist in maximising marine awareness and project vessels will as required alert a vessel on a closing approach with a structure.

9.11.151 Should a powered allision incident occur, the consequences will depend on multiple factors including the energy of the contact, structural integrity of the vessel involved, type of structure contacted, and the sea state at the time of the contact. Small craft including commercial fishing vessels and recreational vessels are considered most vulnerable to the impact given the potential for a non-steel construction.

9.11.152 With considerations for lesson learned the most likely consequences are minor damage with the vessel involved able to resume passage and undertake a full inspection at the next port of call. As a worst case, the vessel could allide with an OSP, resulting in foundering with PLL and pollution.

DRIFTING ALLISION RISK

9.11.153 A vessel adrift may only develop into an allision situation where the vessel is in proximity to a structure and the direction of the wind and/ or tide is such as to direct the vessel towards the structure. In the case of VE – and accounting for local metocean conditions – the direction of the peak flood tide is highlighted as potentially sensitive given that:

- Heavily trafficked east-west routeing north of the northern array could be set on an allision course with structures on the northern edge of the northern array area; and
- Moderately trafficked east-west routeing through the Sunk TSS East could be set on an allision course with structures on the northern edge of the southern array area.

9.11.154 Post wind farm modelling using the main commercial route deviations as input gives an estimated drifting allision return period of one in 584 years for base case traffic levels, rising to one in 486 years for future case traffic levels (20%). This is a moderate to high return period compared to that estimated for other UK OWF developments and is reflective of the high volume of vessel traffic in the region and the unsympathetic direction of drift (described above) relative to the shape of the array areas.

9.11.155 From historical incident data, there have been no instances of a third-party vessel alliding with an operational wind farm structure in the UK whilst Not Under Command (NUC). However, there is some potential for a vessel to run adrift in this region; this is reflected in the number of machinery failure incidents[7] reported locally to the MAIB (22% of all reported incidents within the array traffic study area).

9.11.156 In circumstances where a vessel drifts towards a structure, there are actions which may be taken to prevent the incident developing into an allision situation. For a powered vessel, the ideal and likely solution would be regaining power prior to reaching the arrays (by rectifying any fault). Failing this, the vessel's emergency response procedures would be implemented – this may include an emergency anchoring event following a check of the relevant nautical charts to ensure the deployment of the anchor will not lead to other effects (such as anchor snagging on a subsea cable).

[7] An incident reported as a 'machinery failure' may not be so severe as to result in the vessel losing power and becoming NUC.

9.11.157 Where the deployment of the anchor is not possible (such as for small craft) then project vessels on-site may be able to render assistance including under SOLAS obligations (IMO, 1974) and this response will be managed via marine coordination and depends on the type and capability of vessels on site. This would be particularly relevant for sailing vessels which whose propulsion is dictated solely by the metocean conditions, although if the vessel becomes adrift in proximity to a structure there may be limited time to render assistance.

9.11.158 Should a drifting allision incident occur, the consequences will be similar to those outlined for a powered allision incident, including the determining factors. However, the speed at which the contact occurs will likely be lower than for a powered allision, resulting in the contact energy being lower.

9.11.159 It is acknowledged that as per the assessment of powered allision risk, an allision with an OSP is likely to create higher consequence given the size of the structure. This is particularly relevant given the peak flood tide scenario outlined above since both of the highest exposure portions of the arrays include an OSP.

INTERNAL ALLISION RISK

9.11.160 As described for the vessel displacement impact, commercial vessels are not anticipated to navigate internally within the arrays and therefore the likelihood of an internal allision risk for such vessels is negligible.

9.11.161 Post wind farm modelling using the vessel traffic survey data as input gives an estimated commercial fishing allision return period of one in 3.43 years for base case traffic levels, rising to one in 2.86 years for future case traffic levels (20%)[8]. This is a high return period compared to that estimated for other UK OWF developments and is reflective of the high volume of fishing vessel activity in the region, noting that this is largely characteristic of fishing vessels engaged in fishing rather than in transit.

9.11.162 The minimum spacing between structures (830 m) is sufficient for safe internal navigation and is greater than that associated with many other UK OWF, some of which are navigated by commercial fishing vessels in favourable conditions. The minimum spacing between structures is also similar to that present at the neighbouring Greater Gabbard and Galloper. The final array layout will be agreed with the MCA and Trinity House post consent but will be compliant with the requirements of MGN 654 (MCA, 2021), including the completion of a safety justification for a SLoO layout should this be taken forward.

