NORTH FALLS

Offshore Wind Farm

9.23 Formal Safety Assessment Removal of the Galloper Recommended Ferry Route

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NORTH FALLS
Offshore Wind Farm

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Formal Safety Assessment
Removal of the Galloper
Recommended Ferry Route

Prepared by	Anatec Limited
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00	15th November 2024	Initial Draft
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Abbreviations Table

Abbreviation	Definition
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
CBA	Cost Benefit Analysis
CD	Chart Datum
CO_2	Carbon Dioxide
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
CoS	Chamber of Shipping
EMSA	European Maritime Safety Agency
EU	European Union
FSA	Formal Safety Assessment
g	Grams
GT	Gross Tonnes
GW	Gigawatt
IMO	International Maritime Organization
LOA	Length Overall
m	Metre
MCA	Maritime and Coastguard Agency
nm	Nautical mile
nm^2	Square nautical mile
NRA	Navigational Risk Assessment
RLB	Red Line Boundary
RoRo	Roll-on/Roll-off
SEZ	Structure Exclusion Zone
TSS	Traffic Separation Scheme
UK	United Kingdom

1 Introduction

North Falls Offshore Wind Farm Limited (hereafter 'the Applicant') is proposing to develop the North Falls Offshore Wind Farm (hereafter 'the Project'), a planned offshore wind farm located at the approach to the Thames Estuary.

The array area of the Project (hereafter the 'array area') intersects the Galloper Recommended Ferry Route, an International Maritime Organization (IMO) adopted routeing measure, introduced in 2007 as a component of the wider Sunk routeing measures scheme to provide a shortcut for use by ferries to or from Ostend. Data analysis and consultation has indicated that the Galloper Recommended Ferry Route is no longer used for this original purpose, and therefore it is proposed that the measure is removed to facilitate development of the Project. The Belgian Directorate General of Shipping has confirmed via consultation that they would not object to the route removal assuming it can be demonstrated by means of a Formal Safety Assessment (FSA) that alternate routeing options exist that are safe, commercially viable and that would not lead to significant environmental impacts from additional vessel emissions. The United Kingdom (UK) Maritime and Coastguard Agency (MCA) have confirmed they will support a joint application to remove the Galloper Recommended Ferry Route subject to approval of the FSA by the Belgian Directorate General of Shipping.

On this basis Anatec Ltd were commissioned by North Falls to perform the FSA on the removal of the Galloper Recommended Ferry Route.

The aims and objectives of this report are as follows:

- Summarise past and current usage of the Galloper Recommended Ferry Route;
- Analyse Automatic Identification System (AIS) data to establish current routeing between the Sunk area and Belgian ports;
- Identify potential routeing options that could be used in the event that the Galloper Recommended Ferry Route is removed; and
- Assess the identified routeing options from safety, commercial viability, and environmental perspectives.

1.1 Scope of Assessment

This assessment looks specifically at the impact on commercial ferries routeing to or from Ostend using the Galloper Recommended Ferry Route, in the event that measure was removed. Impacts on other vessels are not considered, however have been assessed separately in the Navigational Risk Assessment (NRA) undertaken for the Project (Anatec, 2024).

1.2 Project Overview

Figure 1.1 presents an overview of the array area, which is located approximately 22 nautical miles (nm) south-east of the East Suffolk coast. The total area covered by the array area is

approximately 95 square nautical miles (nm^2) with charted water depths ranging between 8m and 46m below Chart Datum (CD). The Project will provide:

- A vital contribution to United Kingdom (UK) government climate change and net zero targets, including 50 gigawatt (GW) wind by 2050.
- Over £1.5 billion investment in UK energy infrastructure.
- Energy security and lower energy costs – supplying renewable energy equivalent to at least 400,000 homes.
- A significant number of jobs throughout all phases of the project.

