SOFIA OFFSHORE WIND FARM

SAFETY ZONE APPLICATION

SUBMITTED TO THE DEPARTMENT FOR ENERGY SECURITY AND NET ZERO

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Abbreviations

ABBREVIATION	DEFINITION
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
BEIS	Department for Business, Energy & Industrial Strategy
DESNZ	Department for Energy Security & Net Zero
DP	Dynamic Positioning
Fl	Flashing
FLO	Fishing Liaison Officer
kJ	Kilojoule
km	Kilometre
IALA	International Association of Lighthouse Authorities
LAT	Lowest Astronomical Tide
MCA	Maritime and Coastguard Agency
m	Metre
MW	Megawatt
nm	Nautical Mile
nm^2	Square Nautical Mile
NRA	Navigational Risk Assessment
OCP	Offshore Converter Platform
OWF	Offshore Wind Farm
PLGR	Pre-Lay Grapnel Run

ABBREVIATION	DEFINITION
RAM	Restricted in Ability to Manoeuvre
s	Second
SOLAS	Safety of Life at Sea
SOV	Service Operations Vessel
SPS	Significant Peripheral Structures
UKHO	United Kingdom Hydrographic Office
VHF	Very High Frequency
WTG	Wind Turbine Generator
Y	Yellow

1. INTRODUCTION

1.1 BACKGROUND

1.1.1 Sofia Offshore Wind Farm (OWF) is being developed by Sofia Offshore Wind Farm Limited (herein referred to as the Developer) within the southern North Sea. Consent was granted for Sofia OWF on the 4th August 2015 under Dogger Bank Teesside A and B Offshore Wind Farm Order 2015.

1.2 SCOPE OF THE SAFETY ZONE APPLICATION

1.2.1 This document represents the primary supporting document for the Developer's application for safety zones to be implemented for the Sofia OWF. The application will be submitted to the Department for Energy Security & Net Zero (DESNZ), formerly the Department for Business, Energy & Industrial Strategy (BEIS), as required under its safety zone guidance (BEIS, 2011), which is based upon the relevant legislation and guidance in place for safety zone applications (see Section 1.3).

1.2.2 The proposed safety zones are intended for the purposes of making clear to passing traffic the areas where the Sofia OWF construction and maintenance activities are taking place and therefore which areas should be avoided, with a view to minimising the risk of an incident which may threaten life or the environment.

1.2.3 Safety zones are applied for around the Wind Turbine Generators (WTG) and the Offshore Converter Platform (OCP) under the circumstances detailed in the following sections.

CONSTRUCTION PHASE

1.2.4 During the construction phase, the following safety zones are applied for:

- "Rolling" 500 metre (m) safety zone established around each WTG or the OCP, and / or their foundations, whilst construction work is being performed, as indicated by the presence of a construction vessel(s); and
- Pre-Commissioning 50 m safety zones established around any WTG or the OCP which is either partially completed or constructed where a construction vessel is not present prior to commissioning of the wind farm.

1.2.5 Further details as to what will trigger these safety zones are provided in Section 8.

OPERATION AND MAINTENANCE PHASE – MAJOR MAINTENANCE

1.2.6 During any periods of major maintenance within the operation and maintenance phase, the following safety zones are applied for:

- 500m safety zones around all "major maintenance" being undertaken around a WTG or the OCP, as denoted by the presence of a major maintenance vessel.

1.2.7 For reference, the definition of "*major maintenance*" given within the Electricity Regulations 2007 (which details regulations associated with application procedures and control of access related to safety zones) is as follows:

"*works relating to any renewable energy installation which has become operational, requiring the attachment to, or anchoring next to, such an installation of a self-elevating platform, jack-up barge, crane barge or other maintenance vessel*."

1.2.8 Further details as to what will trigger these safety zones are provided in Section 8.

OPERATION AND MAINTENANCE PHASE – NORMAL OPERATIONS

1.2.9 No permanent safety zones are applied for during normal operations (i.e., activities not classed under the definition of major maintenance, see Section 5).

DECOMMISSIONING PHASE

1.2.10 Safety zones for the decommissioning phase of the Sofia OWF will be applied for prior to such operations taking place once associated requirements are known.

1.3 LEGISLATION AND GUIDANCE COMPLIANCE

1.3.1 This document has been drafted in compliance with the following legislation and guidance to ensure all necessary information required is included within this safety zone application:

- Section 95 and Schedule 16 of the Energy Act 2004;
- Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007; and
- Guidance Notes: Applying for Safety Zones around Offshore Renewable Energy Installations (BEIS, 2011).

2. PROJECT OVERVIEW

2.1 LAYOUT

2.1.1 Sofia OWF is located on the Dogger Bank, approximately 90 nautical miles (nm) off the Flamborough Head, as shown in Figure 2.1. The project site covers an area of approximately 165 square nautical miles (nm^2) / 566 square kilometres (km^2).

2.1.2 In summary, the project design consists of:

- 100 WTGs, each with a generating capacity of 14 megawatts (MW);
- WTGs constructed on monopile foundations;
- One OCP on a jacket foundation;
- A network of 18 strings of inter-array cables with combined length of up to 330.1 kilometres (km) to connect strings of WTGs together and connect WTGs to the OCP;
- Two bundled export cables (and a fibre optic cable) of length 220.4km to transmit the electricity from the OCP to landfall at Redcar in Teesside.

2.1.3 The final layout of WTGs and OCP across the site is shown in Figure 2.2. It is noted that this includes one spare location which may be required in the event that a preferred location proves unsuitable. Precise positions of structures may also be subject to micrositing. The layout has been agreed with the Maritime & Coastguard Agency (MCA), Trinity House and the Marine Management Organisation via the approved Array Location and Layout Plan.

2.1.4 Minimum spacing between the periphery WTGs is approximately 0.78 nm (1.4 km). The "internal" structures are spaced approximately in an approximate 1.6 x 1.6 nm (2.9 x 2.9 km) grid.

2.2 PROJECT SCHEDULE

2.2.1 Offshore construction activities are scheduled to commence in 2023 with completion and final commissioning expected by 2026. An indicative construction schedule is summarised in Table 2.1, however it should be noted that the actual schedule given will depend on various factors (e.g., weather, supply, etc.) and therefore the stated dates are subject to change.

Table 2.1 Indicative Project Schedule

Schedule	Scope of Work	Timing
1	F10 Notification, Develop Construction Phase Plan	Q2 2022
2	Landfall horizontal directional drill (HDD)	Q2 2022

Schedule	Scope of Work	Timing
3	Foundations transport , preparation work in 2023, first foundation installation Q1 2024	Q2 2023 - Q4 2024
4	Subsea Array Cable transport and installation, preparation work in Q2 2023	Q1 2024 - Q4 2024
5	Subsea Export Cable installation (including cable pull in activities at landfall)	Q3 2023 – Q3 2024
6	WTG installation transport and installation	Q4 2024 – Q3 2026
7	Offshore Convertor Jacket & Topside transport, installation, completion	Q2 2024 - Q4 2024
8	Offshore Commissioning	Q3 2024 – Q3 2026
9	Commercial operation	Q3 2026

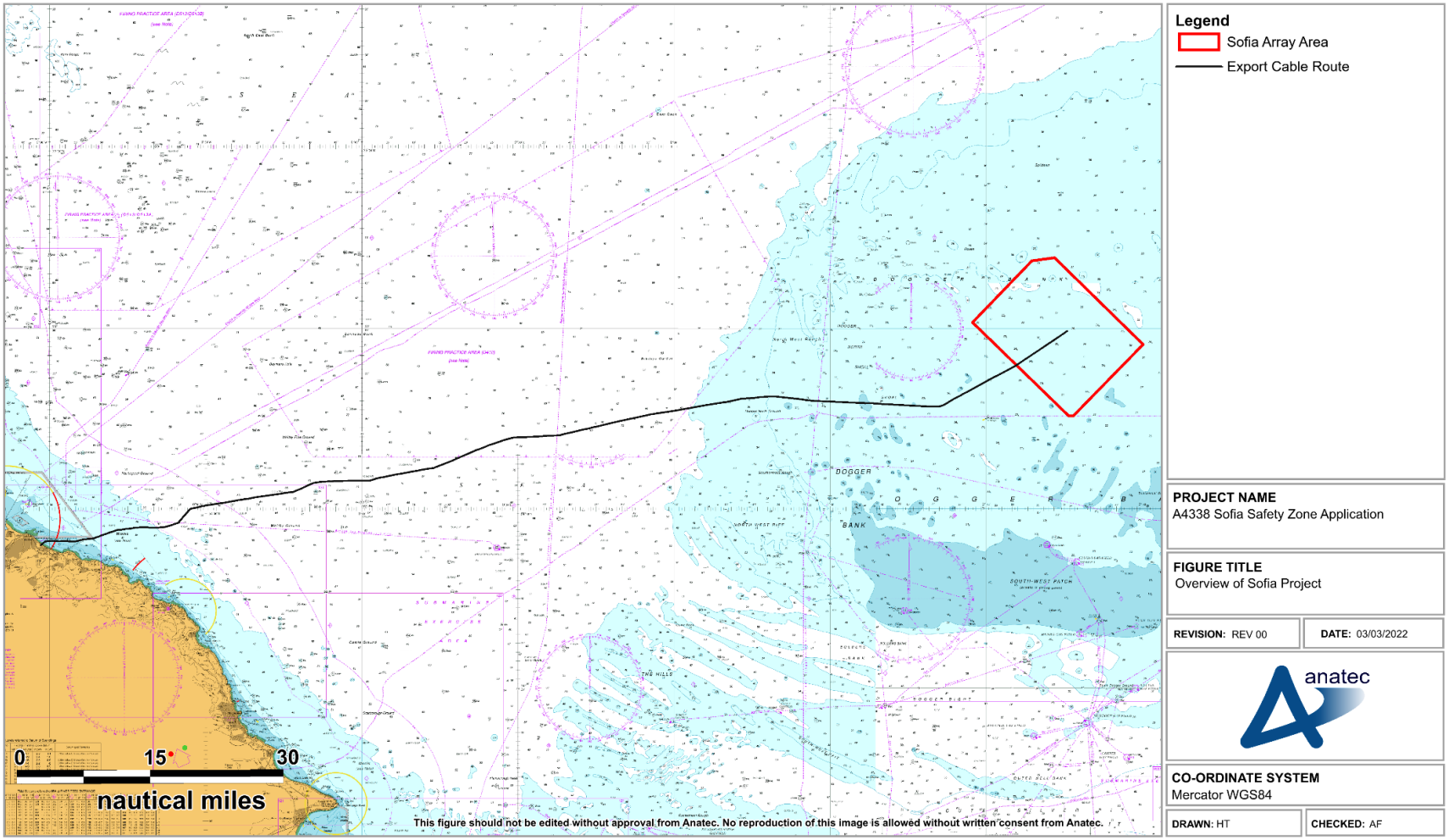

Figure 2.1: Overview of Sofia Project

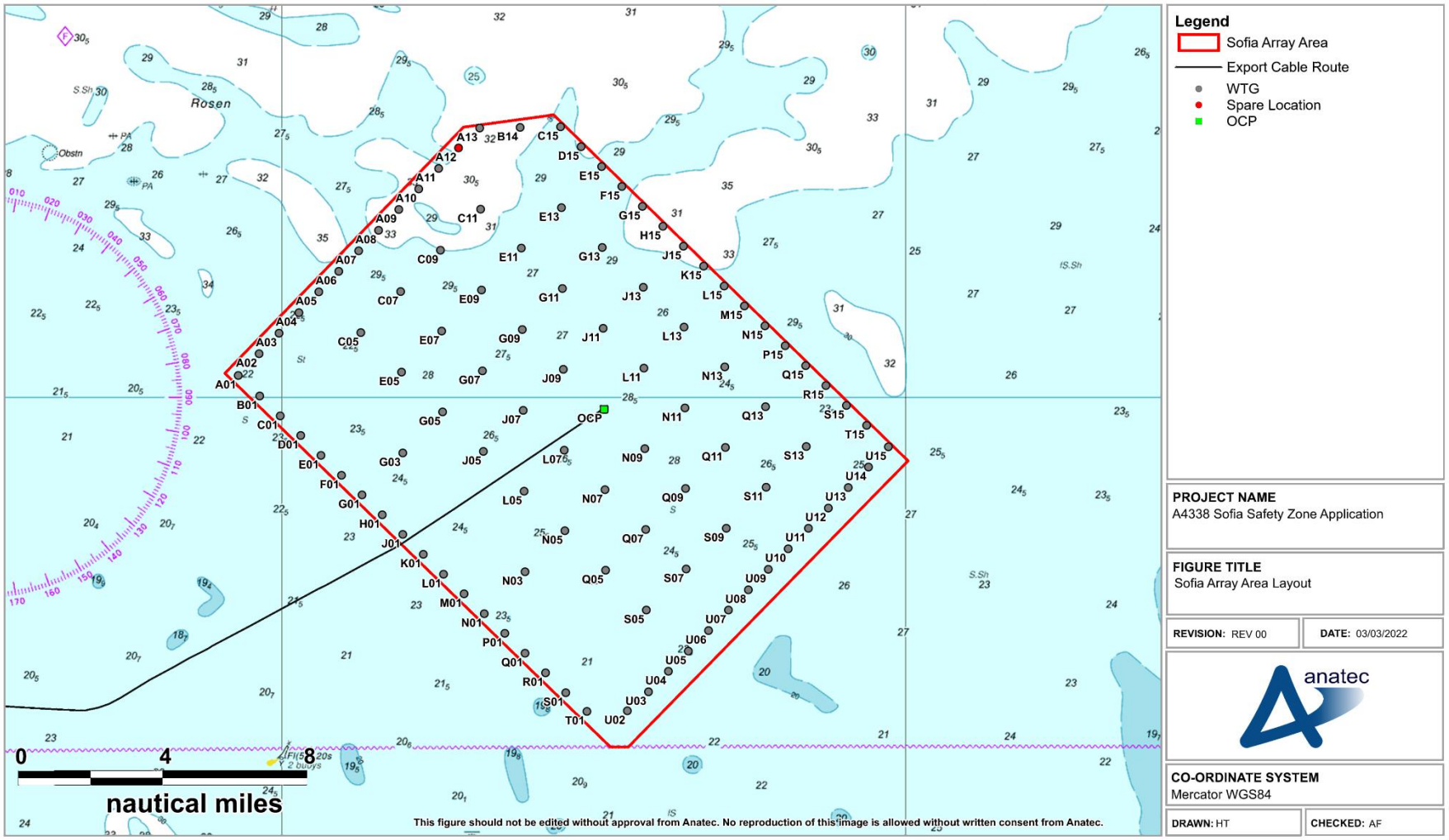

Figure 2.2: Sofia Array Area Layout

3. PROJECT COMPONENTS

3.1 WIND TURBINE GENERATORS

3.1.1 Key specifications of the WTGs are provided in Table 3.1, with an indicative schematic of a WTG relative to the waterline presented in Figure 3.1. A foundation schematic is shown in Figure 3.2. For reference, water depths within the site range from approximately 20 to 33 m.

Table 3.1: WTG Parameters

SPECIFICATION	VALUE
Capacity	14 MW
Foundation Type	Extended Monopile
Rotor Diameter	222 m
Hub Height above Lowest Astronomical Tide (LAT)	142 m
Maximum Tip Height above LAT	254 m
Interface Height above LAT	21 m
Tower Height above Interface	116 m
Blade Clearance above LAT	31 m

3.2 OFFSHORE CONVERTOR PLATFORM

3.2.1 The OCP topside will be installed on a jacket foundation, and will be approximately 78 x 36 m. An indicative schematic of the OCP relative to the waterline is presented in Figure 3.3.

