# The Sizewell C Project

## 6.3 Volume 2 Main Development Site

### Chapter 24 Marine Navigation

### Appendices 24A - 24B

| | |
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# VOLUME 2 APPENDIX 24A NAVIGATIONAL RISK ASSESSMENT

# Sizewell C Project

# Appendix 24A

# Navigational Risk Assessment

| | |
|---|---|
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| **Presented to** | SZC Co. |
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*Please note that the red line boundary was amended after this document was finalised, therefore figures in this document do not reflect the boundaries in respect of which development consent has been sought in this application. However, amendments to the red line boundary do not have any impact on the findings set out in this document and all other information remains correct.*

# Table of Tables

# Abbreviations Table

| Abbreviation | Definition |
|---|---|
| **AIL** | Abnormal Indivisible Load |
| **AIS** | Automatic Identification System |
| **ALARP** | As Low as Reasonably Practicable |
| **BLF** | Beach Landing Facility |
| **CDO** | Combined Drainage Outfall |
| **DCO** | Development Consent Order |
| **DfT** | Department for Transport |
| **DWT** | Deadweight Tonnage |
| **EIA** | Environmental Impact Assessment |
| **EPR** | European Pressurised Reactor |
| **ES** | Environmental Statement |
| **EU** | European Union |
| **FLO** | Fisheries Liaison Officer |
| **FRR** | Fish Recovery and Return |
| **km** | Kilometre |
| **IMO** | International Maritime Organisation |
| **m** | Metre |
| **MAIB** | Marine Accident Investigation Branch |
| **MMO** | Marine Management Organisation |
| **MW** | Megawatt |
| **NRA** | Navigational Risk Assessment |
| **RNLI** | Royal National Lifeboat Institution |
| **RYA** | Royal Yachting Association |
| **UK** | United Kingdom |
| **UKHO** | United Kingdom Hydrographic Office |
| **ZOI** | Zone of Influence |

# 1 Introduction

Anatec Ltd were commissioned by SZC Co. to undertake a Navigational Risk Assessment (NRA) for the development of Sizewell C, a nuclear power station on the Suffolk Coast.

An initial baseline assessment is undertaken to identify navigational features and shipping activity in the vicinity of the proposed development. This is then used to identify the potential impacts related to shipping and navigation associated with the construction and operational phases of the proposed development. The significance of each impact is then determined using the International Maritime Organisation (IMO) Formal Safety Assessment process (Ref. 1).

## 1.1 Objectives

A NRA has been undertaken for the proposed development and includes:

- overview of navigational features;
- marine traffic survey;
- Formal Safety Assessment;
- impacts on marine navigation; and
- identification of mitigation measures.

# 2 Guidance and Legislation

## 2.1 Legislation

The following legislation has been used for this assessment:

- United Nations Convention on the Law of the Sea (Ref. 2) – which defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment and the management of marine natural resources.
- IMO International Regulations for Preventing Collisions at Sea 1972/78 (Ref. 3), as implemented in the UK through Merchant Shipping Notices – which sets the navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels.
- Chapter V, Safety of Navigation, of the Annex to the International Convention for the Safety of Life at Sea (Ref. 4), as amended, as implemented under United Kingdom (UK) legislation by The Merchant Shipping (Safety of Navigation) Regulations 2002 (Ref. 5) which specifies minimum standards for the construction, equipment and operation of ships, compatible with their safety.

## 2.2 Primary Guidance

The primary guidance document used during the assessment is given below:

- The Formal Safety Assessment method used in this assessment complies with the IMO guidelines for Formal Safety Assessment – MSC/Circ. 1023 (Ref. 1).

## 2.3 Secondary Guidance

The secondary guidance documents used during the assessment are listed below:

- Marine Guidance Note 543 (Ref. 6) Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response Issues.
- International Association of Marine Aids to Navigation and Lighthouse Authorities Recommendation O-129 on the Marking of Man-Made Offshore Structures, Edition Two (Ref. 7).

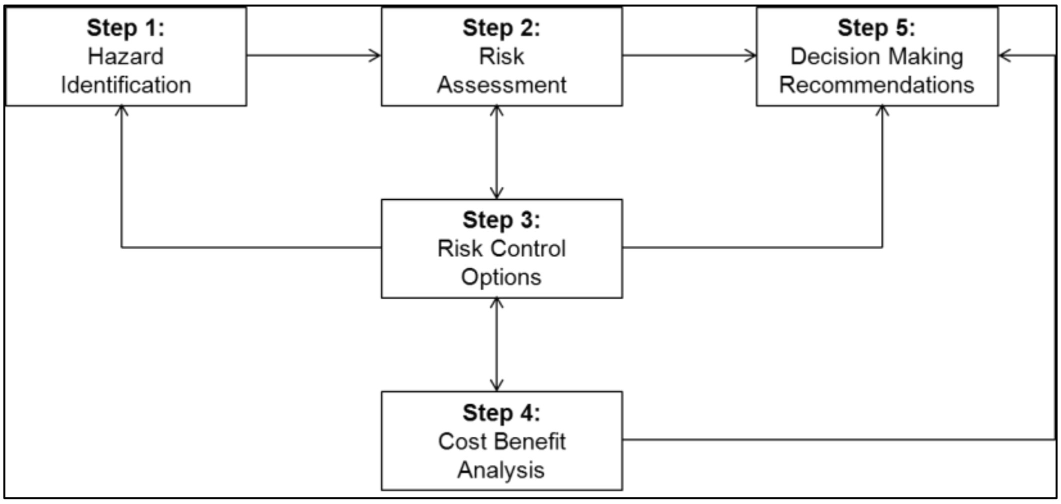
# 3 Navigational Risk Assessment Methodology

## 3.1 Formal Safety Assessment Methodology

The IMO Formal Safety Assessment process (Ref. 1) approved by the IMO in 2002 under SC/Circ.1023/MEPC/Circ392 has been applied within this study. This is a structured and systematic methodology based on risk analysis and cost benefit analysis (if applicable). There are five basic steps within this process (this assessment focuses on Steps 1-3):

- identification of hazards (a list of all relevant accident scenarios with potential causes and outcomes);
- assessment of risks (evaluation of risk factors);
- risk control options (devising regulatory measures to control and reduce the identified risks);
- cost benefit analysis (determining cost effectiveness of risk control measures); and
- recommendations for decision-making (information about the hazards, their associated risks and the cost effectiveness of alternative risk control measures).

**Figure 3.1** is a flow diagram of the Formal Safety Assessment methodology applied.




### Figure 3.1 Formal Safety Assessment process

The NRA uses a baseline assessment (established using the data sources listed in **section 6**), in addition to consultation with local stakeholders, to identify potential impacts relevant to shipping and navigation receptors that may arise as a result of the marine aspects of the Sizewell C development.

The impacts have been identified by phase, i.e. construction phase, and operations phase. Where identified, the overall severity of consequence to the receptor and the frequency of occurrence have been determined. As this process incorporates a degree of subjectivity, the assessment uses the various sources provided within the NRA to inform the rankings assigned to each impact.

The severity of consequence has been assessed against the frequency of occurrence to provide the level of tolerability of the impact. Further detail of the assessment methodology is provided in **section 13**.

## 3.2 Cumulative Impacts Assessment Methodology

The assessment of cumulative impacts within this NRA will consider the impacts arising from multiple development activities within proximity of the Sizewell C development. It is noted that fishing, recreation and military transits have been considered as part of the baseline assessment. The cumulative impacts that are considered are detailed in **section 14**.

## 3.3 Assumptions

The navigation baseline and impact assessment has been carried out based on the information available and responses received at the time of preparation. It is assumed that any notable changes will be re-assessed if required.

Assumptions related to construction works and time scales are discussed in **section 4**.

# 4 Project Design Statement

## 4.1 Project Overview

The project, known as Sizewell C Project, will be a new nuclear power station located on the Suffolk coast, north of Sizewell B. The construction of Sizewell C, consisting of two European Pressurised Reactor (EPR™) reactors, will involve the import of backfill material, bulk construction material and Abnormal Indivisible Loads (AILs), as well as other general goods. The proposed development consists of a Beach Landing Facility (BLF) constructed to accept AILs.

## 4.2 Sizewell C Infrastructure

**Figure 4.1** presents a general overview of the Sizewell C infrastructure. The marine components used for assessment of construction and operational impacts include:

- BLF;
- cooling water infrastructure including intakes and outfall heads;
- fish recovery and return (FRR) system; and
- combined drainage outfall (CDO).

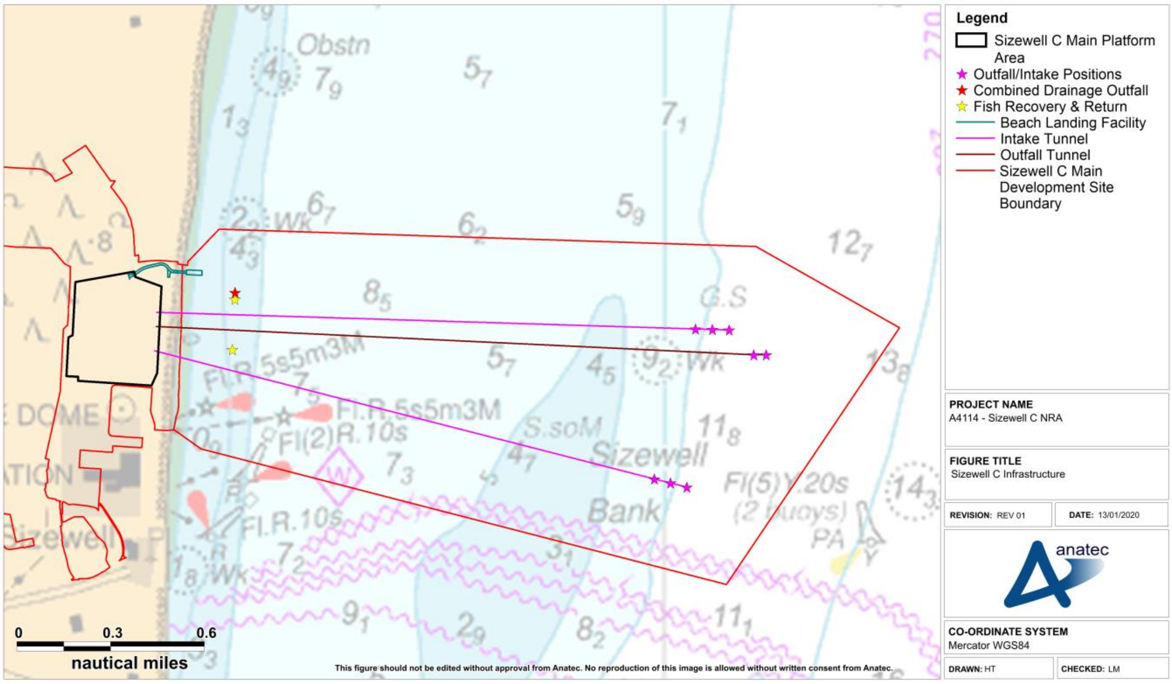



**Figure 4.1 Sizewell C infrastructure**

The BLF is required for delivery of AILs during the construction phase and during the operational phase if maintenance is required. The landward termination of the BLF will be at approximately 5.5 metre (m) Above Ordnance Datum to provide the necessary depth to accommodate the required barges. The BLF will include a temporary deck structure that can be removed when not in use, leaving minimum visible elements. To accommodate the safe passage of barges and accompanying tugs to the BLF a navigational channel and grounding area will be required in the nearshore zone. Further details on AIL deliveries are provided in **section 4.3.**

The FRR systems and the CDO tunnels will be directionally drilled under the beach. The structures will rest within the sand surface and therefore are not expected to present any risk to shipping and navigation.

The cooling water infrastructure consists of two intake tunnels and one outfall tunnel, both approximately 3 kilometre (km) long and excavated by tunnel boring machines from landward. Vertical connecting shafts will be driven down to meet each tunnel. Seabed headworks will be mounted at the head of each shaft; two structures per intake tunnel and two structures on the outfall tunnel. The possible locations of the structures are shown in **Figure 4.1**. Each structure will be secured to the bedrock by piles.

The proposed dimensions of the outfall structure are approximately 15m (length) by 15m (breadth) by 8m (height), protruding approximately 4m above initial seabed level. The water depths at the two possible locations are 15.19m and 15.29m, relative to lowest astronomical tide, giving a clearance of 11.09m and 11.19m.

The proposed dimensions of the intake structures (worst case) are 50m (length) by 10m (breadth). The height of the structures at their highest point is 8m, protruding approximately 4m above initial seabed level (noting that the structure will be at this height for a maximum length of 35m). The water depths at the possible locations range from 9.89m to 13.49m relative to lowest astronomical tide, giving a clearance of 5.89m to 9.49m for the intake structures.

## 4.3 AIL Deliveries

The construction period is expected to comprise four annual campaigns of offshore works, each with a seven month campaign period lasting between 31st March and 31st October. During each annual campaign period, there is estimated to be 50 AIL deliveries resulting in a total approximation of 200 beach landings within the course of the construction period. There are three ports being considered as the transhipment facility base including Great Yarmouth, Harwich and Rotterdam.

During the operational phase, AIL deliveries would only be required if a large piece of equipment needed to be replaced. It is estimated that AILs would occur once every five years and comprise very few individual deliveries.

## 4.4 Construction Works

Dredging will be required to create an access channel for the BLF during the construction phase and throughout the operational phase, as required. Plough dredging will be used to create a planar surface for the barges to come aground. Plough dredging agitates the sediment which is then transported away by the tide. Dredging activities could be up to 12 weeks. During the construction period, it is estimated that small scale dredging (approximately 10% of the initial volume) will also be required at monthly intervals. A full scale maintenance dredge is anticipated annually due to infilling during winter periods. Marine piling for the BLF will be constructed from a walking jack-up barge or from the advancing BLF as construction progresses seawards. Given the low volume of materials, it is unlikely that there will be multiple trips.

Dredging (maximum of 12 weeks) will also be required for the placement of the intake/outfall headworks. The structures will be pre-built and lowered into place by crane vessels with support vessels. Placement of heads is likely to be completed within six months.

The intake/outfall tunnels will be excavated by directional drilling from landward and are not expected to present a risk to shipping and navigation. Drilling of the shafts will likely be undertaken by a jack-up barge, with support vessels. It is assumed that this will take a maximum of six months.

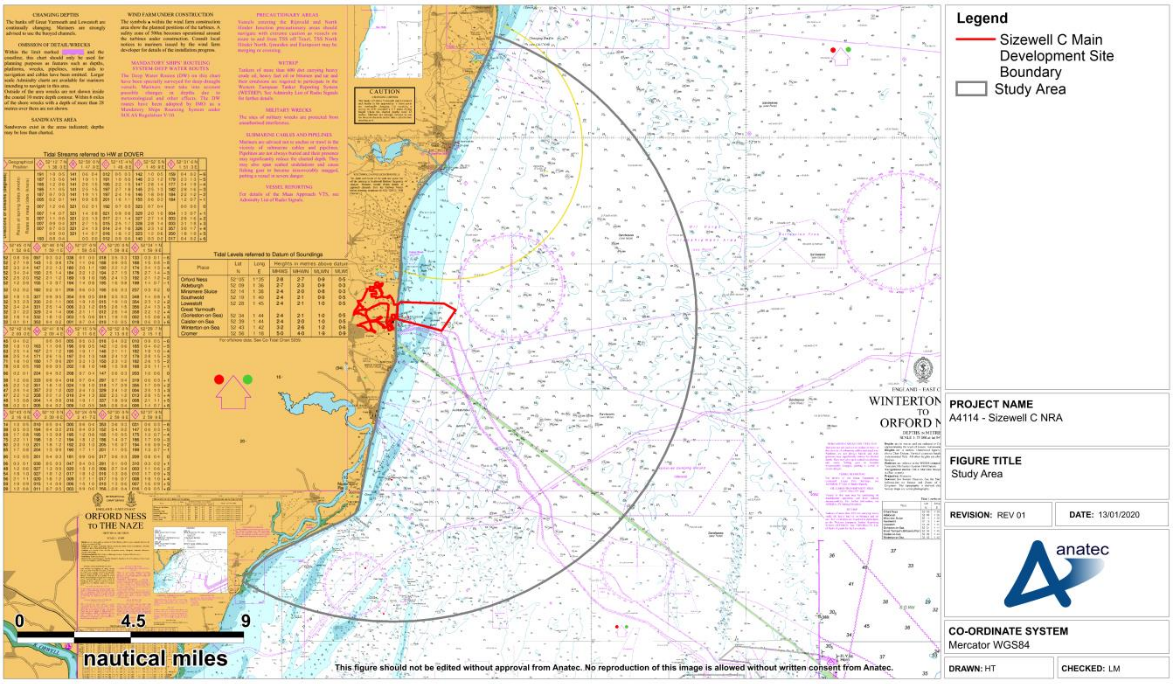
There may also be dredging requirements prior to installation of the FRR and CDO.

Other vessel movements associated with construction include support vessels such as guard boats, small survey vessels, support ribs, work boats, etc. These vessels are considered to pose a lesser risk to marine navigation compared to jack-up barges, crane vessels and dredgers, as they are smaller and not restricted in manoeuvrability.

Each phase of offshore construction (i.e. BLF, intake/outfall headworks, CDO, FRR) in intended to be completed within one calendar year.

## 4.5 Study Area

The study area for the baseline analysis (defined as a 12nm buffer around the Sizewell C location) is presented in **Figure 4.2.**




## Figure 4.2 Study area

# 5 Consultation

## 5.1 Scoping

A scoping request was submitted to the Secretary of State in 2014 with regards to the proposed Sizewell C nuclear development as part of the consultation process. The main issues raised from scoping from a shipping and navigation perspective are summarised below in **Table 5.1**. Following changes to the proposed development since the 2014 scoping process, a new Scoping Report was issued in 2019. The main issues raised in the 2019 scoping opinion are summarised in **Table 5.2.**

**Table 5.1 Summary of 2014 scoping responses**

| Organisation/ Company | Summary of Scoping Response | Response/Where Addressed |
|---|---|---|
| Marine Management Organisation (MMO) | A NRA is required which will form part of the Environmental Impact Assessment (EIA). The NRA will consider recreation and commercial navigation, plus any cumulative effects. | This document forms the NRA. Recreation and commercial navigation has been assessed in **section 10**.<br>Any cumulative effects have been considered in **section 14**. |
| MMO | It would be beneficial to characterise vessel traffic to and from ports and harbours within the study area (e.g. Southwold, Walberswich, etc.), and larger ports and harbours adjacent to the study area (e.g. Felixstowe, Harwich, etc.). Additionally, effects and interaction with marine traffic using the Southwold ship-to-ship transfer area should also be considered within the NRA. | Analysis of vessel destinations undertaken in **section 10**.<br>Vessels using the Southwold ship-to-ship transfer area are included in the baseline assessment. |
| MMO | Coastline adjacent to the proposed location is frequented by recreational vessels. Commercial angling boats also operate in the inshore area around Sizewell. The effect upon these sea-users during and after the works should be assessed. | Impacts to recreational activity have been assessed in **section 13**. |

| Organisation/ Company | Summary of Scoping Response | Response/Where Addressed |
|---|---|---|
| Galloper Wind Farm Ltd | Galloper Wind Farm should be considered as a key receptor with regard navigation, in particular when considering the effects of Sizewell C construction on the water intakes on construction and maintenance of Galloper Wind Farm export cables in their vicinity. | Cumulative impacts associated with Galloper Wind Farm assessed in **section 14.** |

**Table 5.2 Summary of 2019 scoping responses**

| Organisation/ Company | Summary of Scoping Response | Response/Where Addressed |
|---|---|---|
| Planning inspectorate | The Scoping Report states that the off-site associated development of the proposed development do not have the potential to impact the marine environment and is therefore scoped out of assessment. In the case of effects on marine navigation the inspectorate considers that significant effects are unlikely to result from the off-site associated development and agrees to scope this matter out of the **Environmental Statement (ES)** (Doc Ref. 6.2). | N/A |
| Planning inspectorate | The **ES** should identify the anticipated type and number of vessel movements generated by the development during the construction and operation phases and assess the potential impact to other existing vessel movements in the area. | Type and number of vessel movements described in **chapters 3 and 4** of **volume 2** (Doc Ref. 6.2). Impact to existing vessel movements assessed in **section 13.5**. |
| Planning inspectorate | The operation of the BLF has potential to cause disturbance to fishing and recreational activities through collision and displacement. These impacts must be assessed where a likely significant effect would occur. | Impacts to fishing and recreational activities assessed in **section 13.5**. |
| MMO | We welcome the intention to complete an additional (14 day) marine traffic survey in June/Summer 2019. | N/A |

| Organisation/ Company | Summary of Scoping Response | Response/Where Addressed |
|---|---|---|
| Maritime and Coastguard Agency | The overall approach to the required and updated traffic study and NRA as described in **section 6.17** is accepted. | N/A |
| Maritime and Coastguard Agency | The applicant should consult with Trinity House Lighthouse Service for the requirements for lighting and marking of the outfalls and jetty | Consultation with Trinity House undertaken (see **section 5.3**) |
| Defence Infrastructure Organisation | With respect to the offshore element of the proposed development, it is noted that the scheme will feature the installation of subsea coolant intake and discharge infrastructure. The Ministry of Defence would wish to review the plans for any such installations and associated marine works to ensure they will not impact on generic maritime defence interests. | Noted |

## 5.2 Hazard Workshop

The Sizewell C Hazard Workshop was held on the 3 April 2019 at the Waterloo Centre in Leiston. The purpose of this workshop was to provide an opportunity to consult both statutory and local stakeholders to identify potential hazards to shipping and navigational safety. The output was then used to inform the Hazard Log, which is discussed further in **section 12**; however for reference, the key consultation points arising from the meeting are presented below in **Table 5.3.**

In addition, a previous Hazard Workshop was held on 5 March 2015 as part of an earlier stage of the consultation process. Relevant key points from this workshop are presented in **Table 5.4.**

### Table 5.3 2019 Hazard Workshop main points

| Organisation | Point Raised | Response/Where Addressed |
|---|---|---|
| Local Fisherman | Queried whether marker buoys would be used to mark the headworks as they are obstructions on the seabed, which need to be marked for fishing. Also queried whether any buoys would be lit and/or visible on radar. | Marker buoys included as additional mitigation (**section 13.6**). Trinity House will advise on all requirements for marker buoys. A separate meeting was held with Trinity House on 22 May 2019 (see **section 5.3**). |
| | Queried whether there would be an exclusion area around the headworks. | No exclusion area associated with the headworks once operational. |
| | Lobster and crab fishing grounds could be impacted by dredging (similar to Sizewell B). | Disruption to fishing activities assessed in **section 13.5**. |
| | Fishing activity during winter survey may be impacted by construction of Galloper and Greater Gabbard wind farms. | Summer survey will not be influenced by construction activities. |
| | Major disruption to one local fisherman. | Disruption to fishing activities assessed in **section 13.5**. |
| Cruising Association | Recreational activity under-represented by automated identification system data. Yachts will move further offshore in bad weather and location depends on tidal stream. | Traffic surveys included radar data and visual observations as well as Automatic Identification System (AIS) data to ensure recreational activity represented. |

| Organisation | Point Raised | Response/Where Addressed |
|---|---|---|
| | Recreational fishing boats operating from Sizewell beach may be more exposed to risks. | Impact to recreational craft, including recreational fishing boats, assessed in **section 13**. |
| Royal Yachting Association (RYA) | There would be benefit in issuing notices to local marinas and ports, including Great Yarmouth, Harwich, Ipswich and Southwold. | Circulation of information included as embedded mitigation (**section 13.4**). |
| RYA | Collision risk associated with dredgers should be included in impact assessment. | This impact is assessed in **section 13.5**. |
| Royal National Lifeboat Institution (RNLI) | Patrol launch and guard vessels suggested as mitigation during construction activities. | Guard vessels included as embedded mitigation (**section 13.4**). Patrol launch considered as additional mitigation (**section 13.6**). |
| Cruising Association | Mitigation measures should include prescribed routes for barges coming into the BLF. | Delivery and logistics plan for all AIL deliveries will be available. This is included as embedded mitigation (**section 13.4**). |
| RNLI | Suggested that the coastguard be informed well in advance of construction activities, with minimum of 10 days' notice for notice to mariners. | Notice to mariners included as embedded mitigation (**section 13.4**). |

### Table 5.4 2015 Hazard Workshop main points

| Organisation | Point Raised | Response / Where Addressed |
|---|---|---|
| Cruising Association | The importance of carrying out localised analysis of vessel movements in the immediate vicinity of Sizewell C was emphasised. | Vessel based surveys at the site were carried out including AIS and radar to record all local movements. Findings are presented in **section 10.** |
| | It was noted that recreational craft take account of tide when passage planning and thus further analysis on the effect of tide on the direction of recreational transit to be undertaken within the NRA. | Recreational vessels have been analysed by course in **section 10.9**, with tidal data also presented for the area. |
| | Recreational users are likely to stay clear of construction vessels and therefore the likelihood of a recreational vessel/Sizewell C construction vessel collision was low. | Increased risk of vessel collision due to the presence of construction vessels assessed in **section 13.** |
| SZC Co. | The importance and potential impact from hazardous cargoes within the vicinity of Sizewell C was highlighted. Analysis of hazardous cargo criteria (broadcast on AIS) for data to be carried out in NRA. | Discussion of hazardous cargoes presented in **section 10.11.** |
| Galloper Wind Farm Ltd | Introduction of east-west traffic transiting to Sizewell C in an area dominated by north-south traffic could increase vessel to vessel collision risk. | Traffic only constrained to transiting east-west within navigational corridor. Impact of vessel to vessel collision risk assessed in **section 13.** |

| Organisation | Point Raised | Response / Where Addressed |
|---|---|---|
| Orford & District Fishing Association | Queried whether the water intakes/outfalls would be designed in order to reduce the probability of snagging. | Due to design this is not possible, however mitigation measures to reduce risk of snagging presented in **section 13.4.** |
| CEMEX UK Marine Ltd | Issue of deliberate grounding was raised for vessels in distress in the vicinity of the development. | The risk of grounding is assessed in **section 13.** |
| Hanson Aggregates Marine Ltd. | It was noted that the movements of survey vessels, tenders and tug boats are to be fully considered within the NRA. | Vessel based surveys (AIS & radar) undertaken for the area. Findings are detailed in **section 10.** |
| All | Details of response to oil spills (particularly due to the presence of the oil cargo transhipment area) to be included in the NRA. | Emergency responses for the area are detailed in **section 8.** |

## 5.3 Additional Consultation Meetings

### 5.3.1 November 2014

A consultation meeting was held at the EDF office on Friday 21 November 2014 with representatives from Trinity House Lighthouse Service, Maritime and Coastguard Agency, Anatec, NNB Genco, Royal Haskoning DHV and the MMO. Key points from the meeting are summarised in **Table 5.5**. It should be noted that, at this time, the option for a Marine Offloading Facility was still being considered, but has since been scoped out; therefore any comments relevant to the Marine Offloading Facility have been excluded.

**Table 5.5 2014 meeting on navigation issues main points**

| Organisation/ Company | Point Raised | Response/Where Addressed |
|---|---|---|
| Anatec | Radar indicated high levels of recreational activity, particularly in summer. This should be outlined in the shipping analysis. | Analysis of recreational activity (AIS & radar) was undertaken. Findings are detailed in **section 10.** Disruption to recreational activities assessed in **section 13.** |
| Trinity House Lighthouse Service | Queried whether the water intakes/outfalls should have some form of navigation protection (such as a restricted area). | Further consultation (see below) confirmed that the structures should be marked with buoys or beacons. |
| Maritime and Coastguard Agency | It was noted that the presence of shipwrecks nearby could attract divers. | The locations of wrecks identified within proximity to the Sizewell C location are presented in **section 7.** |
| Trinity House Lighthouse Service/Maritime and Coastguard Agency | Advised that data should not be more than two years old to inform a navigation assessment. | Winter 2018 and summer 2019 surveys undertaken. |
| Maritime and Coastguard Agency | Discussions had on the requirements for a harbour authority. | Application for competent harbour authority included in Sizewell C Development Consent Order (DCO) application. |

### 5.3.2 May 2019

A consultation meeting was held at Trinity House office on Wednesday 22 May 2019, with representatives from Trinity House and the Maritime and Coastguard Agency. Key points from the meeting are summarised in **Table 5.6.**

**Table 5.6 Additional consultation meeting key points**

| Organisation/ Company | Point Raised | Response/Where Addressed |
|---|---|---|
| Trinity House | The clearance of the structures below sea level was queried based on the heights and the water depths on the charts. | The water depths used in the assessment were identified in detailed bathymetric surveys. |
| Trinity House | Trinity House agreed that the intake/outfall structures will need to be marked either by beacons or buoys. If buoys are used, the eastern-most structure associated with each tunnel should be marked. If beacons are used, the western-most structure could also be marked. | Marking of structures with buoys or beacons included in embedded mitigations (**section 13.4**). |
| Maritime and Coastguard Agency | Maritime and Coastguard Agency agreed that although the headworks are large, marking them with buoys or beacons will mitigate the risk. | Marking of structures with buoys or beacons included in embedded mitigations (**section 13.4**). |
| Trinity House | The offshore piles associated with the BLF will need to be marked. No need to mark the inner pilings. | Marking of offshore piles included in embedded mitigations (**section 13.4**). |
| Trinity House | Raised the possibility of marking the construction zone for the intake/outfall structures with buoys. | Included as additional mitigation (**section 13.6**). |

# 6 Data Sources

## 6.1 Data Sets

The key data sources of information used to inform this assessment are listed below:

- shipping data including automated identification system and radar data;
- MMO satellite fishing data (Ref. 8);
- ten years of Marine Accident Investigation Branch (MAIB) data, 2005-2014 (Ref. 9);
- ten years of RNLI incident data, 2005-2014 (Ref. 10);
- UK Admiralty charts (Ref. 11);
- Admiralty sailing directions, North Sea (West) Pilot, 10th edition (Ref. 12) and Dover Strait Pilot, 10th edition (Ref. 13);
- aggregate dredging areas from The Crown Estate (Ref. 14);
- offshore wind farms from The Crown Estate (Ref. 15); and
- recreational boating facilities and general boating areas (Ref. 16).

### 6.1.1 Shipping Data

The primary input to this NRA is the shipping survey data collected from vessel-based surveys undertaken at the Sizewell C location, comprising AIS recordings, radar recordings, and visual observations (where feasible). The data was taken from the following periods to cover seasonal variation:

- 16 November – 30 November 2018.
- 14 June – 28 June 2019.

AIS equipment is required to be fitted on all vessels of 300 gross tonnage and upwards engaged on international voyages, cargo vessels of 500 gross tonnage and upwards not engaged on international voyages, and passenger vessels irrespective of size, built on or after 1 July 2002. As of the 31 May 2014, all fishing vessels of length 15m and above are required to carry AIS equipment.