9.11.163 As with any passage, a vessel navigating internally within the arrays is expected to passage plan in accordance with SOLAS Chapter V (IMO, 1974). The lighting and marking of the arrays as required by Trinity House, MCA, and CAA and MGN 654 compliant unique identification marking of structures in an easily identifiable pattern will assist with minimising the likelihood of a mariner becoming disoriented whilst navigating internally within the arrays.

[8] These results are very conservative sine the model cannot account in detail for how fishing vessels will adapt to the presence of the arrays.

9.11.164 For recreational vessels under sail navigating internally within the arrays, there is also potential for effects such as wind shear, masking, and turbulence to occur. From previous studies of offshore wind developments, it has been concluded that WTGs do reduce wind velocity downwind of a WTG (MCA, 2022) but that no negative effects on recreational craft have been reported on the basis of the limited spatial extent of the effect and its similarity to that experienced when passing a large vessel or close to other large structures (such as bridges) or the coastline. In addition, no practical issues have been raised by recreational receptors to date when operating in proximity to existing offshore wind developments.

9.11.165 An additional allision risk associated with the WTG blades applies for recreational vessels with a mast when navigating internally within the arrays. However, the minimum blade tip clearance will be 22 m above MHWS which is aligned with the minimum clearance the RYA recommend for minimising allision risk (RYA, 2019) and which is also noted in MGN 654.

9.11.166 Should an internal allision incident occur, the consequences will be similar to those outlined for a powered allision incident, including the determining factors. However, as with a drifting allision incident, the speed at which the contact occurs will likely be lower than for an external allision, resulting in the contact energy being lower.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.167 Although allision risk is localised in nature, there remains a cumulative effect associated with routeing through the navigation corridor between VE and East Anglia Two (Route 3) which has a minimum width of 2.86 nm. A safety case has been undertaken in Section 17 of Volume 7, Report 6: Navigational Risk Assessment and includes consideration of the suitable width for the corridor based on various guidance including the MGN 654 Shipping Route Template. The safety case concluded that the corridor's design (including width) meets safety of navigation expectations.

TIER 2

9.11.168 For this impact there is no direct link between the array areas and any Tier 2 developments and therefore no additional assessment of effects has been undertaken.

TIER 3

9.11.169 For this impact there is no direct link between the array areas and any Tier 3 developments and therefore no additional assessment of effects has been undertaken.

MITIGATION

9.11.170 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Application for safety zones (major maintenance only);
- Charting of infrastructure;
- Compliance with MGN 654;
- Lighting and marking;

- Marine coordination for project vessels;
- Minimum blade tip clearance;
- Pollution planning;
- Project vessel compliance with international marine regulations; and
- Promulgation of information.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.171 The frequency of occurrence and severity of consequence due to creation of allision risk associated with the array areas for the O&M phase of VE is presented in Table 9.21 alongside the resulting significance of effect.

Table 9.21: Significance of effect for creation of allision risk (array areas).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	O&M	Allision incident occurs with an OSP with the vessel foundering, PLL, and/ or pollution.	Negligible	Major	Tolerable
Cumulative	O&M		Extremely Unlikely	Major	Tolerable

9.11.172 An additional mitigation has been identified relevant to this impact: the array layout should be discussed as part of the ongoing process to identify suitable locations for OSPs.

IMPACT 8: ANCHOR INTERACTION WITH SUBSEA CABLES (ARRAY AREAS)

9.11.173 The presence of array cables may result in the creation of a risk of a vessel anchor making contact with an array cable.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.174 Up to 108 nm of array cables will be located within the array areas. Where available, the primary means of cable protection will be by seabed burial, with a target burial depth of 0.5 m. Indicatively, up to 20% of array cables may require alternative cable protection with a height (including for crossings) of 1.0 m. The burial depth will be informed by the Cable Burial Risk Assessment.

9.11.175 There are three anchoring scenarios which are considered for this impact:

- Planned anchoring – most likely as vessel awaits a berth to enter port but may also result from adverse weather conditions, machinery failure, or subsea operations;
- Unplanned anchoring – generally resulting from an emergency situation where the vessels has experienced steering failure; and
- Anchor dragging – caused by anchor failure.

9.11.176 Since the array cables will be fully contained within the array areas, it is considered unlikely that a vessel will choose to anchor in close proximity to an array cable. Moreover, from the vessel traffic data, anchoring activity within and in proximity to the array areas is limited, with vessels instead choosing to use designated anchorage areas in the region.