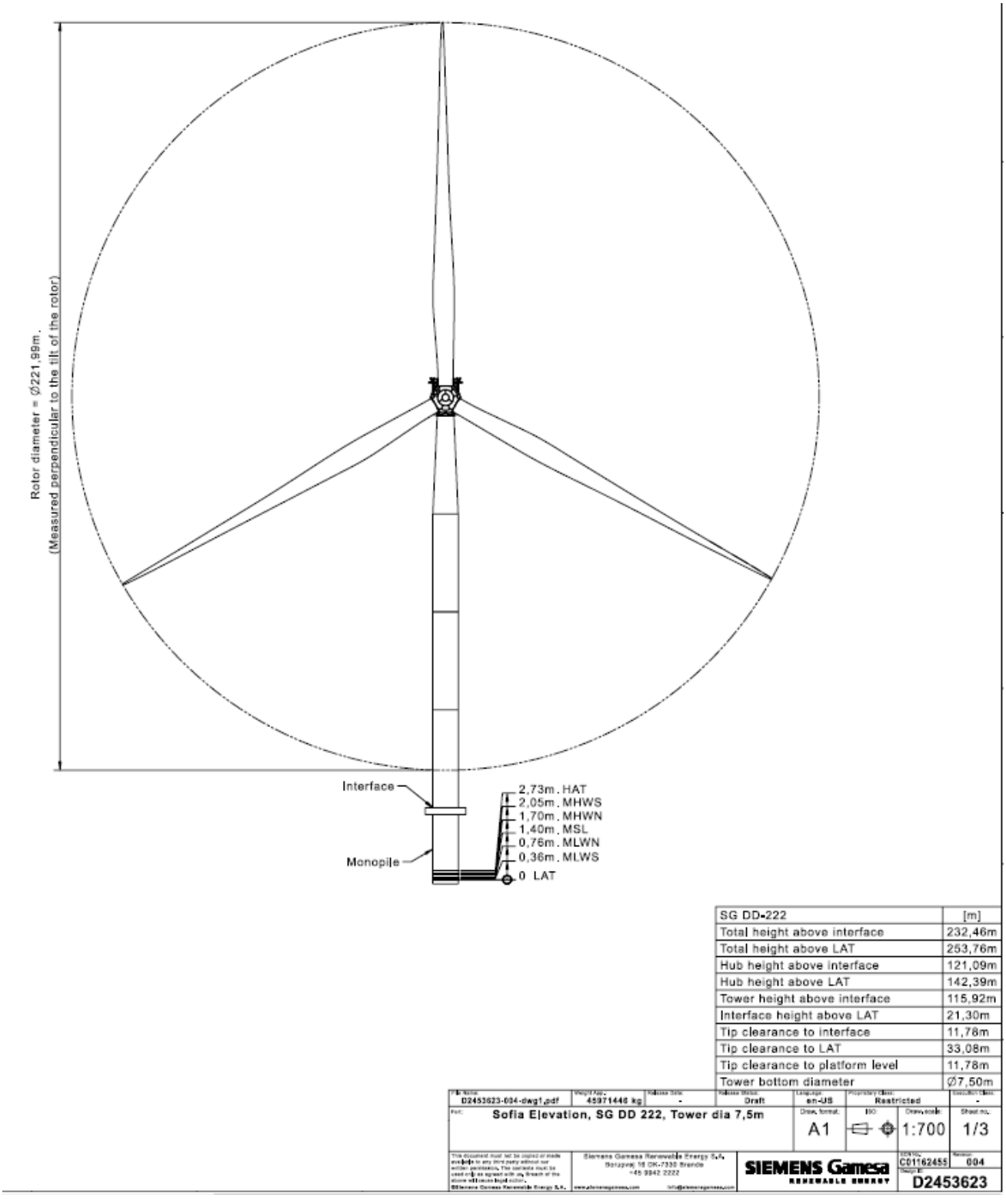

Figure 3.1: WTG Schematic

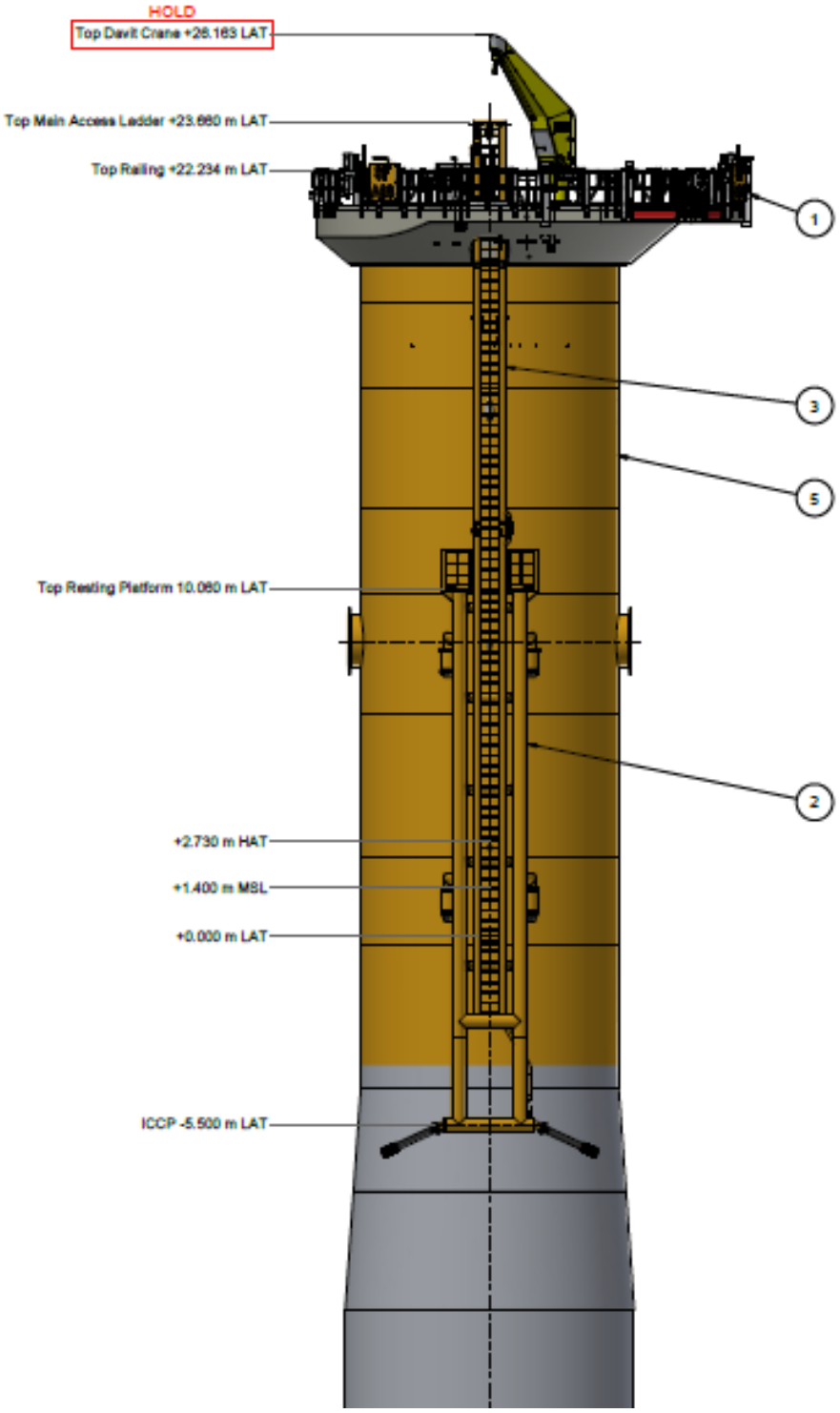

Figure 3.2: Indicative Foundation Schematic

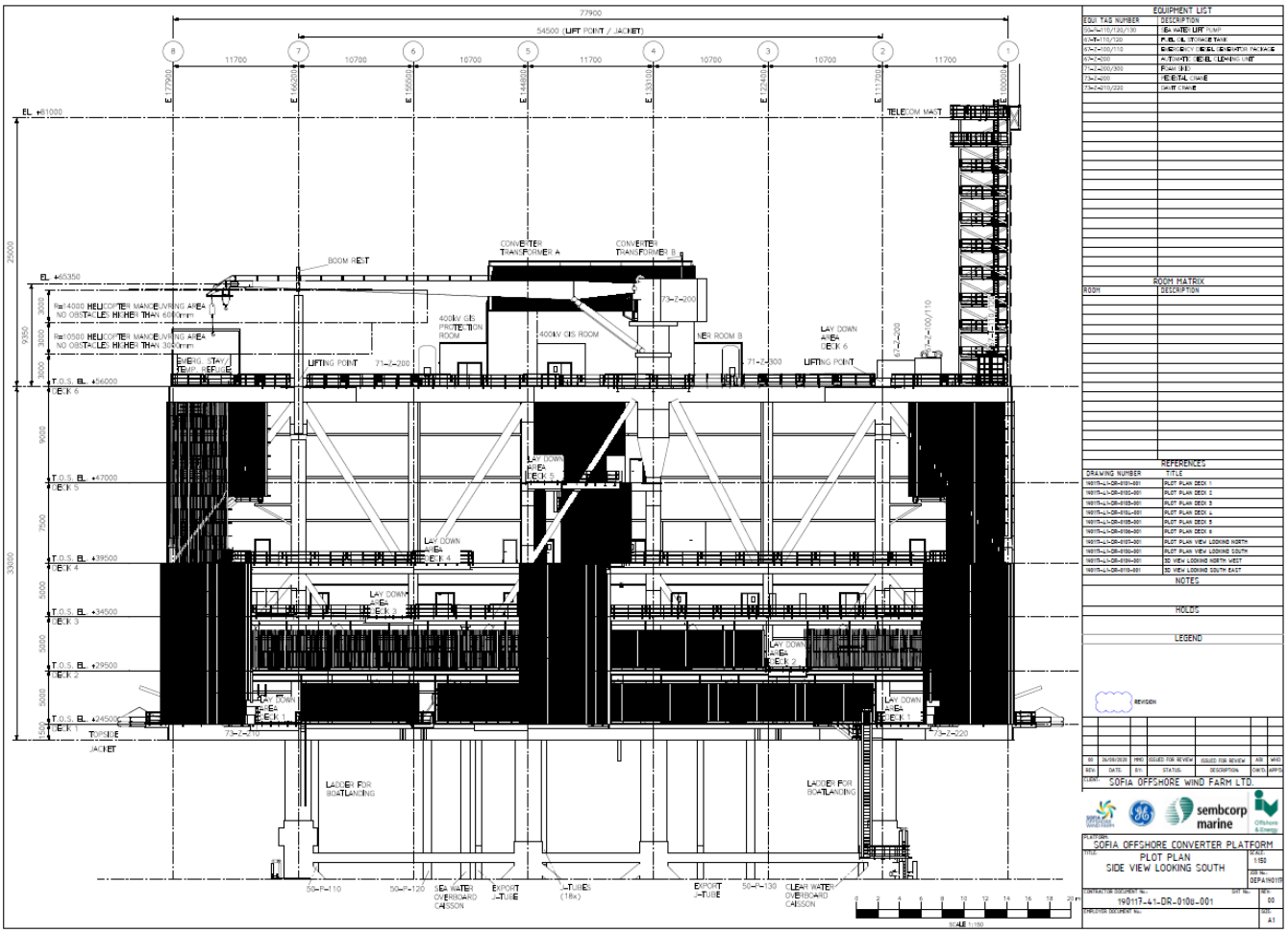

Figure 3.3: OCP Schematic

3.3 CABLES

3.3.1 An indicative export cable route and inter array cables are shown in Figure 2.1. It is noted that final cable positions are subject to micrositing and therefore this information is indicative only.

3.3.2 The approximate length of the total export cable route is 227.5 km, 220 km of which is offshore, and 7.5 km onshore. It is intended that the cables will make landfall at Redcar, Teesside.

3.3.3 A network of 18 strings of inter-array cables with combined length of up to 330 km will connect strings of WTGs together and connect WTGs to the OCP.

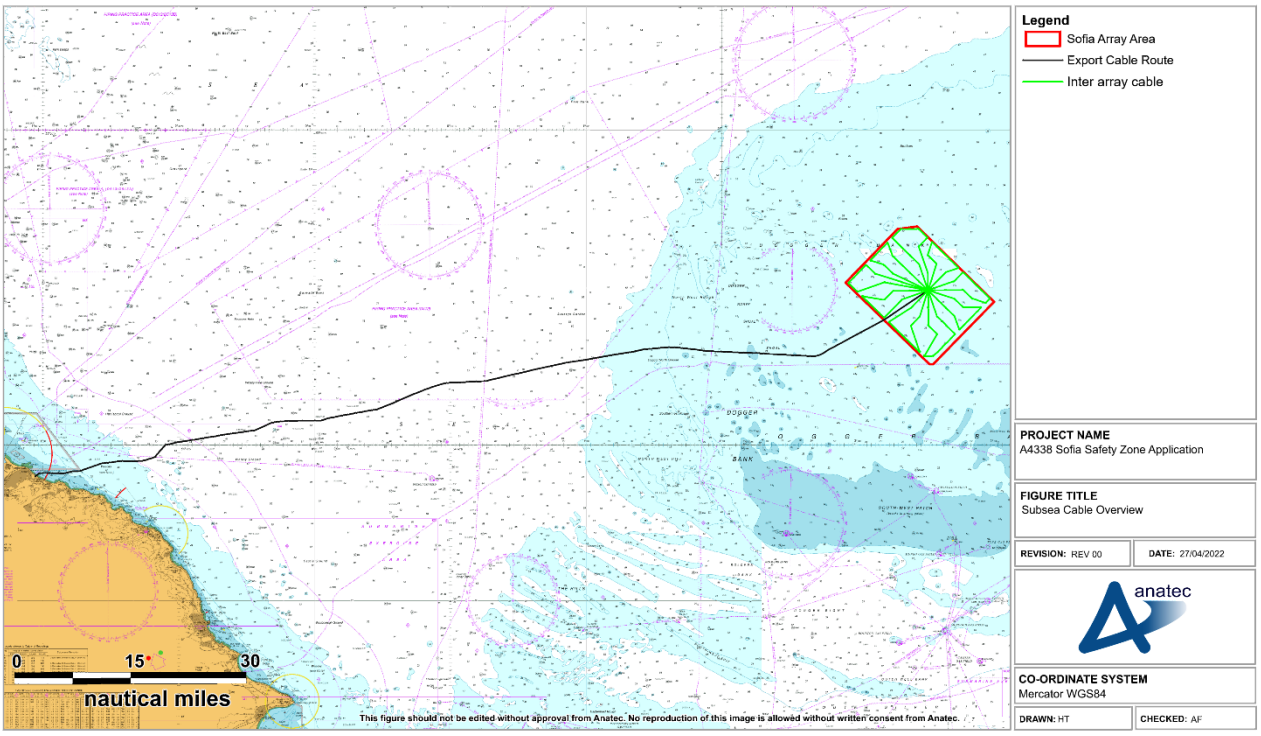

Figure 3.4: Subsea Cable Overview

4. CONSTRUCTION OVERVIEW

4.1 SCOUR PROTECTION

4.1.1 It is anticipated that scour protection will be installed between Q3 2023 to Q4 2023. All locations will have either a single or two-layer scour protection system made up of a single armour layer and/or a filter and armour layer, noting the specific design will depend on the water depth and the diameter of the foundation at mudline. Rock placement will be undertaken by two vessels operating via Dynamic Positioning (DP):

- Filter layer installed between July and October 2023; and
- Armour layer installed between July and October 2023.

4.2 WIND TURBINE GENERATOR FOUNDATIONS

4.2.1 It is anticipated that WTG foundation (monopile and secondary structures) installation will occur between Q1 2024 to Q3 2024. The installation process is summarised as follows:

- A jack-up installation vessel will transport the foundations to site (anticipated three foundations per cycle).
- The installation vessel will “jack-up” at each location, and the main crane will be used to lift and upend a monopile (MP) and place it in the pile gripper before lowering the structure to the seabed.
- Once the MP has achieved self-penetration (stabilised by the gripper), the crane will be released. A hydraulic piling hammer (up to 4000 kilojoules (kJ)) will then be used to pile the foundation to design embedment.