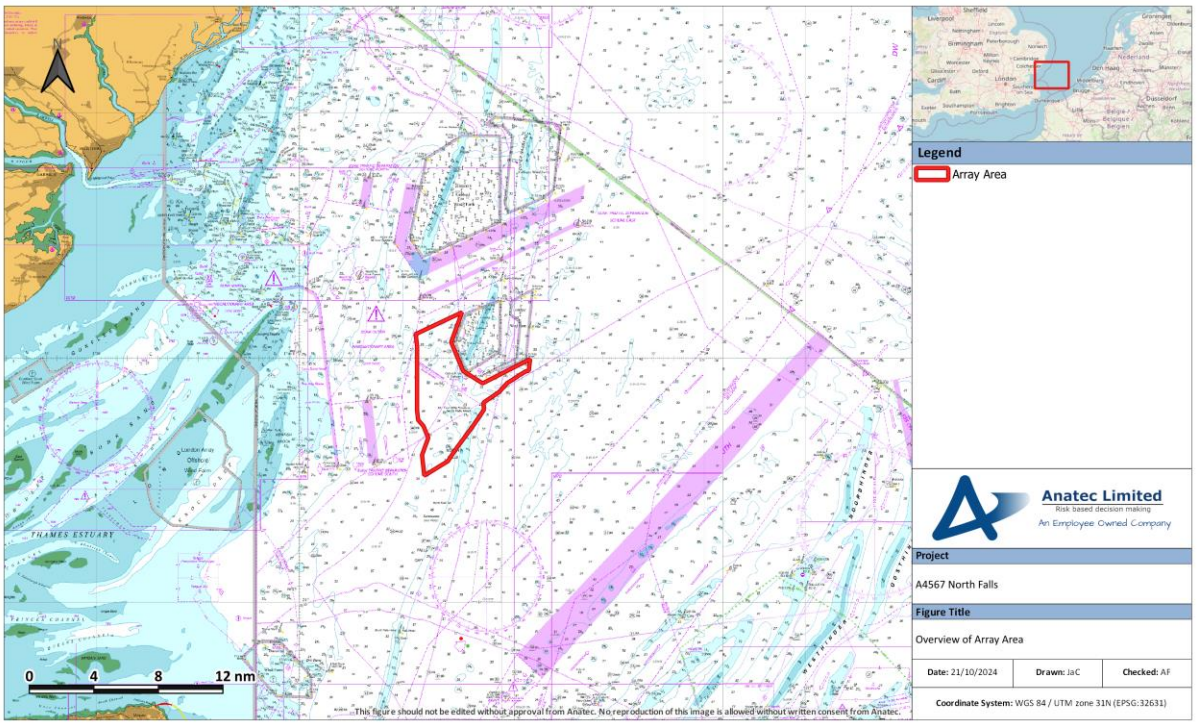


Figure 1.1 Overview of Array Area

2 Methodology

2.1 Area of Interest

The area of interest in this report (hereafter 'Area of Interest') is illustrated in Figure 2.1, defined to encompass the Sunk routeing measures, the approaches to Ostend (Belgium) and the approaches to Harwich Haven ports (UK).

Also shown is the 10nm study area (hereafter 'study area') used for assessing a six-month AIS dataset from 2023 (see Section 2.2) within the NRA (Anatec, 2024), the results of which have been used to inform the analysis within the wider Area of Interest.