9.11.177 In any anchoring scenario, an interaction risk exists only where the anchoring occurs in proximity to an array cable and it is anticipated that the charting of infrastructure including the array cables will inform the decision to anchor, as per Regulation 34 of SOLAS (IMO, 1974). Feedback from Mariners indicated that this will also occur in an emergency situation, even where time for decision-making is limited – a key priority for Bridge crew whilst the anchor is being readied would be to check charts.

9.11.178 The most likely consequences in the event of a vessel anchoring over an array cable is that no interaction occurs given the protection applied to the cable (by burial or other means). Should an interaction occur, historical incident data suggests that the consequences would be negligible, with no damage caused to the vessel or cable. As a worst case, a snagging incident could occur to a commercial fishing vessel with damage caused to the anchor and/ or the cable, compromising the stability of the vessel.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.179 NeuConnect is expected to intersect the northern array area. Should a vessel anchor within the northern array area the likelihood of a snagging incident will be greater given the wider spatial extent compared to the in isolation scenario. However, the impact remains localised in nature and the likelihood of a vessel anchoring within the array areas is low, as discussed for the in isolation scenario.

9.11.180 It is assumed that, as with the export cables, NeuConnect will be subject to a Cable Burial Risk Assessment and will be shown on relevant nautical charts.

TIER 2

9.11.181 For this impact there is no direct link between the array areas and any Tier 2 developments and therefore no additional assessment of effects has been undertaken.

TIER 3

9.11.182 For this impact there is no direct link between the array areas and any Tier 3 developments and therefore no additional assessment of effects has been undertaken.

MITIGATION

9.11.183 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Cable Burial Risk Assessment;
- Charting of infrastructure;
- Guard vessels as required; and
- Promulgation of information.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.184 The frequency of occurrence and severity of consequence due to anchor interaction with subsea cables associated with the array areas for the O&M phase of VE is presented in Table 9.22 alongside the resulting significance of effect.

Table 9.22: Significance of effect for anchor interaction with subsea cables (array areas).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	O&M	Anchor snagging incident occurs with anchor and/ or cable damage and compromised vessel stability.	Extremely Unlikely	Minor	Broadly Acceptable
Cumulative	O&M		Negligible	Moderate	Broadly Acceptable

IMPACT 9: ANCHOR INTERACTION WITH SUBSEA CABLES (OFFSHORE EXPORT CABLE CORRIDOR)

9.11.185 The presence of export cables may result in the creation of a risk of a vessel anchor making contact with an export cable.

IN ISOLATION SCENARIO – ALL RECEPTORS

9.11.186 Up to four export cables each of 50 nm length may be installed within the offshore ECC with an indicative separation between cables of 50 m[9]. The cable protection methodology for array cables is again applicable, although the indicative cable protection height (including for crossings) is 1.4 m. The burial depth will be informed by the Cable Burial Risk Assessment.

9.11.187 The three anchoring scenarios outlined for the array cables are again applicable.

9.11.188 Following pre PEIR consultation the offshore ECC avoids and does not overlap with any designated anchorage areas. The Sunk Inner anchorage is located directly south of the offshore ECC and the Sunk DW anchorage is located approximately 1.5 nm north of the offshore ECC. Both of these designated anchorage areas were noted by the UK Chamber of Shipping during consultation and HHA indicated that deeper burial will be required where there is an increased interaction risk from anchorage areas. From the vessel traffic data, anchoring activity in proximity to the offshore ECC is substantial but limited to these two anchorage areas. Therefore, planned anchoring within the offshore ECC is considered unlikely, particularly given that the offshore ECC passes through the Sunk VTS area.

[9] Noting spacing between individual cables may range between 5 and 200 m and the maximum overall width of the cable corridor is expected to be approximately 300 m, but will be influenced by the seabed constraints encountered.

9.11.189 With suitable metocean conditions, an anchor dragging event could cause an interaction incident, particularly out of the Sunk Inner anchorage given its proximity. Commercial vessel sizes utilising this anchorage area are relatively small (average 112 m) compared to those utilising the Sunk DW anchorage (average 257 m), with concerns raised by Stena Line during consultation relating primarily to the largest commercial vessels which use the Sunk DW anchorage. Again, it is noted that vessels at anchor will be monitored by Sunk VTS.

9.11.190 The location of unplanned anchoring cannot be pinpointed to any specific locations within the offshore ECC given the nature of this activity. This element of this impact was a key topic of discussion during the Hazard Workshop, with specific locations noted as higher risk including the Sunk Inner Precautionary Area (given the shifting seabed) and where the offshore ECC crosses the Sunk Outer Precautionary Area. For the latter, Stena Line indicated that the burial depth would need to be greater than where the offshore ECC follows the Sunk TSS East. Any unplanned anchoring is highly likely to be undertaken in consultation with Sunk VTS. Anchoring activity, and in particular the likelihood of anchor dragging, will be considered further as part of work undertaken post-PEIR.