  The installation vessel will then be used to install the secondary structures to the MP.

4.3 WIND TURBINE GENERATORS

4.3.1 It is anticipated that WTG installation will occur Q1 2025 to Q3 2026. The installation process is summarised as follows:

- A jack up installation vessel will transport all component of the WTGs to site (anticipated 3-6 WTGs per cycle).
- Each WTG is made up of 5 components: the tower, the Nacelle and the 3 blades.
- The blades a are transported in a horizontal position in a cassette made up of up to between 9-18 blades. The towers are assembled from 3 sections at the pre-assembly port, and transported vertically as a single tower.
- The Installation Vessel will “jack up” at a location, and the main crane lift each component onto the foundation.

- After each component is lifted, it will be bolted together and bolts will be tightened and torqued to the required tension.
- The HV cables that run down the tower will be connected to the transformer which is in the nacelle to the HV switchgear which is in the bottom of the tower. Finally, the HV 'dropper' cables that run between the HV switchgear and the foundation will be terminated into the Phisterer terminations that reside in the foundation.
- It is anticipated that the jack up vessel will remain on site until the dropper cables terminated into the foundations, after which it perform the jacking down operation and progress to the next location.
- A team will perform the 'cold commissioning' activities and activate the Self Sustaining Turbine function which allows the WTG to provide itself with power by rotating the blades.
- The final 'hot commissioning' activity where the WTG is energised in preparation for generation is planned to be undertaken as a group of WTGs on the same cable string, and subsequent visits to each WTG will continue throughout the trial operation runs prior to Takeover of each WTG.

4.4 OFFSHORE CONVERTOR PLATFORM

4.4.1 The OCP is planned to be installed during Q2/Q3 2024. The installation process is summarised as follows:

- The OCP foundation and topsides will arrive at site together on a Semi-Submersible Heavy Transport Vessel (HTV) having travelled directly from the fabrication yard
- The OCP foundation piles will arrive at the same time on board a barge from a port in North West Europe
- The OCP Jacket will be lifted off the HTV by a Semi-Submersible Crane Vessel (SSCV) operating on DP and placed in position on the seabed
- The 8 No. 107 m x 2.4 m diameter piles will then be lifted from the transport barge and placed into the legs. Once all are in position piling will commence, driving each pile in turn to target depth.
- Once piling is complete they will be fixed to the jacket legs by fitting welded crown plates in the annulus at the top of the leg and grouting the annulus at seabed level
- Following cutting the piles to level the OCP, topsides will be lifted from the HTV by the SSCV and, guided by stabbing cones, will be lowered onto the levelled jacket leg piles whilst the SSCV is fixed using an anchor spread consisting of 12 anchors at a radius of up to 1250 m from the vessel
- The topsides will then be fixed to the top of the jacket piles by welding
- During the period between installation and completion of commissioning in Q1/Q2 2025 an accommodation jack up vessel will be mobilised and positioned adjacent to the OCP to enable several operations to be undertaken in order to hook up and commission the OCP in readiness for energisation to the grid, e.g. removal of internal equipment sea fastenings, connection of caissons and j-tubes, export and array cable pull-ins and terminations, commissioning works etc.

4.5 ARRAY CABLES

4.5.1 It is anticipated that array cables will be installed in one campaign, with pre installation works starting in Q2 2023 and then the installation campaign in Q2 to Q4 2024. The array cable installation process is summarised as follows:

- Pre installation survey.
- Boulder clearance where necessary to clear a suitable corridor. *(depends on whether pre plough option is undertaken or not – only required where pre-ploughing has not been undertaken)*.
- Pre ploughing prior to laying of cable.
- Pre-lay grapnel run (PLGR).
- Pre-lay cable route survey.
- Cable installation.
- Burial and installation of cable protection.

4.6 EXPORT CABLES

4.6.1 It is anticipated that export cables will be installed over two campaigns, with the first cable installation occurring during Q3 2023 and the second between Q2 and Q3 2024. The export cable installation process is summarised as follows:

- Boulder clearance where necessary to clear a suitable corridor and clearance of out of service cables (currently only one expected).
- Cable crossing pre works (rock or pre-lay mattress using Fall Pipe Vessel (to lay a foundation)).
- Pre-lay grapnel run (PLGR).
- Trenching prior to laying of cable.
- Campaign 1 – Cable installation KP0 – KP130 involving cable free lay (bundled power cores 2No. with fibre optic) and post lay burial with trenching and jetting up to KP90 together with surface lay and burial using a plough from KP90 to KP130 and wet store cable end until Campaign 2.
- Installation of cable protection where required at cable crossings or burial depth anomalies using Fall Pipe Vessel with rock armour protection
- Campaign 2 – Cable installation, initially Campaign 1 cable end recovery and inline joint then surface lay and burial with a plough from KP130 to KP 220 at the OCP
- Installation of cable protection where required at cable crossings or burial depth anomalies using Fall Pipe Vessel with rock armour protection.
- Post-lay cable route survey.

Cable landfall will be via three separate Horizontal Directional Drill ducts.

5. OPERATIONS AND MAINTENANCE

5.1.1 The definition of 'major maintenance' given within the Electricity Regulations 2007 (which details regulations associated with application procedures and control of access related to safety zones) is as follows:

"*works relating to any renewable energy installation which has become operational, requiring the attachment to, or anchoring next to, such an installation of a self-elevating platform, jack-up barge, crane barge or other maintenance vessel.*"

5.1.2 Under this definition, only vessels that are "anchoring next to" or require "attachment to" the operational structures can trigger a 500 m major maintenance safety zone during the operational phase.

5.1.3 Full details of major maintenance activities that will occur as part of the operation of the project are unable to be confirmed at the time of writing based on the information available given this will include unexpected / unplanned operations. However, throughout any periods of major maintenance, details of the work being carried out shall be promulgated through Notification to Mariners, radio warnings as designated by the United Kingdom Hydrographic Office (UKHO), the Kingfisher bulletin, and liaison with the fishing industry via the Fishing Liaison Officer (FLO).

5.1.4 Additional details as to specific activities that could trigger a safety zone during the operational phase are provided in Section 8.

6. LIGHTING AND MARKING

6.1 OVERVIEW

6.1.1 This section summarises the marine lighting and marking of the Sofia OWF which has been drafted in consultation with Trinity House and the MCA. Aviation lighting (including Search and Rescue lighting) is not considered pertinent to this safety zone application and has therefore not been included, noting that the relevant lighting and marking aspects have been agreed with the Civil Aviation Authority and the MCA and are compliant with the relevant guidance.

6.2 CONSTRUCTION PHASE

LIGHTING

6.2.1 During construction, all fixed structures, including partially constructed structures (e.g., WTG foundations), will be mounted and marked with a Flashing (Fl) Yellow (Y) 2.5 seconds (s) light (Fl. Y. 2.5s) visible through 360 degrees with a minimum 2 nm range.

6.2.2 These lights will meet International Association of Lighthouse Authorities (IALA) Availability Category 2 (not less than 99.0%) and will remain in place until the operational lighting has been commissioned, and has been accepted as such by Trinity House.

BUOYAGE

6.2.3 All required construction phase buoyage will be established at least eight weeks prior to the commencement of construction works associated with the array (including scour protection installation) and will remain in place until the permanent operational marking requirements have been inspected and passed by Trinity House. The buoyed construction area will be marked with 20 buoys during the construction phase comprising:

- 2 x north cardinals;
- 5 x east cardinals;
- 1 x south cardinals;
- 4 x west cardinals; and
- 8 x special marks.

6.3 OPERATIONAL PHASE

LIGHTING AND SOUND SIGNALS

6.3.1 During the operational phase, and in line with requirements under IALA O-139[1] (IALA, 2013), certain peripheral structures will be marked as Significant Peripheral Structures (SPS). Each SPS will be fitted with a marine light satisfying the following criteria:

- 5nm light Fl (4) Y 12s, 360° visibility, flashing in synchronicity, IALA category 2 (> 99.0% availability).

6.3.2 There will also be peripheral structures marked as “Secondary” SPS as directed by Trinity House, which will be fitted with a marine light satisfying the following criteria:

- 5nm light Fl Y 5s, 360° visibility, flashing in synchronicity, IALA category 2 (> 99.0% availability).

6.3.3 Each WTG fitted with an SPS light (including “Secondary” SPS) will be fitted with sound signals, which will activate whenever visibility is less than 2nm. When activated, the signals will sound a blast lasting 2s every 30s. These sound signals will meet IALA category 3 availability requirements (> 97.0%).

BUOYAGE

6.3.4 In agreement with Trinity House, no buoyage will be utilised during the operational phase.

[1] Active relevant IALA lighting and marking guidance at the time of the Lighting and Marking Plan.

7. MARINE TRAFFIC SURVEY DATA

7.1 INTRODUCTION

7.1.1 In line with DESNZ guidance (BEIS 2011) this safety zone application includes an assessment of recent marine traffic survey data collected during 2022. Marine traffic assessment has primarily been based on 28 days of Automatic Identification System (AIS) data collected during June and July of 2022 within a 10 nm buffer of the array area (the 'study area'). The periods were chosen such that downtime was minimal.

7.1.2 Any traffic deemed to be temporary has been removed from further analysis (e.g., survey vessels).

7.1.3 Noting the offshore location of the site, it should be considered that data coverage is not necessarily comprehensive of the entire study area. Further, the assessment may be unrepresentative of certain vessel types not required to transit via AIS (i.e., fishing vessels less than 15 m and recreational vessels).

7.1.4 Therefore, due consideration has also been given to the following data sources to validate the findings of the primary assessment:

- Non-AIS survey data collected via Radar as part of the Navigational Risk Assessment (NRA) (Anatec, 2014);
- Additional assessment of two months AIS data from 2021 (see APPENDIX A).
- Anatec's internal ShipRoutes database (Anatec, 2023).

7.1.5 Reference to these additional data sources has been made where appropriate, noting that the assessment is primarily based on the 2022 AIS data.

7.1.6 It should be noted that offshore construction of the nearby Dogger Bank B wind farm construction commenced in early 2023[2], and therefore the marine traffic data studied predates deployment of the associated construction buoyage. It should be considered when viewing the analysis that it is likely that the vessel routeing in the area will have changed to account for the Dogger Bank B buoyed construction areas. This has been considered where appropriate within this section and within the impact assessment of commercial vessel activity in Section 10.1.

7.2 MARINE TRAFFIC SURVEY DATA ASSESSMENT

VESSEL COUNT

7.2.1 The number of unique vessels per day recorded within the study area during the 28 day period is presented in Figure 7.1.

[2] Based on Notice to Mariners issued by Dogger Bank Wind Farm.

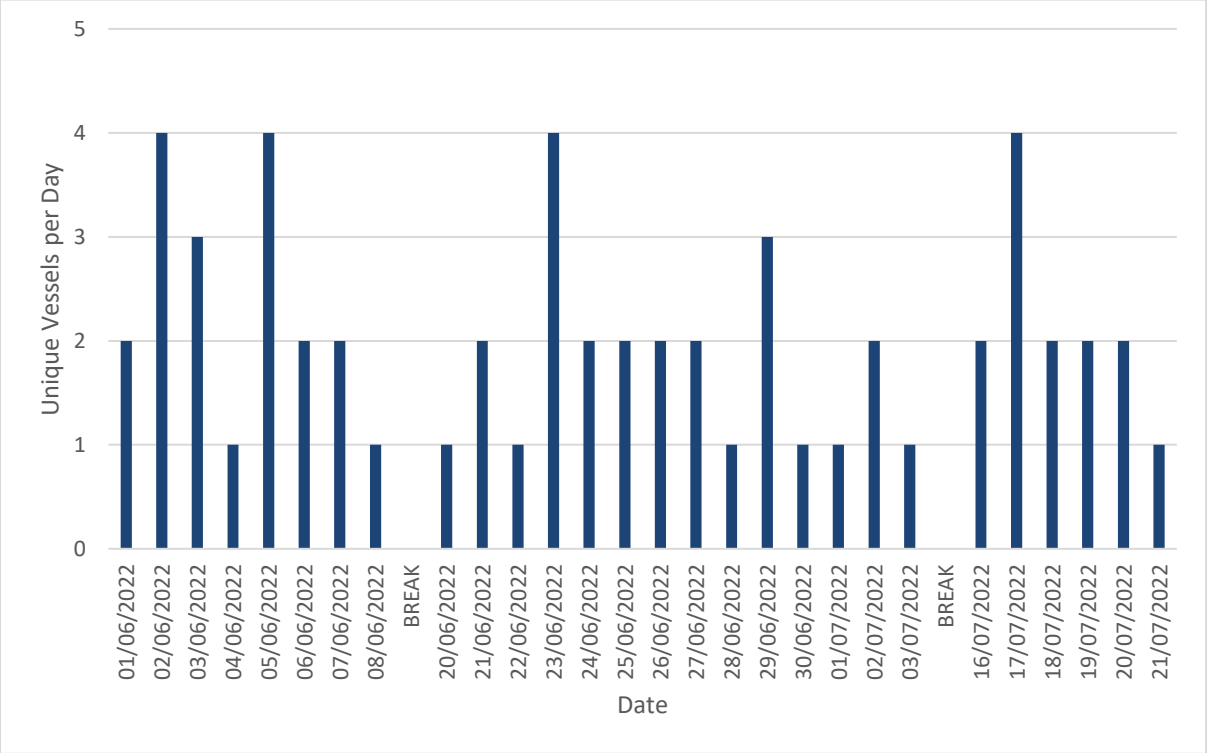

Figure 7.1: Unique Vessels per Day

7.2.2 An average of approximately two unique vessels per day were recorded within the study area over the 28 days. This is less than the average recorded over the 2021 dataset, when an average of five vessels per day was recorded (see APPENDIX A). This is considered likely to be reflective of changes in traffic patterns in the area following the implementation of the Dogger Bank A buoyed construction area, noting that the 2021 data predates the deployment of the Dogger Bank A buoys.