The reporting interval between position reports for a given vessel is typically a few seconds up to three minutes, depending on its speed and navigational status (less frequent for anchored and moored vessels).

Supplementary AIS and radar fishing vessel data collected over two 14 days periods in winter 2015 and summer 2016 was also used to validate fishing activity.

### 6.1.2 Satellite Data

The MMO monitors fishing vessels of 15m and above via a vessel monitoring system. This is presented as a fishing intensity grid for the United Kingdom Continental Shelf. Five years of fishing data (2013-2017) was reviewed to inform the baseline. It is noted, fishing activity for 2018 was not available at time of writing.

### 6.1.3 RNLI and MAIB Data

The RNLI logs details of incidents it responds to, including the cause of the incident. Data were available for 2005 to 2014.

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 are inside the UK 12nm territorial waters and carrying passengers to a UK port. There are no requirements for non-commercial recreational craft to report accidents to MAIB. The MAIB will record details of significant accidents of which they are notified by bodies such as the Coastguard, or by monitoring news and other information sources for relevant accidents. When reporting the location of incidents, the MAIB aim for 97% accuracy. Data were available from 2005 to 2014.

### 6.1.4 UK Admiralty Charts

Admiralty charts are nautical charts issued by the United Kingdom Hydrographic Office (UKHO) and are subject to Crown Copyright. The charts have been used to identify navigational features in the area as well as ports/ harbours. The following are the main charts used in this study:

- 1504: Cromer to Orford Ness.
- 1543: Winterton Ness to Orford Ness.
- 1610: Approaches to the Thames Estuary.
- 1630: West Hinder and Outer Gabbard to Vlissingen and Scheveningen.
- 2052: Orford Ness to the Naze.

### 6.1.5 Admiralty Sailing Directions

Pilot books are used by mariners to safely navigate when steaming on passage, and to identify safe anchorage and berthing. The North Sea (West) Pilot Book (Ref.7) and the Dover Strait Pilot Book (Ref.8) have been used in this assessment to identify the significant navigational features in proximity to the proposed development.

### 6.1.6 Aggregate Dredging Areas

The marine aggregate dredging area layer was obtained from The Crown Estate. The Crown Estate are responsible for providing licences for the extraction of marine sand and gravel resources from the seabed, which are an important source of quality aggregate for construction and civil engineering projects. They are also responsible for licensing capital and maintenance dredging projects which enable navigational channels to be created and maintained on the UK seabed. The latest available data is from April 2018.

### 6.1.7 Offshore Wind Farms

The offshore wind farm boundaries in proximity to the Sizewell C development were obtained from The Crown Estate. The latest available layer is from July 2019.

### 6.1.8 RYA Coastal Atlas UK

The RYA UK Coastal Atlas of Recreational Boating 2.0 provides data relating to the recreational boating activity around the UK. The data set includes an intensity grid, general boating areas and offshore routes, as well as the locations of clubs, training centres and marinas. The intensity grid utilises AIS data from 2016.

## 6.2 Data Limitations

The main limitations associated with the data sets are outlined below.

- AIS equipment carriage is not mandatory for all vessels. Military vessels and smaller craft such as fishing vessels below 15m in length and recreational craft are not required to carry AIS, and therefore will be under-represented within the analysis.
- Trials carried out by Anatec in the North Sea found that a minority of fishing vessels do not broadcast on AIS at all times, especially when engaged in fishing, thus coverage of fishing vessels 15m length and under may be under-represented.

Radar data and visual observations have been used to supplement AIS to help overcome these limitations.

# 7 Navigational Features

## 7.1 Main Ports

**Figure 7.1** presents the main ports relative to the proposed Sizewell C development.

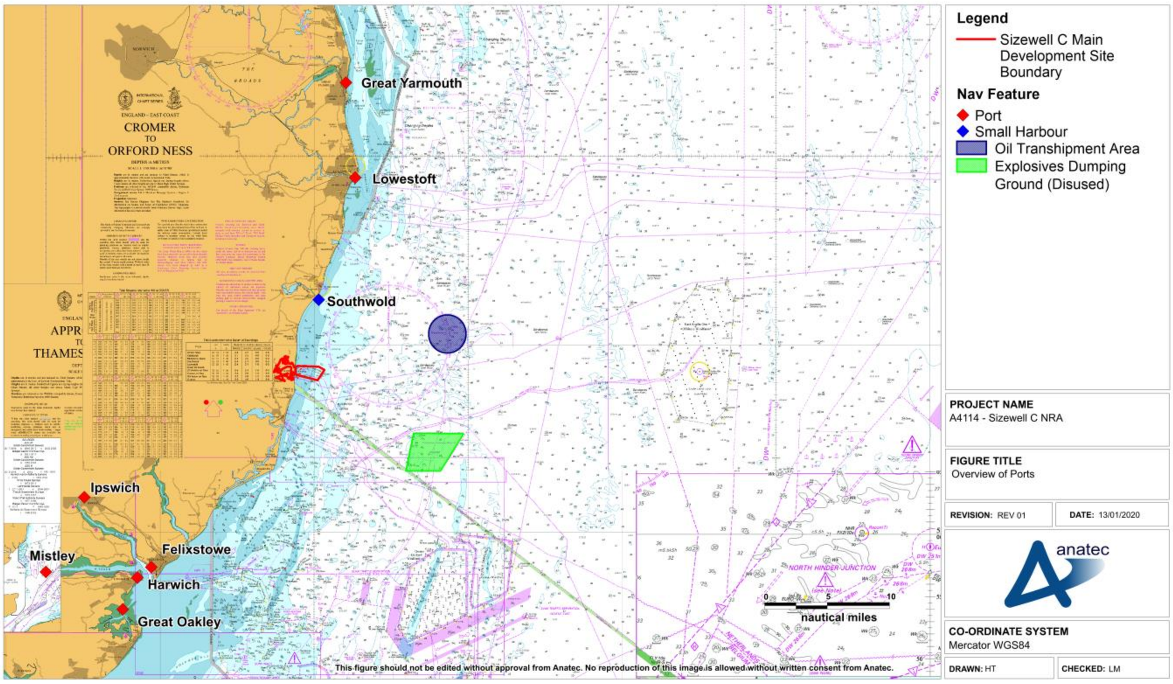



**Figure 7.1 Overview of ports**

The closest major port to the Sizewell C development is the Port of Lowestoft, located approximately 16nm to the north. Felixstowe and Ipswich are the closest ports to the south, however these are located in excess of 20nm away, as is Great Yarmouth to the north. Great Yarmouth and Harwich, as well as Rotterdam, are the three ports being considered as the transhipment port for Sizewell C.

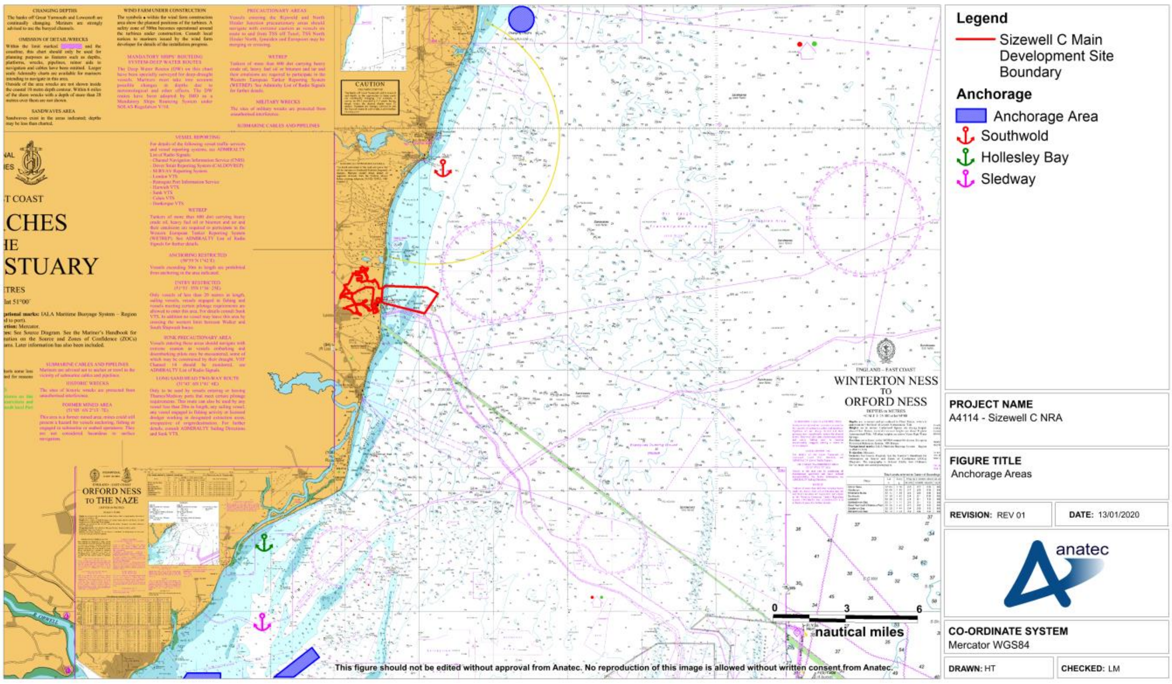
The Port of Lowestoft is a commercial and fishing port which also acts as a base for supply vessels servicing the offshore oil and gas and offshore wind farm industries. It also offers fabrication and repair facilities. The port is home to the operations and maintenance base for Greater Gabbard offshore wind farm.

Southwold Harbour, located approximately 6nm north of Sizewell C, is a small harbour which accommodates small fishing boats and recreational craft.

There is an oil transhipment area located approximately 11nm northeast of the Sizewell C location where tankers may transfer oil from one vessel to another.

## 7.2 Anchorage Areas

**Figure 7.2** presents the anchorage areas in proximity to the Sizewell C location.

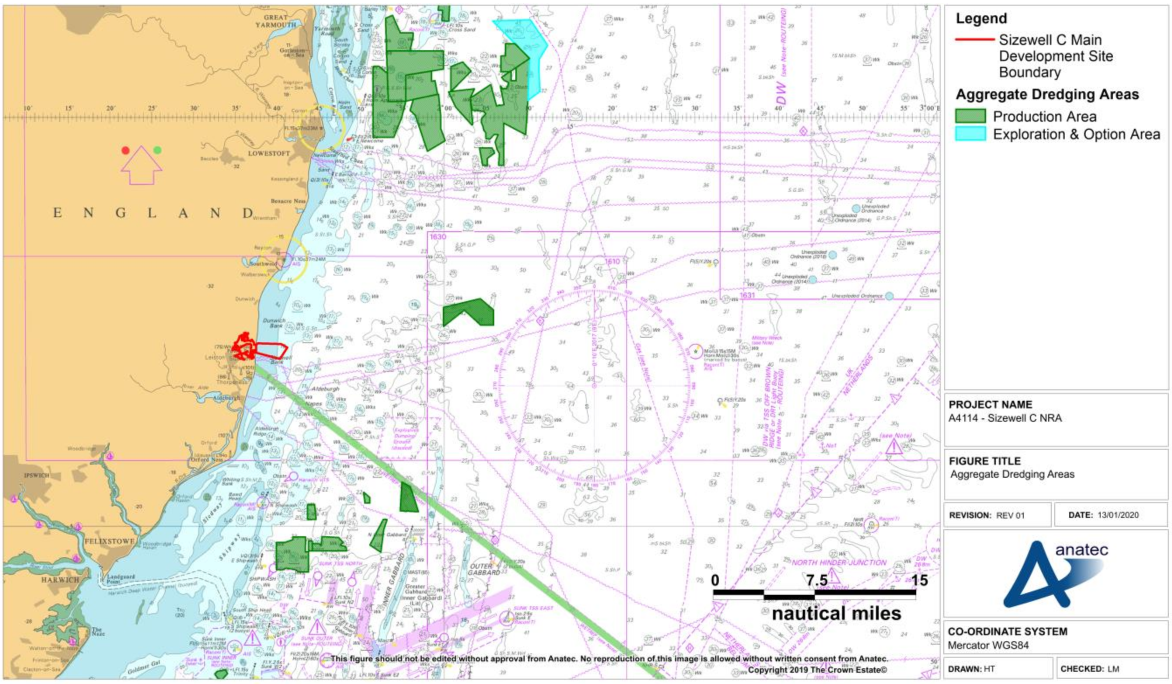



## Figure 7.2 Anchorage areas

The closest anchorage area to Sizewell C is Southwold, approximately 5nm to the north of the development site boundary. Charted depths around this area range from approximately 10-12m. Hollesley Bay, located approximately 11nm south of Sizewell C, provides anchorage in depths between 6m and 10m. The seabed is made up of mud and clay however, sand is found close to Whiting Bank where the greatest depths are found. There is also available anchorage at Sledway in depths of around 11m further south.

## 7.3 Dredging

The aggregate dredging areas identified in proximity to Sizewell C are presented in **Figure 7.3.**

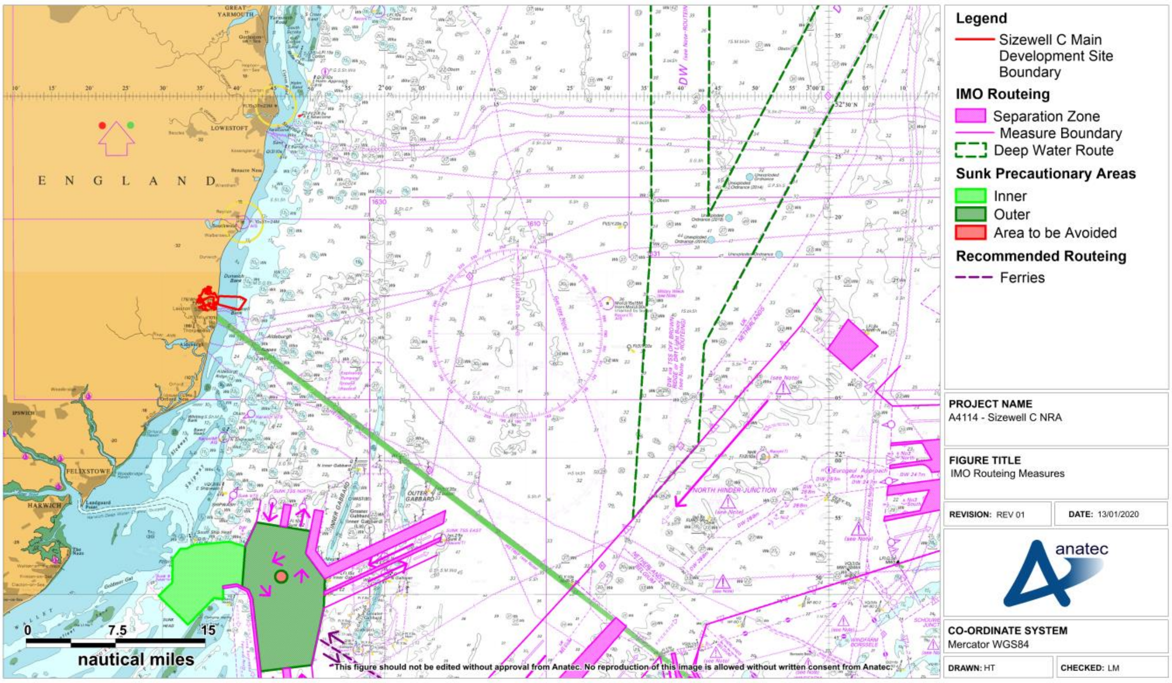



### Figure 7.3 Aggregate dredging areas

It can be seen from **Figure 7.3** that the majority of aggregate dredging areas identified are production areas, with only one exploration and option area to the north. The closest production areas include area number 430 (located approximately 12nm east of Sizewell C) operated by Tarmac Marine Ltd and area numbers 507/2 and 507/5 (located approximately 11-12nm south-east of Sizewell C) operated by CEMEX UK Marine Ltd.

## 7.4 IMO Routeing Measures

**Figure 7.4** presents the IMO routeing measures within proximity to the Sizewell C development.

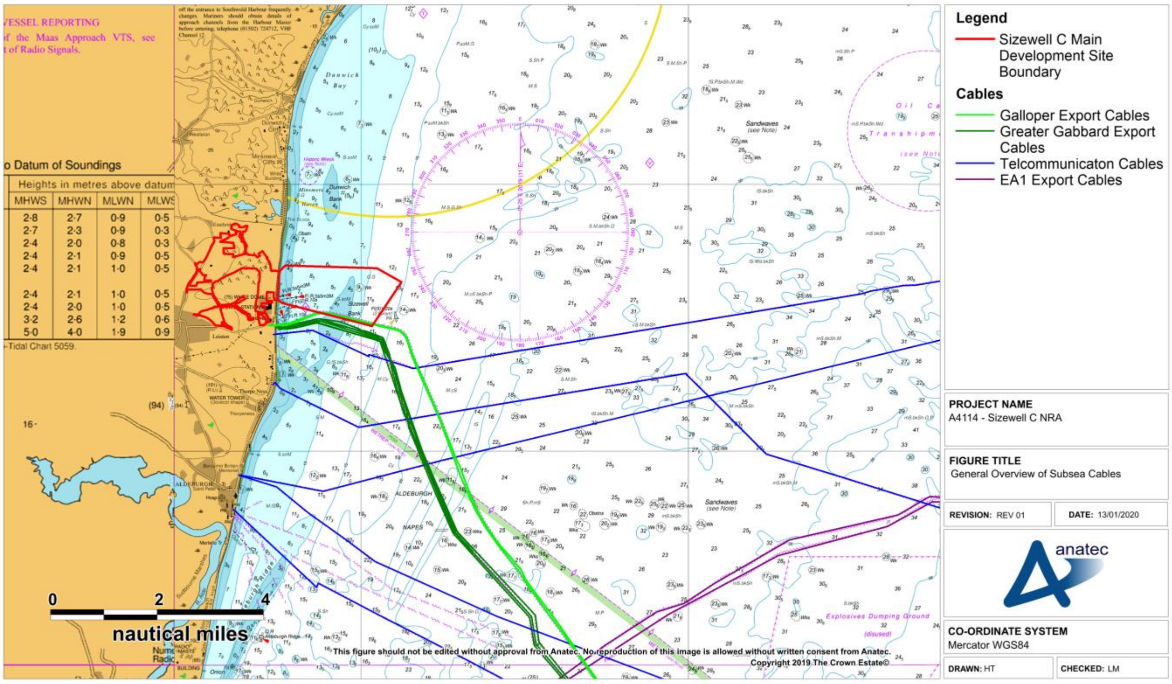



### Figure 7.4 IMO routeing measures

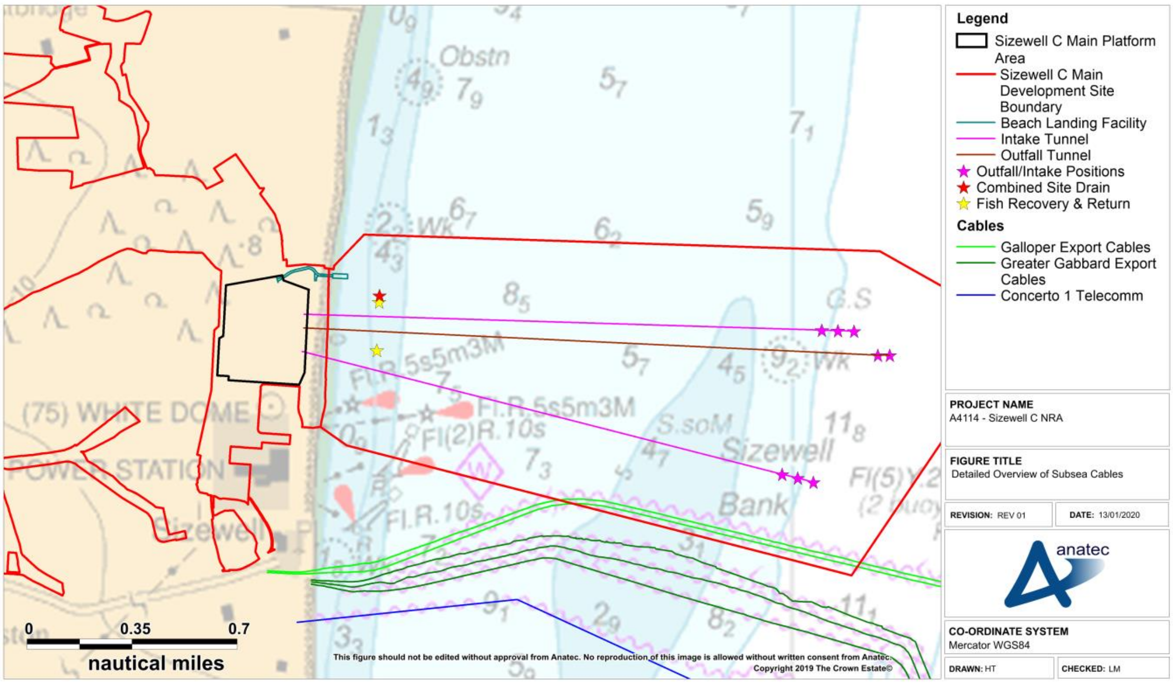
The Sunk Traffic Separation Scheme is located approximately 17nm south of the proposed main development site boundary. Traffic Separation Schemes are used to separate traffic travelling in opposite directions in busy (or sensitive) areas of shipping. In addition, a deep water route is located approximately 33nm east of the main development site boundary.

## 7.5 Subsea Cables

**Figure 7.5** presents a general overview of subsea cables in proximity to the Sizewell C location. This is followed by a more detailed overview of cable landfalls close to the site in **Figure 7.6**.




## Figure 7.5 General overview of subsea cables

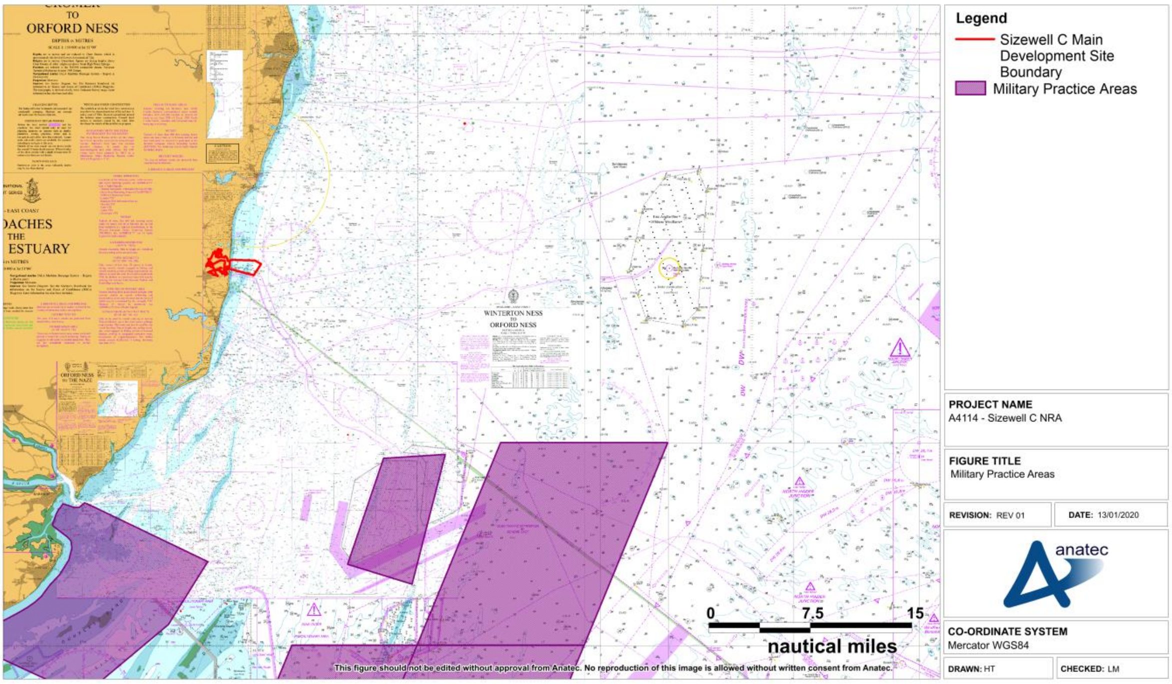



## Figure 7.6 Detailed overview of subsea cables

Export cables associated with Galloper and Greater Gabbard offshore wind farms, in addition to the Concerto 1 North telecommunication cable, all lie within 1nm south of the main development site boundary. It can be seen that the Galloper export cables are the closest to the intake positions, lying approximately 0.2nm south at their closest point.

## 7.6 Military Practice Areas

The UK Ministry of Defence practice and exercise areas in proximity to Sizewell C are presented in **Figure 7.7.**

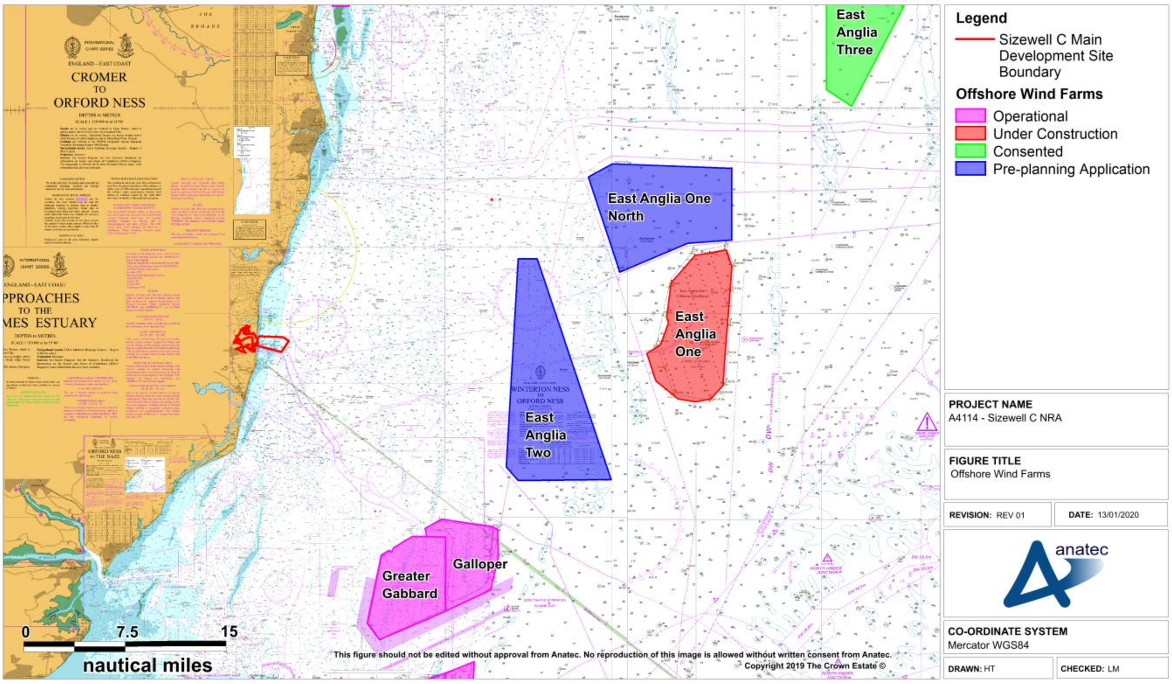



### Figure 7.7 Military practice areas

There are no military practice areas within 10nm of the proposed development. The closest area lies approximately 16.5nm to the south-east. It is noted there are no restrictions placed on the right to transit the firing practice areas at any time. The firing practice areas are operated using a clear range procedure; exercises and firing only take place when the areas are considered to be clear of all shipping.

## 7.7 Offshore Wind Farm Developments

Offshore wind farms within proximity of Sizewell C are presented in **Figure 7.8.**

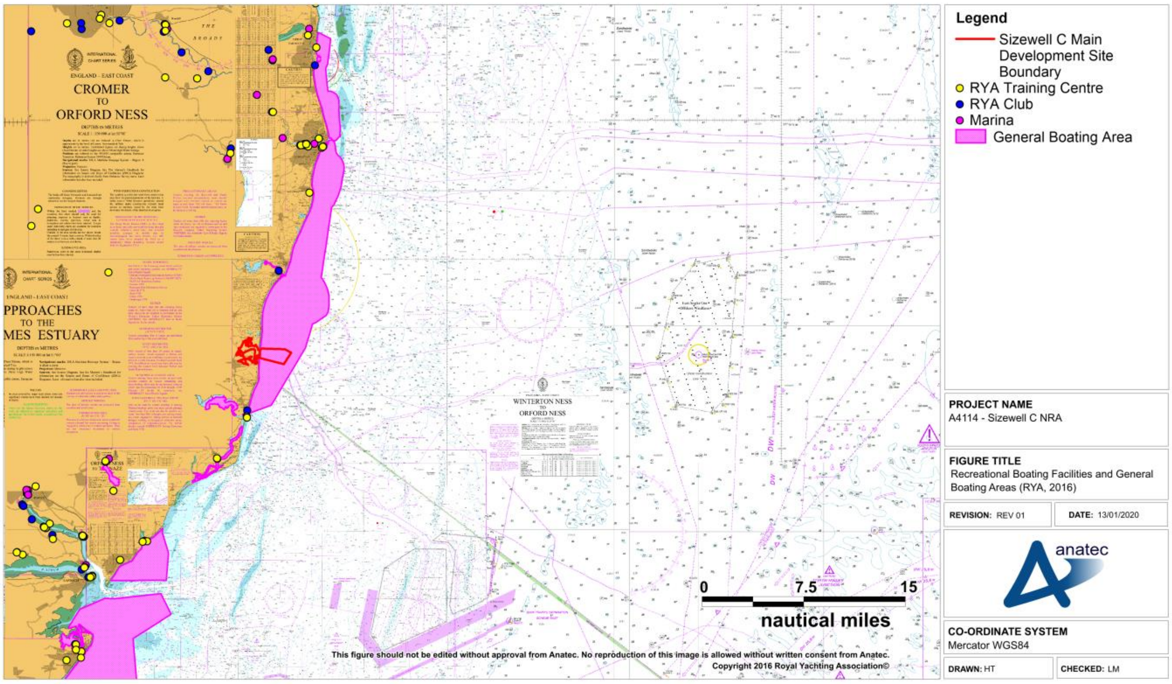



### Figure 7.8 Offshore wind farms

Greater Gabbard offshore wind farm and Galloper offshore wind farm are the only wind farms in proximity to Sizewell C which are currently operational and are situated approximately 17nm to the south-east of the proposed development. East Anglia One is under construction whilst East Anglia One North and East Anglia Two are still in the early planning stages. Further north, East Anglia Three has been consented. The East Anglia One export cables (see **Figure 7.5**) make landfall south of the Sizewell C location however the landfalls for East Anglia One North and East Anglia Two are not yet publicly available.