9.11.191 There is general agreement among stakeholders that the burial depth for export cables will be important, particularly in higher risk areas and with consideration of potential vessel traffic growth in the future case scenario. HHA have indicated during consultation that a burial depth of 0.5 m would likely be insufficient in some areas, and may need to be substantially more. As noted, the Cable Burial Risk Assessment will inform the cable burial depth, with particular consideration given to the types and numbers of vessels crossing the offshore ECC at the higher risk locations and the maintenance and monitoring of the burial depth deployed. This latter point was raised as an important consideration by London Gateway during consultation. In the event of an export cable exposure a guard vessel may need to be deployed (depending upon a dynamic risk assessment) as a precaution whilst awaiting the reburial works alongside a Notification to Mariners.

9.11.192 The most likely and worst case consequences are analogous to those outlined for the array areas.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.193 This impact has been highlighted by stakeholders during consultation, with HHA, PLA, London Gateway, and Stena Line raising concerns relating to the cumulative presence of activities for VE and other subsea cable developments.

9.11.194 North Falls (export cables), NeuConnect, and Sea Link are expected to intersect the offshore ECC with Sea Link crossing and North Falls and NeuConnect potentially installed alongside portions of the export cables. Should a vessel anchor in a location where VE and other subsea cable developments are in close proximity, the level of exposure to anchor snagging will be greater.

9.11.195 However, the application of good seamanship is anticipated, with mariners checking the relevant nautical charts prior to making the decision to drop the anchor. Dropping the anchor over a subsea cable would only occur as a last resort to prevent an incident with potentially greater consequences such as a collision or allision. Additionally, the likelihood of a vessel requiring to drop anchor at a location where the export cables and other subsea cable developments are in close proximity is very low, with the assessment of vessel traffic data provided for the in isolation scenario again applicable.

9.11.196 It is assumed that, as with the export cables, North Falls, NeuConnect, and Sea Link will be subject to a Cable Burial Risk Assessment and will be shown on relevant nautical charts.

TIER 2

9.11.197 For this impact there is no direct link between the offshore ECC and any Tier 2 developments and therefore no additional assessment of effect has been undertaken.

TIER 3

9.11.198 For this impact there is no direct link between the offshore ECC and any Tier 3 developments and therefore no additional assessment of effect has been undertaken.

MITIGATION

9.11.199 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Cable Burial Risk Assessment;
- Charting of infrastructure;
- Guard vessels as required; and
- Promulgation of information.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.200 The frequency of occurrence and severity of consequence due to anchor interaction with subsea cables associated with the offshore ECC for the O&M phase of VE is presented in Table 9.23 alongside the resulting significance of effect.

Table 9.23: Significance of effect for anchor interaction with subsea cables (offshore ECC).

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	O&M	Anchor snagging incident occurs with anchor and/ or cable damage and compromised vessel stability.	Remote	Minor	Broadly Acceptable
Cumulative	O&M		Remote	Moderate	Tolerable

9.11.201 Further assessment will be undertaken post PEIR in relation to future case vessel traffic (in consultation with stakeholders) and will help inform the significance of effect at the ES stage.

IMPACT 10: REDUCTION OF EMERGENCY RESPONSE CAPABILITY (ARRAY AREAS AND OFFSHORE EXPORT CABLE CORRIDOR)

9.11.202 The presence of surface structures within the array areas and O&M activities associated with the array areas and offshore ECC may result in an increased likelihood of an incident occurring which requires an emergency response and may reduce access for surface and air responders, including SAR assets.

9.11.203 The MCA have noted during consultation that particular consideration is needed of the implications due to the presence of VE on SAR resources, with a SAR Checklist requiring completion post consent in consultation with the MCA.

9.11.204 The array areas and offshore ECC are considered collectively for this impact since the assessment undertaken is considered relevant to VE as a whole.

IN ISOLATION SCENARIO – ALL RECEPTORS

EMERGENCY RESPONSE RESOURCES

9.11.205 The O&M phase may last for up to 40 years with up to 27 O&M vessels located on-site simultaneously, and making up to 1,776 annual round trips. With a full build out of the array areas, these vessels will increase the likelihood of an incident requiring an emergency response and subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability.

9.11.206 There are various emergency response resources serving the region, including RNLI stations (closest at Aldeburgh approximately 21 nm to the north-west) and SAR helicopter bases (closest at Lydd approximately 63 nm to the south-west). Given the distances which would be travelled in the event of an emergency response incident in proximity to VE, this impact covers a regional spatial extent.