VESSEL TYPE

7.2.3 A plot of the vessel tracks recorded within the study area during the 28 day period is colour-coded by vessel type and presented in Figure 7.2. Following this, the distribution of these vessel types is presented in Figure 7.3

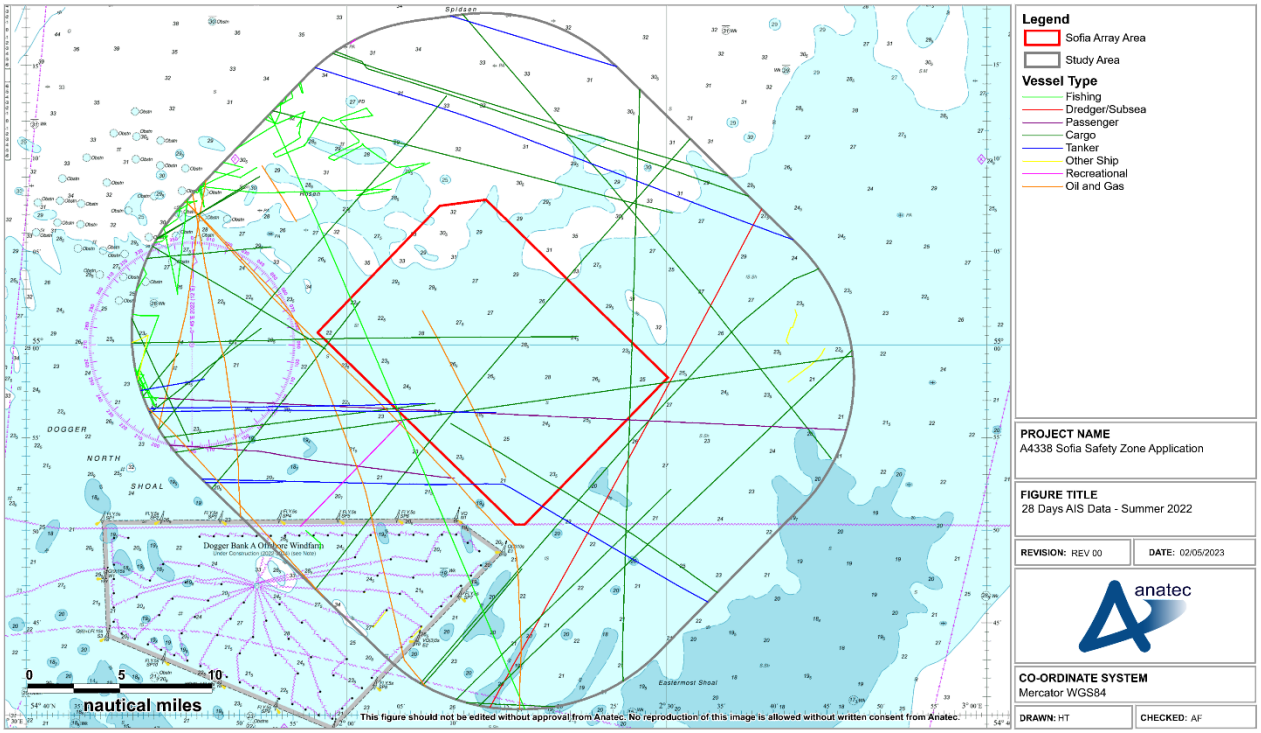

Figure 7.2 28 Days AIS Vessel Traffic (Vessel Type)

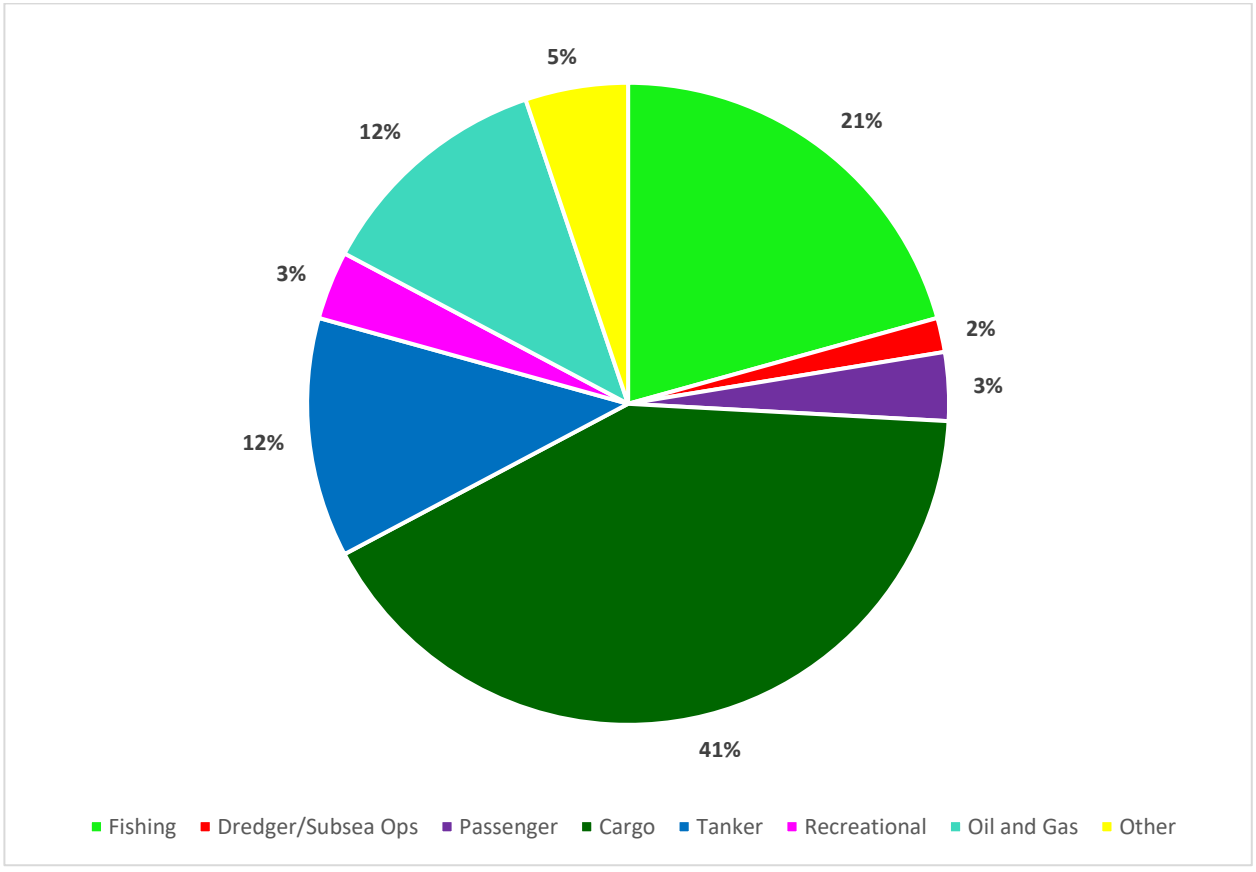

Figure 7.3 Vessel Type Distribution

7.2.4 The main vessel types recorded within the study period over the 28 day period were cargo vessels (42%), followed by fishing vessels (21%). Oil and gas vessels and tankers were also recorded (each accounting for 12%).

CARGO VESSELS

7.2.5 The tracks of cargo vessels recorded within the study area during the 28 day period are presented in Figure **7.4**.

7.2.6 Overall, there was an average of one cargo vessel per day recorded within the study area during the 28 day period. Review of the destinations transmitted via AIS indicated the majority of cargo vessels were on routes between the UK and other European ports notably in Norway.

7.2.7 This broadly aligns with the corresponding findings of the 2021 dataset (see APPENDIX A) in terms of general traffic volumes being low, with 1-2 cargo vessels per day recorded. It is considered likely that vessel numbers are lower within the 2022 dataset due to vessels deviating to avoid the Dogger Bank A buoyed construction area.

7.2.8 It should be considered that east / westbound traffic recorded through the site is likely to be impacted by the presence of the Dogger Bank B buoyed construction area. It is likely that such vessels are deviating to avoid Dogger Bank B.

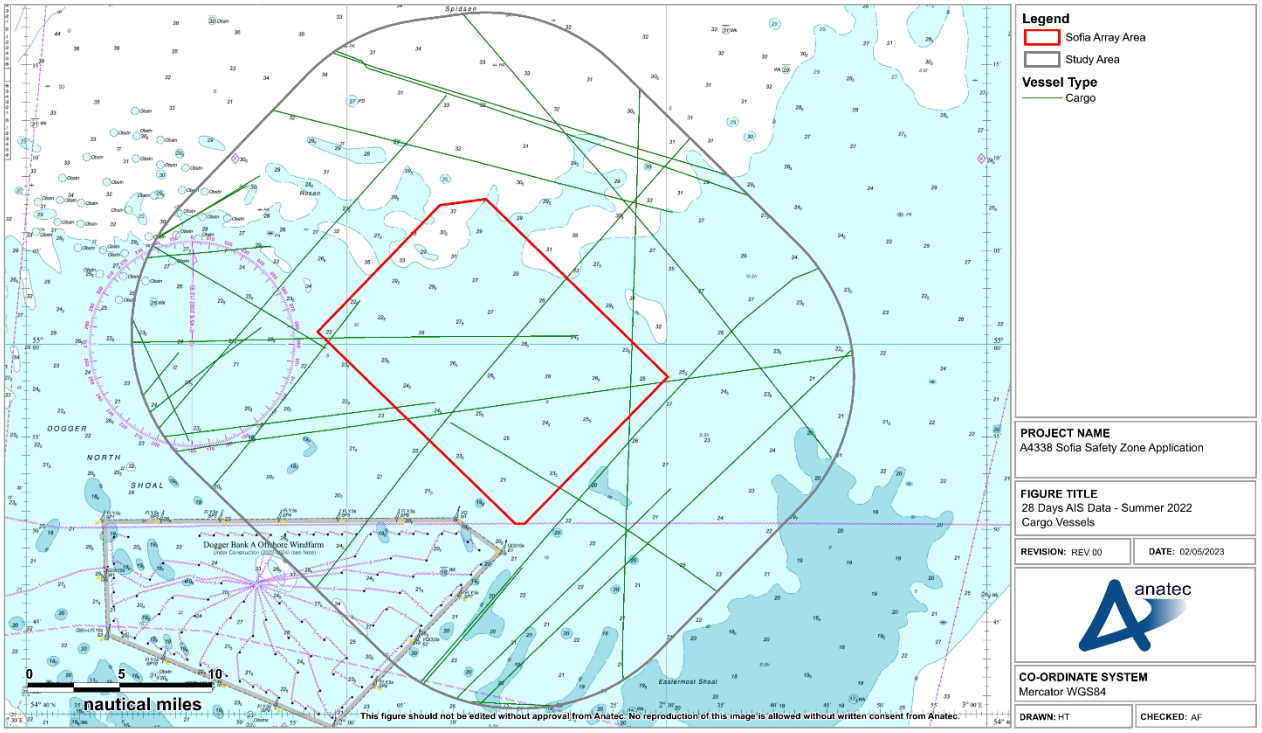

Figure 7.4 **28 Days AIS Vessel Traffic (Cargo Vessels)**

OIL & GAS VESSELS

7.2.9 The tracks of oil and gas vessels recorded within the study area during the 28 day period are presented in Figure 7.5.

7.2.10 Overall, there was an average of less than one oil and gas vessel per day recorded within the study area during the 28 day period. Based on the information transmitted via AIS, these vessels were most commonly associated with the Cygnus field to the south of the site. These findings broadly align with findings of the 2021 dataset (see APPENDIX A) in terms of general traffic volumes being low.

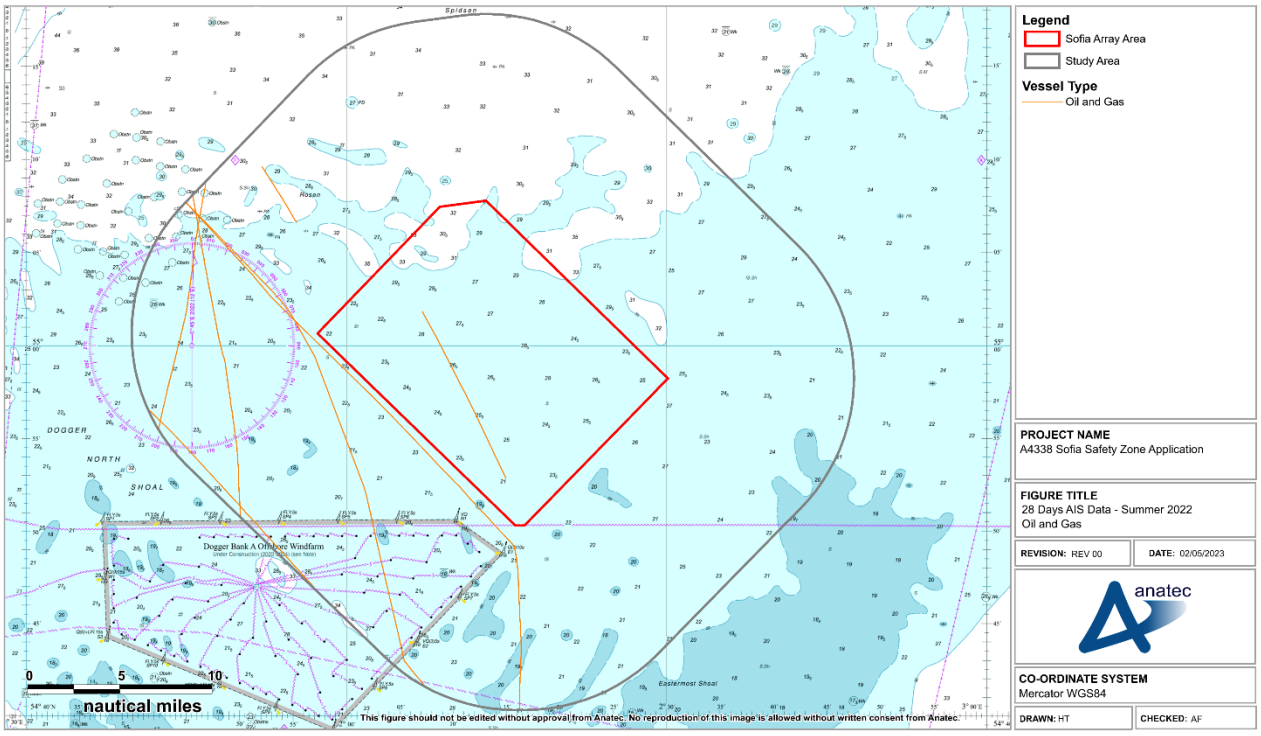

Figure 7.5 28 Days AIS Vessel Traffic (Oil & Gas Vessels)

TANKERS

7.2.11 The tracks of tankers recorded within the study area during the 28 day period are presented in Figure 7.6.

7.2.12 Overall, there was an average of less than one tanker per day recorded within the study area during the 28 day period. Similarly to cargo vessels, based on the information transmitted via AIS the majority of tankers were on routes between the UK and other European ports.

7.2.13 This broadly aligns with the corresponding findings of the 2021 dataset (see APPENDIX A), in terms of traffic volumes below generally low, with less than one tanker per day also recorded. It is likely that tankers previously recorded in the area are now deviating to avoid the Dogger Bank A buoyed construction area.

7.2.14 It should be considered that east / westbound traffic recorded through the site is likely to be impacted by the presence of the Dogger Bank B buoyed construction area. It is likely that such vessels are now deviating.

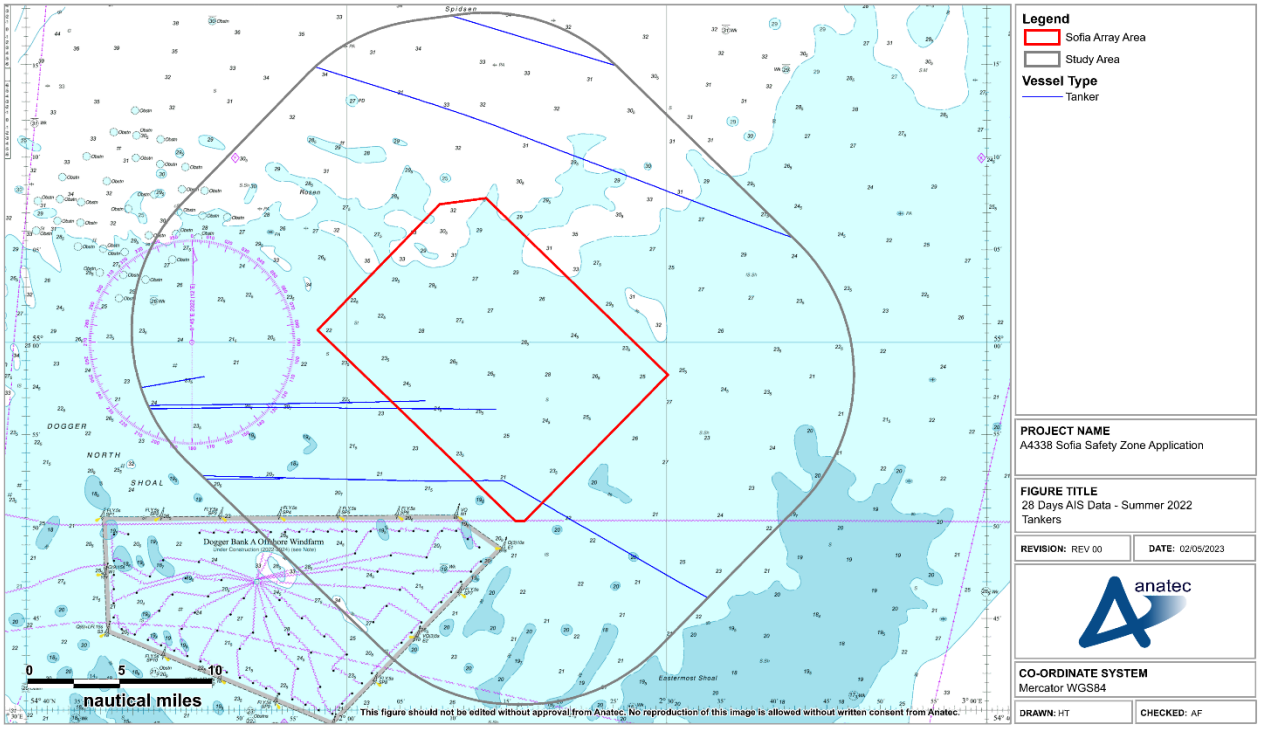

Figure 7.6 28 Days AIS Vessel Traffic (Tankers)

FISHING VESSEL ACTIVITY

7.2.15 The tracks of fishing vessels recorded within the study area during the survey period are presented in Figure 7.7, colour coded by primary gear type.