## 7.8 Recreational Boating Areas

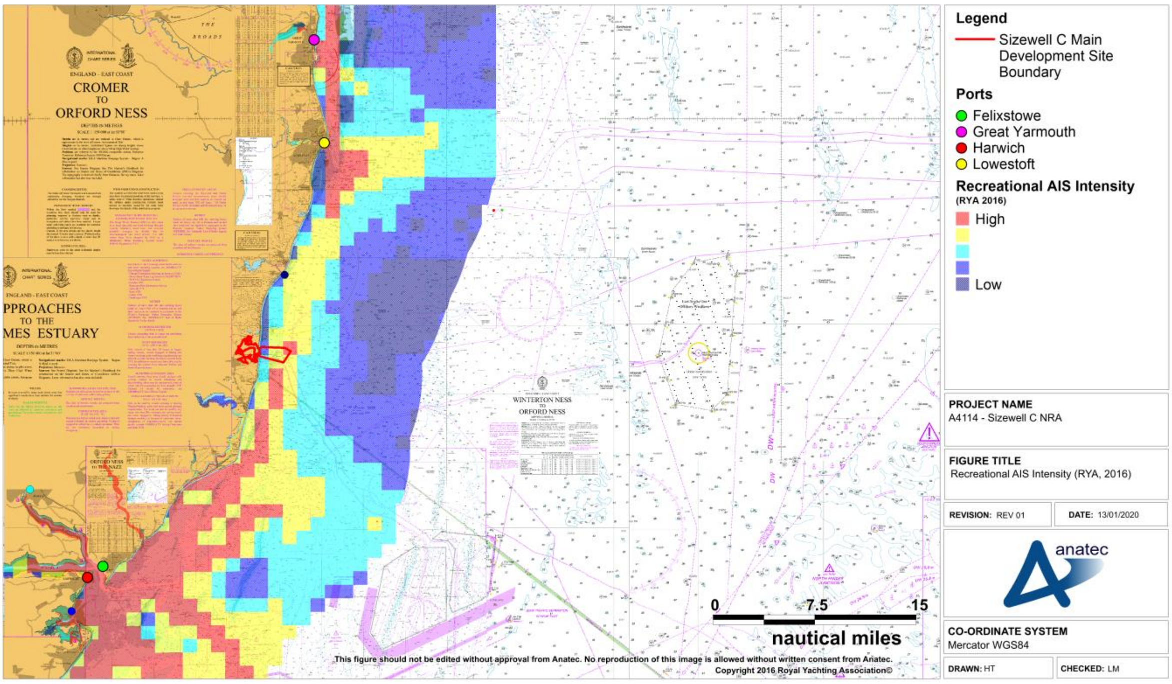
General boating areas and recreational boating facilities in the general area surrounding of the main development site are presented in **Figure 7.9.**




### Figure 7.9 Recreational boating facilities and general boating areas (RYA, 2016)

It can be seen that the proposed main development site lies within a general boating area, with an RYA club and training centre located approximately 4.5nm south of the site boundary.

**Figure 7.10** presents the intensity of recreational AIS traffic from Thames Estuary to Orford Ness.



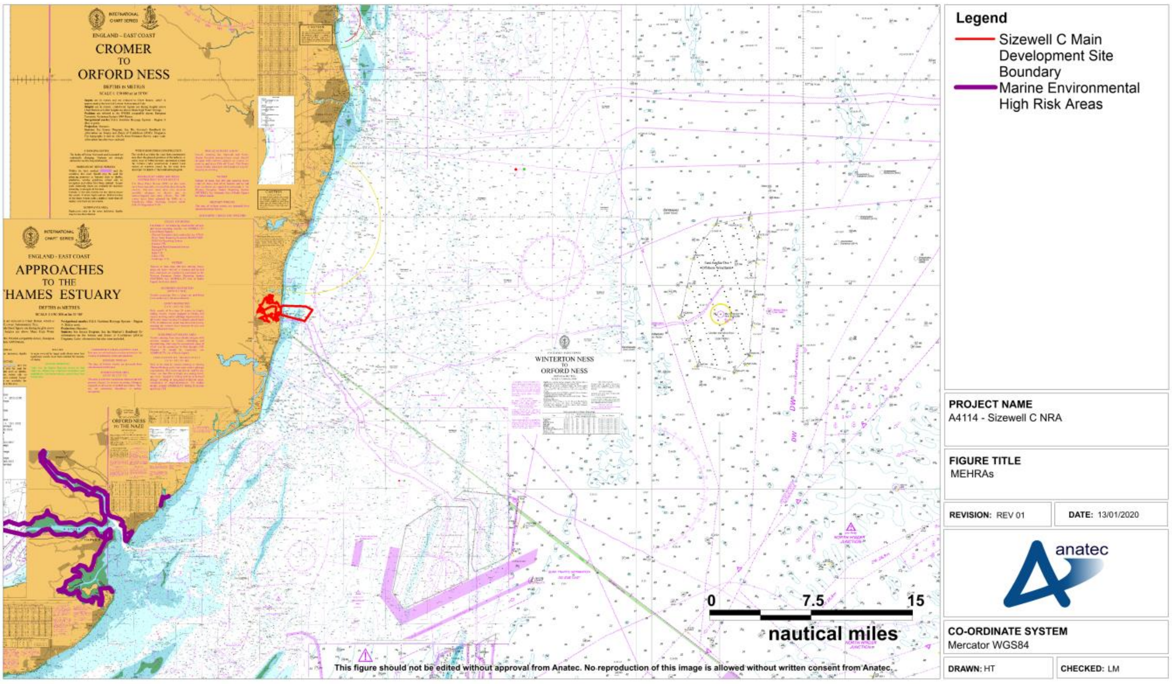

### Figure 7.10 Recreational AIS intensity (RYA, 2016)

It can be seen that the highest density of recreational traffic is around the ports of Harwich and Felixstowe to the south of Sizewell C, and the ports of Great Yarmouth and Lowestoft to the north. It can also be seen that the recreational traffic passing within the development site boundary is of relatively high density.

## 7.9 Marine Environmental High Risk Areas

Marine environmental high risk areas are areas that have been identified by the UK Government as areas of environmental sensitivity and at high risk of pollution from vessels. The UK Government expects mariners to take note of marine environmental high risk areas and either keep well clear or, where this is not practicable, exercise an even higher degree of care than usual when passing nearby.

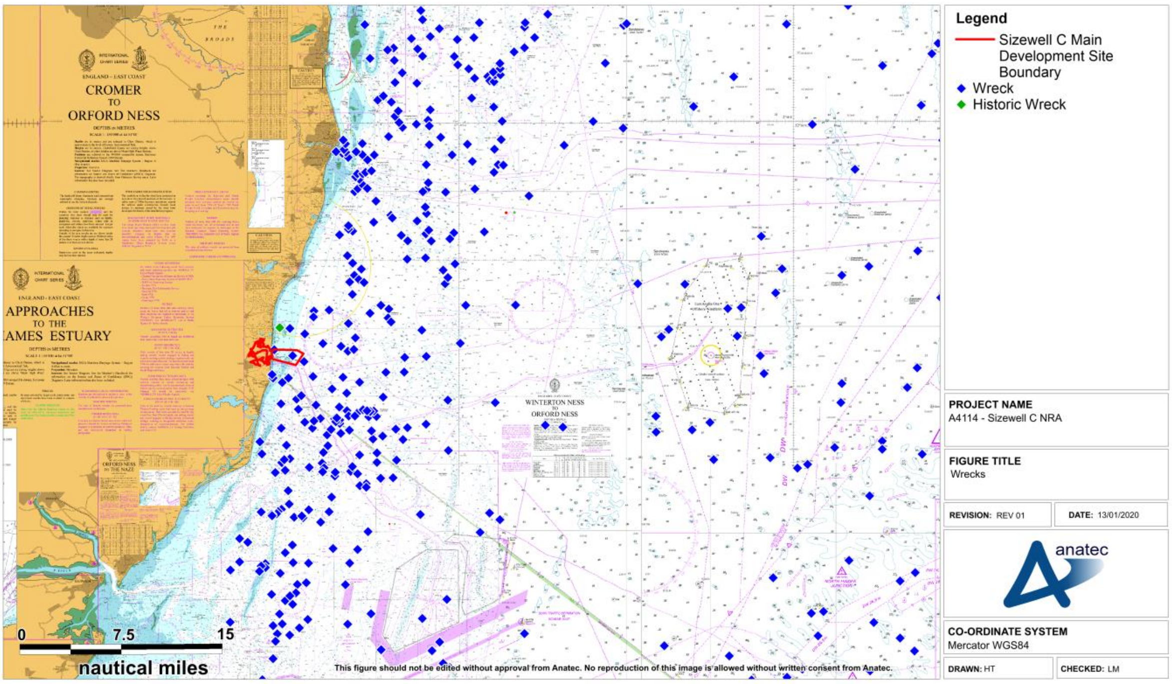
Marine environmental high risk areas in proximity to the Sizewell C location are presented in **Figure 7.11**. The closest marine environmental high risk area is approximately 15nm to the south, along the mouth of the River Deben.




## Figure 7.11 Marine environmental high risk areas

## 7.10 Wrecks

The locations of wrecks identified within proximity to the Sizewell C location are presented below in **Figure 7.12.**




## Figure 7.12 Wrecks

It can be seen that there are a number of wrecks close to the main development site boundary, and one that lies inside. There is also a historic wreck near Dunwich Bank, approximately 1.7nm to the north of the main development site.

# 8 Emergency Response Overview and Assessment

This section summarises the existing search and rescue resources in proximity to the proposed Sizewell C development.

## 8.1 RNLI

The RNLI is organised into six divisions, with the relevant region for the proposed Sizewell C development being the east division. Based out of more than 230 stations, there are more than 350 lifeboats across the RNLI fleet, including both all-weather lifeboats and inshore lifeboats. Based on the location of Sizewell C, it is likely that inshore lifeboats from Southwold or Aldeburgh would respond to an incident in proximity of the proposed development. Locations of RNLI lifeboat stations along the south-east coast of England and details of the types of lifeboats operating out of these stations are given in **Table 8.1**. At each station, lifeboats are available on a 24-hour basis throughout the year.

**Table 8.1 UK lifeboats operated from southern North Sea RNLI stations**

| Station | Lifeboats | ALB Class | Inshore Lifeboat Class | Distance from Sizewell C |
|---|---|---|---|---|
| Lowestoft | All-weather lifeboats | Shannon | - | 15.9nm |
| Southwold | Inshore Lifeboat | - | B Class Atlantic | 7nm |
| Aldeburgh | All-weather lifeboats & inshore lifeboat | Mersey | D Class | 4nm |
| Great Yarmouth & Gorleston | All-weather lifeboats & inshore lifeboat | Trent | B Class Atlantic | 22.2nm |
| Harwich | All-weather lifeboats & inshore lifeboat | Severn | B Class Atlantic | 20.6nm |

## 8.2 Her Majesty’s Coastguard Stations

Her Majesty’s Coastguard, a division of the Maritime and Coastguard Agency, is responsible for requesting and tasking search and rescue resources made available to other authorities and coordinating the subsequent search and rescue operations (unless they fall within military jurisdiction).

The Her Majesty’s Coastguard coordinates search and rescue through a network of 11 coastguard operations centres, including a national maritime operations centre based in Hampshire. A corps of over 3,500 volunteer coastguard rescue officers around the UK from over 352 local coastguard rescue teams are involved in coastal rescue, searches and surveillance.

All of the Maritime and Coastguard Agency's operations, including search and rescue, are divided into six geographical regions. The England region covers the south-east coast of England, and therefore covers the area around the Sizewell C development.

Each region is divided into four districts with its own coastguard operation centre, which coordinates the search and rescue response for maritime and coastal emergencies within its district boundaries. The nearest rescue coordination centre to the proposed Sizewell C development site is the Dover coastguard operation centre based in Dover, located approximately 67nm south of the Sizewell C location.

## 8.3 Search and Rescue Helicopters

In March 2013, the Bristow Group were awarded the contract by the Maritime and Coastguard Agency (as an executive agency of Department for Transport (DfT)) to provide helicopter search and rescue operations in the UK over a ten-year period. Bristow have now been operating the service since April 2015. There are ten base locations for the search and rescue helicopter service. The nearest search and rescue helicopter base to the Sizewell C proposed development is the Lydd base which is approximately 80nm south and has been in operation since April 2015. This base operates two Augusta Westland AW189 aircraft.

## 8.4 Emergency Towing Vessels

The Maritime and Coastguard Agency has no dedicated emergency towing vessels in the southern North Sea area. Private towing companies may be asked to assist a drifting vessel as well as wreck removal, cargo recovery, towage and pollution prevention. These private vessels are situated throughout the UK waters and ports.

## 8.5 Pollution Control and Clean-up

Any incident of marine pollution or the possibility of pollution must be reported to the Maritime and Coastguard Agency via the nearest coastguard operation centre. The coastguard operation centre initiate any search and rescue response required and reports any pollution incident or risk of significant pollution (whether or not known to involve oil or any other hazardous substance and even if of unknown origin) to the Maritime and Coastguard Agency's duty counter pollution and salvage officer. Any other organisation (e.g. local authority, harbour authority or environmental organisation) receiving a report of marine pollution of any quantity, or a threat of marine pollution, should send that information immediately to the nearest coastguard operation centre.

The Secretary of States' Representative, acting on behalf of their parent organisation the DfT and the Department for Business, Energy & Industrial Strategy, is responsible for overseeing any response to accidents at sea. Their powers extend to UK territorial waters (12nm from coast) for safety issues and to the UK Pollution Control Zone (200 miles or to the median line with neighbouring states) for pollution. They are responsible for removing or reducing the risk to safety, property and the UK environment from accidents involving ships, fixed or floating platforms or subsea infrastructure.

# 9 Maritime Incidents

This section reviews maritime incidents that have occurred in the vicinity of the proposed development from 2005 to 2014.

The analysis is intended to provide a general indication as to whether the area of the proposed development is currently low or high risk in terms of maritime incidents. Data from the following sources have been analysed:

- MAIB.
- RNLI.

It is noted that some incidents may have been recorded by both sources.

## 9.1 MAIB

The locations of incidents reported to the MAIB within 12nm of the Sizewell C for a ten year period (2005-2014), colour-coded by incident type, are presented in **Figure 9.1.** The MAIB aim for 97% accuracy in reporting the locations of incidents.

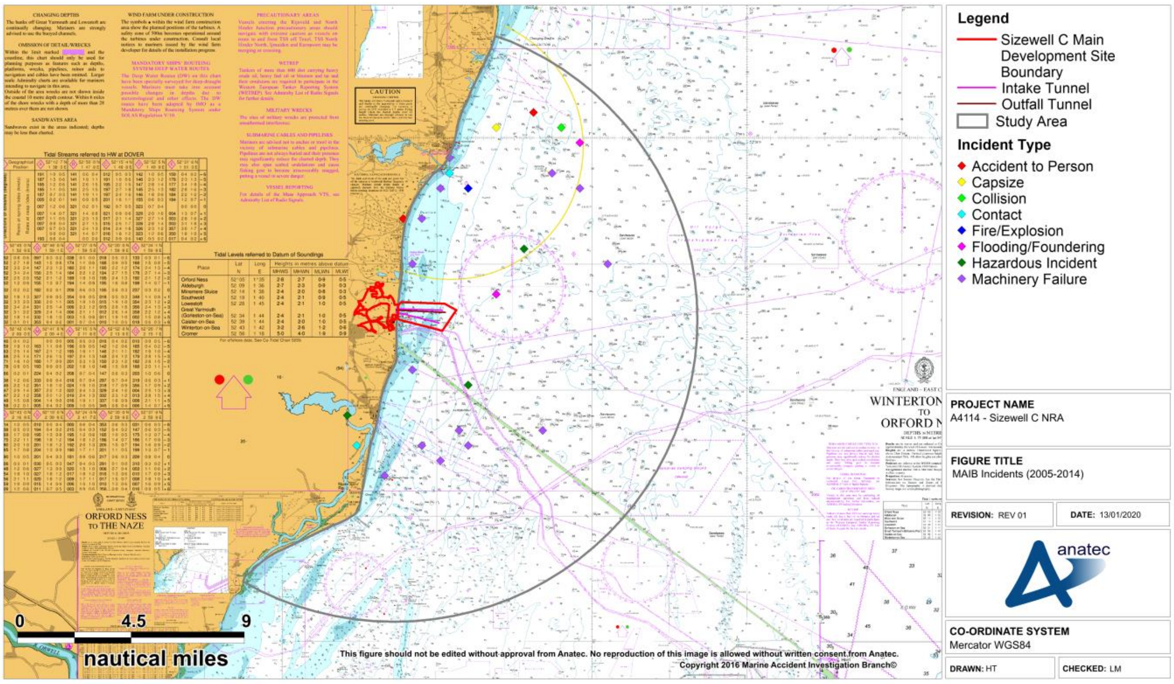



Figure 9.1 MAIB incidents (2005-2014)

A total of 28 incidents were recorded within 12nm of the Sizewell C between 2005 and 2014. The distribution of incidents by type is presented below in **Figure 9.2.**

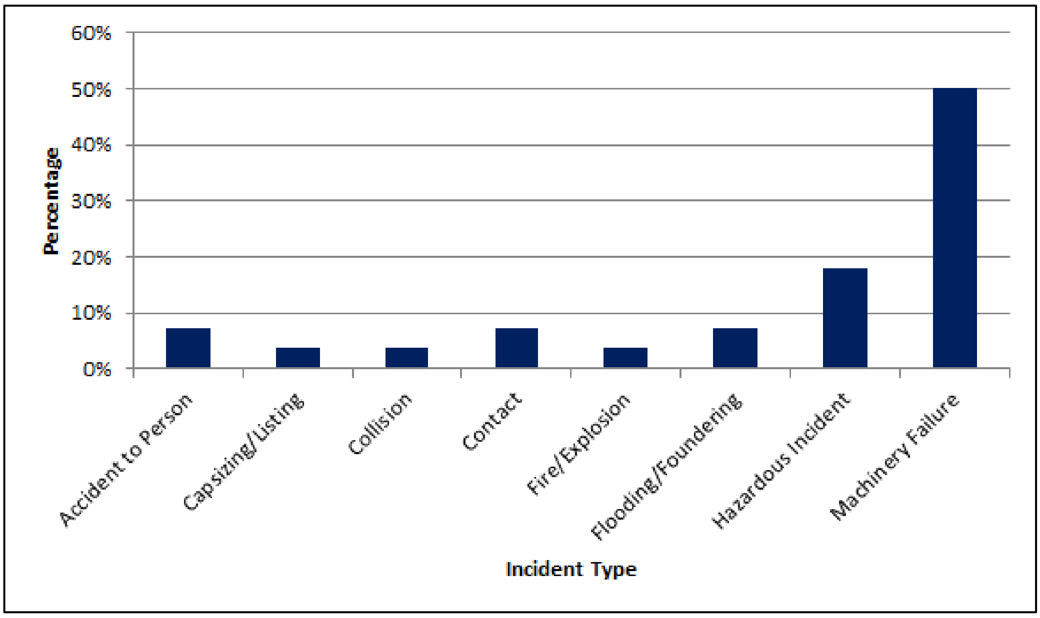



**Figure 9.2 MAIB incident type distribution (2005-2014)**

Machinery failure accounted for half of the incidents recorded in the study period whilst hazardous incidents were also frequently recorded (18%).

Fishing vessels were the vessel type most frequently involved in incidents, followed by other commercial and recreational, as shown in **Figure 9.3.**

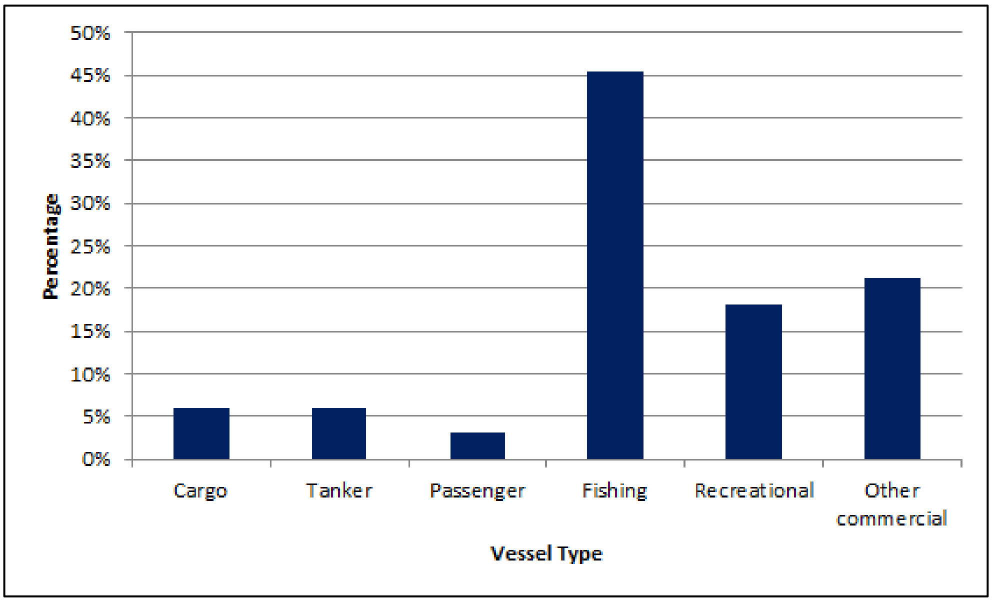
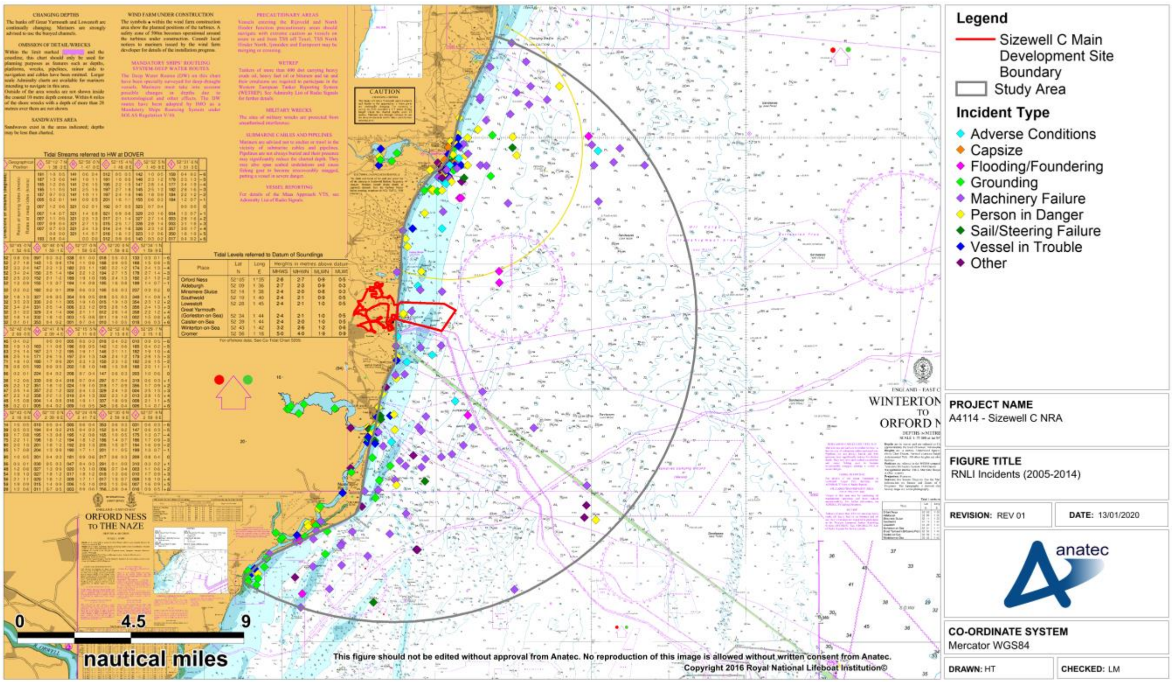



**Figure 9.3 MAIB incidents by vessel type (2005-2014)**

## 9.2 RNLI

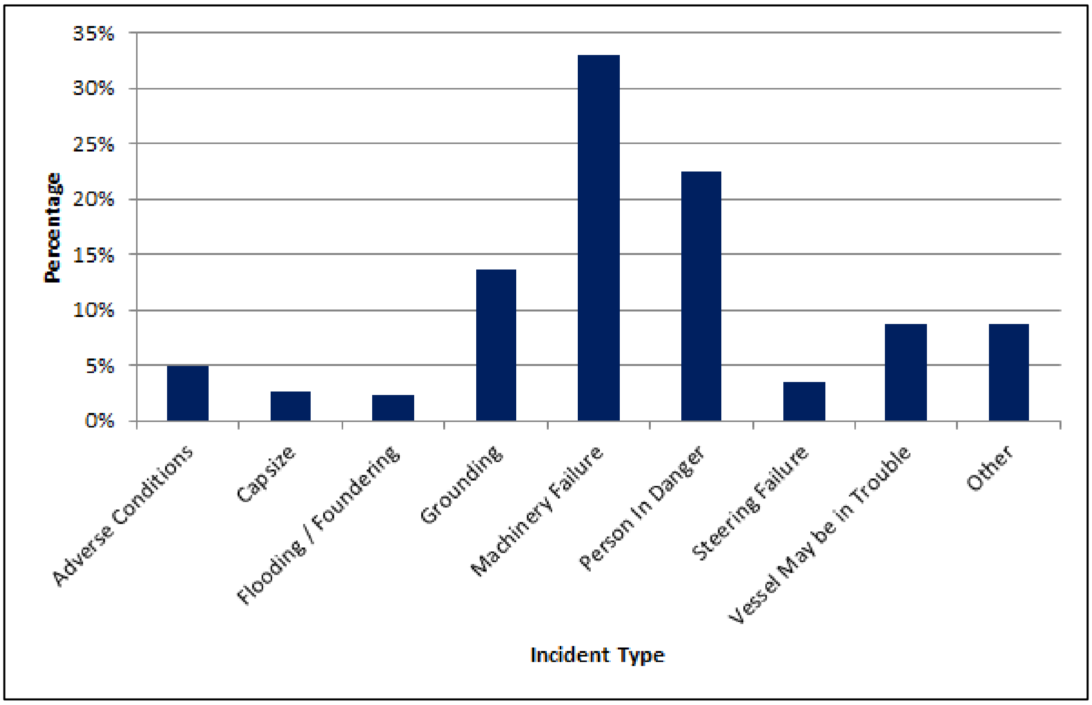
**Figure 9.4** presents the data on RNLI lifeboat responses within 12nm of Sizewell C in the 10 year period between 2005 and 2014. A total of 263 unique incidents were recorded by the

RNLI within the study period (excluding hoaxes and false alarms), corresponding to an average of 26-27 unique incidents per year.




## Figure 9.4 RNLI incidents (2005-2014)

The majority of incidents to which the RNLI responded occurred in the near shore area. The distribution of incidents by incident type is presented in **Figure 9.5.**




## Figure 9.5 RNLI incidents type distribution (2005-2014)

Machinery failure (33%) and person in danger (22%) were the most frequently recorded incident types by the RNLI. The distribution of incidents by vessel type involved is presented in **Figure 9.6.**

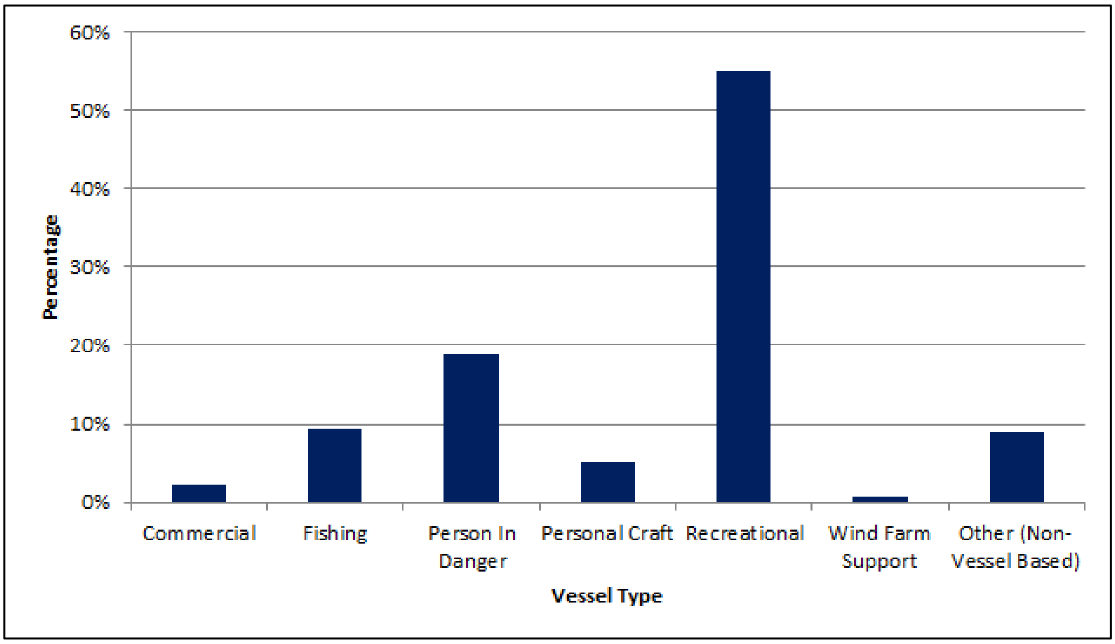
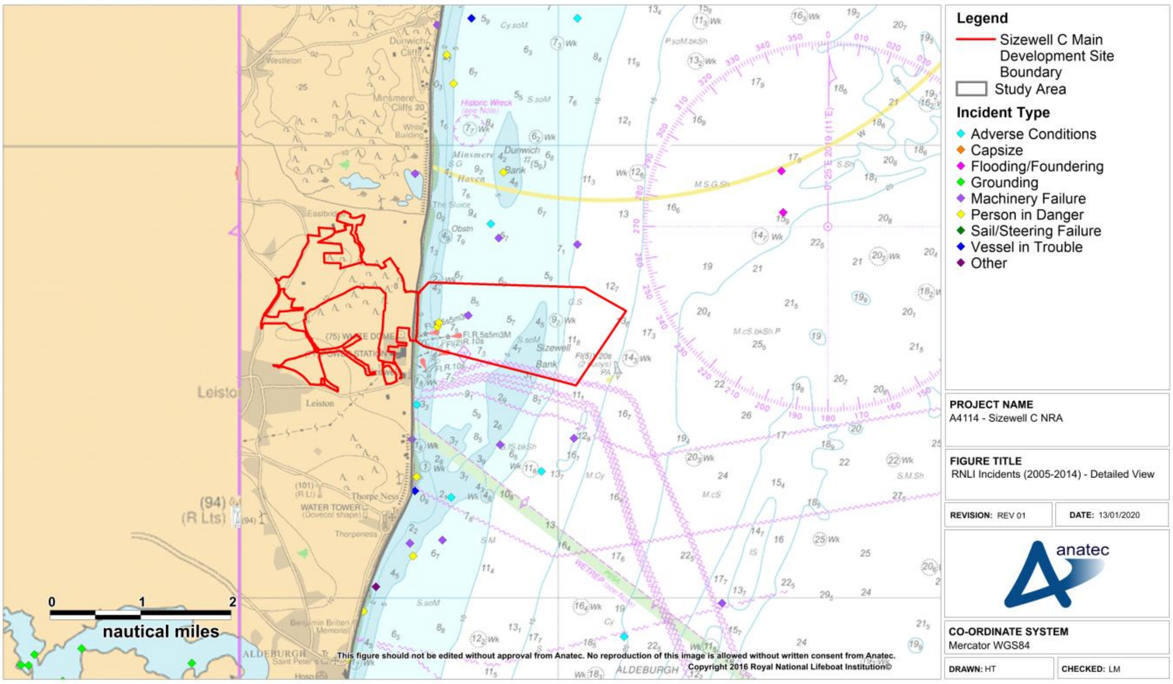



**Figure 9.6 RNLI incidents by vessel type (2005-2014)**

Recreational craft were the vessel type most frequently involved in incidents (55%) followed by person in danger (19%).