9.11.207 From historical incident data, there is a moderate rate of incidents in the region, although the likelihood of an incident relating to VE occurring at the same time is low. Additionally, based on the number of collision and allision incidents[10] associated with UK OWF reported to date, there is an average of one incident per 1,500 operational WTG years (as of November 2022). Therefore, VE itself is not expected to result in a marked increase in the frequency of incidents requiring an emergency response.

9.11.208 Additionally, should an incident occur in proximity to the array areas, it is likely that a project vessel would be well equipped to assist under SOLAS obligations (IMO, 1974) and in liaison with the MCA, potentially as the first responder. This is reflected in past experience, with 12 known instances of a vessel (or persons on a vessel) being assisted by an industry vessel for a nearby UK OWF.

9.11.209 The most likely consequences in the event of an incident in the region requiring an emergency response is that emergency responders are able to assist without any limitations on capability. As a worst case, there could be a delay to a response request due to a simultaneous incident associated with VE leading to PLL, pollution, and vessel damage. However, this worst case scenario is highly unlikely.

SEARCH AND RESCUE ACCESS

9.11.210 With a full build out of the array areas, its physical presence may restrict access for SAR responders, either due to the incident in question occurring within the arrays or the arrays obstructing the most effective path to each an incident (likely further offshore). This is more likely to be an issue in adverse weather conditions. The project is committed to working within the parameters of MGN 654 to minimise impacts.

9.11.211 From recent SAR helicopter taskings data, the frequency of UK SAR operations in proximity to the array areas is relatively low. Those incidents reported primarily occurred inshore of the array areas, with only one incident occurring east of the array areas.

9.11.212 The total area covered by the array areas is approximately 37 square nautical miles (nm^2), which represents a low to moderate area to search compared to other OWF. It is unlikely that a SAR operation will require both array areas to be searched; it is much more likely that a search could be restricted to the northern array area or southern array area exclusively depending upon the information available regarding the casualty location (inclusive of any assumptions on the drift of the casualty).

9.11.213 The minimum spacing between all structures (including OSPs) is 830 m which is greater than that associated with many other UK OWFs and similar to that present at the neighbouring Greater Gabbard and Galloper. The northern array area includes a SLoO but given the size of the array area this is not expected to compromise the effectiveness of a SAR operation noting that the longest SAR access lane for the indicative array layout is less than 5 nm length. As per MGN 654 requirements, a setback of at least 1 nm (measured tip-to-tip) will be maintained from the neighbouring Galloper for both array areas, assuming the array layouts do not align. This will allow a SAR asset to safely exit one array without entering the other.

[10] Although other types of incidents are acknowledged, collision and allision incidents have the potential to be among the most serious and give a reasonable indication of the rate of incidents requiring an emergency response.

9.11.214 The final array layout will be agreed with the MCA and Trinity House post consent but will be compliant with the requirements of MGN 654 (MCA, 2021), including:

- Completion of a safety justification for a SLoO layout should this be taken forward;
- Completion of a SAR Checklist;
- Completion of an ERCoP; and
- Application of unique identification marking of structures in an easily identifiable pattern.

9.11.215 The SAR Checklist and ERCoP will remain live documents throughout the O&M phase.

9.11.216 The most likely consequences in the event of a SAR operation is that SAR assets are able to fulfil their objectives without any limitations on capability. As a worst case, it may not be possible to undertake an effective search. However, given compliance with MGN 654 for the final array layout, this is considered highly unlikely.

CUMULATIVE SCENARIO – ALL RECEPTORS

TIER 1

9.11.217 Activities associated with East Anglia Two, North Falls, NeuConnect, and Sea Link will further increase the likelihood of an incident requiring an emergency response and could subsequently increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability.

9.11.218 However, as with VE, it is assumed that these developments will have suitable mitigation in place to reduce the likelihood of a reduction in emergency response capability including marine coordination for project vessels and ERCoPs. Furthermore, SOLAS obligations (IMO, 1974) are applicable to all developments and may have a positive effect on a cumulative level, e.g., a project vessel for East Anglia Two may be able to assist with an incident associated with VE.

9.11.219 Given that the array areas are not immediately adjacent to East Anglia Two (minimum separation of 2.86 nm), there is not considered to be any cumulative effect associated with SAR access, noting that this separation distance exceeds the 1 nm distance required by MGN 654.

TIER 2

9.11.220 Activities associated with East Anglia One North will further increase the likelihood of an incident requiring an emergency response and subsequently could increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability.