7.2.16 There was an average of less than one unique fishing vessel per day recorded within the study area during the survey period. Based on vessel speeds and behaviours this included vessels actively fishing (i.e., potential that gear was deployed), with this activity occurring to the northwest and west of the site from potters.

7.2.17 In terms of nationality, all were UK registered, with the exception of one German trawler. The majority of the UK tracks were recorded from potters.

7.2.18 It is noted that the array area is located within the Dogger Bank Special Area of Conservation, and that the Marine Management Organisation (MMO) introduced a byelaw in 2022 (MMO, 2022) prohibiting bottom towed fishing gear within the SAC. This correlates with the data which shows that the activity in the area is primarily from potters.

7.2.19 An average of 1-2 vessels were recorded within the 2021 dataset. The decrease in numbers is considered likely to be primarily due to the introduction of the Dogger Bank Special Area of Conservation byelaw noting that 60% of the fishing vessels recorded within the site in the 2021 dataset were trawlers (see APPENDIX A).

7.2.20 On this basis, for the purposes of this safety zone application it has been assumed that fishing vessels may be present in the area post commencement of construction, including within the site itself.

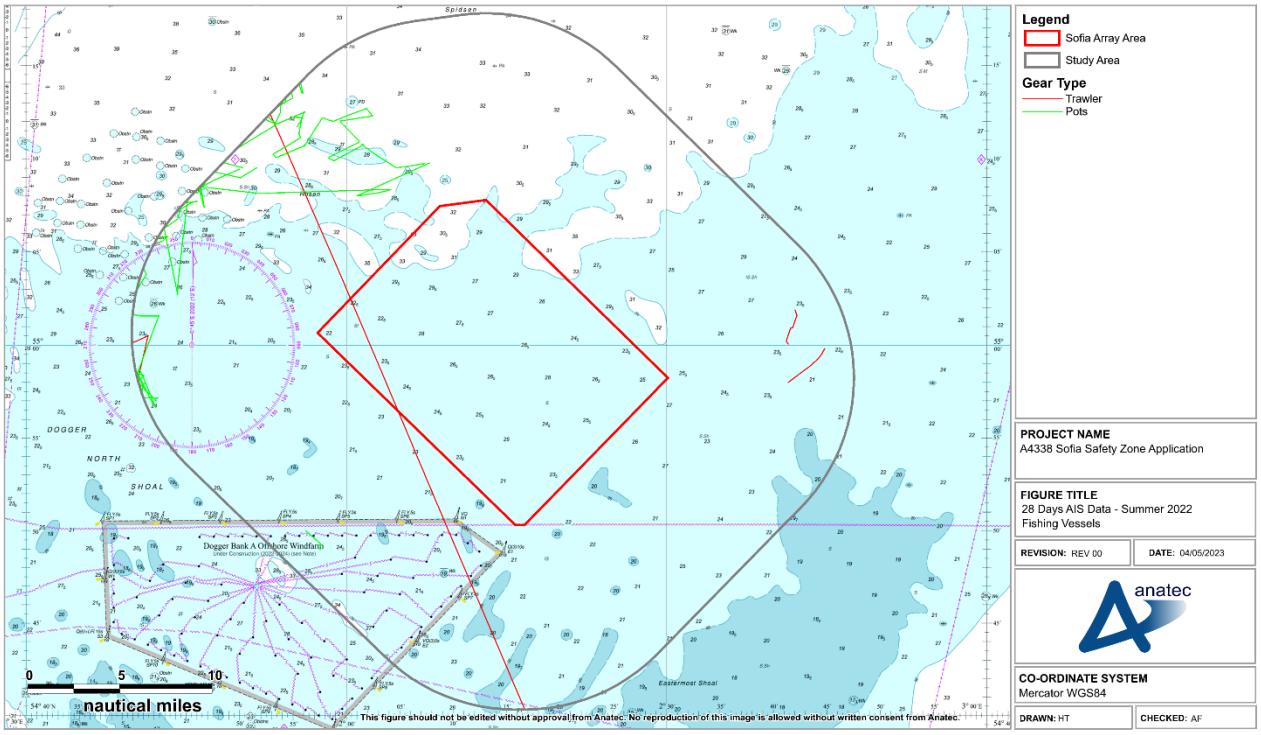

Figure 7.7 28 Days AIS Vessel Traffic (Fishing Vessels)

RECREATIONAL VESSEL ACTIVITY

7.2.21 Only two recreational vessels were recorded within the study area during the survey period, which is expected due to the distance of the site offshore. Given the distance offshore, it is considered unlikely that recreational vessels would regularly transit in or in proximity to the site and it is noted that this aligns with the findings of the NRA both in terms of data assessment and consultation. In particular, the Royal Yachting Association stated during NRA consultation that "*due to the distance offshore, recreational sailors around Dogger Bank are expected to be competent and on well-equipped vessels.*" It also aligns with the 2021 dataset, which recorded no recreational vessels (see APPENDIX A).

7.2.22 On this basis, for the purposes of the safety zone application it has been assumed that recreational transits may occur on an infrequent basis, noting these are likely to be from experienced users on well-equipped vessels running between the UK and the continent.

ANCHORED VESSELS

7.2.23 Assessment of the information transmitted via AIS and an additional behavioural assessment was undertaken to identify any potential instances of vessel anchoring within the study area. No anchoring activity was identified on this basis, noting this is to be expected given the distance offshore. This aligns with the findings of the 2021 dataset (see APPENDIX A).

7.3 DATA VALIDATION

7.3.1 For the purposes of data validation, vessel numbers in the area based on Anatec's internal ShipRoutes database (Anatec, 2023) have been compared with the numbers estimated from

the AIS data (both the 2021 and 2022 datasets). The results of the comparison are summarised in Table 7.1 (noting that only vessels on routes i.e., cargo, tanker, passenger and oil and gas are captured).

7.3.2 As shown, there is good overall correlation between the data sets in terms of overall traffic volumes i.e., it is not a heavily trafficked area.

Table 7.1: Data Validation Exercise

VESSEL TYPE	SHIPROUTES VESSEL NUMBERS PER DAY		AIS VESSELS PER DAY 2021		AIS VESSELS PER DAY 2022	
	Study Area	Array Area	Study Area	Array Area	Study Area	Array Area
Cargo	2	< 1	1-2	< 1	1	< 1
Tanker	< 1	< 1	< 1	< 1	< 1	< 1
Passenger	< 1	0	0	0	< 1	< 1
Oil and Gas	< 1	< 1	< 1	< 1	< 1	< 1

8. SAFETY ZONE OVERVIEW

8.1.1 This section sets out on an indicative basis activities and scenarios that could trigger a 500 m safety zone during the construction and operational phases. This does not seek to provide a comprehensive list of all scenarios and activities that could trigger a safety zone, but does set out on a general basis where they may be implemented.

8.1.2 The general principles for determining when a 500 m safety zones is implemented are as follows:

- Whether an activity is considered as being allowed a safety zone under the relevant guidance and legislation as listed in Section 1.3; and
- Whether the safety zones are a necessary mitigation to bring relevant risks (as per Section 9) to within As Low As Reasonably Practicable (ALARP) parameters.

8.1.3 Applying these general principles, it is anticipated that the following scenarios will trigger a 500 m safety zone:

- Any construction operation involving a vessel that is Restricted in Ability to Manoeuvre (RAM) stationed at a structure (within 500 m);
- Any construction or major maintenance operation involving any kind of attachment to a structure; and
- Any construction or major maintenance operation involving a vessel that is required to be anchored to the seabed next to the structure for the purposes of that operation (e.g., heavy lift operations).

8.1.4 It is noted that major maintenance safety zones triggered by Service Operations Vessels (SOV) are not applied for under this application.

9. JUSTIFICATIONS FOR SAFETY ZONES

9.1 OVERVIEW

9.1.1 This section details the key hazards for which safety zones are a relevant mitigation. The justification considers the findings of the NRA (Anatec, 2014), operational experience of other wind farms, and the marine traffic assessment undertaken for this application (see Section 7).

9.2 REDUCTION IN COLLISION RISK

9.2.1 Throughout the construction of the Sofia OWF, various vessels will be present within the buoyed construction area to carry out the installation of the foundations, WTGs, OCP, and cables. Given the scale of the largest components of these structures and the sensitive nature of the associated works, the vessels on site will include those that are RAM with the potential for multiple such vessels to be on site simultaneously.

9.2.2 Project vessel numbers during operation are anticipated to be significantly less than during construction. However, during periods of major maintenance there may be a requirement for project vessels undertaking similar sensitive operations to those during the construction phase.

9.2.3 The marine traffic data assessed indicates commercial vessels do pass through and in proximity to the site. However, it should be considered that the data predates commencement of construction of the neighbouring Dogger Bank B project. Regardless, based on operational experience of other constructing wind farms, it is likely that once the site is marked as a buoyed construction area, commercial vessels will deviate around the site, noting that details of the Sofia OWF including in relation to the buoyage will be promulgated in advance of construction to assist in vessel passage planning. During the early stages of construction, limited numbers of commercial vessels may still choose to transit through areas of the site where construction was not ongoing, and the 500 m safety zones would make it clear to such vessels which areas should be avoided to reduce collision risk to within ALARP parameters.

9.2.4 Fishing vessels are present in the area based on the marine traffic data assessed, and may also choose to avoid the buoyed construction area. However, given the typical size of such vessels, they may be more likely to enter into the site than larger commercial vessels, and may therefore also be more comfortable passing closer to sensitive operations. Recreational activity is anticipated to be limited, but again, any such vessels present in the area may choose to transit through. The 500m rolling construction safety zones would make it clear to these smaller vessels the areas where such operations are being undertaken (i.e., those involving a RAM vessel), and as such which areas should be avoided to reduce collision risk to ALARP.

9.2.5 During operation, it is likely that commercial vessels deviations would be well established, and as such associated traffic would already be avoiding the structures (noting again routeing is likely to evolve in the area on a cumulative basis). However, smaller vessels may still choose to enter the site, and may be more likely to do so than during the construction phase given lower project vessel volumes. The implementation of 500 m safety zones to protect any major maintenance activities will ensure collision risk to the associated vessels is ALARP.

9.3 REDUCTION IN ALLISION RISK

9.3.1 The structures installed within the site will create new allision risk to passing vessels. During the construction phase, passing vessels may be less familiar with the Sofia OWF, and there may also be partial structures present, noting that operational lighting and marking will not yet be active.

9.3.2 As discussed in Section 9.2, it is likely that the majority of commercial vessels will avoid the site altogether once it is marked as a buoyed construction area and instead deviate around the construction works and structures. However, it should be considered that such vessels may still choose to transit through, particularly during the early stages of construction through areas where no works were ongoing. Smaller vessels (e.g., fishing and recreation) may choose to avoid the site during construction, however given their size and manoeuvrability would be more comfortable navigating through than commercial vessels.

9.3.3 The implementation of 50m safety zones around pre-commissioned structures (partial or complete) would make it clear to passing vessels the areas which should be avoided to minimise allision risk. In this regard details of the safety zones would be promulgated in advance to ensure that vessels which were able to passage, plan in advance to account for the presence of the structures and associated safety zones. This promulgation would also increase awareness of the Sofia OWF in general, further reducing allision risk.

9.3.4 As per Section 11, any safety zones would be monitored and policed to ensure they are an effective mitigation, noting that the formal approval of the safety zones provides the legislative framework to warn passing third party vessels that entry into active safety zones is prohibited.

9.4 PROTECTING PROJECT PERSONNEL

9.4.1 During the construction phase or during periods of major maintenance there will be a notable increase in the number of crew and personnel on site. This includes personnel on RAM vessels which are at particular risk of collision as per Section 9.2 and also any personnel stationed on the structures themselves, which are at risk of allision as per Section 9.3.

9.4.2 Therefore, there is a need to ensure the safety of the crew working on-board construction / maintenance vessels throughout the construction and maintenance phases and any other on site personnel. The implementation of mandatory 500 m safety zones provides an alert to vessels transiting within the area that a sensitive operation is underway and allows them to passage plan to maintain a safe passing distance for any activity and thus ensures the safety of the crew and personnel (to within ALARP parameters). Similarly, during the construction phase in situations where personnel were stationed on a structure but with no construction vessel alongside, the 50 m safety zones will reduce allision risk (see Section 9.3) and hence reduce risk to the personnel.

9.5 REDUCTION IN FISHING GEAR SNAGGING

9.5.1 Based on the marine traffic data studied (see Section 7.2), fishing vessels do currently transit in and near the site. Based on speed and behaviour of the recorded vessels, this activity included both active fishing and transit activity.

9.5.2 The anchor spread of construction / maintenance vessels, partially completed structures, and inter-array cables in proximity to structures all pose a snagging risk to deployed fishing gear.

The implementation of 500 m safety zones around structures where construction or major maintenance works were ongoing and 50 m safety zones around pre-commissioned structures will therefore reduce the likelihood of an associated snagging incident.

9.5.3 Further, as details of the works and presence of safety zones will be promulgated including to fishing users, general awareness of the Sofia OWF will increase, which will reduce the overall potential for interaction and thus snagging risk.

9.6 REDUCTION IN INTERACTION WITH ANCHOR SPREAD

9.6.1 As per Section 4.4, it is anticipated that the installation of the OCP will include use of an installation vessel utilising an anchor spread. There may also be a need for similar activity during certain periods of major maintenance. These subsea anchors and lines / chains create an interaction risk with vessels, anchors and fishing gear. This could lead to severe consequences for the passing vessel and / or the project vessel, with the potential for injury or loss of life as a worst case.

9.6.2 The implementation of mandatory 500 m safety zones provides a buffer from passing traffic and thus reduces the likelihood of an anchor spread interaction. It is anticipated that the anchor spreads will be of 1,600 m in radius, however the sections posing most under keel risk to passing vessels will be within the 500 m confines of the safety zone.

9.6.3 As per Section 11, any safety zones would be monitored and policed to ensure they are an effective mitigation, noting that the formal approval of the safety zones provides the legislative framework to warn passing third party vessels that entry into active safety zones is prohibited.

9.7 ACCOUNTING FOR INEXPERIENCED MARINERS

9.7.1 As discussed in Section 7, recreational traffic is limited in and near the site, and it is likely that any recreational users this far offshore would be experienced mariners on well-equipped vessels (noting this aligns with RYA consultation input during the NRA process). However, it should be considered that there may be infrequent transits from recreational vessels that carry a lower standard of navigational equipment than commercial vessels, and / or with crews that may not be as experienced or have few formal qualifications.

9.7.2 Implementation of mandatory safety zones in conjunction with other embedded mitigation measures (e.g., guard vessel used where identified as necessary, construction site marking and charting, monitoring and policing of safety zones) is therefore necessary to mitigate risks to any recreational users.

9.7.3 As previously detailed, if a vessel were to infringe a safety zone, and therefore becoming at risk of an allision and / or collision, the monitoring and policing procedures would be actioned as detailed in Section 11. Any infringements to these safety zones shall be noted by the onsite vessel(s) and efforts made to contact the vessel using standard marine procedures, alerting it to the safety zone infringement. Furthermore, the on-site vessels shall be contactable (via Very High Frequency (VHF)) and be able to provide information to recreational vessels navigating in or in proximity to the site should they require.