Three incidents occurred within the main development site boundary; two incidents on the 24 March 2012 and the 25 June 2014 where a person was in danger of drowning on both occasions and one machinery failure incident involving a fishing vessel on the 24 May 2011. The locations of these are presented in **Figure 9.7.**




## Figure 9.7 RNLI incidents (2005-2014) – detailed view

# 10 Baseline Shipping Analysis

## 10.1 Introduction

This section presents the analysis of the shipping data. Assessments of vessel numbers, types, sizes and densities are provided below. The data was analysed using an AIS and radar data set consisting of 28 days from the following periods:

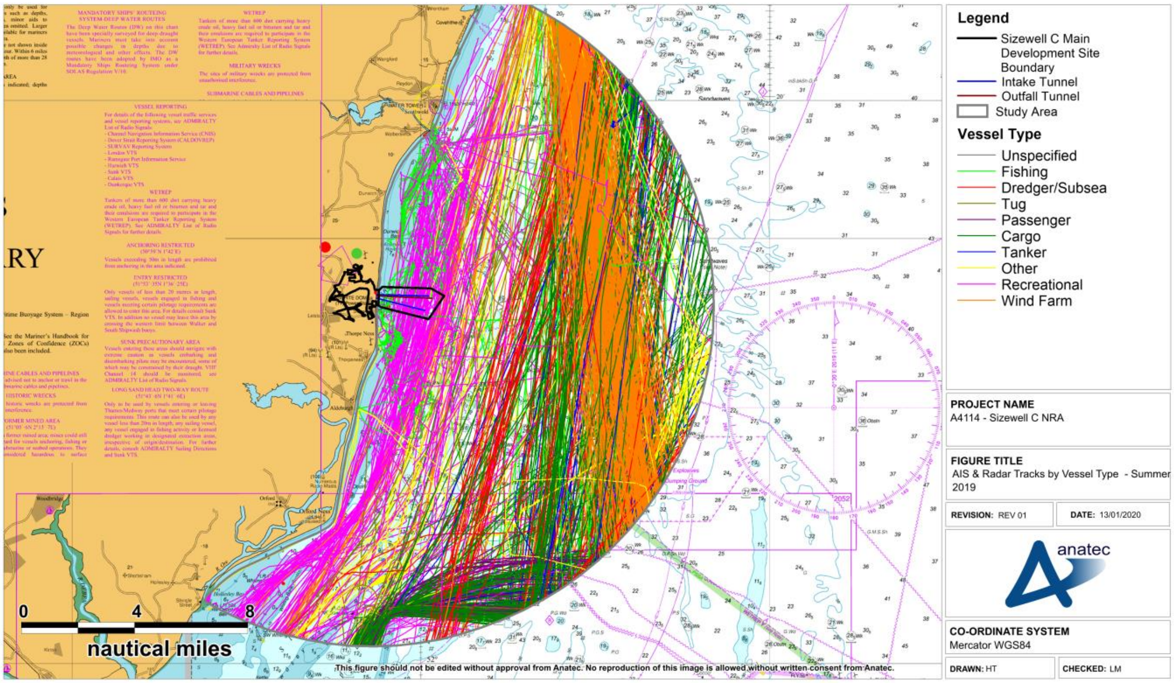
- 14 June – 28 June 2019 (14 days summer).
- 16 November – 30 November 2018 (14 days winter).

This data was used to provide good coverage of the study area as well as account for any seasonal trends. It is noted radar was included to provide coverage of fishing vessels less than 15m in length and recreational craft not obligated to carry AIS.

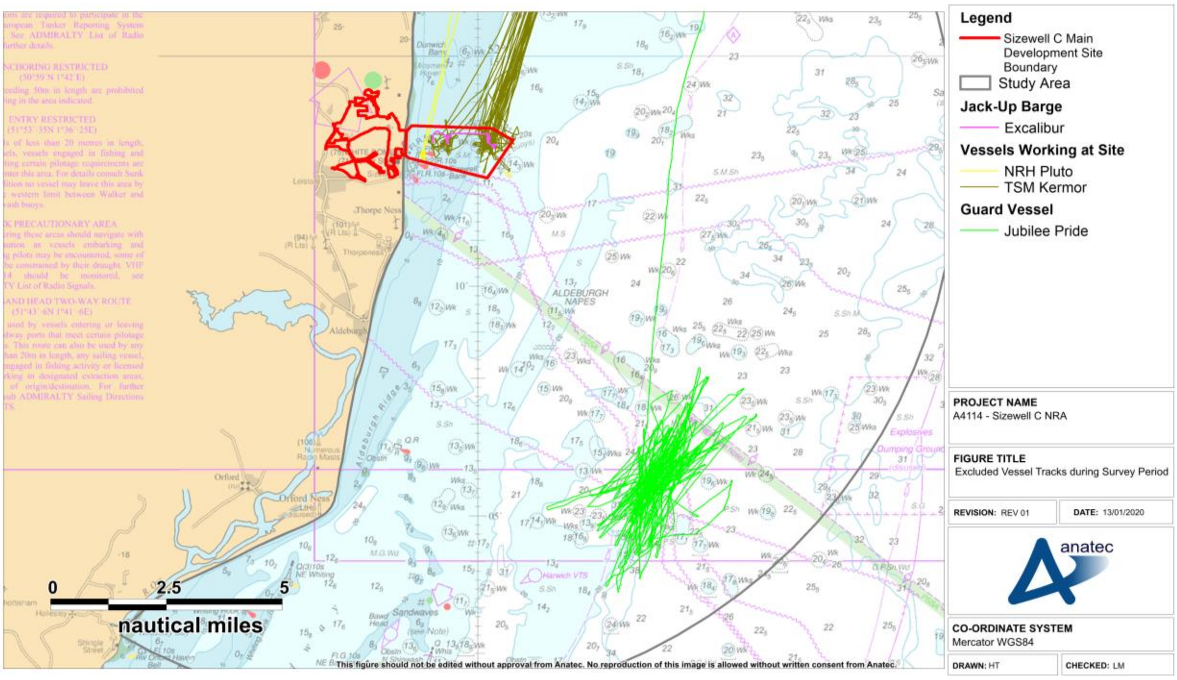
## 10.2 Vessel Type

**Figure 10.1** and **Figure 10.3** presents the AIS and radar tracks recorded in the study area for the summer and winter periods, respectively. It is noted that 3% of vessels recorded in the summer survey and less than 1% of vessels in the winter survey were unspecified and thus have not been included in the analysis.

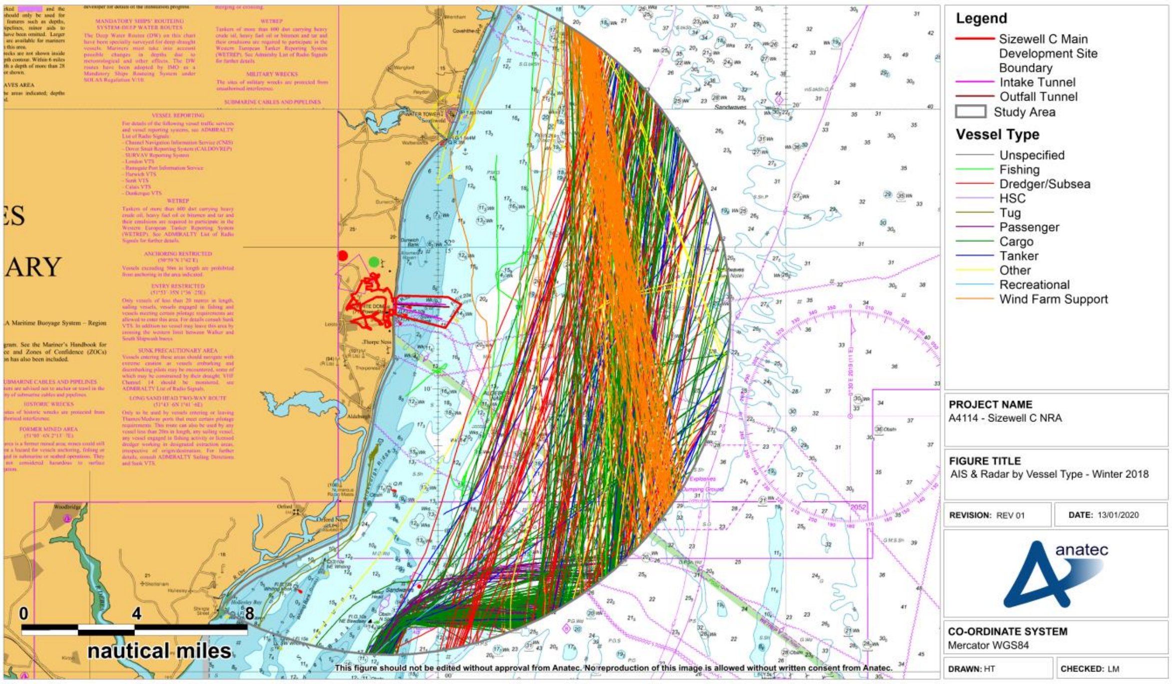
The tracks of vessels excluded from the analysis include the jack-up barge *Excalibur* and supporting vessels working at the Sizewell C site in June 2019, and the guard vessel *Jubilee Pride*. These tracks are presented in **Figure 10.2**. It is noted that the presence of the jack-up barge and associated vessel activities may have resulted in reduced fishing and recreational vessel activity in the vicinity of the Sizewell C main development site during the summer survey period.




## Figure 10.1 AIS & radar tracks by vessel type – summer 2019

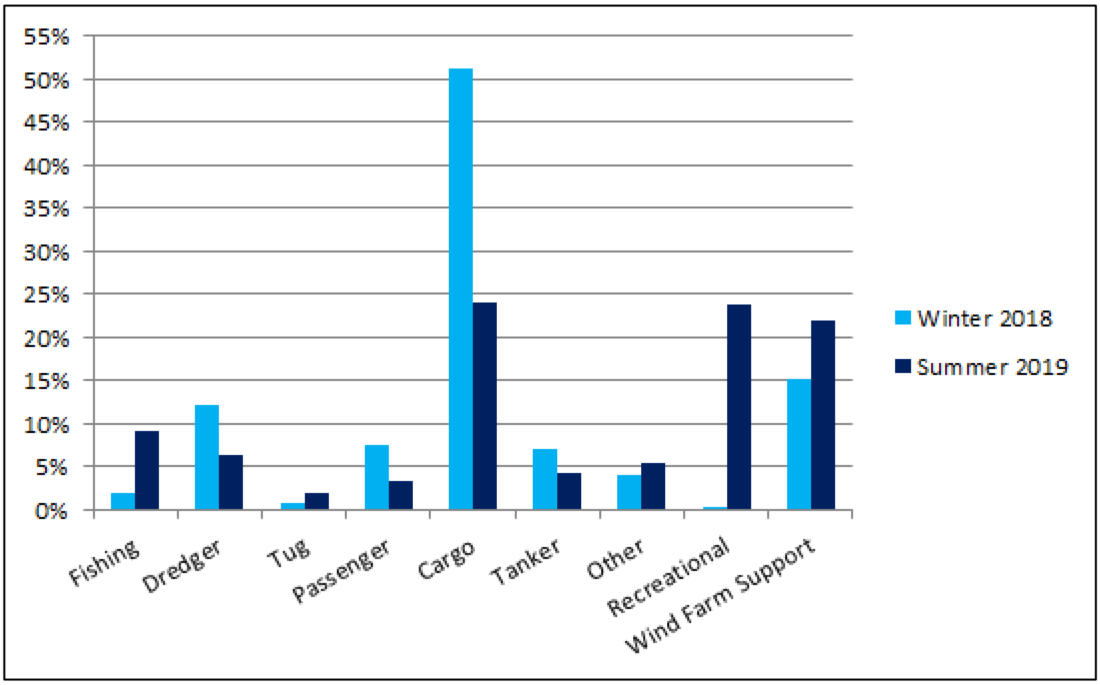



## Figure 10.2 Excluded vessel tracks during survey period




## Figure 10.3 AIS & radar by vessel type – winter 2018

**Figure 10.4** presents a comparison of vessel type distribution between the winter 2018 and summer 2019 surveys.




## Figure 10.4 AIS & radar vessel type distribution

In summer, the most frequently recorded vessels were recreational (24%) and cargo (24%), followed by wind farm support vessels (22%). In winter, the most frequently recorded vessels were cargo (51%) followed by dredgers (12%), fishing vessels and tankers (7% each). The difference in distribution is due to the large number of recreational craft recorded in summer compared to winter.

A detailed overview of all vessels tracks recorded within close proximity to the proposed infrastructure for 28 days of combined summer 2019 and winter 2018 AIS & radar data is presented in **Figure 10.5.**

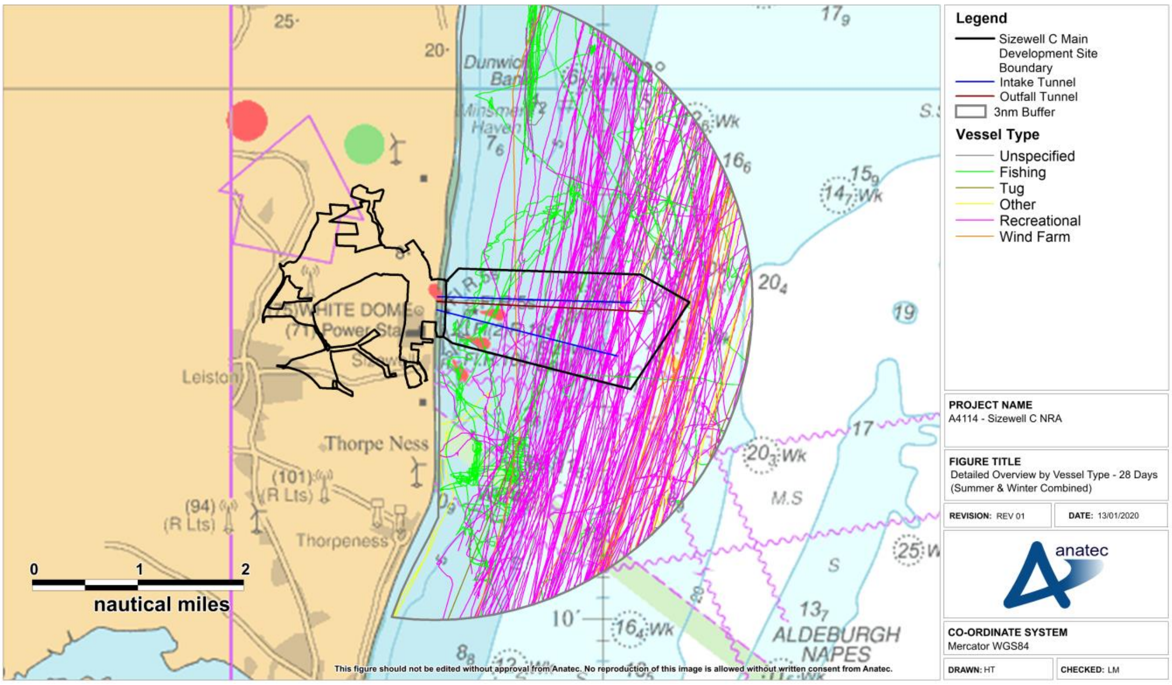
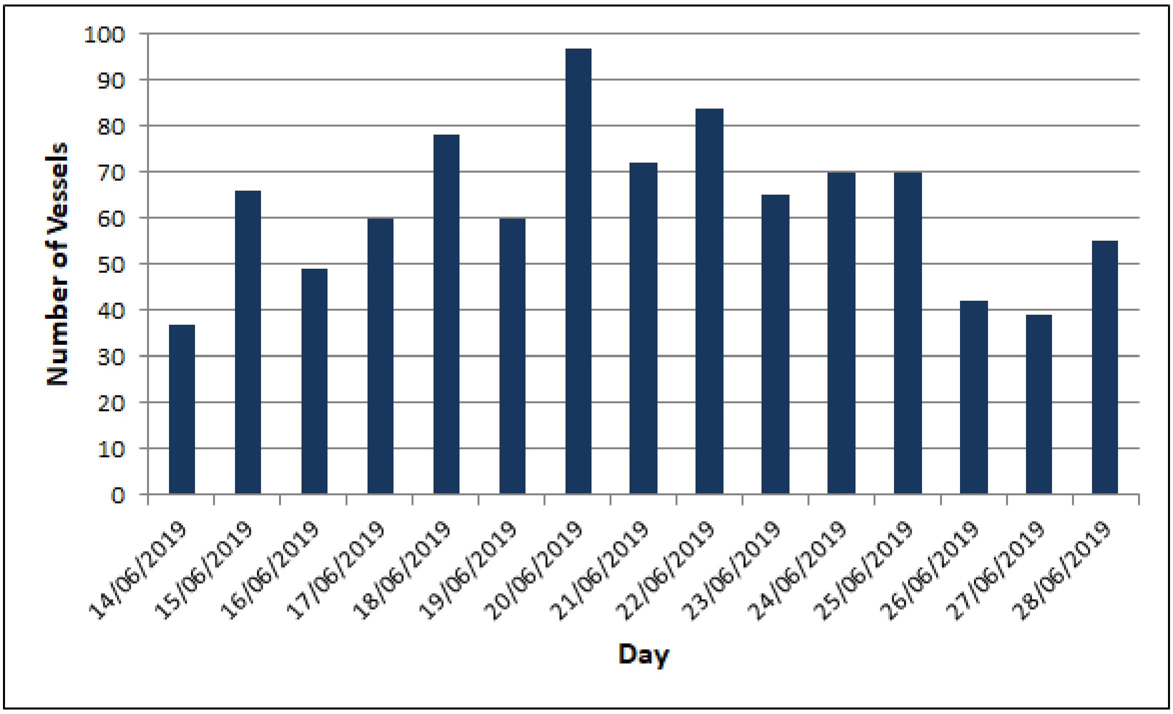



**Figure 10.5 Detailed overview by vessel type – 28 days (summer & winter combined)**

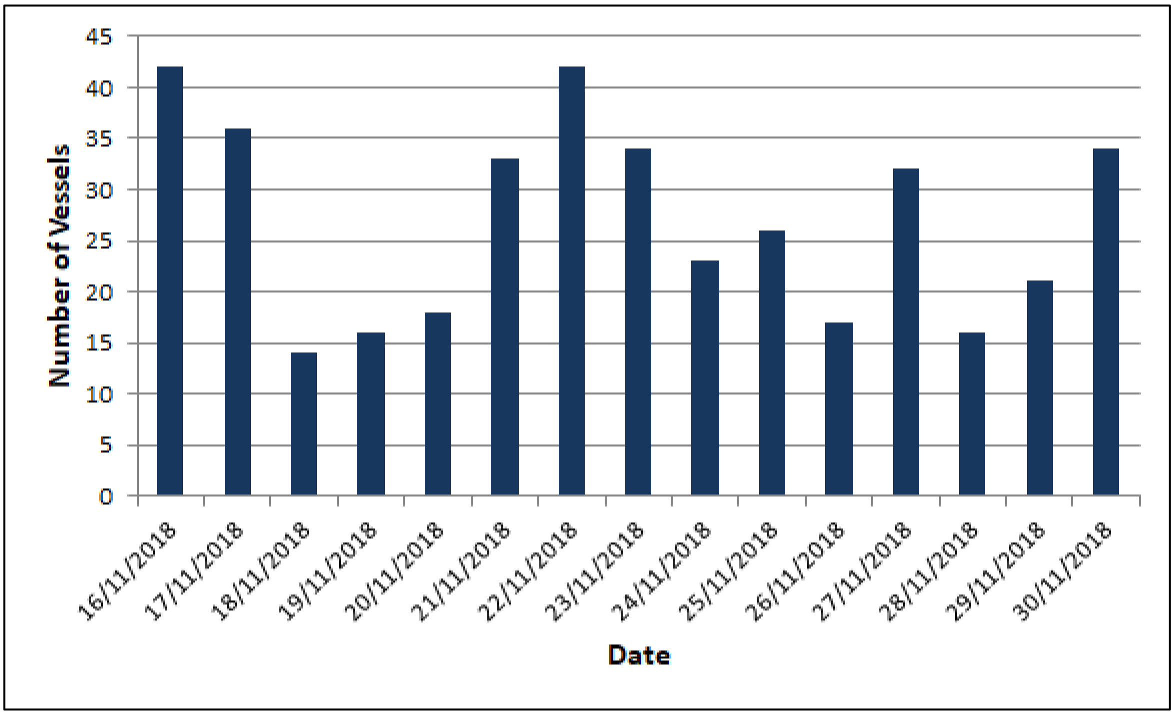
It can be seen from **Figure 10.5** that the vast majority of vessels intersecting or in close proximity to the main development site boundary were recreational vessels, with some fishing vessels operating closer to shore.

## 10.3 Vessel Numbers

**Figure 10.6** and **Figure 10.7** present the daily unique counts recorded in the summer and winter periods, respectively.



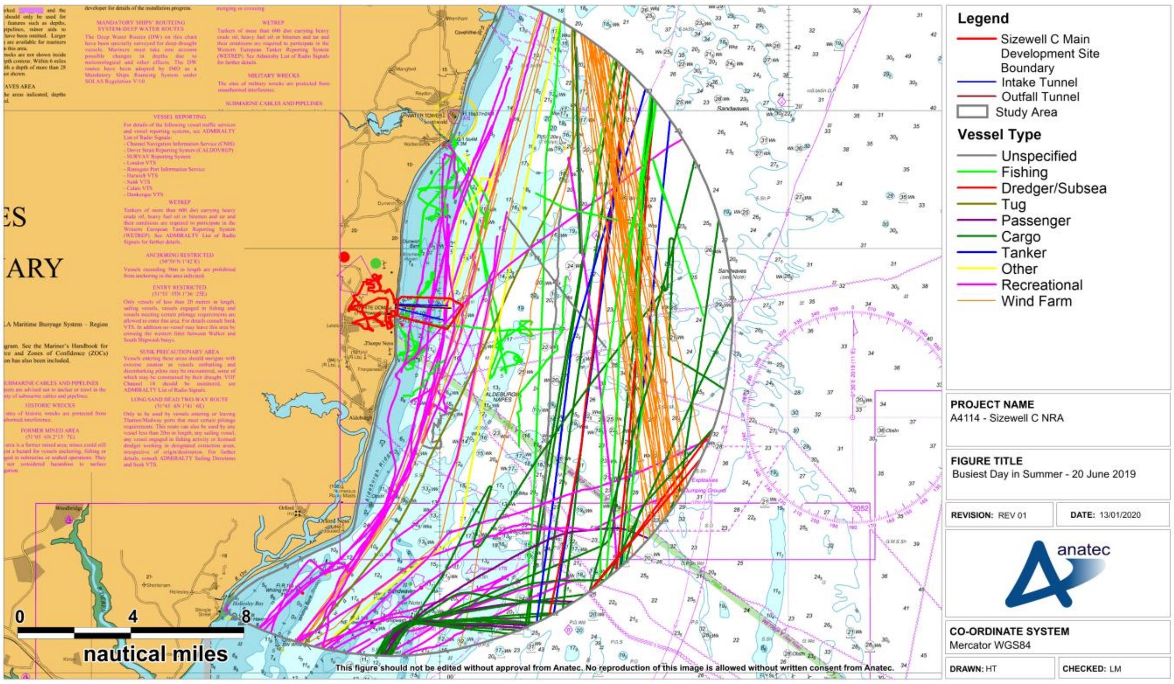

## Figure 10.6 Daily unique vessel count – summer 2019



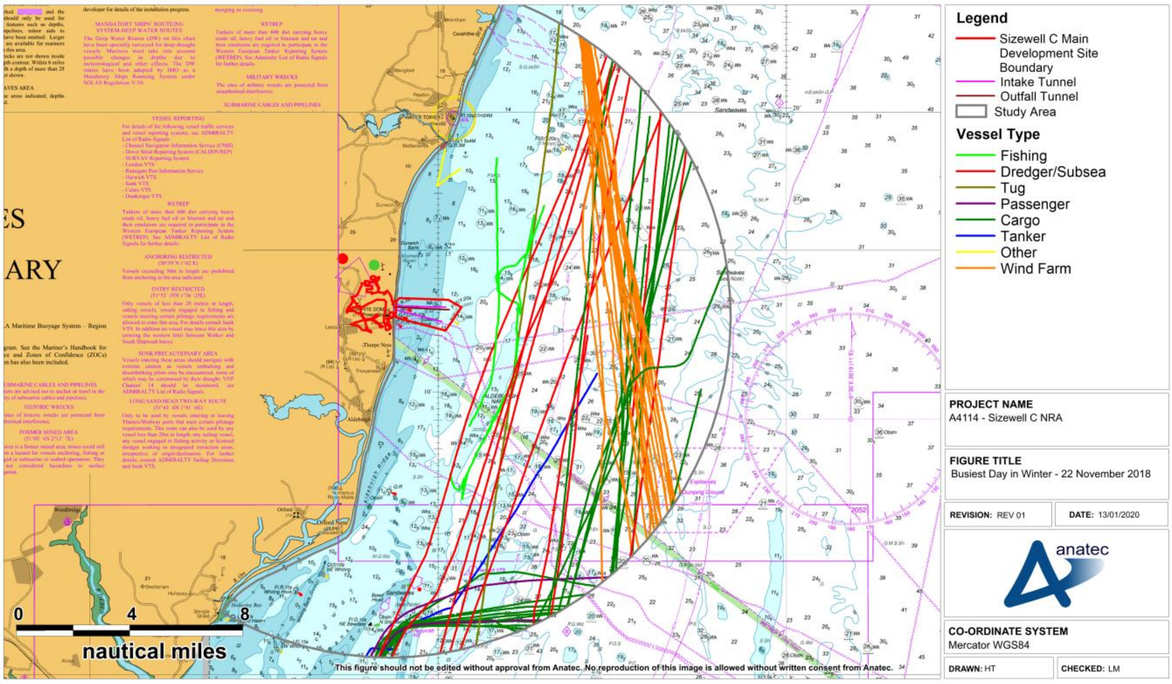

## Figure 10.7 Daily unique vessel count – winter 2018

There was an average of 66 unique vessels per day recorded in the study area in summer compared to 27 per day recorded in winter. A comparison of numbers by vessel type revealed the vessels contributing most to this difference were smaller craft such as recreational, wind farm support and fishing vessels.

The busiest day in summer was the 20 June 2019 on which 97 unique vessels were recorded in the study area. The busiest days in winter were the 16th and 22nd November 2018 on which 27 unique vessels were recorded. **Figure 10.8** and **Figure 10.9** present the AIS tracks recorded on these days.




## Figure 10.8 Busiest day in summer – 20 June 2019




## Figure 10.9 Busiest day in winter – 22 November 2018

## 10.4 Vessel Density

**Figure 10.10** and **Figure 10.11** present the vessel density for the summer and winter periods, respectively. This is based on the number of track intersects of a 1km x 1km grid cell. It is noted the ranges used differ according to each data set, as the summer period was busier overall.