9.11.221 Again, it is assumed that East Anglia One North will have suitable mitigation in place to reduce the likelihood of a reduction in emergency response capability. However, given the distance from VE (minimum 18 nm), it is unlikely that SOLAS obligations would be as relevant for project vessels associated with East Anglia One North in the event of an incident associated with VE (compared with Tier 1 developments).

TIER 3

9.11.222 Activities associated with East Anglia Three, Norfolk Vanguard East, Norfolk Vanguard West, Hollandse Kust (West), and Hollandse Kust F will further increase the likelihood of an incident requiring an emergency response and subsequently could increase the likelihood of multiple incidents occurring simultaneously, diminishing emergency response capability.

9.11.223 Again, it is assumed that these developments will have suitable mitigation in place to reduce the likelihood of a reduction in emergency response capability. However, given the distance from VE (minimum 35 nm for East Anglia Three), it is unlikely that SOLAS obligations would be as relevant for project vessels associated with these developments in the event of an incident associated with VE.

9.11.224 Moreover, it is likely that differing emergency response resources may respond to an incident associated with these developments compared to VE, including Dutch resources (for Hollandse Kust (West) and Hollandse Kust F) and the Humber Maritime Rescue Coordination Centre (MRCC) (for Norfolk Vanguard East and Norfolk Vanguard West). Therefore, the likelihood of this impact arising is not substantially higher than with the Tier 2 developments *in situ*.

MITIGATION

9.11.225 Mitigation identified as relevant to reducing the significance of effect are as follows:

- Compliance with MGN 654;
- Lighting and marking;
- Marine coordination for project vessels;
- Pollution planning; and
- Project vessel compliance with international marine regulations.

POTENTIAL SIGNIFICANCE OF EFFECT

9.11.226 The frequency of occurrence and severity of consequence due to reduction of emergency response capability for the O&M phase of VE is presented in Table 9.24 alongside the resulting significance of effect.

Table 9.24: Significance of effect for reduction of emergency response capability.

Scenario	Phase	Worst case consequences	Frequency of occurrence	Severity of consequence	Significance of effect
VE in isolation	O&M	Delay to a response request and inability to undertake an effective search leading to vessel damage, PLL, and pollution.	Negligible	Serious	Broadly Acceptable
Cumulative	O&M		Extremely Unlikely	Serious	Tolerable

9.12 INTER-RELATIONSHIPS

9.12.1 Potential effects may arise on receptors from different aspects. For shipping and navigation, the following inter-related impact has been identified:

- Commercial fisheries – displacement of commercial fishing vessels from fishing grounds due to the presence of the buoyed construction/ decommissioning area during the construction and decommissioning phases.

9.12.2 Inter-related impacts are addressed in Volume 2, Chapter 14: Inter-relationships.

9.13 TRANSBOUNDARY EFFECTS

9.13.1 Given the international nature of routeing by commercial vessels – particularly in the region containing VE given the proximity to international maritime boundaries with the Netherlands and Belgium – a transboundary effect relating to the displacement of commercial vessels undertaking international voyages has been identified.

9.13.2 Since the use of AIS transceivers (the primary data source for characterisation of commercial vessel movements) is international, the characterisation of the existing environment in Section 9.7 is suitable for identifying relevant other European Economic Areas (EEA). Other EEAs with port(s) which feature in the main commercial routes include the Netherlands, Belgium, northern Europe, Germany, and the Baltic. Additionally, various routes in/ out of the Dover Strait have been identified and lead to further EEAs and beyond.

9.13.3 This aligns with the transboundary screening undertaken by the Planning Inspectorate which identified the Dutch, Belgian and French international maritime boundaries as closest to VE and displacement from existing routes as a potential impact (Planning Inspectorate, 2021).

9.13.4 Since such international commercial routeing is captured in the existing baseline environment, the environmental assessment for both VE in isolation and cumulatively with other projects and plans suitably considers this effect in transboundary terms.

9.14 SUMMARY OF EFFECTS

9.14.1 Based on the established existing environment, outputs of consultation with key stakeholders and consideration of the future case scenario including the outputs of collision and allision risk modelling, the following impacts have been assessed:

- Vessel displacement and increased collision risk (array areas and offshore ECC);
- Third-party with project vessel collision risk (array areas and offshore ECC);
- Reduced access to local ports and harbours and reduction in under keel clearance (array areas and offshore ECC);
- Creation of allision risk (array areas);
- Anchor interaction with subsea cables (array areas and offshore ECC); and
- Reduction of emergency response capability (including SAR access) (array areas and offshore ECC).