9.7.4 Therefore, the implementation of safety zones in tandem with a suite of other mitigation measures shall bring the risk to within ALARP parameters.

9.8 ACCOUNTING FOR UNFORESEEN RISK

9.8.1 During the construction phase and any periods of major maintenance, there is potential for a number of events to occur which may result in previously unforeseen risk. Such events could include:

- Fire / Explosion on board construction / maintenance vessel;
- Machinery failure (including steering) on board construction / maintenance vessel;
- Cargo (e.g., structure components) shifting on board construction / maintenance vessel;
- Structural failure of wind farm component;
- Dropped object;
- Accidental interaction with unexploded ordnance / wreck; or
- Accident associated with adverse weather.

9.8.2 If any of these incidents were to occur throughout the construction / during periods of major maintenance of the Sofia OWF, there is potential for loss of life and / or serious environmental damage. While safety zones would not necessarily directly mitigate any of these events in of themselves, they would decrease the likelihood of a third party vessel being exposed to a hazard by sterilising the immediate working areas of existing marine traffic. The presence of these safety zones allows third party traffic to passage plan and pass at a safe distance, and therefore reduces the risk of a third-party vessel becoming involved in any of the aforementioned unforeseen risk scenarios. This greatly reduces the overall severity of consequence to third party users of any potential incident.

9.8.3 The safety zones will be implemented in tandem with a suite of other mitigation measures (e.g., onsite vessel(s), construction site marking, lighting and marking, charting, monitoring and policing of safety zones) thus bringing the risk to within ALARP parameters.

10. IMPACT OF SAFETY ZONES

10.1 COMMERCIAL VESSEL ROUTEING

10.1.1 As discussed in Section 7.2, the data studied shows commercial vessel traffic currently intersects the site, albeit in low volumes. The data predates the implementation of the Dogger Bank B buoyed construction area, however this is unlikely to lead to notable changes in overall traffic volumes in the general region (which are already low).

10.1.2 Based on experience of other wind farms commercial vessels will typically avoid wind farm sites once construction is underway (i.e., from when the site is marked as a buoyed construction area). Any vessels that did still enter the site would likely avoid the active works, and by extension the 500 m safety zones (noting that the smaller 50m safety zones are considered as having no impact on transits of commercial vessels).

10.1.3 On this basis the safety zones are not considered as having any additional impact on commercial vessels over that of the structures themselves. This is considered as applying regardless of any cumulative routeing changes in the area.

10.1.4 It is noted that promulgation of information will be undertaken including details of active safety zones which will facilitate passage planning of commercial vessels.

10.2 FISHING VESSELS

10.2.1 As shown in the marine traffic data assessment (Section 7.2 and APPENDIX A), fishing activity has historically occurred in and near the site. However, the Dogger Bank Special Area of Conservation (Specified Area) Bottom Towed Fishing Gear Byelaw means that bottom trawling fishing is now prohibited within the array area, and as such any activity will be from other fishing gear types (which aligns with the 2022 dataset). On this basis, it is considered that fishing vessels may seek to transit through and / or fish within the array area (excluding bottom trawling) during and post construction.

10.2.2 As detailed in Section 2.1, minimum spacing of the periphery structures is 1.4 km, with internal grid spacing of 2.9 x 2.9 km. This spacing is considered sufficient for fishing vessels to enter and transit through the site including with the implementation of 500 m safety zones around certain structures, noting that the decision as to whether to transit through and / or actively fish would be at the discretion of individual vessel masters.

10.2.3 The 500 m safety zones would only be active around structures where construction was ongoing, and as such the affected spatial areas would only cover a small proportion of the site as a whole. The 50 m safety zones are considered unlikely to have any effect given minimum spacing is 1,400 m on the periphery, and rising to 2.9 km within the internal grid.

10.2.4 During the operational phase, safety zones would only be active during periods of major maintenance. On this basis they will only be active for limited periods of time, and are likely to be much lower in frequency than during the construction phase.

10.2.5 Details of the safety zones would be promulgated in advance of and during construction / maintenance activities as appropriate. This will include notice issued in the Kingfisher Bulletin and via the project FLO. It is also noted that construction vessels will have a Fishing Liaison Representative on board.

10.2.6 Therefore, no notable impact to fishing vessels is anticipated from the safety zones.

10.3 RECREATIONAL VESSELS

10.3.1 As discussed in the marine traffic data assessment (Section 7.2), it is likely that recreational transits through the site would be an infrequent occurrence. Infrequent recreational transits may still occur through the site, however these are likely to be from experienced and well equipped mariners.

10.3.2 As detailed in Section 2.1, minimum spacing of the periphery structures is 1.4 km, with internal grid spacing of 2.9 x 2.9 km. This spacing is considered sufficient for recreational vessels to enter into and transit through the site including with the implementation of 500 m safety zones around certain structures, noting that the decision as to whether to transit through would be at the discretion of each individual vessel. The 50 m safety zones are considered unlikely to have any effect given minimum spacing is 1,400 m on the periphery and rising to 2.9 km within the internal grid.

10.3.3 Based on the structure spacing and anticipated levels of recreational traffic, no notable impact to recreational vessels is anticipated from the safety zones.

10.4 ANCHORED VESSELS

10.4.1 It is considered unlikely that a vessel would deliberately choose to anchor within the site once construction was underway or when operational except in the event of an emergency. As detailed in Section 7.2, anchoring activity is very limited within the area (which would be expected given the distance offshore), and as such any impact from safety zones on anchoring is likely to be minimal.

11. MONITORING AND POLICING

11.1 MONITORING

11.1.1 The Developer will ensure any active safety zones are appropriately monitored. The monitoring approach at any given time will be proportionate to the relevant active factors including number of active safety zones, types of safety zones active (e.g., 50 m vs 500 m) and levels of onsite project vessel presence / availability. On this basis at any one time the monitoring approach will include one or a combination of the following:

- Where appropriate and practicable, a vessel(s) will be designated as a dedicated monitoring vessel. This vessel(s) will be designated the responsibility of monitoring and communicating with third party traffic including in relation to the active safety zones. When on site the monitoring vessel(s) will have overarching responsibility for monitoring active safety zones, however they may also be assigned responsibility to monitor specific 500 m safety zones of other vessels if required as determined by risk assessment.

- Where a construction vessel is stationed at a structure and operating within the resultant active 500m safety zone, it will be risk assessed as to whether the vessel can effectively monitor that safety zone. In such cases the vessel would only monitor its own safety zone.

- A dedicated 24/7 Marine Coordination Centre (MCC) will be in place monitoring the site via a dedicated Marine Management System (MMS). This will allow for remote monitoring via AIS overlay implemented within the site chart and will also be supplemented with communications to support vessel contact.

11.1.2 Where a vessel is monitoring a safety zone (via AIS, radar, and visual watch), VHF communications shall be utilised to make early contact with any third-party vessels (as early as practicable) in the area identified as approaching. Such third party vessels will be alerted to the presence of any currently active (or soon to be active) safety zones. Any vessels observed to enter into a safety zone (or pass in close proximity) will be contacted again by the monitoring vessel (using standard marine procedures), and informed that they have or are close to infringing the safety zone. The vessel will be instructed to increase their minimum passing distance from the safety zone and to avoid or refrain from entering active safety zones in the future.

11.1.3 Where no monitoring vessel is available, the site will be monitored from the Marine Coordination Centre to identify (where possible) any vessels approaching or infringing the active safety zones. Where feasible, contact will be made with the associated vessels at the earliest opportunity, and details of any incidents will be logged, with any evidence retained for submission to DESNZ where appropriate as discussed in Section 11.2.

11.1.4 Direct navigational advice will not be given to any third party vessel. Standard marine terminology will be used to warn any relevant vessels in instances where action to avoid active safety zones is required.

11.2 POLICING

11.2.1 The details of any vessels which consistently ignore the warnings issued with regards to safety zones, and / or are considered to be causing a potential danger to vessels within the area will be noted and reported to DESNZ as the licensing authority. This will include any

supporting evidence collected (e.g., AIS recording, witness statements, video, photographs). Where infringements occur when no monitoring vessel was available, reports may still be made to DESNZ where the associated activity was considered dangerous based on the AIS evidence, or where the infringement was made by a vessel which has previously infringed a safety zone. Where any reports are made to DESNZ, the MCA will also be notified.

11.2.2 DESNZ will then decide what action, in consultation with other stakeholders, is required. Prosecutions are only likely to be sought where infringements are deliberate and malicious, causing damage, nuisance or endangering lives. In particular, prosecution would not be sought in the event of a third-party vessel entering into a safety zone to fulfil obligations under Safety of Life at Sea (SOLAS) (IMO, 1974) to render assistance to persons in danger.

11.3 EXISTING EXPERIENCE

11.3.1 It is noted that due to the development of other existing wind farms including large scale projects across the North Sea area (e.g., Hornsea One and Two, Triton Knoll, Race Bank, and the Dogger Bank projects), the majority of regular operators (including local recreational sailors) are likely to be familiar with the implementation and operation of construction / major maintenance safety zones, and the associated procedures around how they are monitored and policed.

12. SUMMARY

12.1.1 This document represents the primary supporting document to the safety zone application submitted for the Sofia OWF. Safety zones have been applied for during the construction and operational phases as follows:

- "Rolling" 500 metre (m) safety zone established around each WTG or OCP, and / or their foundations, whilst construction work is being performed, as indicated by the presence of a construction vessel(s);
- Pre-Commissioning 50m safety zones established around any WTG or OCP which is either partially completed or constructed where a construction vessel is not present prior to commissioning of the wind farm; and
- 500m safety zones around all "major maintenance" being undertaken around a WTG or OCP, as denoted by the presence of a major maintenance vessel.

12.1.2 A safety case has been provided which builds on the NRA (Anatec, 2014), which indicates the safety zones (in combination with other mitigation measures) are necessary to bring the following risks to within ALARP parameters:

- Collision risk;
- Allision risk;
- Interaction with the anchor spread of construction / maintenance vessels;
- Risks to persons involved in the construction / maintenance process; and
- Fishing gear snagging.

12.1.3 The safety zones will also facilitate advanced passage planning by third party vessels and reduce consequences in the event of an unforeseen emergency incident by decreasing the likelihood that a third party vessel will be in proximity.

12.1.4 The findings of the NRA (Anatec, 2014) in combination with assessment of up to date marine traffic survey data has indicated no significant impacts to third party vessels are expected from the safety zones, and thus they are considered a proportionate mitigation measure.

12.1.5 The 500m safety zones shall be monitored for infringements by a nominated vessel where available / feasible. Construction / maintenance vessels may also monitor their own 500m safety zones noting this would be risk assessed based on the activities the vessel will be undertaking and its available monitoring resources. General site monitoring will be undertaken from the Marine Coordination Centre including when no vessels are on-site (i.e., when only 50m pre-commissioning safety zones are present). The primary response to potential infringement will be to warn passing traffic of the ongoing works and any active safety zones, and to alert any vessels where an infringement may occur or has already occurred.

12.1.6 Details of all infringements and / or near misses shall be recorded. Where necessary (i.e., where a vessel has infringed safety zones on multiple occasions or where a vessel has behaved in a dangerous manner), details and relevant evidence shall be passed to DESNZ with the MCA also notified.

13. REFERENCES

Anatec (2014). Navigational Risk Assessment Dogger Bank Teesside A & B. Aberdeen: Anatec.

Anatec (2023). Anatec ShipRoutes Database. Aberdeen: Anatec.

BEIS (2011). Guidance Notes: Applying for Safety Zones around Offshore Renewable Energy Installations.

IALA (2013). IALA O-139. Recommendations on the Marking of Man-Made Offshore Structures. Edition 2. Saint Germain en Laye, France: IALA.

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

MMO (2022). The Dogger Bank Special Area of Conservation (Specified Area) Bottom Towed Fishing Gear Byelaw 2022.

APPENDIX A. 2021 VESSEL TRAFFIC ANALYSIS

A.1 As discussed in Section 7.1, in line with DESNZ guidance (2011) this safety zone application includes an assessment of marine traffic survey data collected during 2022. This appendix provides additional supplementary assessment of additional data collected during March and July of 2021 within the same study area for the purposes of validating the primary findings. It should be noted that offshore construction of the nearby Dogger Bank A wind farm commenced in March 2022[3] and Dogger Bank B[3] construction commended in early 2023, and therefore the marine traffic data studied predates these offshore constructions[4]. The data shown is therefore not likely to be reflective of precise current routeing patterns (as demonstrated within the 2022 data), however is considered sufficient to provide additional indication as to overall traffic volumes in the study area.

A.2 The two month period was chosen such that downtime was minimal. Any traffic deemed to be temporary has been removed from further analysis (e.g., survey vessels).

A.3 As discussed for the 2022 dataset (Section 7.1), noting the offshore location of the site it should be considered that data coverage is not necessarily comprehensive of the entire study area. Further, the assessment may be unrepresentative of certain vessel types not required to transit via AIS (i.e., fishing vessels less than 15m and recreational vessels). It should also be considered that the ongoing COVID-19 pandemic may have had an impact on traffic recorded within the 2021 data.

Vessel Count

A.4 The number of unique vessels per day recorded within the study area throughout the March and July periods is presented in Figure A.1 and Figure A.2 respectively.

[3] Based on Notice to Mariners issued by Dogger Bank Wind Farm.

[4] Figures in this Appendix do not show the Dogger Bank A or Dogger Bank B buoyed construction areas noting the data predates both.