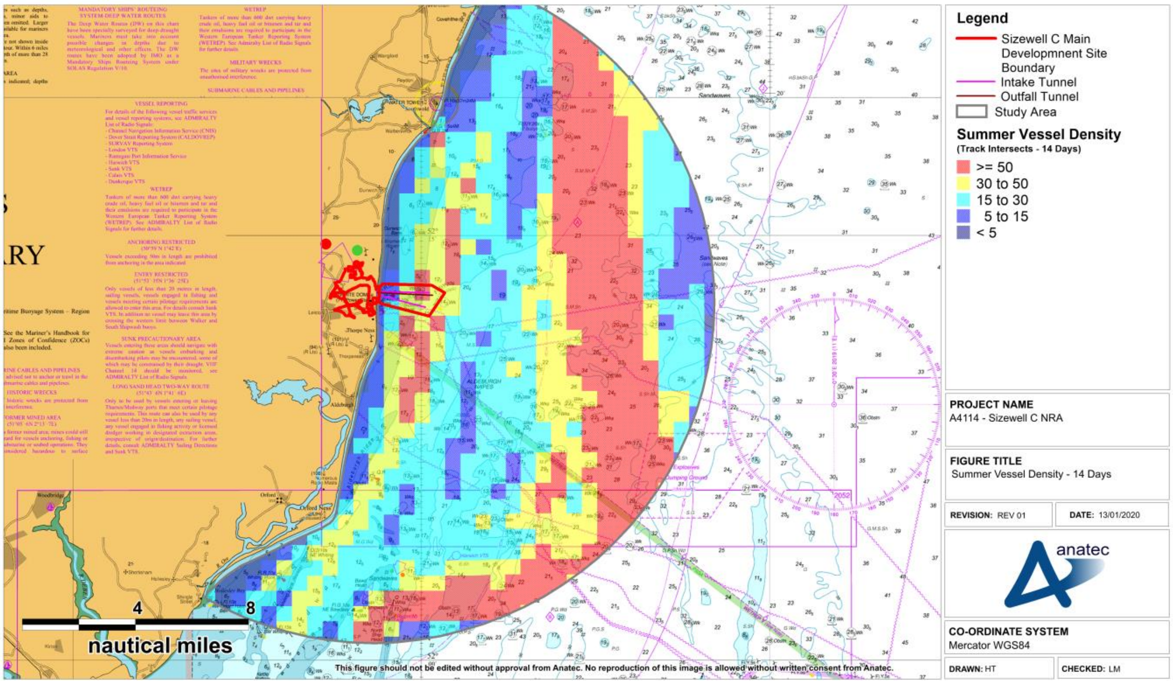
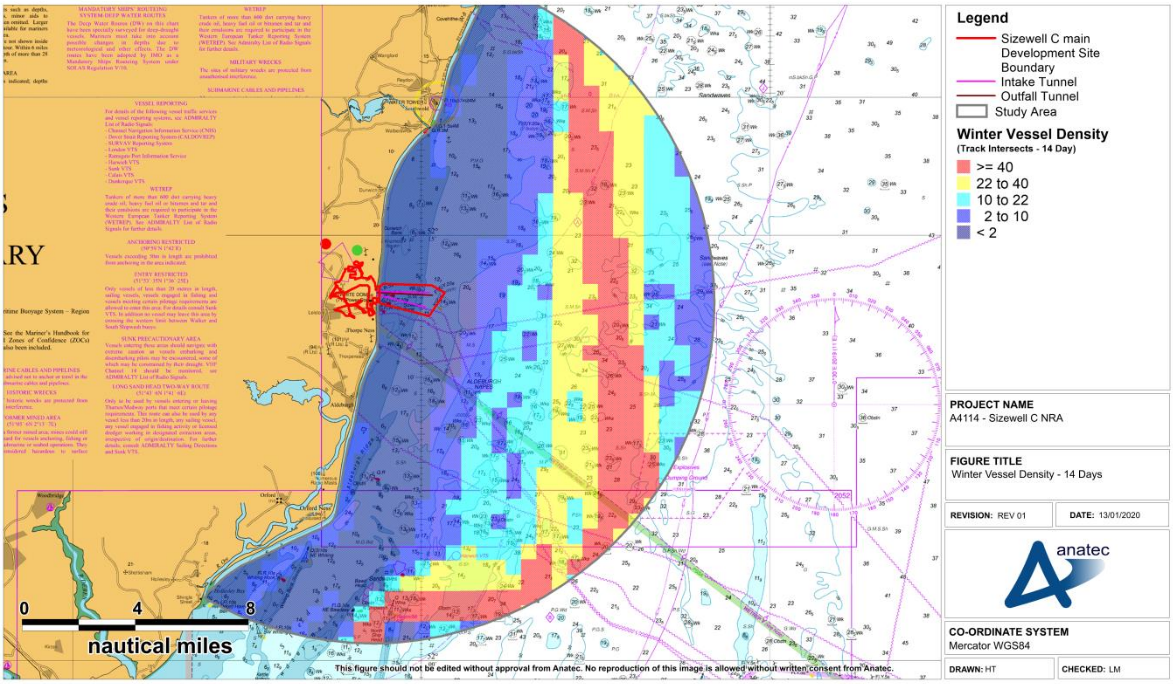



**Figure 10.10 Summer vessel density – 14 days**



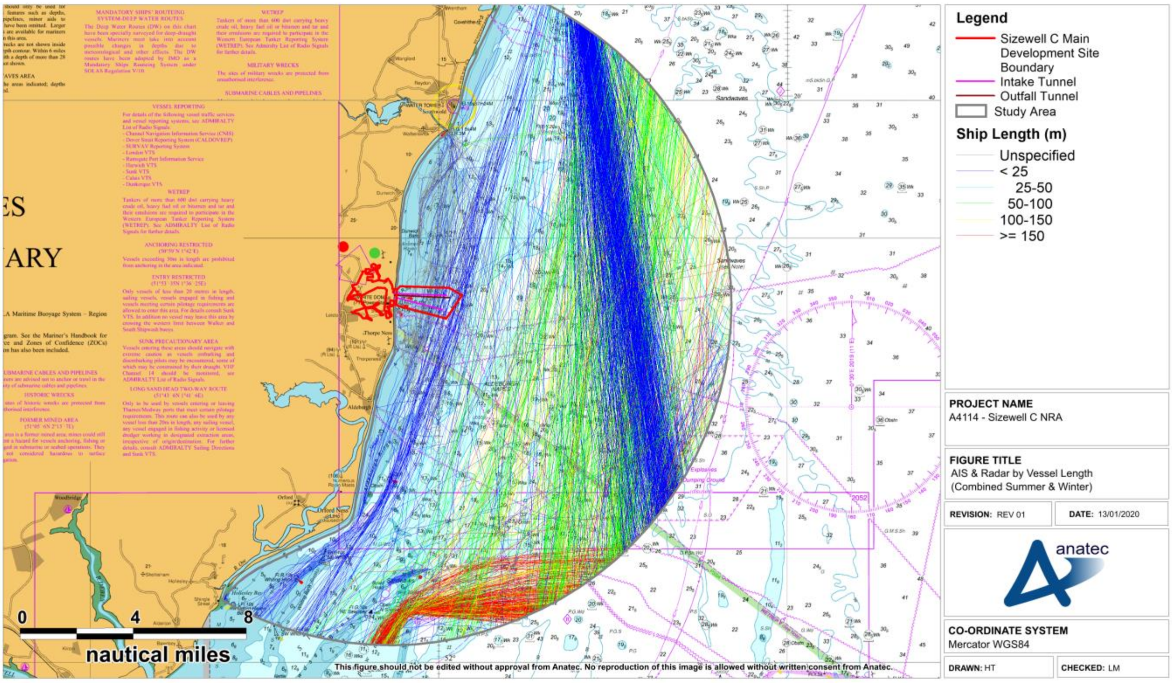

### Figure 10.11 Winter vessel density – 14 days

It can be seen that in both summer and winter the high density areas include the north/south route, approximately 4nm east of the proposed main development site boundary, for transient traffic identified in the study area. This route is largely utilised by commercial vessels transiting to various ports such as those within the Humber Estuary and Thames Estuary. In both summer and winter there is also a high density of traffic associated with the Sunk Traffic Separation Scheme, approximately 10nm south of the proposed main development site boundary. In summer higher density is also seen nearer the proposed development in summer due to the abundance of small craft, particularly recreational vessels, in the area.

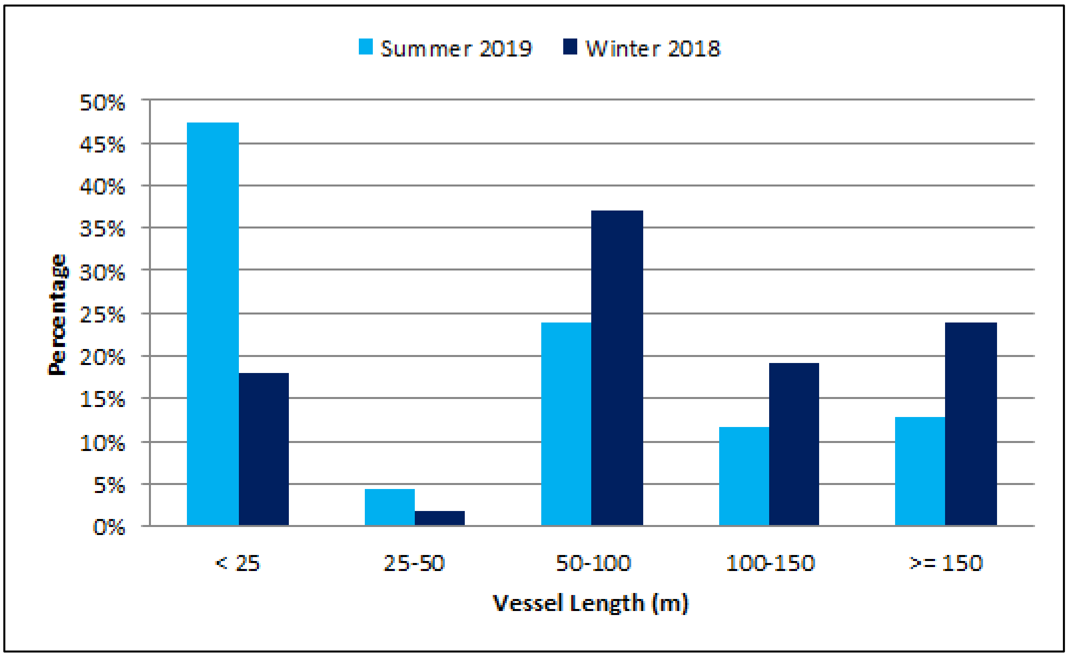
## 10.5 Vessel Sizes

### 10.5.1 Vessel Length

**Figure 10.12** presents the AIS and radar tracks recorded in the study area for the combined summer 2019 and winter 2018 survey periods (28 days), colour-coded by vessel length. Following this, **Figure 10.13** presents the vessel length distribution, based on unique vessels per day. It is noted the length of approximately 12% of unique vessels per day could not be identified due to limited information available for the vessels. These have been excluded from the distribution although the majority are recreational craft and thus likely to be less than 25m.




## Figure 10.12 AIS & radar by vessel length (combined summer & winter)




## Figure 10.13 AIS & radar vessel length distribution

The average vessel length recorded was 70m in summer and 110m in winter. It can be seen from **Figure 10.13** that in summer, the largest proportion of vessels was recorded in the less than 25m category. In contrast, the largest proportion of vessels in winter was recorded in the 50m to 100m range. This difference reflects the high number of small craft recorded in summer compared to winter.

The longest vessel recorded in the study area was the 399m container ship *Merete Maersk*, with the closest track recorded approximately 10nm south-east of the proposed main development site boundary.

### 10.5.2 Vessel Draught

**Figure 10.14** presents the AIS and radar tracks recorded in the study area for the combined summer and winter survey periods (28 days) colour-coded by vessel draught. Following this, **Figure 10.15** presents the vessel draught distribution. It is noted approximately 20% of vessel tracks did not have draught information and have therefore been excluded from the distribution analysis.

The majority of vessels recorded without draught information were smaller vessels (e.g. recreational craft, fishing vessels, and wind farm support vessels) and thus not likely to have a deep draught.

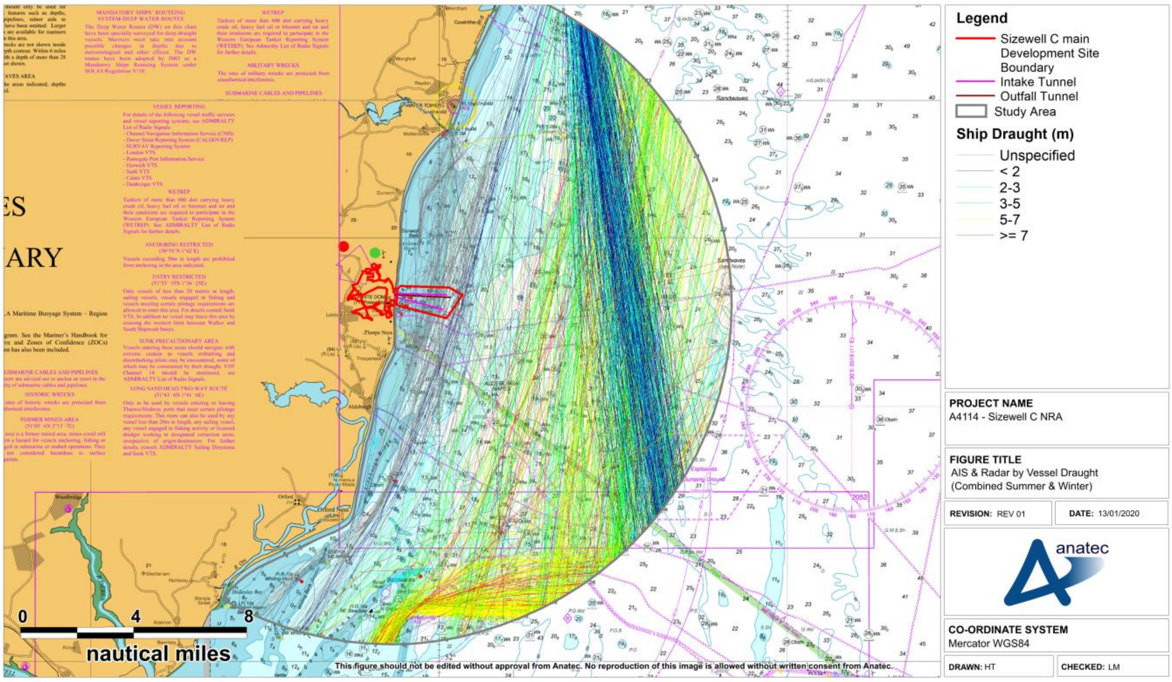
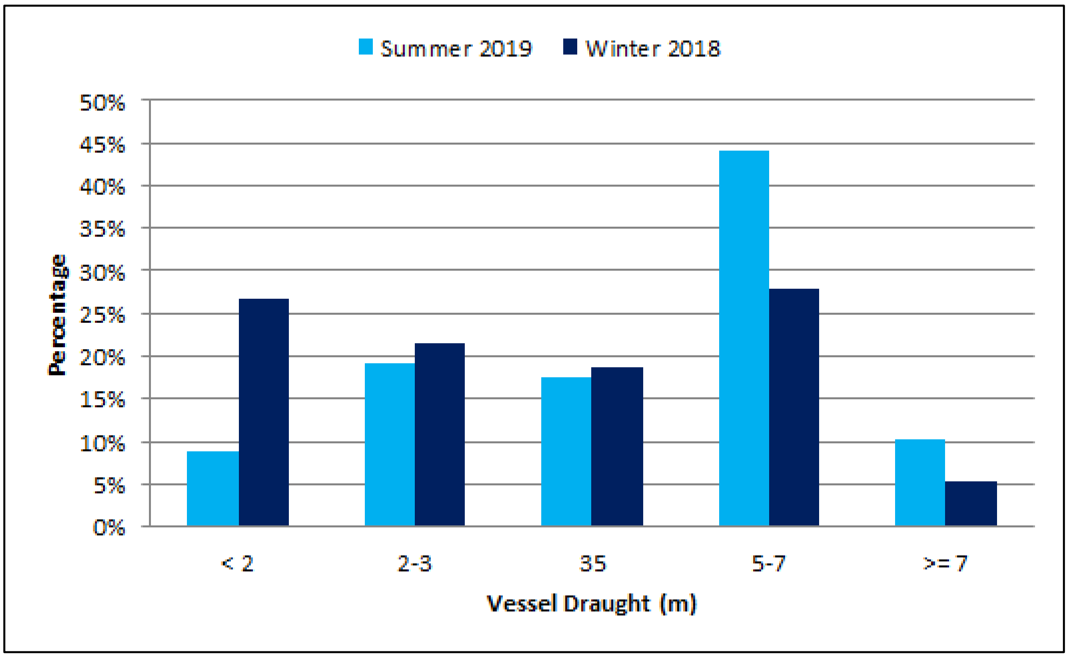



Figure 10.14 AIS & radar by vessel draught (combined summer & winter)

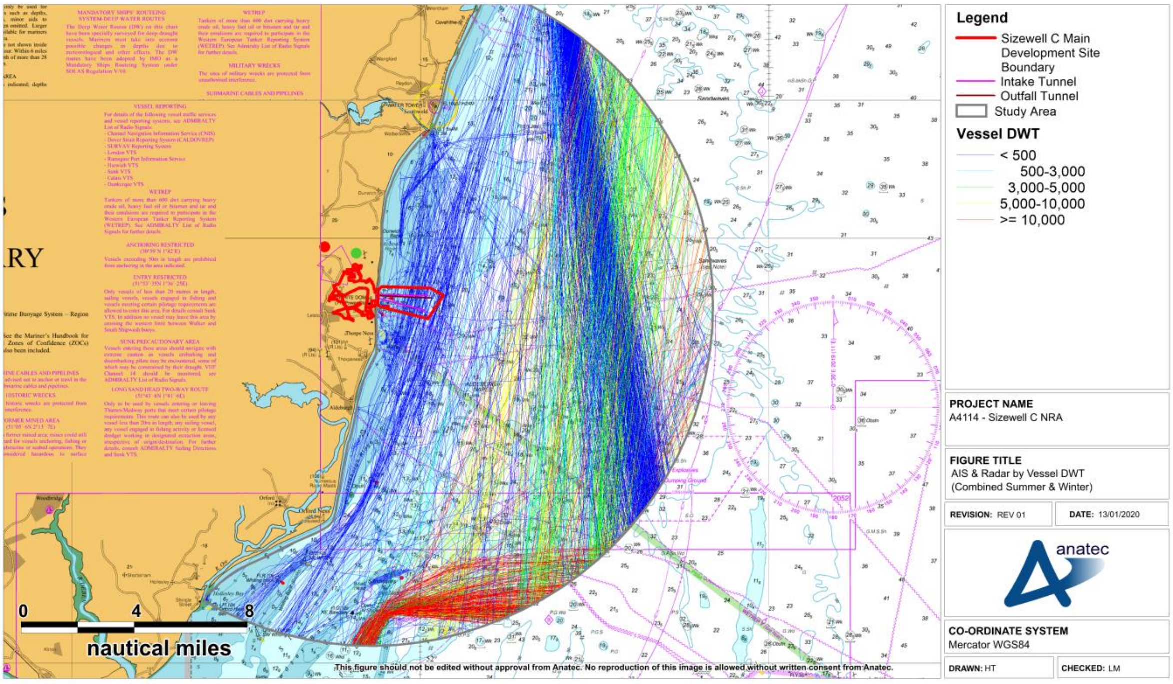



### Figure 10.15 AIS & radar vessel draught distribution

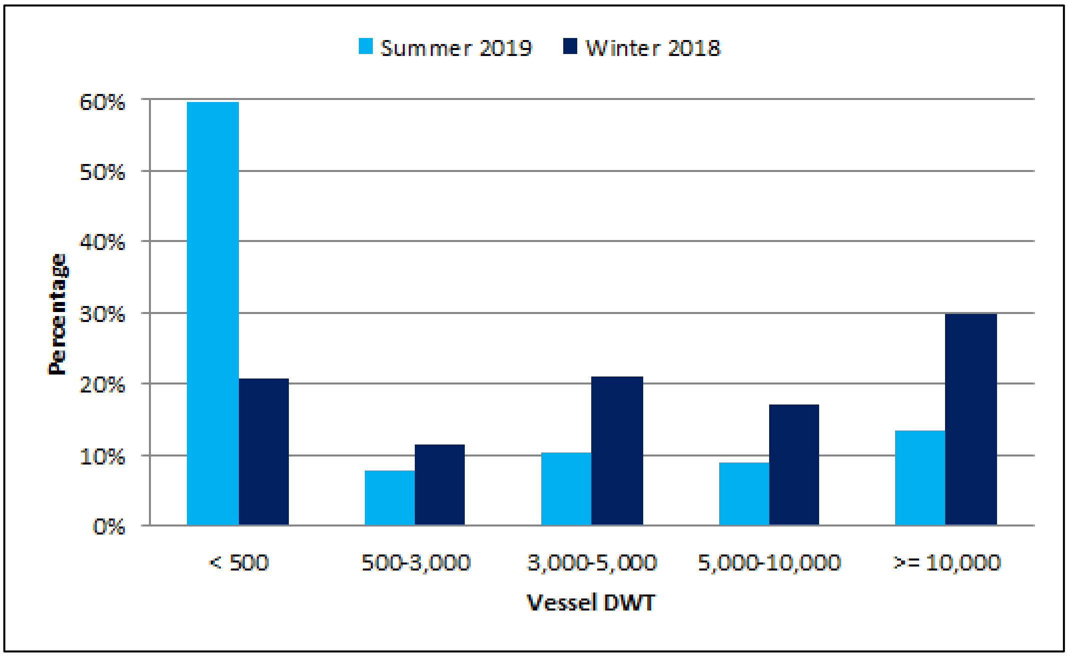
The average draughts recorded in the study area were 4m and 5m for the summer and winter periods respectively. The vessel recorded with the deepest draught of 14.5m was the crude oil tanker, *Searanger*, recorded approximately 11.7nm north-east of the proposed main development site boundary.

### 10.5.3 Vessel Deadweight Tonnage

**Figure 10.16** presents the AIS and radar tracks recorded in the study area for the full survey period (28 days), colour-coded by vessel deadweight tonnage (DWT). Following this, **Figure 10.17** presents the vessel DWT distribution, based on unique vessels per day. DWT is not broadcast on AIS and, where possible, has been researched separately by Anatec based on the ship identity information. In cases where limited information was available, a DWT has been approximated based on the vessel type and dimensions (e.g. small fishing vessels and recreational craft estimated to be less than 500 DWT).




## Figure 10.16 AIS & radar by vessel DWT (combined summer & winter)




## Figure 10.17 AIS & radar vessel DWT distribution

In summer, the majority (60%) of vessels were less than 500 DWT. This can be attributed to the large number of small recreational craft, fishing vessels and wind farm support vessels recorded during this period. In contrast, the most common DWT category during the winter survey was greater than 10,000.

During the 28 day combined summer and winter survey period, the largest vessel recorded was the container ship *Merete Maersk*, with a DWT of 194,915. This vessel was recorded passing through the study area on the 21 November 2018, approximately 10nm from the main development site boundary.

## 10.6 Vessel Speed

**Figure 10.18** presents the AIS and radar tracks recorded in the study area for the full survey period (28 days), colour-coded by average track speed. Following this, **Figure 10.19** presents the average speed distribution excluding less than 1% unspecified.

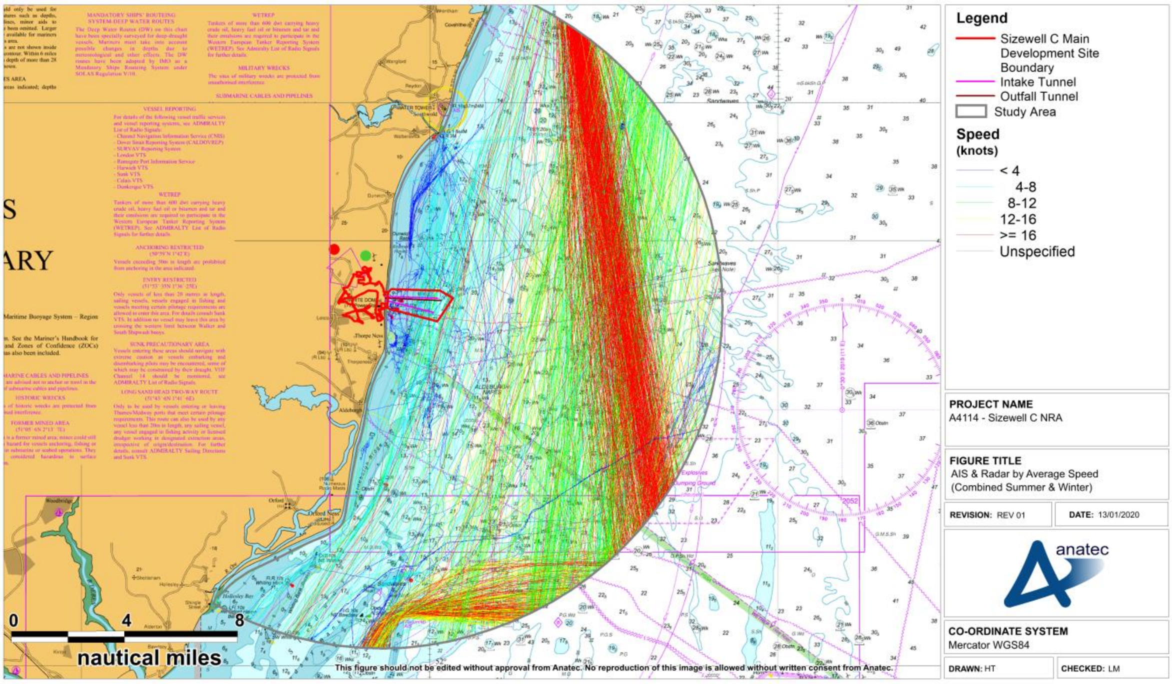



**Figure 10.18 AIS & radar by average speed (combined summer & winter)**

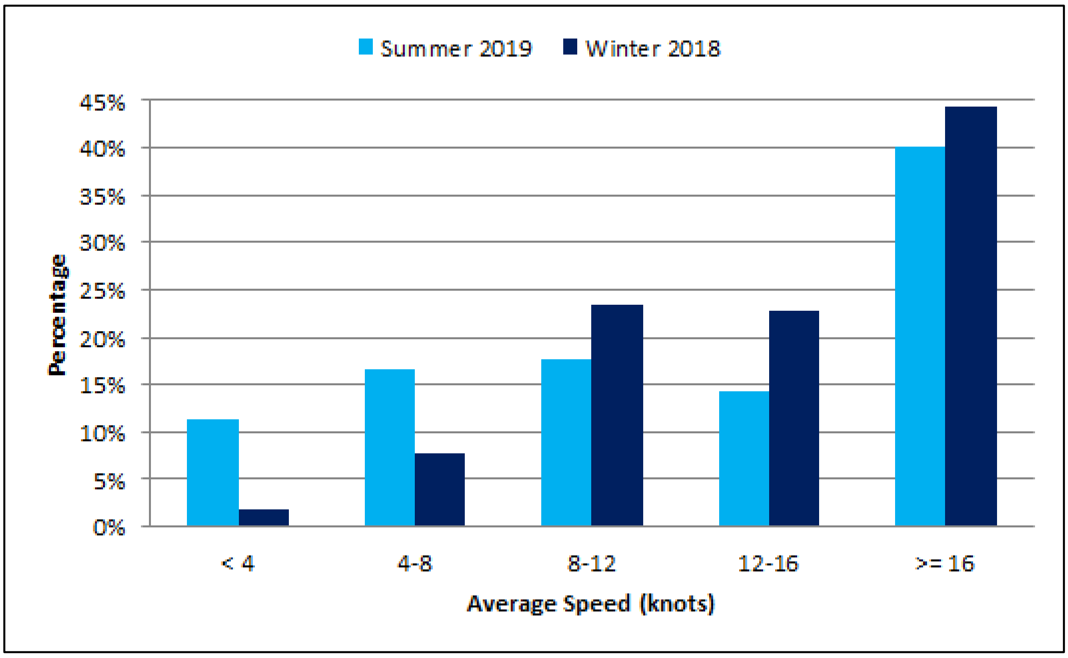



**Figure 10.19 AIS & radar average speed distribution**

The average vessel speeds recorded in the study area were 14.0 during the summer period and 15.3 during the winter period. The fastest vessel recorded a fast craft recorded on radar, with a speed of 29.0 knots.

## 10.7 Vessel Destination

**Figure 10.20** presents the distribution of the most frequently recorded destinations within the AIS data sets (including both summer and winter).

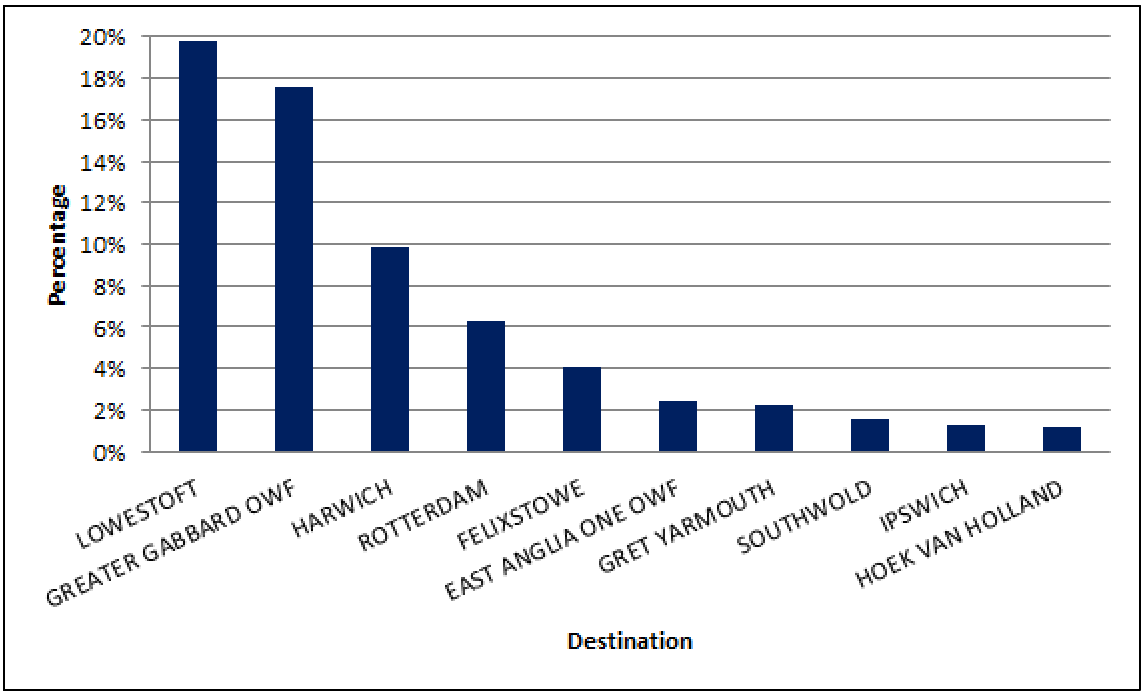
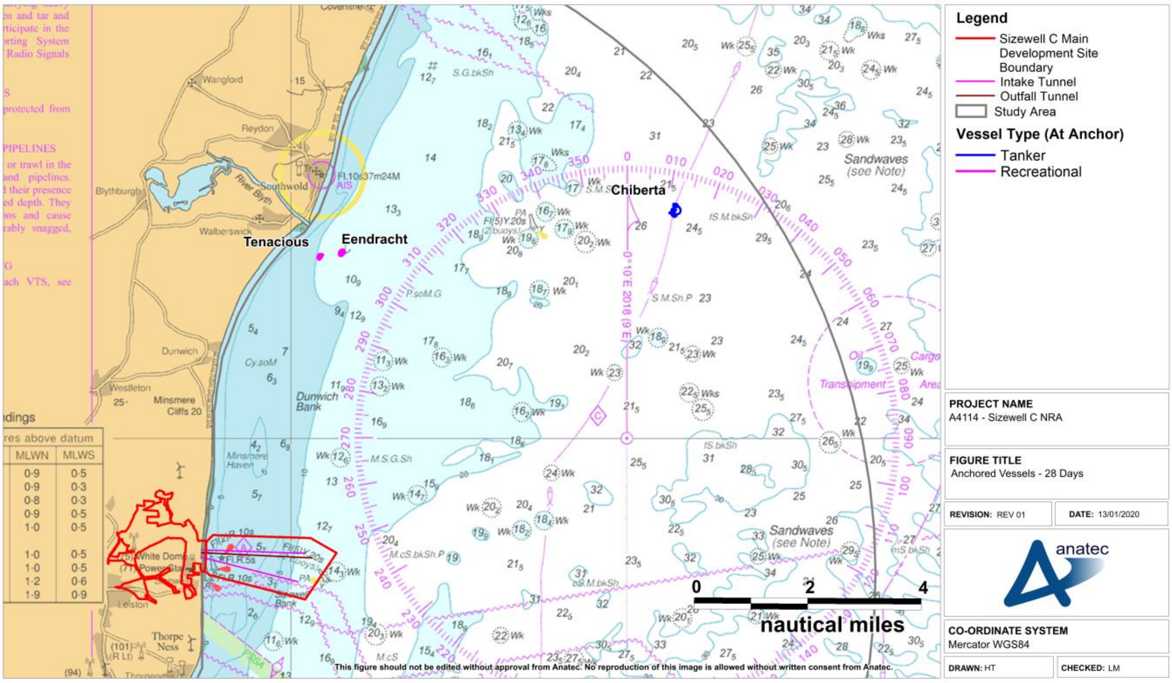



**Figure 10.20 Top vessel destinations**

The most frequently recorded destination on AIS was the port of Lowestoft, with 20% of the total traffic during the 28 day study period. Other frequently recorded destinations included Greater Gabbard offshore wind farm (18%) and the ports of Harwich (10%), Rotterdam (6%) and Felixstowe (4%).