9.14.2 Overall, the environmental assessment concludes that there will be no significant effects arising from VE – both in isolation and cumulative with other projects – during the construction, O&M, and decommissioning phases.

9.14.3 Table 9.25 presents a summary of effects for shipping and navigation

Table 9.25: Summary of effects for shipping and navigation.

Description of impact	Significance of effect	Additional mitigation measures	Residual effect
Construction			
Impact C1: Vessel displacement and increased collision risk (array areas)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS	Broadly Acceptable
Impact C2: Vessel displacement and increased collision risk (offshore ECC)	Tolerable	Traffic management strategy discussed with local ports and the Sunk VTS	Tolerable with Mitigation
Impact C3: Third-party with project vessel collision risk (array areas)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS Inclusion of day-to-day project vessel movements in marine coordination	Broadly Acceptable
Impact C4: Third-party with project vessel collision risk (offshore ECC)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS	Broadly Acceptable
Impact C5: Reduced access to local ports and harbours and reduction in under keel clearance (array areas)	Broadly Acceptable	None identified	Broadly Acceptable
Impact C6: Reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC)	Tolerable	Traffic management strategy discussed with local ports and the Sunk VTS	Tolerable with Mitigation
O&M			

Description of impact	Significance of effect	Additional mitigation measures	Residual effect
Impact O1: Vessel displacement and increased collision risk (array areas)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS	Broadly Acceptable
Impact O2: Vessel displacement and increased collision risk (offshore ECC)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS	Broadly Acceptable
Impact O3: Third-party with project vessel collision risk (array areas)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS Inclusion of day-to-day project vessel movements in marine coordination	Broadly Acceptable
Impact O4: Third-party with project vessel collision risk (offshore ECC)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS	Broadly Acceptable
Impact O5: Reduced access to local port and harbours and reduction in under keel clearance (array areas)	Tolerable	None identified	Tolerable
Impact O6: Reduced access to local port and harbours and reduction in under keel clearance (offshore ECC)	Tolerable	Traffic management strategy discussed with local ports and the Sunk VTS	Tolerable with Mitigation
Impact O7: Creation of allision risk (array areas)	Tolerable	Discussions to identify suitable locations for OSPs	Tolerable with Mitigation
Impact O8: Anchor interaction with subsea cables (array areas)	Broadly Acceptable	None identified	Broadly Acceptable

Description of impact	Significance of effect	Additional mitigation measures	Residual effect
Impact O9: Anchor interaction with subsea cables (offshore ECC)	Broadly Acceptable	None identified	Broadly Acceptable
Impact O10: Reduction of emergency response capability (including SAR access)	Broadly Acceptable	None identified	Broadly Acceptable
Decommissioning			
Impact D1: Vessel displacement and increased collision risk (array areas)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS	Broadly Acceptable
Impact D2: Vessel displacement and increased collision risk (offshore ECC)	Tolerable	Traffic management strategy discussed with local ports and the Sunk VTS	Tolerable with Mitigation
Impact D3: Third-party with project vessel collision risk (array areas)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS Inclusion of day-to-day project vessel movements in marine coordination	Broadly Acceptable
Impact D4: Third-party with project vessel collision risk (offshore ECC)	Broadly Acceptable	Traffic management strategy discussed with local ports and the Sunk VTS	Broadly Acceptable
Impact D5: Reduced access to local ports and harbours and reduction in under keel clearance (array areas)	Broadly Acceptable	None identified	Broadly Acceptable

Description of impact	Significance of effect	Additional mitigation measures	Residual effect
Impact D6: Reduced access to local ports and harbours and reduction in under keel clearance (offshore ECC)	Tolerable	Traffic management strategy discussed with local ports and the Sunk VTS	Tolerable with Mitigation
Cumulative effects			
Impact 1: Vessel displacement and increased collision risk (array areas)	Tolerable[11]	Traffic management strategy (including cumulative considerations) discussed with local ports and the Sunk VTS	Tolerable with Mitigation
Impact 2: Vessel displacement and increased collision risk (offshore ECC)	Tolerable[5]	Traffic management strategy (including cumulative considerations) discussed with local ports and the Sunk VTS	Tolerable with Mitigation
Impact 3: Third-party with project vessel collision risk (array areas)	Tolerable[5]	Traffic management strategy (including cumulative considerations) discussed with local ports and the Sunk VTS Inclusion of day-to-day project vessel movements in marine coordination	Tolerable with Mitigation
Impact 4: Third-party with project vessel collision risk (offshore ECC)	Broadly Acceptable	Traffic management strategy (including cumulative considerations)	Broadly Acceptable

[11] Associated with construction and decommissioning phases – significance of effect is Broadly Acceptable for the O&M phase.