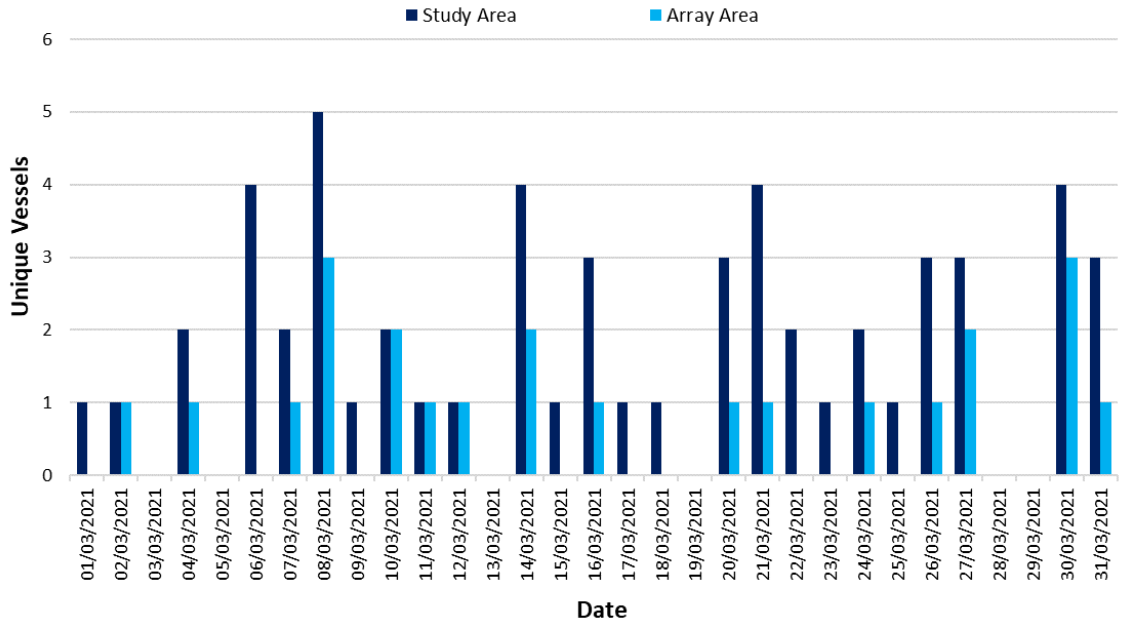

Figure A.1 Unique Vessels per Day - March 2021

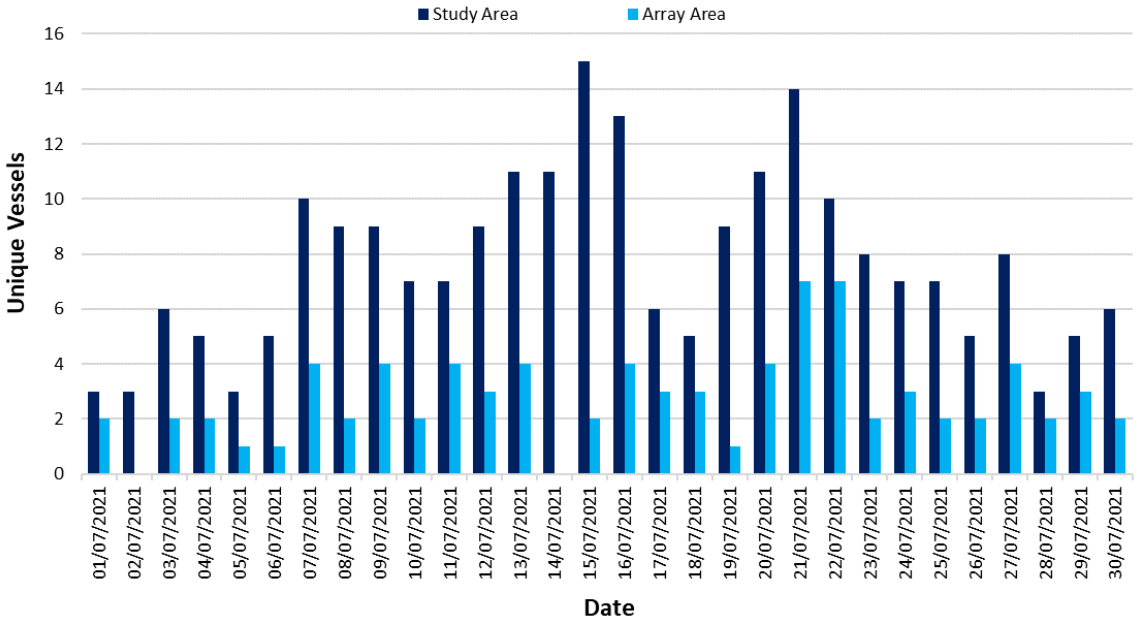

Figure A.2 Unique Vessels per Day - July 2021

A.5 An average of approximately two unique vessels per day were recorded within the study area during the month of March, of which an average of less than one per day also intersected the array area. An average of approximately eight unique vessels per day were recorded within the study area during the month of July, of which an average of two to three per day also intersected the array area. The increase in vessel numbers during summer was primarily observed to be associated with fishing vessels and as such may be in relation to seasonal variations in fishing activity. However, as discussed above it should be considered that AIS coverage may also be a factor behind reduced numbers during the winter period.

A.6 A plot of the vessel tracks recorded within the study area during the two month period is colour-coded by vessel type and presented in Figure A.3. Following this, the distribution of these vessel types is presented in Figure A.4.

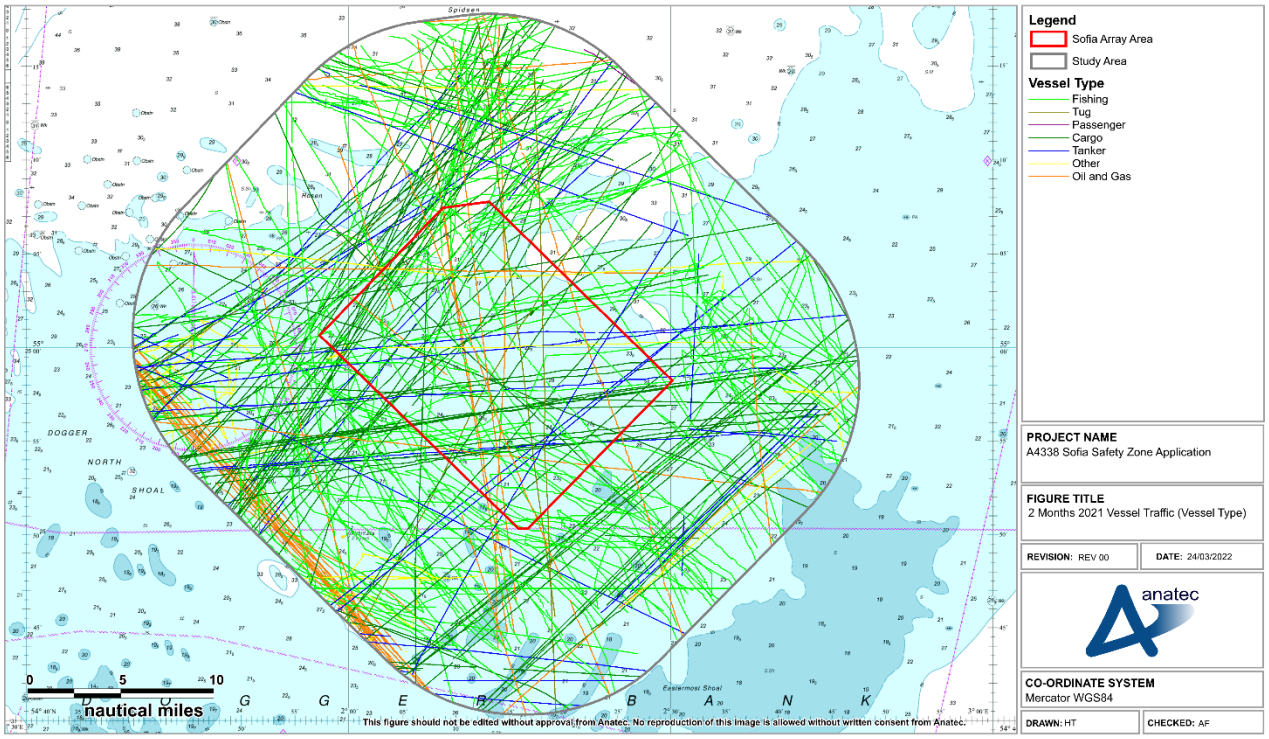

Figure A.3 Two Months 2021 Vessel Traffic (Vessel Type)

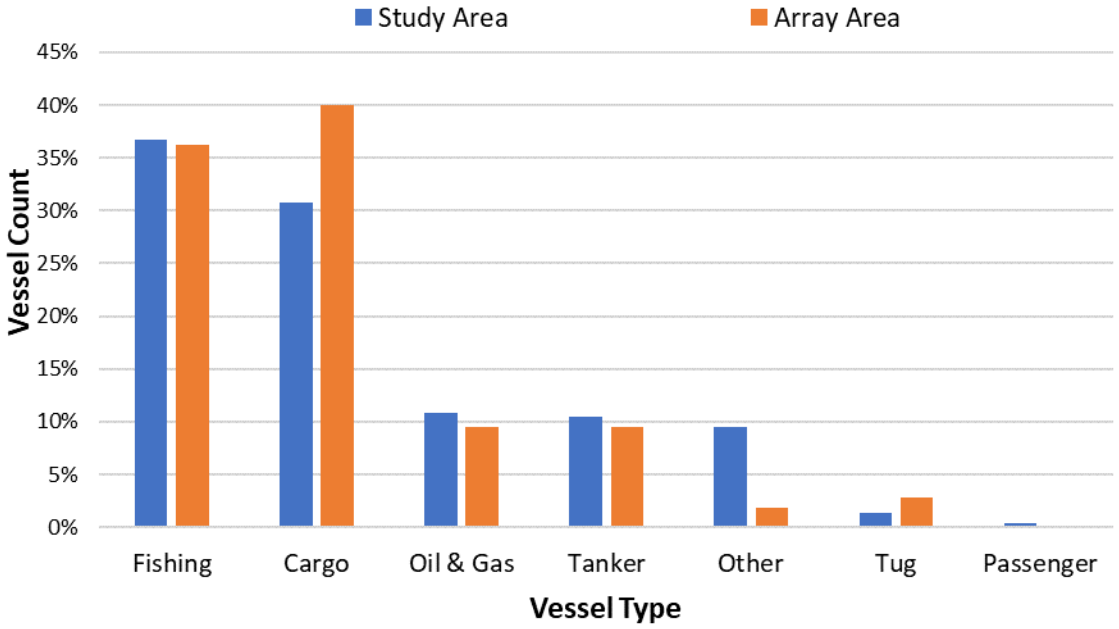

Figure A.4 Vessel Type Distribution

A.7 The main vessel types recorded within the study period over the two month period were fishing vessels (37%), followed by cargo vessels (31%). Oil and gas vessels and tankers were also frequently recorded (11% and 10%, respectively).

A.8 Similarly, fishing vessels and cargo vessels were also the main vessel types recorded within the array area (accounting for 36% and 40%, respectively) during the two month period. Oil and gas vessels and tankers accounted for 10% each of vessel traffic within the array area.

No passenger vessels were recorded within the array area, with activity in the study area also limited.

A.9 No recreational vessels were recorded within the study area during the survey period, noting that relevant discussion is provided in more detail in the recreational vessel section below.

Cargo Vessels

A.10 The tracks of cargo vessels recorded within the study area during the two month period are presented in Figure A.5.

A.11 Overall, there was an average of one to two cargo vessels per day recorded within the study area during the two month period, with an average of one cargo vessel per one to two days recorded intersecting the array area. Review of the destinations transmitted via AIS indicated the majority of cargo vessels were on routes between the UK and other European ports notably in Norway and Denmark.

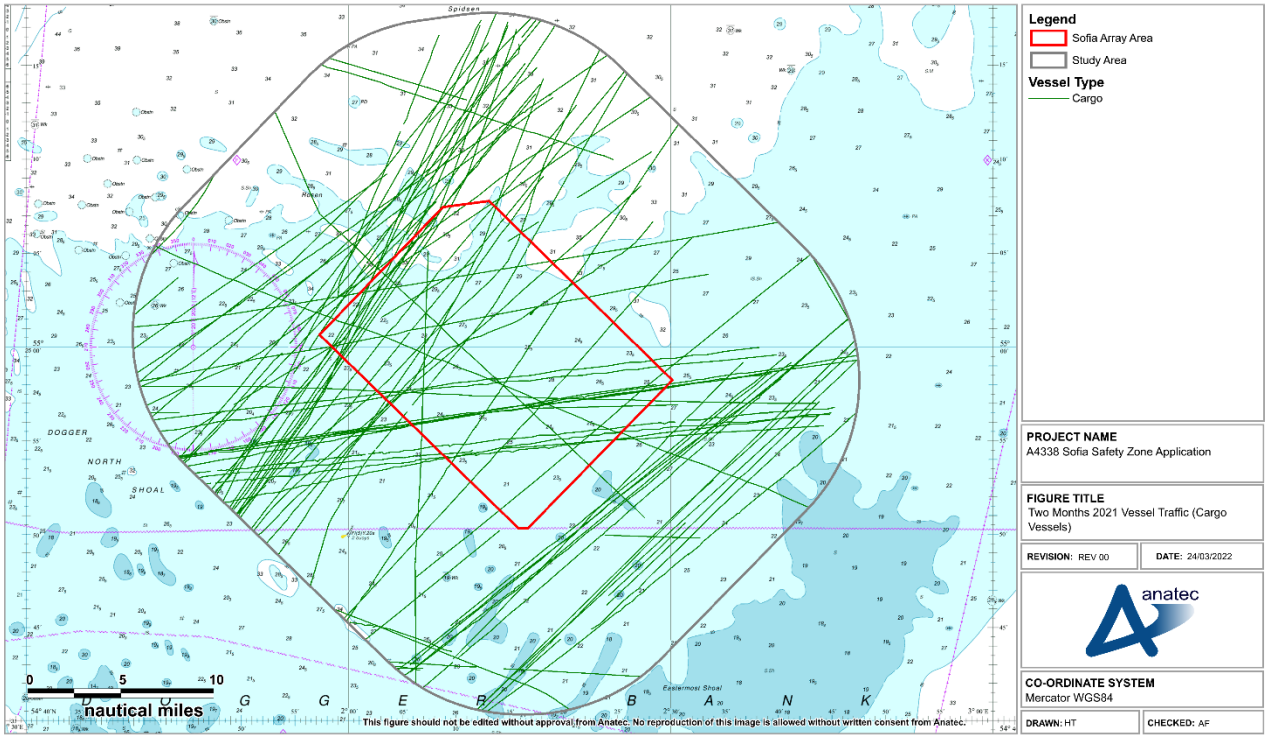

Figure A.5 Two Months 2021 Vessel Traffic (Cargo Vessels)

Oil & Gas Vessels

A.12 The tracks of oil and gas vessels recorded within the study area during the two month period are presented in Figure A.6.

A.13 Overall, there was an average of less than one oil and gas vessel per day recorded within the study area during the two month period. Based on the information transmitted via AIS it is likely that the majority of oil and gas vessels in the study area were associated with the Cygnus field to the south of the site.

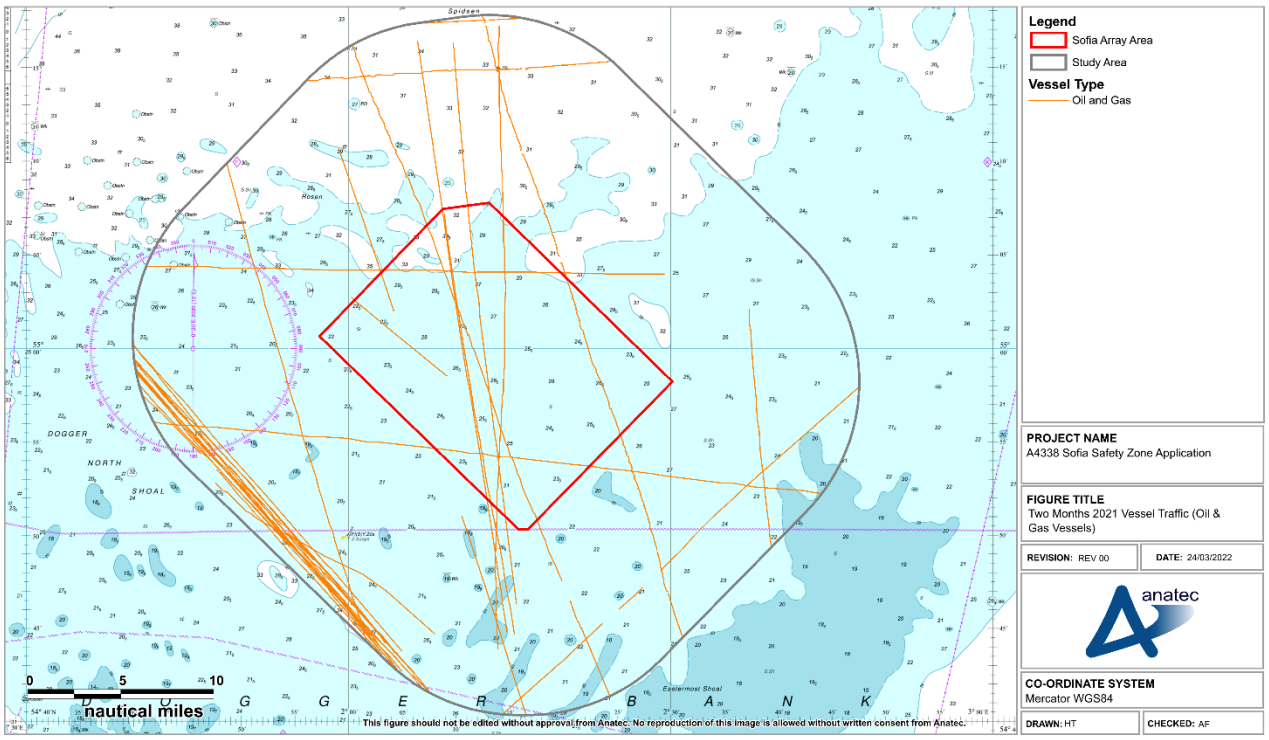

Figure A.6 Two Months 2021 Vessel Traffic (Oil & Gas Vessels)

Tankers

A.14 The tracks of tankers recorded within the study area during the two month period are presented in Figure A.7.