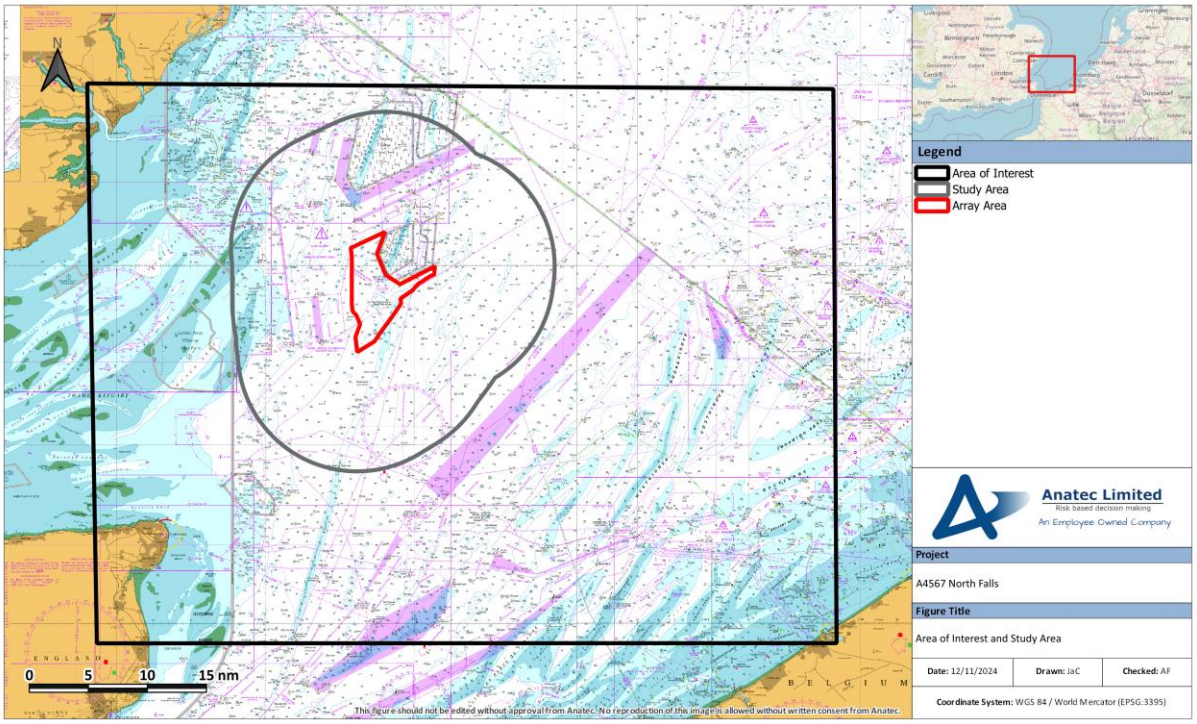


Figure 2.1 Area of Interest

2.2 Data Sources

AIS data has been used as a primary assessment tool to inform this report. The carriage of AIS is required on board all vessels of greater than 300 Gross Tonnes (GT) engaged on international voyages, cargo vessels of more than 500GT not engaged on international voyages, passenger vessels irrespective of size built on or after 1 July 2002 and fishing vessels over 15 metres (m) Length Overall (LOA). On this basis, AIS data is considered comprehensive for the vessel types of interest in this report i.e. commercial ferries.

Three AIS datasets are considered in this report, which when combined cover a continuous four-year period from July 2020 to June 2024; the first two datasets were collected at NRA (Anatec, 2024) stage while the third was collected as an up-to-date dataset encompassing the Area of Interest specifically for the purposes of this report. The datasets are as follows:

- **July 2020 – June 2023 (three years)** within the array area, considered in Section 5.2 to identify vessels using the Galloper Recommended Ferry Route.
- **July 2023 – December 2023 (six months)** within the study area, used to inform the alternative routeing assessment in Section 6.1.
- **January 2024 – June 2024 (six months)** within the Area of Interest, considered in Section 6.1 to identify vessels using alternatives to the Galloper Recommended Ferry Route.

In addition, Anatec's internal *ShipRoutes Database* (Anatec, 2024) was used to inform analysis and understanding of routeing behaviour.

2.3 Formal Safety Assessment

The IMO Formal Safety Assessment (FSA) process (IMO, 2018) as approved by the IMO in 2018 under Maritime Safety Committee – Marine Environment Protection Committee (MEPC).2/circ. 12/Rev.2 has been used to assess safety impacts within this report.

The FSA process is the industry standard methodology for marine risk assessment and is a structured and systematic methodology based upon risk analysis and Cost Benefit Analysis (CBA) (if applicable) to reduce impacts to As Low as Reasonably Practicable (ALARP). There are five basic steps within this process as illustrated by Figure 2.2 and summarised in the following list:

- Step 1 – Identification of hazards (a list is produced of hazards prioritised by risk level specific to the problem under review);
- Step 2 – Risk assessment (investigation of the causes and initiating events and risks of the more important hazards identified in step 1);
- Step 3 – Risk control options (identification of measures to control and reduce the identified risks);
- Step 4 – CBA (identification and comparison of the benefits and costs associated with the risk control options identified in step 3); and
- Step 5 – Recommendations for decision-making (defining of recommendations based upon the outputs of steps 1 to 4).

Figure 2.2 Flow chart of the FSA methodology

Table 2.1 and Table 2.2 define the severity of consequence and the frequency of occurrence rankings that have been used to assess risks within the FSA in this report.