Description of impact	Significance of effect	Additional mitigation measures	Residual effect
		discussed with local ports and the Sunk VTS	
Impact 5: Reduced access to local port and harbours and reduction in under keel clearance (array areas)	Tolerable[5]	None identified	Tolerable
Impact 6: Reduced access to local port and harbours and reduction in under keel clearance (offshore ECC)	Tolerable	Traffic management strategy (including cumulative considerations) discussed with local ports and the Sunk VTS	Tolerable with Mitigation
Impact 7: Creation of allision risk (array areas)	Tolerable	Discussions to identify suitable locations for OSPs	Tolerable with Mitigation
Impact 8: Anchor interaction with subsea cables (array areas)	Broadly Acceptable	None identified	Broadly Acceptable
Impact 9: Anchor interaction with subsea cables (offshore ECC)	Tolerable	None identified	Tolerable
Impact 10: Reduction of emergency response capability (including SAR access)	Tolerable	None identified	Tolerable

9.15 POINTS FOR STAKEHOLDER CONSIDERATION AT SECTION 42

9.15.1 To assist with informing the impact assessment at the ES stage, VE OWFL would appreciate any feedback from stakeholders as part of their Section 42 consultation response on the following points:

- VE OWFL has undertaken substantial consultation relating to the offshore ECC and have accounted for this in determining the preferred offshore ECR. Are you

satisfied that concerns have been addressed by the preferred offshore ECR? And if not then why and what additional mitigation measures are requested?

- VE OWFL would be grateful if you could provide predicted future case vessel traffic values for operations including any sources that can be considered in the detailed future case vessel traffic methodology proposed for the ES stage.
- VE OWFL would be grateful if you could provide any additional mitigation measures that could be considered to ensure the significance of effect associated with the offshore ECC is reduced to acceptable levels, e.g., traffic management strategies.
- If any of the concerns raised in response to the previous points relate to the presence of another cumulative development then please highlight this other development.
- If you feel unable to adequately respond to these points at this stage then please advise what additional information is required to allow you to do so.

9.16 NEXT STEPS

9.16.1 Although this chapter and the NRA do address the requirements of MGN 654 Checklist (see Appendix A of the NRA), it is acknowledged that various additional steps will be required post PEIR to ensure a comprehensive environmental assessment and NRA is submitted at the ES stage. These include:

- Additional consultation with shipping and navigation stakeholders including through Section 42;
- Consideration of the RYA Coastal Atlas of Recreational Boating (RYA, 2019);
- Development of a detailed methodology for future case vessel traffic;
- Modelling of vessel to vessel encounters for the pre wind farm scenario based on the vessel traffic survey data; and
- Consequences assessment based on the outputs of the collision and allision risk modelling.

9.16.2 The completion of these additional steps will allow further inputs to be considered in the environmental assessment, thus ensuring that the significance of effect determined for each impact at the ES stage is as well informed as possible.

9.17 REFERENCES

BEIS (2021). Draft National Policy Statement for Renewable Energy Infrastructure (EN-3).

DECC (2011). Overarching National Policy Statement for Energy (EN-1).

DECC (2011). National Policy Statement for Renewable Energy Infrastructure (EN-3).

DfT (2012). National Policy Statement for Ports.

HM Government (2011). UK Marine Policy Statement.

IALA (2021). International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation O-139 on The Marking of Man-Made Offshore Structures. Edition 3.0.

IALA (2021). International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Guidance G1162: The Marking of Offshore Man-Made Structures. Edition 1.1.

IMO (1972/77). Convention on International Regulations for Preventing Collisions at Sea (COLREGs).

IMO (1974). International Convention for the Safety of Life at Sea (SOLAS).

IMO (2018). Revised Guidelines for Formal Safety Assessment (FSA) for Use in the Rule-Making Process. MSC-MEPCC.2/Circ.12'Rev.2.

MCA (2021). Marine Guidance Note 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response.

Planning Inspectorate (2021). Transboundary screening undertaken by the Planning Inspectorate (the Inspectorate) on behalf of the Secretary of State (SoS) for the purposes of Regulation 32 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 2017 EIA Regulations).

UKHO (2020). Admiralty Sailing Directions Dover Strait Pilot NP28. 13th Edition.

UKHO (2021). Admiralty Sailing Directions North Sea West Pilot NP28. 12th Edition.

UN (1982). United Nations Convention on the Law of the Sea.

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