## 10.8 Anchored Vessels

**Figure 10.21** presents the vessels deemed to be at anchor within the study area, colour-coded by vessel type. It is noted no anchoring activity was recorded during the winter period.




### Figure 10.21 Anchored vessels – 28 days

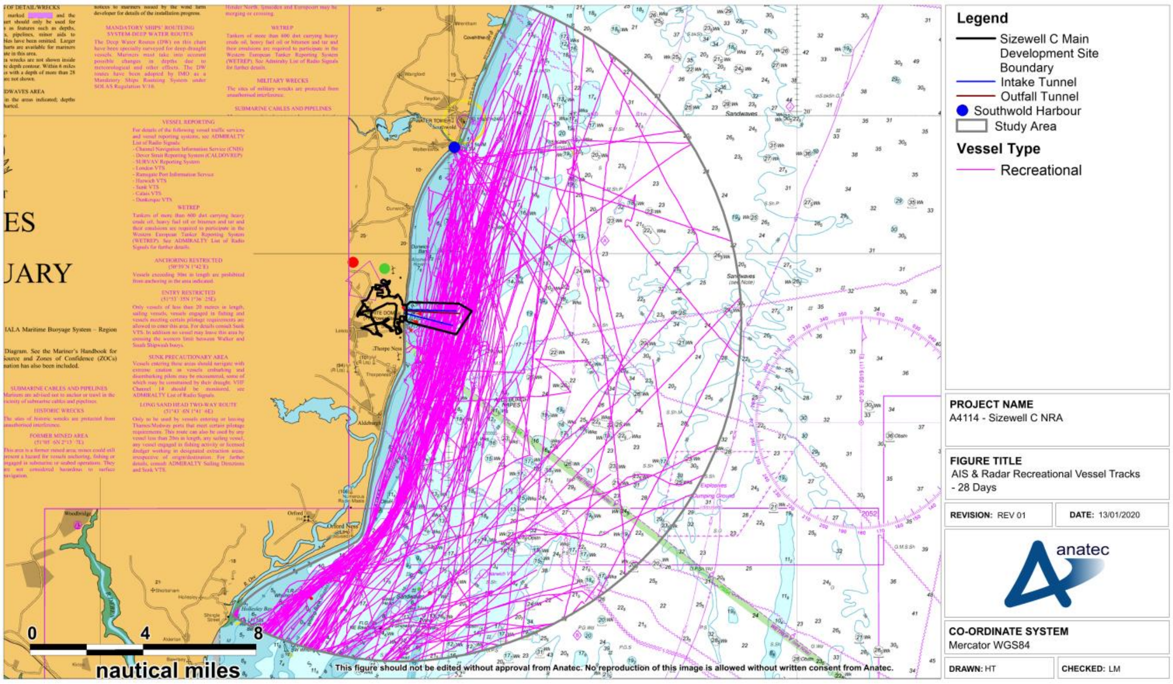
Anchoring activity was relatively low with three unique vessels recorded at anchor, each on one occasion. The closest anchored vessel recorded was the sailing vessel *Tenacious*, approximately 5nm north of the main development site boundary. The details of all anchored vessels are given below in **Table 10.1.**

### Table 10.1 Details of anchored vessels

| Name | Type | Length (m) | DWT | Dates recorded at anchor |
|---|---|---|---|---|
| Chiberta | Tanker | 143m | 19,000 | 14-15 June 2019 |
| Eendracht | Recreational | 59m | 60 | 18-19 June 2019 |
| Tenacious | Recreational | 102m | 325 | 24-25 June 2019 |

## 10.9 Recreational Vessels

**Figure 10.22** presents the AIS and radar recreational vessel tracks recorded in the study area for the full 28 day survey period.




## Figure 10.22 AIS & radar recreational vessel tracks – 28 days

It can be seen from **Figure 10.22** that a high density of recreational vessels were recorded transiting in/out of Southwold Harbour. A large number of tracks were recorded within the proposed main development site boundary.

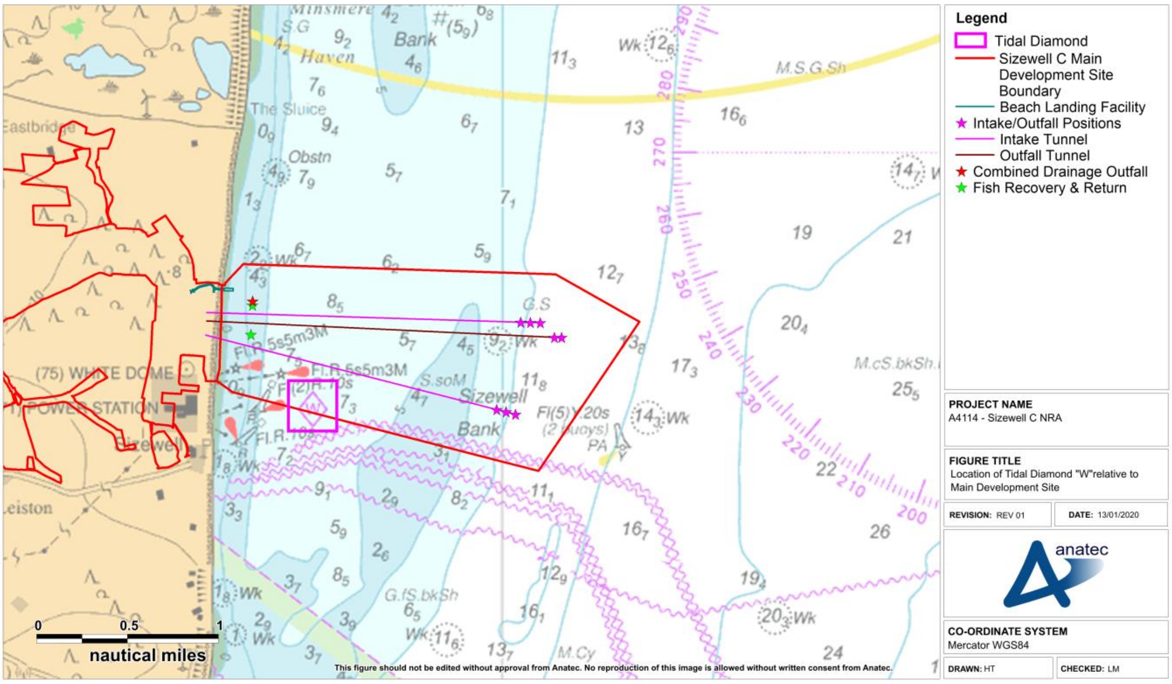
The average vessel length of recreational craft recorded in the study area was 13.2m, based on unique vessels per day, excluding 35% with unspecified length. There was on average 16 unique recreational vessels recorded per day in the summer period compared to one every five days in winter.

### 10.9.1 Tidal Effect on Recreational

This subsection presents the tidal data for the area to determine the effect this has on the direction of recreational transit.

The location of tidal diamond "W" of Admiralty chart 1543 (Winterton Ness to Orford Ness) in relation to the proposed Sizewell C development is illustrated in **Figure 10.23.** Following this, the tidal stream data for a complete 12 hour cycle is summarised in **Table 10.2.** It should be noted that the values reported are in relation to high water at Dover.

Tidal Diamond "W" indicates that the peak rate at spring tides is 1.4 knots (one hour after high water running in a northerly direction) and the minimum is calm waters (five hours after high water). The peak rate at mean neap tides is 0.7 knots (also one hour after high water) with the minimum also calm waters at five hours after high water. It can therefore be concluded that the tidal streams in the sea area adjacent to the proposed Sizewell C development are not significant.

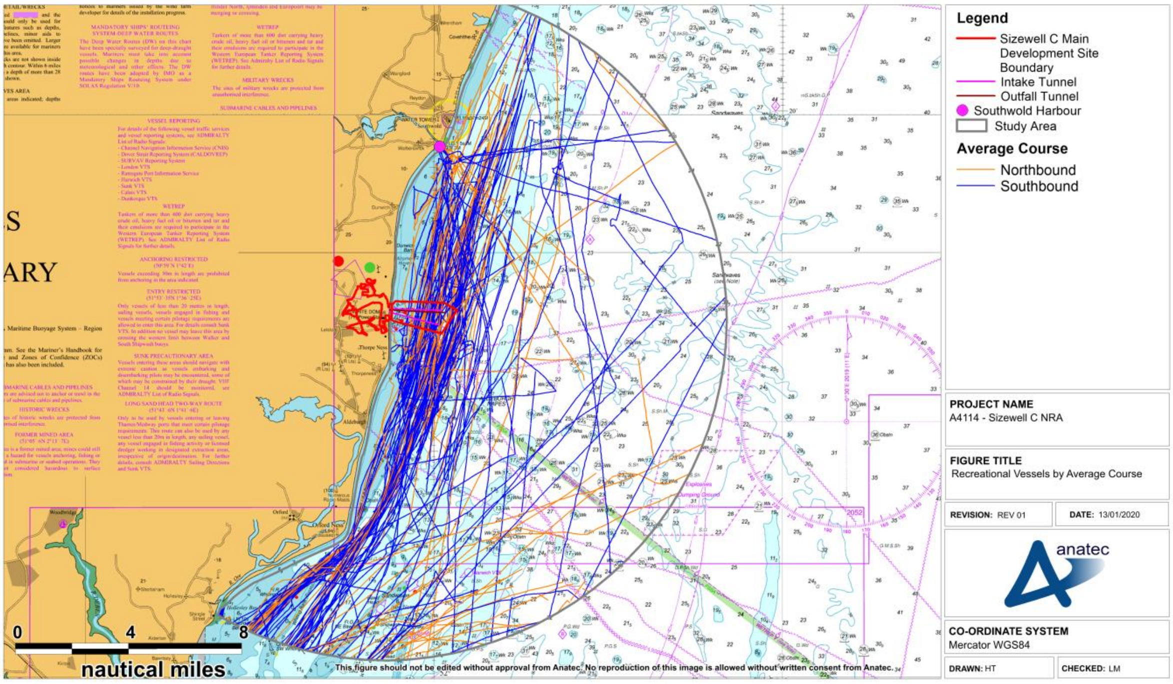



## Figure 10.23 Location of tidal diamond "W" relative to main development site

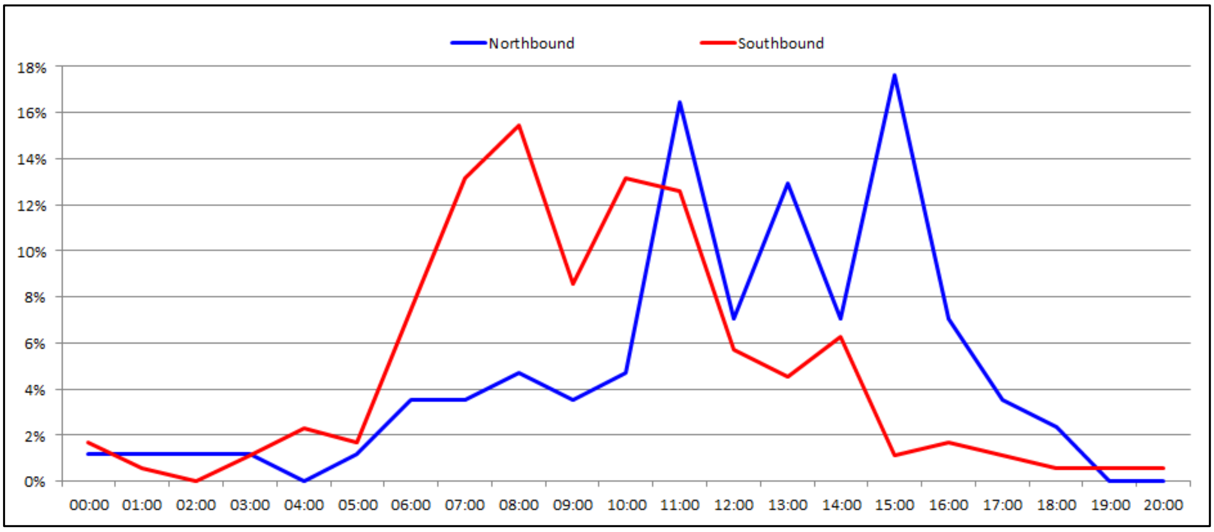
## Table 10.2 Tidal diamond "W" tidal stream data

| Hours | | | | | Tidal Diamond W | | |
|---|---|---|---|---|---|---|---|
| Before High Water | 6 | **Directions of streams (degrees)** | Rates at spring tides (knots) | Rates at neap tides (knots) | 191 | 1.0 | 0.5 |
| | 5 | | | | 187 | 1.3 | 0.6 |
| | 4 | | | | 185 | 1.2 | 0.6 |
| | 3 | | | | 185 | 1.1 | 0.5 |
| | 2 | | | | 187 | 0.7 | 0.3 |
| | 1 | | | | 005 | 0.2 | 0.1 |
| **High Water** | | | | | 007 | 1.2 | 0.6 |
| After High Water | 1 | | | | 007 | 1.4 | 0.7 |
| | 2 | | | | 007 | 1.1 | 0.5 |
| | 3 | | | | 007 | 0.9 | 0.4 |
| | 4 | | | | 007 | 0.7 | 0.3 |
| | 5 | | | | | 0.0 | 0.0 |
| | 6 | | | | 193 | 0.8 | 0.4 |

The recreational tracks by average course are presented below in **Figure 10.24**. Following this, **Figure 10.25** presents the hourly distribution of recreational vessel activity by average course recorded for the entire 28 day survey period.




## Figure 10.24 Recreational vessels by average course




## Figure 10.25 Hourly distribution of recreational vessels

It can be seen from **Figure 10.25** that peak times for transiting in northern direction are 11:00, 13:00 and 15:00. In contrast, the peak times recorded for recreational vessels transiting south are 08:00, 10:00 and 14:00. Overall it can be seen that the majority of traffic was recorded during daylight hours.

## 10.10 Fishing Vessels

**Figure 10.26** presents a general overview of the AIS and radar fishing vessel tracks recorded in the study area for the entire 28 day survey period.

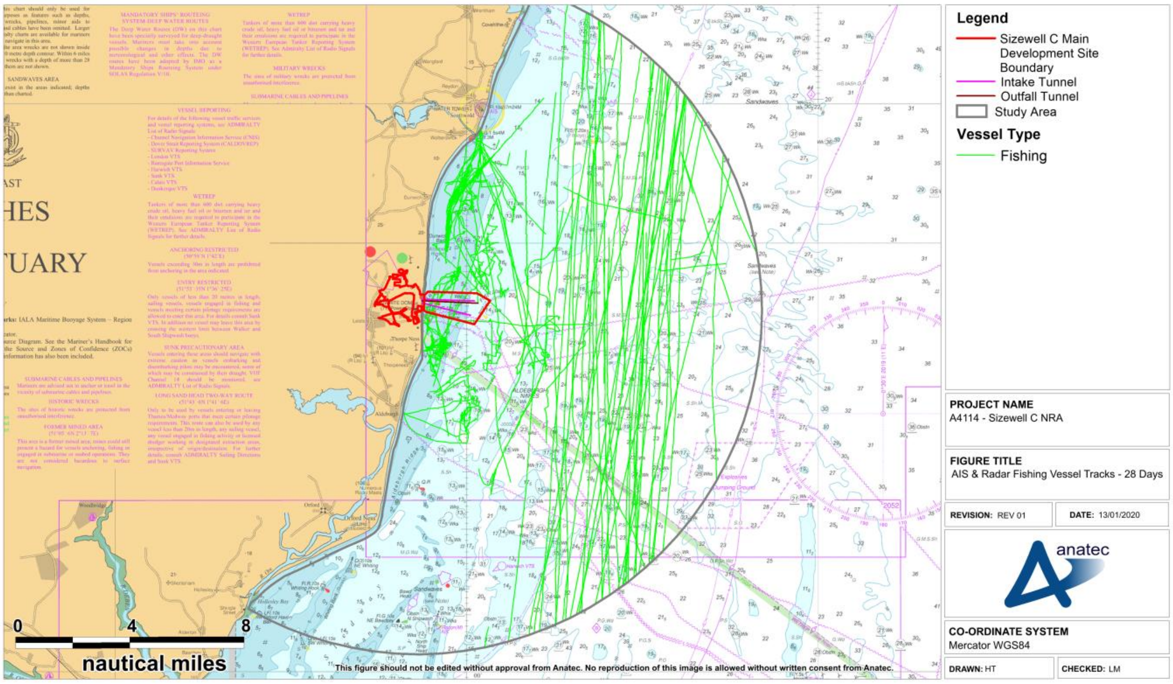
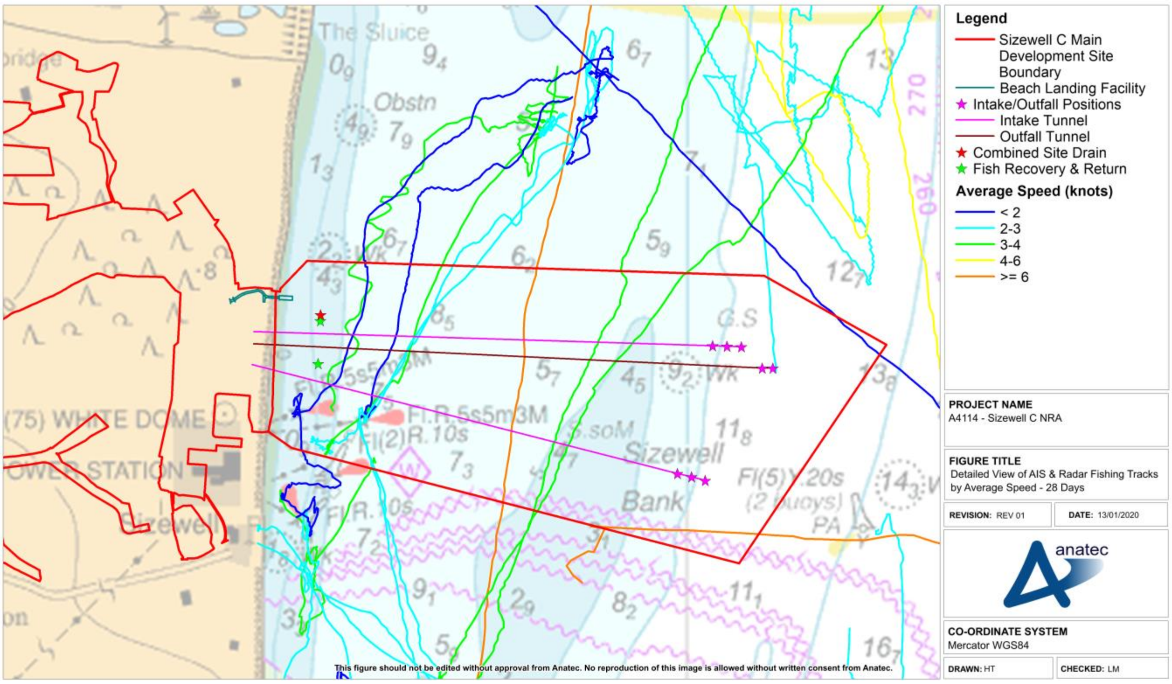



**Figure 10.26 AIS & radar fishing vessel tracks – 28 days**

Throughout the summer survey period, there was an average of three unique fishing vessels per day recorded in the study area. Throughout the winter survey period, there was an average of one unique fishing vessel every three to four days in the study area.

The proportion of unique vessels per day fishing in coastal waters is roughly equal to number of unique vessels per day transiting through the area.

**Figure 10.27** presents a detailed view of fishing vessels operating within the vicinity of the proposed developments, colour-coded by vessel speed.




### Figure 10.27 Detailed view of AIS & radar fishing tracks by average speed – 28 days

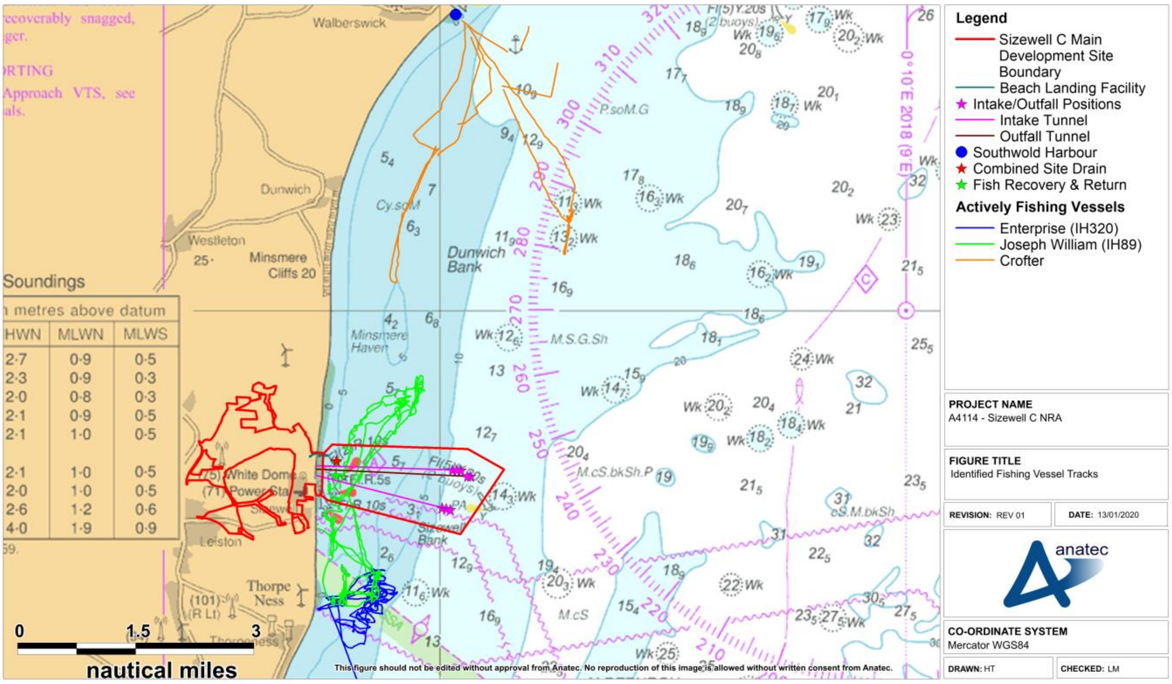
Vessels operating within close vicinity of the proposed developments appear to be engaged in fishing activities, based on their behaviour and average speed. For example, it is generally assumed that fishing vessels with speeds less than 6 knots are actively engaged in fishing operations whilst those with speeds greater than 6 knots are likely transiting on passage.

Details of fishing vessels estimated to be actively fishing in the study area are presented in **Table 10.3.** It is noted detailed information on some vessels recorded on radar, that also appeared to be engaged in fishing activities, could not be obtained.

### Table 10.3 Fishing vessel details

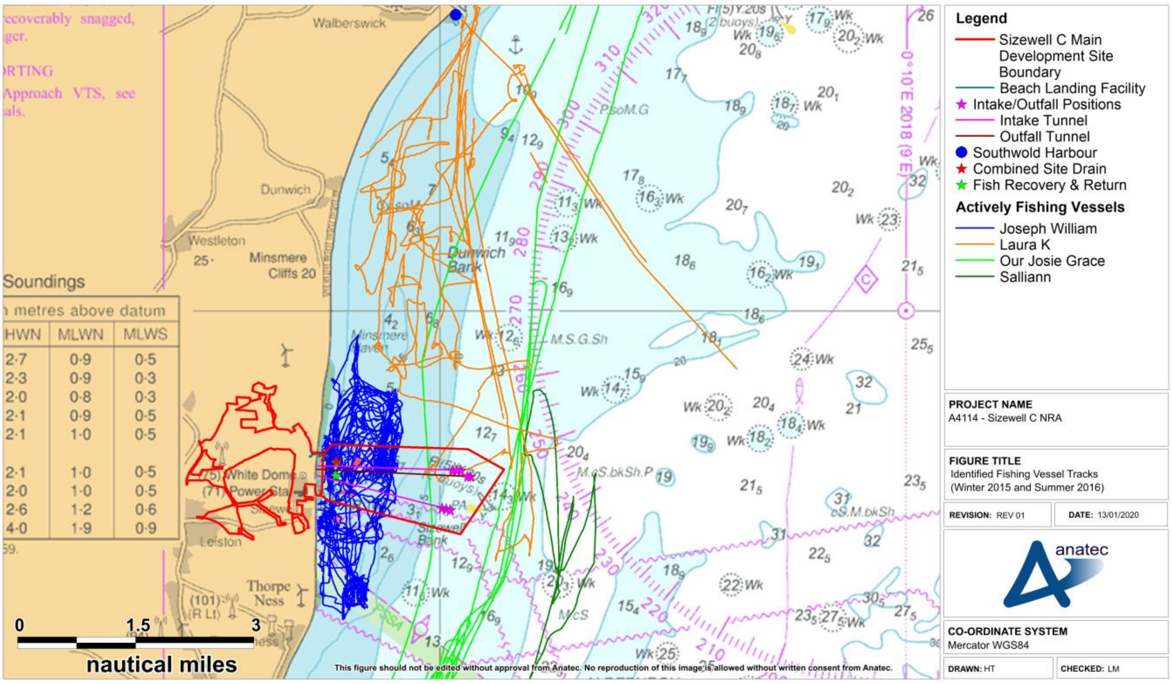
| Name | Length (m) | Main Gear Type | Days Recorded in Study Area |
|---|---|---|---|
| Joseph William (IH89) | 7 | Pots, Nets and Lines | 6 |
| Crofter | 8.25 | Set Gillnets | 4 |
| Enterprise | 8.55 | Pots and Traps | 2 |

The tracks of these vessels are presented in **Figure 10.28.** It can be seen that the Joseph William operates within very close proximity to the proposed main development site, while Crofter operates from Southwold Harbour.




## Figure 10.28 Identified fishing vessel tracks

It is noted that fishing activity around the Sizewell C main development site may have been reduced by the presence of the jack-up barge and associated vessels working at the site. For comparison, **Figure 10.29** presents fishing vessel tracks from winter 2015 and summer 2016.




## Figure 10.29 Identified fishing vessel tracks (winter 2015 and summer 2016)

It can be seen from comparison of **Figure 10.28** and **Figure 10.29** that coastal fishing activity was higher before commencement of work at the Sizewell C main development site.

### 10.10.1 Fishing Satellite Data

Information on fishing vessel intensity (based on number of vessels and time recorded in rectangle) provided by the MMO for years 2013-2017 was reviewed to determine the levels of fishing activity around the proposed development. This covers all fishing vessels of 15m in length and above. It was found that the level of fishing activity was generally low within the study area. An example of fishing activity recorded in 2017 is presented below in **Figure 10.30.**

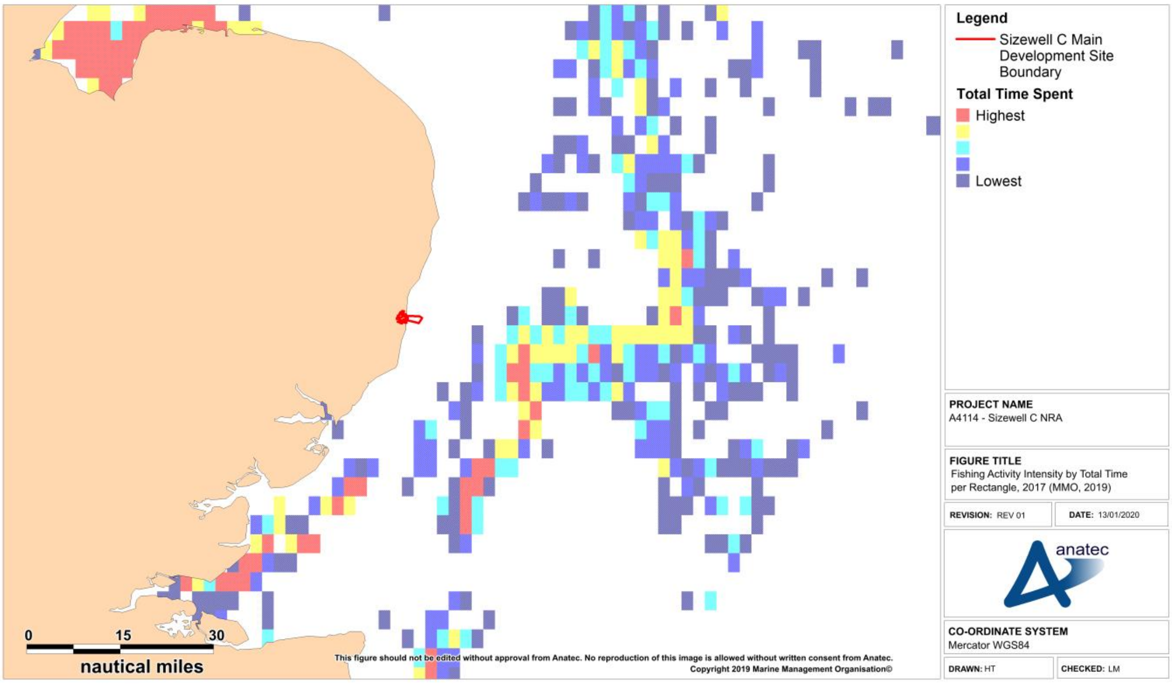



**Figure 10.30 Fishing activity intensity by total time per rectangle, 2017 (MMO, 2019)**

It can be seen from the example figure above, that fishing activity within the vicinity of the proposed development is relatively low. It is noted that the above intensity grid only covers vessels of 15m in length and above and thus will under-represent small vessel activity closer to shore, which is depicted in the AIS and radar survey data.

## 10.11 Hazardous Cargo

An analysis of vessels that could potentially be carrying hazardous cargo within the vicinity of the Sizewell C development was undertaken based on 12 months of AIS data from 1 January to 31 December 2018.

Excluding vessels that were ruled out of carrying hazardous cargoes (e.g. wind farm support vessels, fishing vessels, recreational craft, passenger vessels, vehicle carriers, edible oil tankers, etc.), 1,089 unique cargo vessels and tankers passed within 12nm of the location during the 12 month study period, consisting of 823 cargo vessels and 266 tankers.

For cargo vessels, the type of goods carried by a vessel may regularly change depending on the requirements of the customers. Information on the type of cargo that is being carried for any specific journey is not readily available due to the varying nature of each assignment. In particular, container ships may carry a wide range of cargoes in each container. It is noted that the possession of a dangerous goods certificate entitles the vessel to carry dangerous goods, but does not mean that the vessel will be carrying dangerous goods at all times.

General cargo with container capacity contributed the largest proportion of cargo vessels and the majority of cargo vessels (65%) were less than 10,000 DWT.

For tankers, information on the nature of the substance carried is more readily available, as it is generally provided within the tanker type description. For example, crude oil tankers (crude oil), oil products tankers (refined oil products), chemical tankers (liquid chemicals), liquid petroleum gas tankers, liquid natural gas tankers, etc.