A.15 Overall, there was an average of one tanker every two days recorded within the study area during the two month period. Similarly to cargo vessels, based on the information transmitted via AIS the majority of tankers were on routes between the UK and other European ports notably in Norway and Denmark.

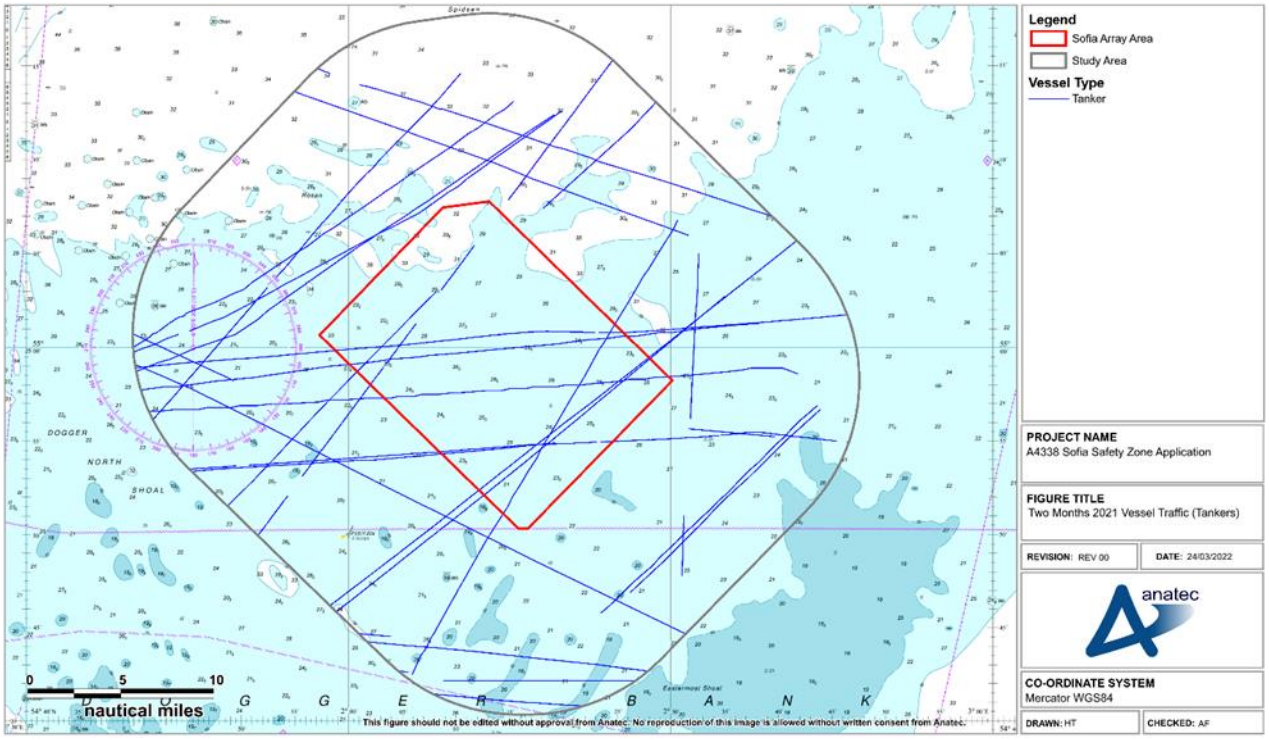

Figure A.7 Two Months 2021 Vessel Traffic (Tankers)

Fishing Vessel Activity

A.16 The tracks of fishing vessels recorded within the study area during the survey period are presented in Figure A.8, colour coded by primary gear type.

A.17 There was an average of one to two fishing vessels per day recorded within the study area during the survey period, with an average of less than one fishing vessel per day recorded intersecting the array area. Based on vessel speeds and behaviours this includes vessels actively fishing (i.e. potential that gear was deployed).

A.18 In terms of nationality, UK registered vessels accounted for 70% of fishing vessel traffic in the study area, with the majority of the remainder being from the Netherlands.

A.19 It is noted that the array area is located within the Dogger Bank Special Area of Conservation, and that the Marine Management Organisation (MMO) introduced a byelaw in 2022 (MMO, 2022) prohibiting bottom towed fishing gear within the SAC. It should therefore be considered that the majority of activity recorded within the AIS data in the array area during the 2021 study period would no longer be permitted (approximately 60% of vessels recorded within the array area of a known gear type utilised demersal trawling as their primary gear type). However, it should be noted that other gear types were still present.

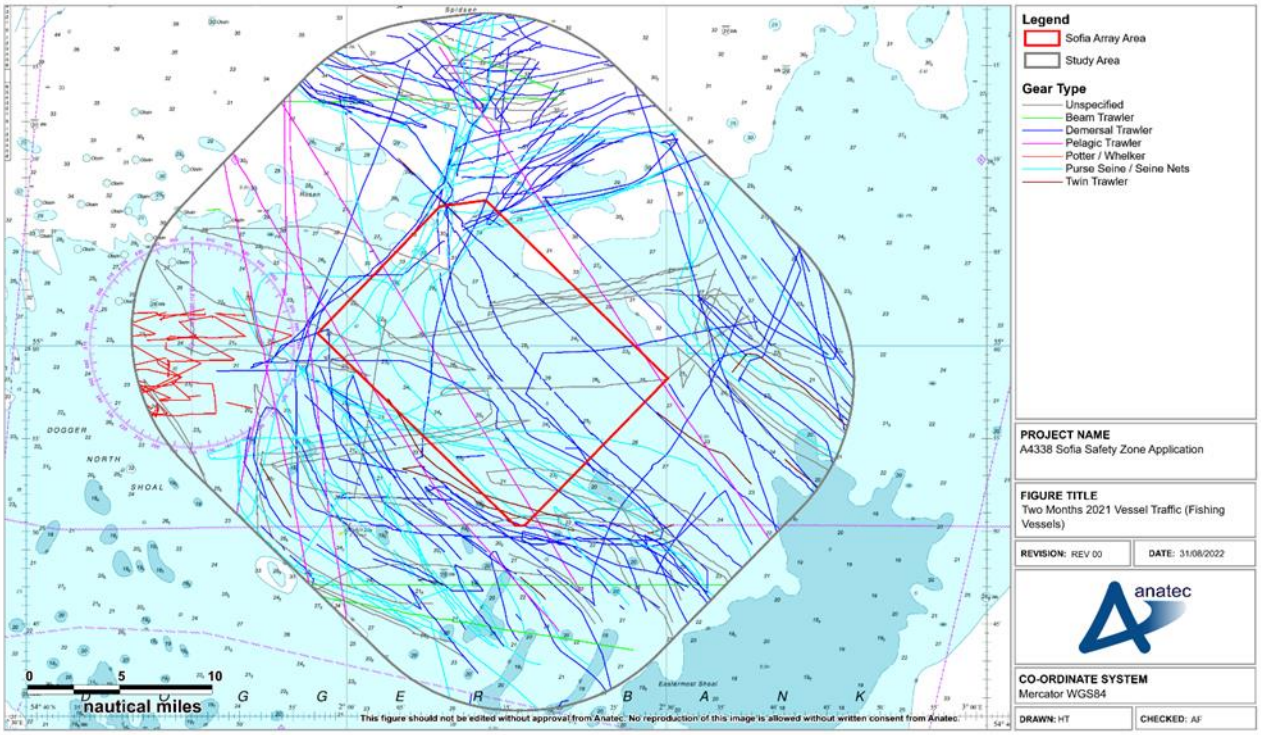

Figure A.8 Two Months 2021 Vessel Traffic (Fishing Vessels)

Recreational Vessel Activity

A.20 There were no recreational vessels recorded within the study area during the survey period, which is expected due to the distance of the site offshore. Given the distance offshore, it is considered unlikely that recreational vessels would regularly transit in or in proximity to the site and it is noted that this aligns with the findings of the NRA both in terms of data assessment and consultation. In particular, the Royal Yachting Association stated during NRA consultation that "*due to the distance offshore, recreational sailors around Dogger Bank are expected to be competent and on well-equipped vessels.*"

A.21 On this basis, for the purposes of the safety zone application it has been assumed that recreational transits may occur on an infrequent basis, noting these are likely to be from experienced users on well-equipped vessels running between the UK and the continent.

Anchored Vessels

A.22 Assessment of the information transmitted via AIS and an additional behavioural assessment was undertaken to identify any potential instances of vessel anchoring within the study area. No anchoring activity was identified on this basis, noting this is to be expected given the distance offshore.

APPENDIX B. STRUCTURE COORDINATES

B.1 Note positions subject to micrositing.

ID	TYPE	LONGITUDE	LATITUDE
SF OCP	OCP	002° 15.501" E	54° 59.7" N
SF A12	SPARE	002° 8.5092" E	55° 6.918" N
SF A01	WTG	001° 57.9132" E	55° 0.636" N
SF A02	WTG	001° 58.9164" E	55° 1.23" N
SF A03	WTG	001° 59.8734" E	55° 1.8" N
SF A04	WTG	002° 0.831" E	55° 2.37" N
SF A05	WTG	002° 1.7892" E	55° 2.94" N
SF A06	WTG	002° 2.748" E	55° 3.51" N
SF A07	WTG	002° 3.7068" E	55° 4.074" N
SF A08	WTG	002° 4.6662" E	55° 4.644" N
SF A09	WTG	002° 5.6262" E	55° 5.214" N
SF A10	WTG	002° 6.5868" E	55° 5.778" N
SF A11	WTG	002° 7.548" E	55° 6.348" N
SF A13	WTG	002° 9.5184" E	55° 7.458" N
SF B01	WTG	001° 58.9458" E	55° 0.06" N
SF B14	WTG	002° 11.4654" E	55° 7.476" N
SF C01	WTG	001° 59.9298" E	54° 59.514" N
SF C05	WTG	002° 3.8058" E	55° 1.818" N

ID	TYPE	LONGITUDE	LATITUDE
SF C07	WTG	002° 5.7234" E	55° 2.952" N
SF C09	WTG	002° 7.6434" E	55° 4.092" N
SF C11	WTG	002° 9.5646" E	55° 5.226" N
SF C15	WTG	002° 13.413" E	55° 7.494" N
SF D01	WTG	002° 0.9132" E	54° 58.968" N
SF D15	WTG	002° 14.3964" E	55° 6.948" N
SF E01	WTG	002° 1.8966" E	54° 58.422" N
SF E05	WTG	002° 5.7726" E	55° 0.72" N
SF E07	WTG	002° 7.6908" E	55° 1.86" N
SF E09	WTG	002° 9.6102" E	55° 2.994" N
SF E11	WTG	002° 11.5308" E	55° 4.146" N
SF E13	WTG	002° 13.455" E	55° 5.262" N
SF E15	WTG	002° 15.3804" E	55° 6.396" N
SF F01	WTG	002° 2.8794" E	54° 57.876" N
SF F15	WTG	002° 16.3632" E	55° 5.85" N
SF G01	WTG	002° 3.8616" E	54° 57.324" N
SF G03	WTG	002° 5.8224" E	54° 58.488" N
SF G05	WTG	002° 7.7382" E	54° 59.628" N
SF G07	WTG	002° 9.6558" E	55° 0.762" N
SF G09	WTG	002° 11.5758" E	55° 1.896" N

ID	TYPE	LONGITUDE	LATITUDE
SF G11	WTG	002° 13.497" E	55° 3.03" N
SF G13	WTG	002° 15.4206" E	55° 4.164" N
SF G15	WTG	002° 17.346" E	55° 5.298" N
SF H01	WTG	002° 4.8438" E	54° 56.778" N
SF H15	WTG	002° 18.3276" E	55° 4.752" N
SF J01	WTG	002° 5.8248" E	54° 56.232" N
SF J05	WTG	002° 9.7014" E	54° 58.53" N
SF J07	WTG	002° 11.6196" E	54° 59.664" N
SF J09	WTG	002° 13.5396" E	55° 0.798" N
SF J11	WTG	002° 15.4608" E	55° 1.932" N
SF J13	WTG	002° 17.3844" E	55° 3.066" N
SF J15	WTG	002° 19.3092" E	55° 4.2" N
SF K01	WTG	002° 6.8064" E	54° 55.686" N
SF K15	WTG	002° 20.2908" E	55° 3.654" N
SF L01	WTG	002° 7.7868" E	54° 55.134" N
SF L05	WTG	002° 11.6634" E	54° 57.432" N
SF L07	WTG	002° 13.5816" E	54° 58.566" N
SF L11	WTG	002° 17.4228" E	55° 0.834" N
SF L13	WTG	002° 19.3464" E	55° 1.968" N
SF L15	WTG	002° 21.2712" E	55° 3.102" N

ID	TYPE	LONGITUDE	LATITUDE
SF M01	WTG	002° 8.7666" E	54° 54.588" N
SF M15	WTG	002° 22.2516" E	55° 2.55" N
SF N01	WTG	002° 9.7464" E	54° 54.042" N
SF N03	WTG	002° 11.7072" E	54° 55.2" N
SF N05	WTG	002° 13.6236" E	54° 56.34" N
SF N07	WTG	002° 15.5412" E	54° 57.474" N
SF N09	WTG	002° 17.4612" E	54° 58.602" N
SF N11	WTG	002° 19.383" E	54° 59.736" N
SF N13	WTG	002° 21.3066" E	55° 0.87" N
SF N15	WTG	002° 23.2314" E	55° 2.004" N
SF P01	WTG	002° 10.7256" E	54° 53.49" N
SF P15	WTG	002° 24.2112" E	55° 1.452" N
SF Q01	WTG	002° 11.7042" E	54° 52.944" N
SF Q05	WTG	002° 15.5814" E	54° 55.242" N
SF Q07	WTG	002° 17.4996" E	54° 56.37" N
SF Q09	WTG	002° 19.4196" E	54° 57.504" N
SF Q11	WTG	002° 21.3414" E	54° 58.638" N
SF Q13	WTG	002° 23.265" E	54° 59.772" N
SF Q15	WTG	002° 25.1898" E	55° 0.9" N
SF R01	WTG	002° 12.6828" E	54° 52.392" N

ID	TYPE	LONGITUDE	LATITUDE
SF R15	WTG	002° 26.1684" E	55° 0.354" N
SF S01	WTG	002° 13.6608" E	54° 51.846" N
SF S05	WTG	002° 17.538" E	54° 54.144" N
SF S07	WTG	002° 19.4562" E	54° 55.272" N
SF S09	WTG	002° 21.3762" E	54° 56.406" N
SF S11	WTG	002° 23.2974" E	54° 57.54" N
SF S13	WTG	002° 25.221" E	54° 58.668" N
SF S15	WTG	002° 27.147" E	54° 59.802" N
SF T01	WTG	002° 14.6844" E	54° 51.324" N
SF T15	WTG	002° 28.1694" E	54° 59.244" N
SF U02	WTG	002° 16.6182" E	54° 51.342" N
SF U03	WTG	002° 17.643" E	54° 51.87" N
SF U04	WTG	002° 18.6006" E	54° 52.44" N
SF U05	WTG	002° 19.5594" E	54° 53.004" N
SF U06	WTG	002° 20.5182" E	54° 53.574" N
SF U07	WTG	002° 21.4776" E	54° 54.138" N
SF U08	WTG	002° 22.4376" E	54° 54.702" N
SF U09	WTG	002° 23.3976" E	54° 55.272" N
SF U10	WTG	002° 24.3582" E	54° 55.836" N
SF U11	WTG	002° 25.3194" E	54° 56.4" N

ID	TYPE	LONGITUDE	LATITUDE
SF U12	WTG	002° 26.2812" E	54° 56.964" N
SF U13	WTG	002° 27.243" E	54° 57.534" N
SF U14	WTG	002° 28.2054" E	54° 58.098" N
SF U15	WTG	002° 29.1684" E	54° 58.662" N

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