The majority of tankers were products tankers (oil products or chemical oil products) and 71% were less than 10,000 DWT.

For chemical tankers, information on the IMO chemical class is also provided. The definitions are presented below:

- class I : intended to transport chapter 17 of the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk products with very severe environmental and safety hazards which require maximum preventive measures to preclude an escape of such cargo;
- class II : intended to transport chapter 17 of the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk products with appreciably severe environmental and safety hazards which require significant preventive measures to preclude an escape of such cargo;
- class III : intended to transport chapter 17 of the International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk products with sufficiently severe environmental and safety hazards which require a moderate degree of containment to increase survival capability in a damaged condition.

**Figure 10.31** presents the distribution of chemical tankers by IMO chemical class.

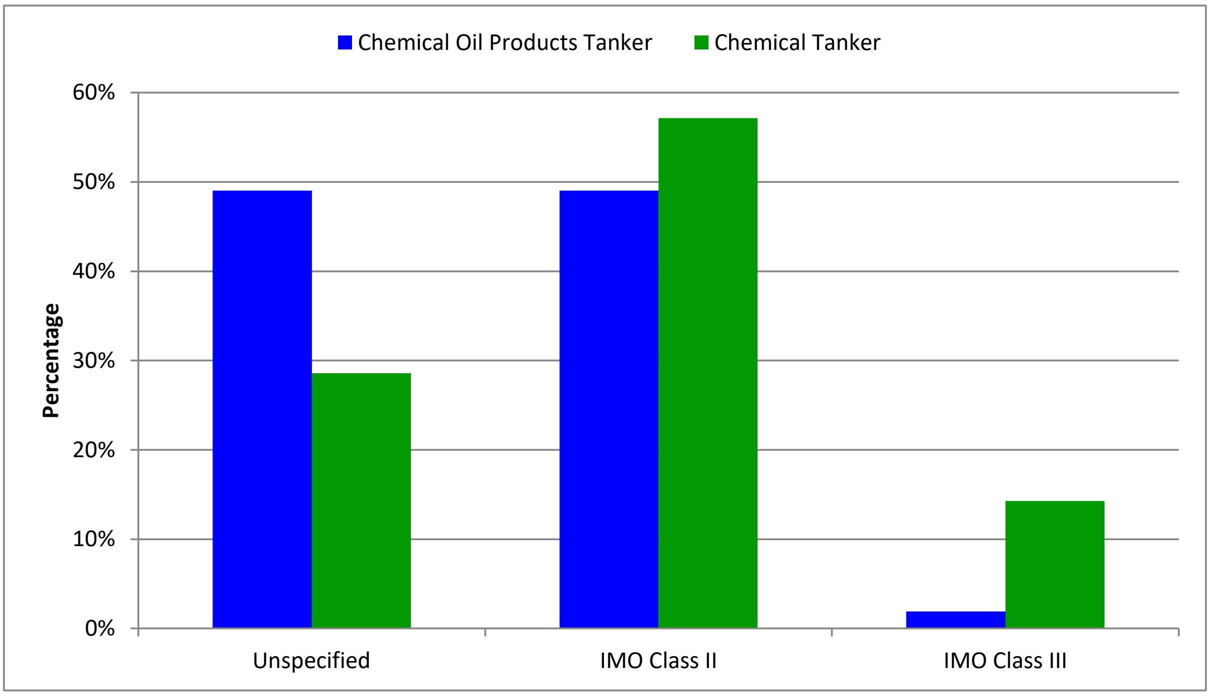



**Figure 10.31 Chemical tankers by IMO chemical class**

It can be seen that information on IMO chemical class could not be found for approximately 50% of chemical oil products tankers and 30% of chemical tankers. The majority of chemical tankers for which information was available had IMO chemical class II. No chemical tankers were identified to have IMO chemical class I.

For liquid natural gas and liquid petroleum gas tankers, the gas carrier type provides an indication of the severity of the hazard. The following definitions are used:

- Type 1G : Designed to carry the most hazardous cargoes.
- Type 2G and 2PG : Designed to carry cargoes having a lesser degree of hazard.
- Type 3G : Designed to carry cargoes of the least hazardous nature.

**Figure 10.32** presents the distribution of gas carriers by gas carrier type.

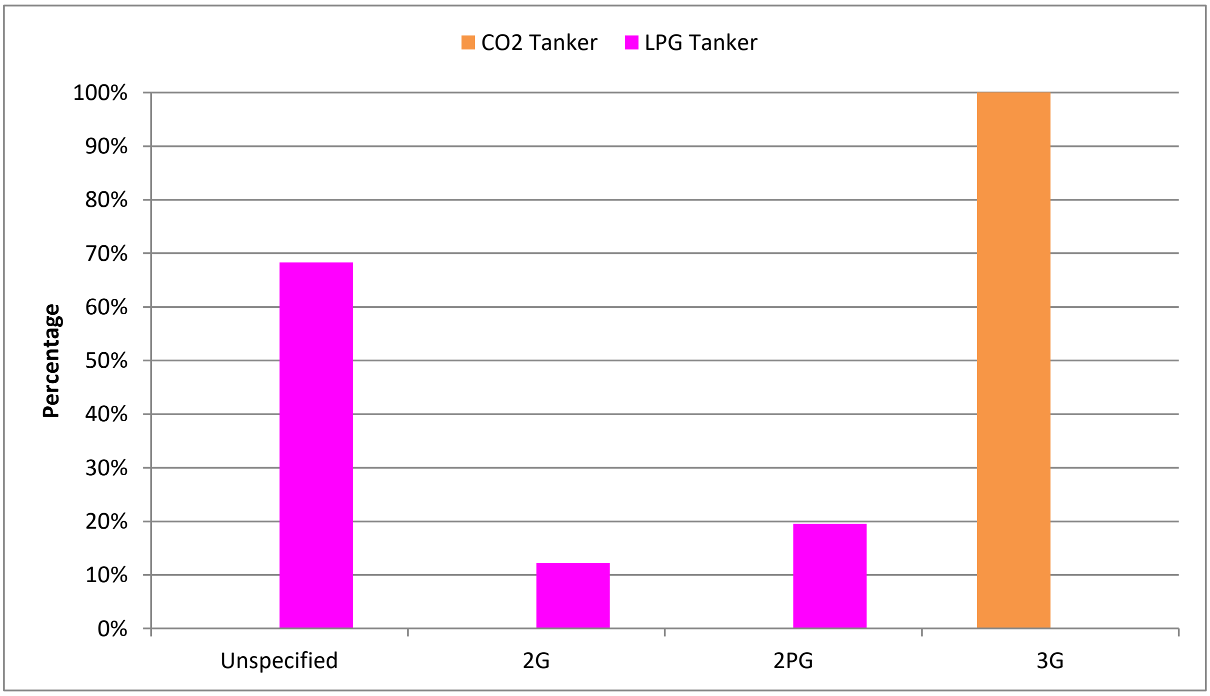



**Figure 10.32 Gas carriers by gas carrier type**

It can be seen that all CO2 tankers had gas carrier type 3G, while information on the gas carrier type for the majority of liquid petroleum gas tankers could not be found. All liquid petroleum gas tankers for which information was available had gas carrier type 2G or 2PG.

Overall, 295 cargo vessels and 71 tankers were determined to carry a dangerous goods certificate, although it is noted that the information available is not comprehensive and other vessels may carry this certificate. In addition, vessels carrying this certificate may not be transporting hazardous goods regularly. Dangerous goods certificates include:

- ICCP : Certificate for the Carriage of Dangerous Chemicals in Bulk.
- ICG : Certificate of Fitness for the Carriage of Liquefied Gases in Bulk.
- IDG-IC : Document of Compliance for the Carriage of Dangerous Goods.
- NLS : Certificate for the Carriage of Noxious Liquid Substances in Bulk.
- IHM : Certificate (or Statement of Compliance) for Inventory of Hazardous Materials.

Other sources stated whether the vessel is fitted with a dangerous goods certificate according to Regulation 19 of Safety of Life at Sea Chapter II-2 (Ref. 4). The purpose of this regulation is to provide additional safety measures in order to address the fire safety objectives of the chapter for ships carrying dangerous goods.

Of the cargo vessels and tankers, one vessel passed within the main development site boundary; the oil products tanker *Rix Merlin*. The majority of cargo vessels passed between 4nm and 8nm from the location while the majority of tankers passed between 6nm and 10nm from the location.

# 11 Future Baseline

## 11.1 Introduction

This section discusses any forecasted changes to the baseline environment, including planned developments.

## 11.2 Future Shipping Trends

The total number of ship arrivals at ports in proximity to the Sizewell C development is presented in **Figure 11.1** for the years 2009-2017 (Ref. 17).

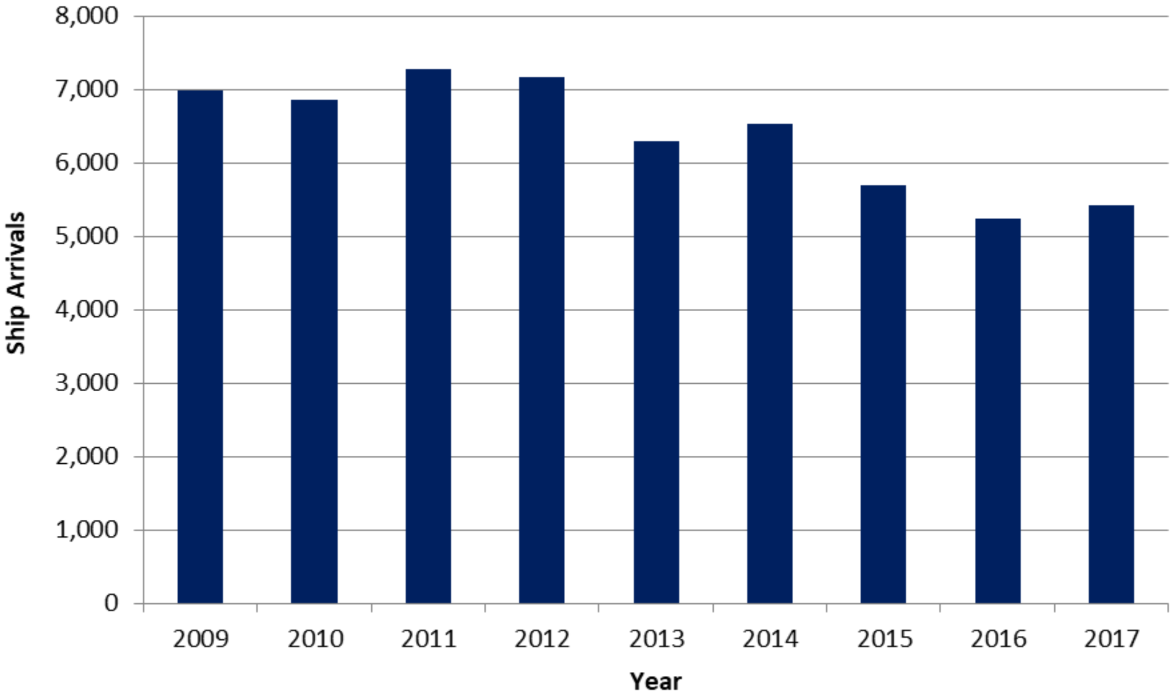



Figure 11.1 Total number of ship arrivals (2009-2017)

It can be seen that the annual number of vessels arriving at the main ports in the area has reduced since 2009, with 2017 receiving approximately 22% fewer vessels than 2009, although the number of arrivals did increase slightly from 2016 to 2017.

Although the general trend in port arrivals was a reduction in shipping, the new offshore wind developments (both consented and planned) suggest that shipping activity may increase in the future. It is noted that growth in UK shipping in particular is uncertain due to the many unknowns surrounding the decision to leave the European Union (EU) and therefore, this may affect traffic transiting between UK and foreign ports.

The majority of vessels likely to be affected by the Sizewell C Project are fishing and recreational vessels. Trends in fishing and recreational activity are difficult to predict. Fishing activity can depend on various influencing factors such as fish stocks, quotas, Brexit, etc., while recreational activity can be impacted by factors such as weather and the economy. Climate change, including increased number of storm events, could reduce recreational activity, whilst increase in temperatures could increase recreational activity.

Overall, there is not anticipated to be any significant increase in the shipping activity presented in the baseline assessment.

## 11.3 Planned Developments

### 11.3.1 East Anglia One

The East Anglia One offshore wind farm is currently under construction and scheduled to be fully operational in 2020, with first energy generation expected by the end of 2019. The wind farm will include 102 turbines each with a 7 Megawatt (MW) capacity resulting in a total project capacity of 714MW. The operations and maintenance base will be constructed at Hamilton Dock, Lowestoft, and so there is not anticipated to be any significant increase in traffic in proximity to Sizewell C once this wind farm is operational.

If Harwich is chosen as the transhipment facility for AIL deliveries, there may be a slight increase in collision risk if any maintenance and/or repair works were required within the vicinity of the East Anglia One export cable landfall during the delivery period. However, due to the low number of vessels involved in deliveries relative to the number of vessels transiting within the area, this is not expected to materially alter the baseline conditions for AIL delivery vessels.

### 11.3.2 Galloper Operations and Maintenance Facility

Construction of an operations and maintenance facility at Harwich for the Galloper offshore wind farm was approved in 2018, with construction expected to be completed in early 2020. However, the wind farm has been operational since 2017 and vessels currently servicing Galloper offshore wind farm have been using temporary facilities at Harwich. Therefore there is not anticipated to be any significant change in baseline associated with the operations and maintenance facility.

# 12 Hazard Log

## 12.1 Introduction

This section details the process by which the Sizewell C hazard log has been created, as per the required NRA methodology. The hazard log lists potential impacts to shipping and navigation that may arise from the Sizewell C Project, and provides significance rankings based on stakeholder input. The full hazard log is provided in **Appendix 24B**.

It is emphasised that the hazard log rankings form only one input to the impact assessment, which also considers the consultation process as a whole and the baseline assessment findings.

## 12.2 Hazard Consultation Meeting

To inform the hazard log, a meeting was held on the 3 April 2019 at the Waterloo Centre in Leiston. Key marine stakeholders and regular operators were invited to attend this meeting to provide input into the hazard log and the Sizewell C Project in general. Attending organisations/individuals are listed below:

- SZC Co. (hosts);
- Anatec Ltd (hosts);
- LDA Design;
- RYA;
- Cruising Association;
- East Anglia Wind Farm;
- Eastern Inshore Fisheries and Conservation Authority;
- RNLI;
- Centre for Environment, Fisheries and Aquaculture Science;
- Joseph William fishing vessel skipper; and
- local resident.

The hazard log was drafted following the hazard workshop, and provided to the attending organisations/individuals for comment, prior to finalisation.

## 12.3 Results

The impacts identified as part of the hazard log process are listed below:

- increased collision risk of passing vessels with construction vessels, dredger and AIL vessels during construction and operation;
- risk of AIL delivery vessel grounding / foundering in shallow waters;
- disruption to fishing and recreational activities during construction;
- fishing gear interaction with subsurface cooling water intakes/outfalls;
- vessel dragging anchor or emergency anchoring on water intakes/outfalls; and

- increased grounding / foundering risk associated with reduction in under keel clearance for vessels passing over intake/outfall structures.

These impacts are assessed in the impact assessment in **section 13**.

# 13 Impact Assessment

## 13.1 Introduction

This section identifies aspects of the proposed development which have the potential to affect shipping and navigation and the methodology used to assess them.

## 13.2 Impacts Overview

The impacts identified based on the shipping and navigation baseline assessment and stakeholder consultation are summarised and listed below in **Table 13.1**. The impacts are grouped by phase.

**Table 13.1 Assessed impacts**

| Phase | Impact |
|---|---|
| Construction | Increased collision risk (passing vessels & vessels actively fishing with installation vessels). |
| | Increased collision risk (passing vessels & vessels actively fishing with dredgers). |
| | Increased collision risk (passing vessels & vessels actively fishing with AIL vessels). |
| | Increased risk of vessel grounding (AIL delivery vessels). |
| | Disruption to fishing and recreational activities. |
| | Disruption to maintenance on Galloper cables |
| Operation | Increased collision risk (passing vessels & vessels actively fishing with dredgers). |
| | Increased collision risk (passing vessels & vessels actively fishing with AIL vessels). |
| | Increased risk of vessel grounding (AIL delivery vessels). |
| | Increased risk of passing vessel grounding on intake/outfall structures. |
| | Fishing gear snagging. |
| | Risk from vessel anchors (anchor drag and emergency anchoring). |
| | Passing vessel foundering. |

## 13.3 Assessment Methodology

The impact assessment process has been evaluated using the IMO Formal Safety Assessment methodology (Ref. 1). The Formal Safety Assessment assigns each impact a "severity of consequence" and a "frequency of occurrence" to evaluate the significance of each impact. The frequency of occurrence will be assessed on a 5-point scale from negligible to frequent as presented in **Table 13.2.**

### Table 13.2 Frequency bands

| Rank | Description |
|---|---|
| 1 | Negligible |
| 2 | Extremely Unlikely |
| 3 | Remote |
| 4 | Reasonably Probable |
| 5 | Frequent |

The severity of the consequences will also be assessed on a five-point scale. The defined consequence bands are presented in **Table 13.3.**

### Table 13.3 Consequence bands

| Rank | People | Property | Environment | Business |
|---|---|---|---|---|
| 1 | Zero injury | Zero damage | Zero effect | Zero impact |
| 2 | Minor injury | Minor damage | Minor effect | Minor impact |
| 3 | Major injury | Moderate damage | Moderate effect | Considerable impact |
| 4 | Single fatality | Major damage | Major effect | Major national impact |
| 5 | Multiple fatalities | Extensive damage | Extensive effect | Major international impact |

Following this, the risk level will be determined using the risk matrix illustrated in **Table 13.4.**

## Table 13.4 Risk matrix

| Consequences | | | | | Frequency | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Severity rating** | **People** | **Property** | **Environment** | **Business** | **1** Negligible | **2** Extremely Unlikely | **3** Remote | **4** Reasonably Probable | **5** Frequent |
| 1 | Zero injury | Zero damage | Zero effect | Zero impact | Broadly Acceptable | Broadly Acceptable | Broadly Acceptable | Broadly Acceptable | Broadly Acceptable |
| 2 | Minor injury | Minor damage | Minor effect | Minor impact | Broadly Acceptable | Broadly Acceptable | Broadly Acceptable | Tolerable | Tolerable |
| 3 | Major injury | Moderate damage | Moderate effect | Considerable impact | Broadly Acceptable | Tolerable | Tolerable | Tolerable | Unacceptable |
| 4 | Single fatality | Major damage | Major effect | Major national impact | Tolerable | Tolerable | Tolerable | Unacceptable | Unacceptable |
| 5 | Multiple fatalities | Extensive damage | Extensive effect | Major international impact | Tolerable | Tolerable | Unacceptable | Unacceptable | Unacceptable |

| | | |
|---|---|---|
| (green) | Broadly Acceptable (low risk) | Under EIA terms broadly acceptable is considered to be **not significant** and impacts are regarded as acceptable and adequately controlled. |
| (orange) | Tolerable (intermediate risk) | Under EIA terms tolerable is considered to be **not significant**, however there is an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are As Low As is Reasonably Practicable (ALARP) and that risks are periodically reviewed to monitor if further controls are appropriate. |
| (red) | Unacceptable (high risk) | Generally regarded as unacceptable whatever the level of benefit associated with the activity. Under EIA terms unacceptable is considered to be **significant** and would require risk mitigation or design modification to reduce to tolerable (ALARP). |

## 13.4 Embedded Mitigation

This section details the embedded (or tertiary) mitigation measures that are assumed to be in place prior to the construction phase as part of the Formal Safety Assessment process.

### 13.4.1 Construction

- Circulation of information via notice to mariners, radio navigational warnings, navigational telex, and/or broadcast warnings in advance of and during the offshore works. The notices will include a description of the work being carried out.
- Communication between the Sizewell C Project and the operators of the Galloper and Greater Gabbard offshore wind farms.
- Vessels would be required to comply with International Regulations for the Prevention of Collision at Sea (Ref. 3) and the International Regulations for Safety of Life at Sea (Ref. 4).
- Should a competent harbour authority be established, the Sizewell C Project will look to deploy temporary safety zones, monitored by guard vessels, around sensitive areas of installation to safely manage navigation. Without a competent harbour authority minimum safe passing distances will be used and promulgated in place of the temporary safety zones.
- A delivery and logistics plan will be developed for AIL deliveries.
- A fisheries liaison officer (FLO) will be in place.

### 13.4.2 Operation

- During AIL deliveries, a temporary safety zone or minimum passing distances will apply, thereby restricting access to beachfront recreational and fishing activities in immediate area.
- A delivery and logistics plan will be developed for AIL deliveries.
- Cooling water intake/outfall headwork positions will be marked on Admiralty charts.
- Details of the cooling water intake/outfall headwork positions will be included in fishermen’s awareness charts issued by Kingfisher.
- Intake/outfall structures will be marked with buoys or beacons.
- Offshore pilings for the BLF will be marked with buoys.
- Notice to mariners to identify presence of infrastructure.

## 13.5 Significant Impacts

This section describes the impacts (summarised in **Table 13.1**) that have been considered as part of the Formal Safety Assessment process.

### 13.5.1 Construction

#### 13.5.1.1 Increased Collision Risk (passing vessels & vessels actively fishing with installation vessels)

An increased collision risk is created during the construction phase for all passing traffic, the majority of which is fishing and recreational, due to the presence of vessels associated with the construction of the infrastructure (BLF, intake/outfall headworks, and CDO and FRR headworks). In addition, vessels actively engaged in fishing activities (both commercial and recreational) also present an increased collision risk.

Vessels likely to be involved in the construction of the headworks include crane vessels, a jack-up barge and support vessels. Vessels will have restricted manoeuvrability and therefore may have limited capability in taking avoidance action from a passing vessel on a collision course, should such a situation arise. Marine piling for the BLF will be constructed from a walking jack-up barge or from the advancing BLF as construction progresses seawards. The intake/outfall tunnels will be excavated by tunnel boring machines from landward and are not expected to present a risk to marine navigation. Similarly, the FRR and CDO tunnels are likely to be directional drilled and or not expected to present a risk to marine navigation.

Each phase of offshore construction (i.e. BLF, intake/outfall headworks, CDO or FRR) is intended to be completed within one calendar year.

It is expected that the majority of vessels in the area will be aware of the construction work before encountering the project vessel(s) through embedded mitigation (circulation of information such as notices to mariners, radio navigation warnings and navigational telex). In addition, a safety zone will be created around sensitive areas of construction activity (i.e. cooling water intake and outfall head structures, BLF, CDO and FRR head structures), and monitored by a guard vessel(s). This will minimise any risk to recreational craft (including recreational fishing boats) that may not have been previously aware of the works.

The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a risk ranking of tolerable.

#### 13.5.1.2 Increased Collision Risk (passing vessels & vessels actively fishing with dredgers)

There is also an increased collision risk associated with dredging activity required for the construction of the BLF and the intake/outfall headworks, from passing vessels and vessels actively fishing. Dredging will also be required prior to installation of the FRR and CDO outfalls. This mainly impacts fishing and recreational vessels close to the coast, as well as small wind farm support vessels and tugs that were noted to transit close to the proposed locations of the intake/outfall structures.

The duration of dredging works required for the BLF and installation of headworks is estimated to be 12 weeks each.

It is expected that the majority of vessels in the area will be aware of the dredging works before encountering the project vessel(s) through embedded mitigation (circulation of information such as notices to mariners, radio navigation warnings and navigational telex). In addition, a safety zone will be created within the vicinity of the BLF to allow preparation and/or maintenance of the navigational channel for AIL deliveries, and monitored by a guard vessel(s)

The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a ranking of tolerable.

#### 13.5.1.3 Increased Collision Risk (passing vessels & vessels actively fishing with AIL vessels)

An increased collision risk with vessels carrying out AIL deliveries during the construction phase is also created.

Accounting for weather downtime, there is expected to be a total of 200 beach landings over a 4-year campaign period during construction. This equates to an estimated 50 AIL landings during each annual campaign (31 March to 31 October). Therefore, these campaigns are expected to increase the risk for passing vessels.

Three ports are being considered as transhipment facilities for the AIL deliveries including Great Yarmouth, Harwich and the Netherlands (Rotterdam/Vlissingen). Therefore, there is potential for three different routes to be taken during the life of the Sizewell C Project.

The collision risk is likely to be greater in higher density shipping areas. This includes coastal areas where a higher level of fishing and recreational activity is carried out. In addition, the north/south route utilised by transiting traffic in the study area is also an area of higher collision risk.

Due to the low number of vessels involved in AIL deliveries relative to the number of vessels transiting within the area between each of the potential transhipment options, the increased risk of collision is not considered to be **significant**.

It is expected that the majority of vessels in the area will be aware of the construction work before encountering the project vessel(s) through embedded mitigation (circulation of information such as notices to mariners, radio navigation warnings and navigational telex). In addition, a delivery and logistics plan will be developed for AIL deliveries.

The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a ranking of tolerable.

#### 13.5.1.4 Increased Risk of AIL Delivery Vessel Grounding

Vessels involved in the AIL deliveries during the construction phase may have an increased risk of grounding due to the shallow water depths of the surrounding area and reduced under keel clearance due to the cooling water intake/outfall subsea infrastructure, once the structures are in place. This risk may be increased through avoidance of fishing and recreational activities at the beachfront during AIL deliveries.

Damage may occur to the vessel and intake/outfall structures, as well as having an environmental impact on the beach due to the close proximity. Mitigation such as promulgation of information of cooling water headwork positions and temporary safety zones around BLF will limit risk. A specific delivery and logistics plan will be developed for these AIL deliveries, including a risk assessment prior to the operation. In addition, the Sizewell C DCO application includes an application for a competent harbour authority, and so AIL deliveries would be under control of the harbour master, thereby requiring appropriate risk assessment.

The frequency of this effect is considered to be extremely unlikely, and the severity moderate resulting in a ranking of tolerable.

#### 13.5.1.5 Disruption to Fishing and Recreational Activities

Fishing and recreational activity is observed in the vicinity of the proposed development. One fishing vessel in particular was recorded operating regularly within close proximity to the proposed BLF, CDO, FRR and cooling water intake/outfall head positions, with another three recorded operating within 1nm of the proposed cooling water intake/outfall head positions. A high level of recreational activity was also observed within the site, passing over the locations of the proposed intake/outfall heads and approximately 0.3nm from the CDO and FRR structures.

Fishing activity was observed during both winter and summer periods, whilst the majority of recreational activity was observed in summer. Therefore, as the construction period will span several years and works may be undertaken during both summer and winter periods, the presence of vessels associated with the construction of the proposed development, may cause a disruption to local fishermen and recreational users.

It was also noted during the hazard workshop that lobster and crab fishing grounds could be impacted by dredging works associated with construction. Impact to fishing grounds is assessed further in **Chapter 22** of **Volume 2** of the **ES**, however any impact to fishing grounds could have a subsequent impact on fishermen using pots and traps to target lobster and crab.

The impact is likely to be greatest in the higher density areas of fishing and recreational activity, i.e. within waters close to shore. It is expected that embedded mitigation measures such as promulgation of information (including Kingfisher and notice to mariners), and consultation with local fisheries through a FLO would help reduce this disruption.

The frequency of this effect is considered to be reasonably probable, and the severity minor, resulting in a ranking of tolerable.

#### 13.5.1.6 Disruption to Maintenance Works on Galloper and Greater Gabbard Offshore Wind Farm Cables

Due to the distance between the proposed cooling water intake/outfall headworks and the export cables for the Galloper offshore wind farms (approximately 0.2nm south at its closest point) and Greater Gabbard offshore wind farm (approximately 0.4nm south at its closest point), there may be some disruption to maintenance works on the cables, if they are required while construction works on the cooling water infrastructure is in progress.

This impact would be mitigated by good communication between the Sizewell C Project and the Operators of the Galloper and Greater Gabbard offshore wind farms and circulation of information about construction works.

Assuming this is the case, the frequency of this effect is considered to be extremely unlikely and the severity minor, resulting in a ranking of broadly acceptable.

### 13.5.2 Operation

#### 13.5.2.1 Increased Collision Risk (passing vessels & vessels actively fishing with dredgers)

There is an increased collision risk associated with any maintenance dredging required for the BLF during the operational phase, from passing vessels and vessels actively fishing.

It is expected that the majority of vessels in the area will be aware of the dredging works before encountering the project vessel(s) through embedded mitigation (circulation of information such as notices to mariners, radio navigation warnings and navigational telex). In addition, a safety zone will be created within the vicinity of the BLF to allow preparation and/or maintenance of the navigational channel for AIL deliveries, and monitored by a guard vessel(s)

The frequency of this effect is considered to be extremely unlikely, and the overall severity moderate, resulting in a ranking of tolerable.

#### 13.5.2.2 Increased Collision Risk (passing vessels & vessels actively fishing with AIL delivery vessels)

During operation, there will be periodic AIL deliveries scheduled over the lifetime of the Sizewell C nuclear power station. It is estimated that AILs would occur once every five years and comprise very few individual deliveries.

Mitigation measures include circulation of information such as notices to mariners, radio navigation warnings and navigational telex. In addition, a delivery and logistics plan will be developed for AIL deliveries, including appropriate risk assessment.

The frequency of this effect is considered to be extremely unlikely, and the severity moderate, resulting in a ranking of tolerable.

#### 13.5.2.3 AIL Delivery Vessel Grounding

Vessels involved in the periodic AIL deliveries may have an increased risk of grounding due to the shallow water depths of the surrounding area. This risk may be increased through avoidance of fishing and recreational activities at the beachfront during AIL deliveries.

Damage may occur to the vessel, as well as having an environmental impact on the beach due to the close proximity. Mitigation such as temporary safety zones around BLF will limit risk, as well as dredging of the approach channel for the BLF and a delivery and logistics plan for AIL delivery vessels. In addition, the Sizewell C DCO application includes an application for a competent harbour authority, and so AIL deliveries would be under control of the harbour master, thereby requiring appropriate risk assessment.

The frequency of this effect is considered to be extremely unlikely, and the severity moderate resulting in a ranking of tolerable.

#### 13.5.2.4 Disruption to Fishing and Recreational Activities

There may also be disruption to fishing and recreational activities during the operational phase, associated with use of the BLF and any requirements for dredging activities.

Disruption is likely to be less during the operational phase due to fewer anticipated AIL deliveries and no construction work associated with the cooling water infrastructure, CDO or FRR systems. It is expected that embedded mitigation measures such as promulgation of information (including Kingfisher and notice to mariners), and consultation with local fisheries through a FLO would help reduce this disruption.

The frequency of this effect is considered to be remote, and the severity minor, resulting in a ranking of broadly acceptable.

#### 13.5.2.5 Passing Vessel Grounding

Passing vessels may also have an increased risk of grounding on the proposed cooling water intake/outfall subsea infrastructure, due to the shallow water depths of the surrounding area and reduced under keel clearance. Passing vessels are mainly comprised of fishing and recreational vessels, although some dredgers and wind farm support vessels were also noted to pass close to the structure locations.

The minimum clearance of the outfall structures is expected to be 11.09m relative to lowest astronomical tide. The intake structures are anticipated to have a minimum clearance of at least 5.89m. This impact is therefore most likely to affect vessels with larger draughts.

Damage may occur to the vessel and intake/outfall structures, as well as having an environmental impact on the beach due to the close proximity. Mitigation includes marking of the structures on navigational charts and in fishermen's awareness charts, marking the structures with buoys or beacons, and notices to mariners to identify the presence of the infrastructure.

The frequency of this effect is considered to be extremely unlikely, and the severity moderate resulting in a ranking of tolerable.

#### 13.5.2.6 Fishing Gear Snagging

Fishing vessels carrying demersal gear that interacts with the seabed when deployed pose a snagging risk to subsea infrastructure such as the proposed cooling water intake/outfall heads. If a snagging incident occurs, damage may occur to the infrastructure and/or the gear. Should a snagging occur, it is safest for the gear to be abandoned; however some vessels have been known to attempt to free their gear. This can result in a loss of stability and potential risk to crew members.

The baseline fishing analysis identified at least two demersal trawlers operating within proximity to the proposed subsea infrastructure in the 2015/2016 data, however, it is again noted vessels under 15m in length are likely under-represented in the area.

The proposed cooling water headwork structures cover a relatively small area of seabed (maximum length of 45m) and thus can easily be avoided by vessels actively fishing if locations are known. Embedded mitigation measures such as circulation of information (e.g. notice to mariners) as well as details provided in fishermen's awareness charts issued by Kingfisher, and the locations being marked on nautical charts, will notify fishermen of positions and therefore avoid fishing in close proximity. Embedded mitigation measures also include marking of the structures with buoys to provide a physical mark for small fishing vessels.

The frequency of this impact is considered to be remote, and the severity serious, resulting in a ranking of tolerable.

#### 13.5.2.7 Risk from Vessel Anchors

During the operation of the proposed subsea cooling water intake/outfall heads, there is a risk that an anchored vessel will lose its holding ground, and subsequently drag anchor towards the infrastructure. It is also possible that a vessel suffers engine failure, and thus may drop anchor to avoid drifting into an emergency situation such as collision or grounding. This may occur in the vicinity of the proposed cooling water intake/outfall positions and thus the anchor may come into contact with the subsea infrastructure.

Anchoring activity was observed to be generally low in the baseline analysis, and therefore an anchor dragging event is considered to be low frequency. It is noted anchoring from smaller craft may be under-represented in the baseline analysis; however these vessels carry smaller anchors which typically present less risk to subsea structures than larger vessel anchors.

A vessel suffering engine failure is only likely to drop anchor if there is immediate danger nearby. This is likely to occur in shallower, coastal waters and thus within proximity to the subsea infrastructure. Review of maritime incidents between 2005 and 2014 (MAIB and RNLI) revealed machinery failure was the most frequently recorded incident type within the area, particularly within coastal waters.

Review of baseline shipping in the area shows the majority of vessels transiting within proximity of the headwork positions are small craft such as fishing and recreational vessels. The main commercial route is located approximately 4nm east of the headwork positions however some cargo vessels and tankers were also recorded on a quieter route within 1nm, with the closest vessel passing approximately 0.2nm from the headworks.

Embedded mitigation such as circulation of information, up to date nautical charts detailing the location of the subsea structures, and the physical presence of marker buoys or beacons would prevent vessels anchoring directly over the headworks.

The frequency of either of these impacts is considered to be extremely unlikely, and the severity estimated to be serious, resulting in a ranking of tolerable.

#### 13.5.2.8 Passing Vessel Foundering

Foundering refers to a vessel losing structural integrity, and subsequently sinking over the proposed cooling water intake/outfall head positions. Areas where fishing and recreational levels are higher generally correspond to areas of higher foundering risk. Higher density of traffic is seen over the proposed cooling water intake/outfall infrastructure in the summer period in particular.

Historically, fishing vessels have been seen to have the greatest risk of foundering, particularly in bad weather. From the baseline analysis, fishing accounted for 10% of traffic in both summer and winter periods. Recreational craft also have a higher risk of foundering compared to larger vessels, and accounted for 34% of traffic in summer. These vessels are the most frequently recorded transiting within proximity of the headwork structures.

Review of maritime incident data (MAIB and RNLI) over ten years between 2005 and 2014 revealed foundering was a low frequency event within the study area.

The frequency of this effect is considered to be extremely unlikely, and the severity moderate, resulting in a ranking of tolerable.

## 13.6 Additional Mitigation

This section provides additional mitigation measures to be implemented to bring impacts assessed as tolerable to ALARP. Impacts assessed as broadly acceptable have not been included in this part of the assessment, although they may also benefit from the additional mitigation. It is noted that no hazards were assessed to be unacceptable.

- Consideration of a buoyed construction zone around the construction works for the intake/outfall structures.
- Availability of a patrol launch to assist vessels in difficulty.

## 13.7 Residual Effects

The additional mitigation measures presented above would reduce the risk of collision with installation vessels, and reduce the severity of consequence associated with vessel grounding and fishing gear snagging; however the overall rankings remain tolerable.

# 14 Cumulative Assessment

This section describes cumulative and in-combination developments potentially relevant to the Sizewell C development, including the expected cumulative impacts. This is based on a review of all developments considered in **volume 10** of the **ES**.

For the NRA, the Zone of Influence (ZOI) was assumed to be 10nm, i.e. a development was considered to have the potential for cumulative effects if any marine aspect of the development is within 10nm of the Sizewell C main development site. Developments outside the ZOI but for which construction / maintenance vessels may cross the route taken by AIL delivery vessels (i.e. if the transhipment base is at Harwich) were also included.

Specific discussion of key developments is provided below.

**East Anglia Three Offshore Wind Farm**

The East Anglia Three offshore wind farm has been consented, with construction planned to start in 2022 and first power anticipated in 2025. The wind farm will include 172 turbines each with a 12MW capacity resulting in a total project capacity of 1,400MW.

Cable landfall is planned at Bawdsey, Suffolk (approximately 15-16nm south of Sizewell C). As the cable corridor lies between Sizewell C and Harwich, there may be a slight increase in collision risk from passing vessels with AIL delivery vessels if any maintenance and/or repair works are required on the East Anglia Three export cable during the delivery period (during the construction or operational phases), if Harwich is chosen as the transhipment facility for Sizewell C AIL deliveries. However, due to the low number of vessels involved in deliveries relative to the number of vessels transiting within the area, the effect remains tolerable (**not significant**).

**East Anglia One North & East Anglia Two**

Development Consent Order applications for East Anglia One North and East Anglia Two wind farms are currently being determined. If these wind farms are granted consent, there may be an increase in collision risk from passing vessels with AIL delivery vessels if the construction period overlaps with the AIL delivery periods during construction or operation of Sizewell C. Due to the low number of vessels involved in deliveries and the distance between the proposed developments, the effect remains tolerable (**not significant**).

There is the potential for the export cables for these wind farms to make landfall close to the Sizewell C development site, with the current lease agreement adjacent to the main development site. As such, there may be cumulative impacts if construction or maintenance of the export cables overlaps with the construction period or any maintenance of the proposed Sizewell C development. There is potential for an increased collision risk with installation vessels and disruption to small craft activities in the area.

Both operators are expected to follow best practice guidelines in order to minimise the risk of collision and thus the effect remains **tolerable (not significant)**.

**Nautilus and Eurolink Interconnectors**

The preferred option for the landfalls of the Nautilus and Eurolink interconnectors is in the Leiston area and therefore within the ZOI. Both projects are currently at scoping stage, with connection expected in 2028 for Nautilus and 2030 for Eurolink, however limited information is available on construction works, including schedules.

If cable installation coincides with the Sizewell C construction period, maintenance works or AIL deliveries during the operational phase, there could be increased collision risk with installation vessels, dredgers, AIL delivery vessels or maintenance vessels, as well as increased disruption to small craft activities. All operators are expected to follow best practice guidelines to minimise the risk of collision and thus the effects remain **tolerable (not significant)**.

**Greater Gabbard and Galloper Offshore Wind Farm Extensions**

Expansion of the Greater Gabbard and Galloper offshore wind farms will include cable installation. Landfall is planned adjacent to the current landfalls for the Greater Gabbard and Galloper export cables, within 1nm south of the Sizewell C main development site boundary. The Greater Gabbard and Galloper extensions are currently in concept/early planning stages and therefore limited information on construction works, including schedules, is available.

If cable installation for the export cables coincides with the Sizewell C construction period, maintenance works or AIL deliveries during the operational phase, there could be increased collision risk with installation vessels, dredgers, AIL delivery vessels or maintenance vessels, as well as increased disruption to small craft activities. Both operators are expected to follow best practice guidelines to minimise the risk of collision and thus the effects remain **tolerable (not significant)**.

**Sizewell B Nuclear Power Station Decommissioning**

Decommissioning of Sizewell B (including offshore structures) is anticipated to commence in 2035. There is the potential for cumulative impacts if decommissioning of Sizewell B overlaps maintenance works for Sizewell C. This includes increased collision risk with installation/decommissioning vessels and increased disruption to fishing and recreational activities. Due to the temporary nature of any required maintenance, the increased collision risk remains **tolerable (not significant)** and the disruption to small craft activities remains **broadly acceptable (not significant)**.

**Eastern Area Navigation Markers**

The Environmental Agency (Anglian region) is undertaking ongoing maintenance works to inspect all navigation markers that are the responsibility of the Environmental Agency and undertake any repairs to markers that are failing. This includes maintenance of existing works at Minsmere Outfall, Southwold to the north of the Sizewell C site, Thorpeness Sluice, and Aldeburgh to the south of Sizewell C site. This work is scheduled to continue to October 2024.

Therefore there may be an overlap of these maintenance works with the construction of the proposed development. This could cause an increase in disruption to small craft activities (e.g. fishing and recreational) if works were being carried out within close proximity. However due to the localised nature of these works and the distance from the Sizewell C site, the effect remains **tolerable (not significant)**.

**Harwich/Felixstowe Outer Channel Dredge Disposal**

Harwich haven authority are responsible for the disposal of maintenance dredging material from the Harwich/Felixstowe outer channel. They will dispose of all maintenance dredged material at the Inner Gabbard East disposal ground (TH056).

This could cause a cumulative impact of increased collision risk with AIL delivery vessels if Harwich is chosen as the transhipment facility. However, since the traffic increase is expected to be slight, the effect remains **tolerable (not significant)**.

# 15 Summary

This NRA has used baseline shipping and navigation conditions to identify the significant impacts that may arise as a result of the proposed Sizewell C development. This was based on the IMO Formal Safety Assessment process (Ref. 1).

The baseline presented a review of relevant navigational features, an overview of emergency response resources, a discussion of historical maritime incidents in the study area, and an analysis of passing shipping, fishing and anchoring based on AIS data. The fishing analysis also used longer term data. A discussion of the potential changes to the baseline in future was also provided.

Consultation was carried out with key navigational stakeholders. Based on the baseline assessment, stakeholder consultation (including the hazard workshop) and general industry experience, the impacts associated with the different phases of the proposed development were assessed, taking into account all embedded mitigation measures.

Of the impacts assessed, all but two were considered to be tolerable, with the remaining impacts broadly acceptable.

Additional mitigation measures identified were consideration of a buoyed construction zone around the construction works for the intake/outfall structures and availability of a patrol launch to assist vessels in difficulty.

The impacts considered within the preceding assessment are summarised in **Table 15.1**. The assessment takes into account the planned (embedded) mitigation.

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### Table 15.1 Summary table of impacts

| Receptor | Phase | Impact Description | Mitigation | Impact Significance | Additional Mitigation | Residual Effects |
|---|---|---|---|---|---|---|
| Passing vessels | Construction | Increased collision risk with installation vessels | Circulation of information | Tolerable | Buoyed construction zone | Tolerable |
| Passing vessels | Construction | Increased collision risk with dredgers | Circulation of information | Tolerable | Buoyed construction zone | Tolerable |
| Passing vessels | Construction | Increased collision risk with AIL vessels | Circulation of information; temporary safety zones (if applicable); delivery and logistics plan | Tolerable | N/A | Tolerable |
| AIL vessels | Construction | Increased risk of vessel grounding | Delivery and logistics plan; temporary safety zones (if applicable) | Tolerable | Patrol launch | Tolerable |
| Fishing and recreational vessels | Construction | Disruption to activities | Circulation of information; FLO | Tolerable | N/A | Tolerable |
| Galloper/ Greater Gabbard cables | Construction | Disruption to maintenance work | Circulation of information | Broadly Acceptable | N/A | Broadly acceptable |

| Receptor | Phase | Impact Description | Mitigation | Impact Significance | Additional Mitigation | Residual Effects |
|---|---|---|---|---|---|---|
| Passing vessels | Operation | Increased collision risk with dredgers | Circulation of information | Tolerable | N/A | Tolerable |
| Passing vessels | Operation | Increased collision risk with AIL vessels | Circulation of information; temporary safety zones (if applicable); delivery and logistics plan | Tolerable | N/A | Tolerable |
| AIL delivery vessels | Operation | Increased risk of vessel grounding | Delivery and logistics plan; temporary safety zones (if applicable) | Tolerable | Patrol launch | Tolerable |
| Fishing and recreational vessels | Operation | Disruption to activities | Circulation of information; FLO | Broadly acceptable | N/A | Broadly acceptable |
| Passing vessels | Operation | Vessel grounding on intake/outfall structures | Marking of structures on charts; marking of structures with buoys/ beacons | Tolerable | Patrol launch | Tolerable |

| Receptor | Phase | Impact Description | Mitigation | Impact Significance | Additional Mitigation | Residual Effects |
|---|---|---|---|---|---|---|
| Fishing vessels | Operation | Fishing gear snagging on intake/outfall structures | Circulation of information; marking of structures on charts; marking of structures with buoys/beacons | Tolerable | Patrol launch | Tolerable |
| Passing vessels | Operation | Risk from anchors snagging on intake/outfall structures | Marking of structures on charts; marking of structures with buoys/beacons | Tolerable | N/A | Tolerable |
| Passing vessels | Operation | Risk of foundering onto intake/outfall structures | Marking of structures on charts; marking of structures with buoys/beacons | Tolerable | N/A | Tolerable |

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# VOLUME 2 APPENDIX 24B HAZARD LOG

# Sizewell C Project
# Appendix 24B
# Hazard Log

| | |
|---|---|
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# Table of Contents

# 1 Introduction

This appendix presents the Hazard Log, which has been created for the purposes of identifying hazards associated with the construction, operation, and decommissioning of the Sizewell C nuclear power station, in relation to shipping and navigation. The assessment has primarily been based on the outputs of Hazard Workshop and consultation meetings held with key marine stakeholders including regular operators. Further details are provided in the Navigational Risk Assessment (NRA).

The Hazard Log provides the list of hazards identified, and includes the following additional details for each:

- relevant phase(s) (construction and decommissioning, operation and maintenance);
- relevant receptors;
- potential hazard causes;
- embedded mitigation;
- most likely consequences;
- worst case consequences;
- preliminary consequence and frequency rankings based on a formal safety assessment approach; and
- other potential risk reduction measures (where required to reduce risks to as low as reasonably practicable), again on a preliminary basis.

The Hazard Log forms a key input to the impact assessment undertaken in **Chapter 24** of this volume of the **Environmental Statement (ES),** however it is emphasised that other inputs are considered within the chapter, including further consultation, collision modelling and the baseline assessment.

# 2 Significance

Each impact within the Hazard Log has been ranked in terms of significance based on a formal safety assessment approach. This approach assigns each impact a ‘frequency of occurrence’ and ‘severity of consequence’ ranking, with a significance matrix used to determine the impact as either ‘broadly acceptable’, ‘tolerable’, or ‘unacceptable’. Further mitigation is then identified where necessary to bring impacts to within as low as reasonably practicable parameters.

Full details of this process are provided in the NRA.

# 3 Hazard Log

The Hazard Log is included below for reference.

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely | | | | | | | Worst Case | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Consequences | | | | | | | Consequences | | | | | | | | |
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| Construction and decommissioning | Collision (construction vessels). | Passing vessels. | Increased collision risk with construction vessels during construction phase. | During the construction phase there could be an increased risk of passing vessels (mainly fishing and recreational vessels) colliding with Sizewell C construction vessels. | Restricted manoeuvrability of construction vessels;<br>lack of promulgation of information on the works;<br>high density of fishing or recreational vessels;<br>navigational error;<br>adverse weather. | Automated identification system (AIS) fitted on construction vessels;<br>promulgation of information (notice to mariners, NAVTEX, radio warnings, Kingfisher);<br>compliance with the International Regulations for Preventing Collisions at Sea;<br>control of working traffic / marine operating procedures;<br>vessel emergency | Increased encounters and therefore more collision avoidance action required by vessels, as per the International Regulations for Preventing Collisions at Sea, but does not result in a collision. | Vessel to vessel collision resulting in major injury to persons and major damage to vessel. | 2 | 1 | 2 | 2 | 2 | 2 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable | Notices to local marinas and ports and local fisherman.<br><br>Pre-defined routeing to/from construction site.<br><br>Designated waiting areas for construction vessels. | Good communication is key to reducing risks. |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely | | | | | | | Worst Case | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
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| | | | | | | | | | Consequences | | | | | | | Consequences | | | | | | | | |
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| | | | | | | response cooperation plans; 500m safety zone around construction activity and within vicinity of the Beach Landing Facility (BLF); guard vessels; fisheries liaison officer. | | | | | | | | | | | | | | | | | | |
| Construction and decommissioning | Collision (dredgers). | Passing vessels. | Increased collision risk with dredgers during construction phase. | During the construction phase there could be an increased risk of passing vessels (mainly fishing and recreational vessels) colliding with vessels | Lack of promulgation of information on the works; high density of fishing or recreational vessels; navigational error; adverse weather. | AIS fitted on dredgers; promulgation of information (notice to mariners, NAVTEX, radio warnings, Kingfisher); compliance with International Regulations | Increased encounters and therefore more collision avoidance action required by vessels as per International Regulations for Preventing Collisions at Sea but does | Vessel to vessel collision resulting in major injury to persons and major damage to vessel. | 2 | 1 | 2 | 2 | 2 | 2 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable | Notices to local marinas and ports and local fisherman. | |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely – Consequences – People | Most Likely – Consequences – Environment | Most Likely – Consequences – Property | Most Likely – Consequences – Business | Most Likely – Consequences – Average | Most Likely – Frequency | Most Likely | Worst Case – Consequences – People | Worst Case – Consequences – Environment | Worst Case – Consequences – Property | Worst Case – Consequences – Business | Worst Case – Consequences – Average | Worst Case – Frequency | Worst Case | Other Potential Risk Reduction Measures | Remarks / Questions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | carrying out dredging works for the BLF or intake/outfall headwork. | | for Preventing Collisions at Sea and the International Convention for the Safety of Life At Sea; vessel emergency response cooperation plans; 500m safety zone around construction activity and within vicinity of the BLF; guard vessels; fisheries liaison officer. | not result in a collision. | | | | | | | | | | | | | | | | | |
| Construction and decommissioning | Collision (abnormal indivisible loads (AILs) delivery | Passing vessels. | Increased collision risk with AIL delivery vessels. | During the construction phase there could be an increased risk of passing | High density shipping areas; restricted manoeuvrability of barges; navigational | Promulgation of information (notice to mariners, NAVTEX, radio warnings, | Increased encounters and therefore more collision avoidance action | Vessel to vessel collision resulting in major injury to persons and major | 2 | 1 | 2 | 2 | 2 | 2 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable | Prescribed route for AIL barges.<br><br>Patrol launch. | |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely | | | | | | | Worst Case | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
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| | | | | | | | | | Consequences | | | | | | | Consequences | | | | | | | | |
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| | vessels). | | | vessels colliding with AIL delivery vessels. | error; lack of promulgation of information; adverse weather. | Kingfisher); temporary 500m safety zone during AIL deliveries; compliance with International Regulations for Preventing Collisions at Sea and the International Convention for the Safety of Life At Sea; vessel emergency response cooperation plans; delivery plan for AIL deliveries. | required by vessels as per International Regulations for Preventing Collisions at Sea but does not result in a collision. | damage to vessel. | | | | | | | | | | | | | | | Notices to local marinas and ports and local fisherman. | |
| Construction and decomm | Grounding / foundering | AIL delivery vessels. | Increased risk of AIL delivery vessel | Vessels involved in the AIL | Shallow water depths; reduced under | Temporary 500m safety zone during | Vessel becomes grounded and | Vessel becomes grounded and | 2 | 2 | 2 | 2 | 2 | 2 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable | Prescribed route for AIL barges. | |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely | | | | | | | Worst Case | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
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| | | | | | | | | | Consequences | | | | | | | Consequences | | | | | | | | |
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| issioning | . | | grounding / foundering. | deliveries during the construction phase may have an increased risk of grounding or foundering due to the shallow water depths of the surrounding area. | keel clearance; attempts to avoid fishing/recreational activities; poor passage planning; machinery failure. | AIL deliveries; delivery plan for AIL deliveries . | requires further assistance. Minor damage to vessel. Minor environmental impact. Minor damage / disruption to Sizewell C. | founders. Possibly resulting in fatality. Potential for serious environmental impact. Damage to BLF resulting in serious disruption to Sizewell C. | | | | | | | | | | | | | | | | |
| Construction and decommissioning | Disruption | Fishing and Recreational vessels. | Disruption to fishing and recreational activities. | The presence of vessels associated with the construction of the proposed development may cause a disruption to local fishermen or recreational users. | High levels of fishing or recreational activities; | Promulgation of information (notice to mariners, NAVTEX, radio warnings, Kingfisher); fisheries liaison officer; work programme to minimise disruption (e.g. offshore | Minor disruption to fishing activity requires vessels to utilise alternative fishing grounds. Disruption to recreational sailors. | Major disruption to some fishing vessels causing loss of livelihood. | 1 | 1 | 1 | 2 | 1 | 4 | Broadly acceptable. | 1 | 1 | 1 | 4 | 2 | 3 | Broadly acceptable. | Notice to recreational community.<br><br>VHF contact.<br><br>Posting on harbour notice boards (e.g. Southwold).<br><br>Defined routes for | Noted that for one local fisherman, disruption is expected to be major. |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely | | | | | | | Worst Case | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
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| | | | | | | | | | Consequences | | | | | | | Consequences | | | | | | | | |
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| | | | | | | works scheduled at a different time to inshore works). | | | | | | | | | | | | | | | | | construction vessels.<br><br>Prescribed route for AIL barges. | |
| Operation and maintenance. | Collision (dredgers). | Passing vessels. | Increased collision risk with dredgers during operation and maintenance phase. | During the operation and maintenance phase there could be an increased risk of passing vessels (mainly fishing and recreational vessels) colliding with vessels carrying out remedial dredging works for the BLF. | Lack of promulgation of information on the works; high density of fishing or recreational vessels; navigational error; adverse weather. | AIS fitted on dredgers; promulgation of information (notice to mariners, NAVTEX, radio warnings, Kingfisher); compliance with International Regulations for Preventing Collisions at Sea and the International Convention for the Safety of Life At Sea; vessel | Increased encounters and therefore more collision avoidance action required by vessels as per International Regulations for Preventing Collisions at Sea but does not result in a collision. | Vessel to vessel collision resulting in major injury to persons and major damage to vessel. | 2 | 1 | 2 | 2 | 2 | 2 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable. | Notices to local marinas and ports and local fishermen. | |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely – Consequences – People | Most Likely – Consequences – Environment | Most Likely – Consequences – Property | Most Likely – Consequences – Business | Most Likely – Consequences – Average | Most Likely – Frequency | Most Likely | Worst Case – Consequences – People | Worst Case – Consequences – Environment | Worst Case – Consequences – Property | Worst Case – Consequences – Business | Worst Case – Consequences – Average | Worst Case – Frequency | Worst Case | Other Potential Risk Reduction Measures | Remarks / Questions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | emergency response cooperation plans;<br>500m safety zone around construction activity and within vicinity of the BLF;<br>guard vessels;<br>fisheries liaison officer. | | | | | | | | | | | | | | | | | | |
| Operation and maintenance. | Collision (AIL delivery vessels). | Passing vessels. | Increased collision risk with AIL delivery vessels. | During the operation and maintenance phase there could be an increased risk of passing vessels colliding with AIL delivery vessels. | High density shipping areas;<br>Restricted manoeuvrability of barges;<br>navigational error;<br>lack of promulgation of information;<br>adverse weather. | Promulgation of information (notice to mariners, NAVTEX, radio warnings, Kingfisher);<br>temporary 500m safety zone during AIL deliveries;<br>compliance with International | Increased encounters and therefore more collision avoidance action required by vessels as per International Regulations for Preventing Collisions at Sea but does not result in a | Vessel to vessel collision resulting in major injury to persons and major damage to vessel. | 2 | 1 | 2 | 2 | 2 | 2 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable | Prescribed route for AIL barges.<br><br>Patrol launch.<br><br>Notices to local marinas and ports and local fishermen. | |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely – Consequences – People | Most Likely – Consequences – Environment | Most Likely – Consequences – Property | Most Likely – Consequences – Business | Most Likely – Consequences – Average | Most Likely – Frequency | Most Likely | Worst Case – Consequences – People | Worst Case – Consequences – Environment | Worst Case – Consequences – Property | Worst Case – Consequences – Business | Worst Case – Consequences – Average | Worst Case – Frequency | Worst Case | Other Potential Risk Reduction Measures | Remarks / Questions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Regulations for Preventing Collisions at Sea and the International Convention for the Safety of Life At Sea; vessel emergency response cooperation plans; ; delivery plan for AIL deliveries. | collision. | | | | | | | | | | | | | | | | | |
| Operation and maintenance. | Grounding / foundering. | AIL delivery vessels. | Increased risk of AIL delivery vessel grounding / foundering. | Vessels involved in the AIL deliveries during the operation and maintenance phase may have an | Shallow water depths; reduced under keel clearance; attempts to avoid fishing/recreational activities; poor passage planning; | Temporary 500m safety zone during AIL deliveries; delivery plan for AIL deliveries. | Vessel becomes grounded and requires further assistance. Minor damage to vessel. Minor environmental | Vessel becomes grounded and founders. Possibly resulting in fatality. Potential for serious environmental | 2 | 2 | 2 | 2 | 2 | 1 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable | Prescribed route for AIL barges. | |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely | | | | | | | Worst Case | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Consequences | | | | | | | Consequences | | | | | | | | |
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| | | | | increased risk of grounding or foundering due to the shallow water depths of the surrounding area. | machinery failure. | | impact. Minor damage / disruption to Sizewell C. | impact. Damage to BLF resulting in serious disruption to Sizewell C. | | | | | | | | | | | | | | | | |
| Operation and maintenance. | Fishing snagging. | Fishing vessels. | Fishing gear interaction with subsea infrastructure, such as the cooling water intake / outfall heads. | Fishing vessel carrying demersal gear might pose a snagging risk to subsea infrastructure, such as the cooling water intake / outfall heads. | Demersal fishing activity; fishing vessels attracted to site; lack of awareness. | Details of headwork positions included in fishermen's awareness charts issued by Kingfisher; promulgation of information (notice to mariners, NAVTEX, radio warnings, Kingfisher); up to date charts; fisheries liaison officer; | Fishing vessel loses gear and suffers disruption. | Fishing vessel snags and becomes fast, resulting in the vessel foundering. Damage caused to water intakes / outfalls. | 2 | 2 | 3 | 3 | 3 | 4 | Tolerable | 5 | 3 | 5 | 5 | 5 | 2 | Tolerable | Subsea infrastructure marked on UKHO charts, with associated warning. | Commercial fishermen likely to avoid the area; recreational fishermen more at risk. |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely Consequences | | | | | | | Worst Case Consequences | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| | | | | | | structures marked with buoyage. | | | | | | | | | | | | | | | | | | |
| Operation and maintenance. | Vessel anchoring. | Passing vessels and anchored vessels. | Vessel anchoring on or dragging anchor over subsurface water intake / outfall heads. | Risk that an anchored vessel drags anchor or that a vessel anchors in an emergency over the subsea infrastructure, such as the cooling water intake / outfall heads. | High levels of anchored vessels; high density of shipping; anchor failure; poor holding ground; engine failure; lack of awareness; | Promulgation of information (notice to mariners, NAVTEX, radio warnings, kingfisher); up to date charts; vessel emergency response cooperation plans; | Due to design of water intake / outfalls, structure likely to topple if commercial vessel with large anchor snags resulting in minor injuries to vessel crew and minor environmental impact. Major impact on business and property. | Vessel snags on water intake / outfall and unable to free itself resulting in loss of vessel and potential for multiple fatalities. Major impact on business and property. | 2 | 2 | 5 | 5 | 4 | 2 | Tolerable | 5 | 3 | 5 | 5 | 5 | 1 | Tolerable | Subsea infrastructure marked on UKHO charts, with associated warning. | |
| Operation and mainten | Grounding / foundering | Passing vessels. | Increased grounding / foundering risk | Due to the presence of subsurface | High levels of fishing / recreational | Details of headwork positions | Vessel becomes grounded on | Vessel becomes grounded on | 2 | 2 | 2 | 2 | 2 | 2 | Broadly acceptable. | 4 | 4 | 4 | 4 | 4 | 1 | Tolerable | | |

| Phase (construction and decommissioning, operation and maintenance) | Impact | Receptor | Hazard Title | Hazard Detail | Possible Causes | Embedded Mitigation | Most Likely Consequences | Realistic Worst Case Consequences | Most Likely | | | | | | | Worst Case | | | | | | | Other Potential Risk Reduction Measures | Remarks / Questions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Consequences | | | | | | | Consequences | | | | | | | | |
| | | | | | | | | | People | Environment | Property | Business | Average | Frequency | | People | Environment | Property | Business | Average | Frequency | | | |
| ance. | (third party vessel). | | association with reduction in under keel clearance for transiting vessels passing over water intake / outfall structures. | water intake / outfall structures and associated reduction in under keel clearance there could be an increased risk of vessel groundings / founderings with structures. | activity; structural failure; watchkeeper failure; adverse weather; vessels attracted to site. | included in fishermen's awareness charts issued by Kingfisher; promulgation of information (notice to mariners, NAVTEX, radio warnings, Kingfisher); up to date charts; fisheries liaison officer; structures marked with buoyage; vessel emergency response cooperation plans; . | structure and requires further assistance. Minor damage to vessel. Minor environmental impact. Minor damage / disruption to Sizewell C. | structure and founders. Possibly resulting in fatality. Potential for serious environmental impact. Water intake / outfall structure damaged resulting in serious disruption to Sizewell C. | | | | | | | | | | | | | | | | |