Table 2.1 Severity of consequence ranking definitions

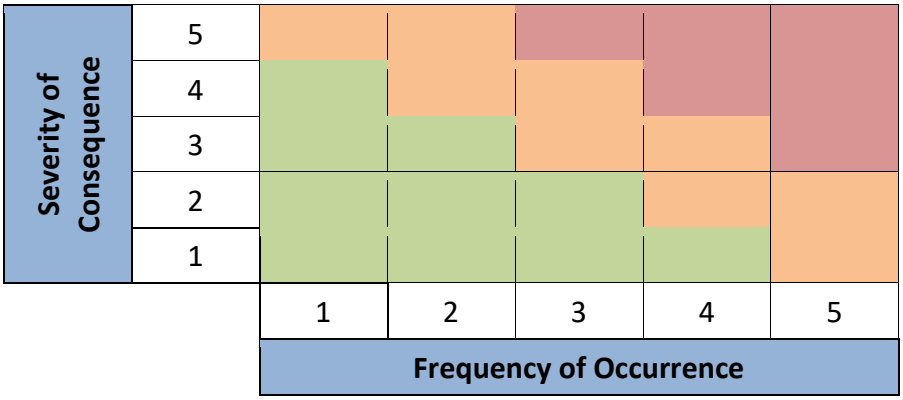
Rank	Description	Definition			
		People	**Property**	**Environment**	**Business**
1	Negligible	No perceptible impact	No perceptible impact	No perceptible impact	No perceptible impact
2	Minor	Slight injury(s)	Minor damage to property i.e., superficial damage	Tier 1 local assistance required	Minor reputational risks – limited to users
3	Moderate	Multiple minor or single serious injury	Damage not critical to operations	Tier 2 limited external assistance required	Local reputational risks
4	Serious	Multiple serious injuries or single fatality	Damage resulting in critical impact on operations	Tier 2 regional assistance required	National reputational risks
5	Major	More than one fatality	Total loss of property	Tier 3 national assistance required	International reputational risks

Table 2.2 Frequency of occurrence ranking definitions

Rank	Description	Definition
1	Negligible	< 1 occurrence per 10,000 years
2	Extremely unlikely	1 per 100 to 10,000 years
3	Remote	1 per 10 to 100 years
4	Reasonably probable	1 per 1 to 10 years
5	Frequent	Yearly

The severity of consequence and frequency of occurrence are then used to define the significance of risk via a tolerability matrix approach as shown in Table 2.3. The significance of risk is defined as Broadly Acceptable (low risk), Tolerable (intermediate risk) or Unacceptable (high risk).

Table 2.3 Tolerability matrix and risk rankings



	Unacceptable (high risk)
	Tolerable (intermediate risk)
	Broadly Acceptable (low risk)

Once identified, the significance of risk will be assessed to ensure it is ALARP. Further risk control measures may be required to further mitigate a hazard in accordance with the ALARP principles. Unacceptable risks are not considered to be ALARP.

2.4 Commercial and Environmental Assessments

In addition to the FSA (see Section 2.3), which primarily considers hazards (i.e., safety impacts), assessments have also been provided on potential commercial and environmental impacts of the routeing options.

3 Consultation

A summary of key consultation undertaken to date regarding the Galloper Recommended Ferry Route is presented in Table 3.1.

Table 3.1 Summary of Consultation

Meeting	Stakeholder	Summary
20th September 2023	Belgian Directorate General of Shipping and UK MCA	▪ An overview of the Project was presented to the Directorate General of Shipping. ▪ It was agreed that the Galloper Recommended Ferry Route is not currently being used for its original purpose, however consideration needs to be given to alternate routeing options in the event that the Ostend ferry routes re-open. ▪ The MCA noted that use of the Sunk TSS East was a possible option.
Hazard Workshop on the 12th October 2023	Various maritime stakeholders including the Belgian Directorate General of Shipping and UK MCA	▪ The hazard workshop was a forum in which multiple shipping and navigation topics were discussed, one of which was the Galloper Recommended Ferry Route. ▪ The MCA noted hazards (i.e., safety) associated with any alternate routeing would need to be considered.
27th May 2024	Belgian Directorate General of Shipping	▪ Update meeting to discuss progress. The Belgian Directorate General of Shipping confirmed internal discussions and consultation was ongoing.
9th September 2024	Belgian Directorate General of Shipping and MCA	▪ The Belgian Directorate General of Shipping confirmed they had no objection in principle to the removal of the Galloper Recommended Ferry Route subject to a documented risk assessment being provided that considered safety, viability, and environmental impacts associated with the identified alternate routeing options.

4 Navigational Features

This section provides an overview of the navigational features which may be of relevance to the Ostend routeing in the event that it were to re-open.

4.1 Routeing Measures

4.1.1 Traffic Separation Schemes

Figure 4.1 presents an overview of the key Traffic Separation Schemes (TSSs) in the Area of Interest of relevance to this report. This includes the three Sunk TSSs (shown in more detail in Figure 4.2), North Hinder South TSS, TSS Off North Hinder and At West Hinder TSS.

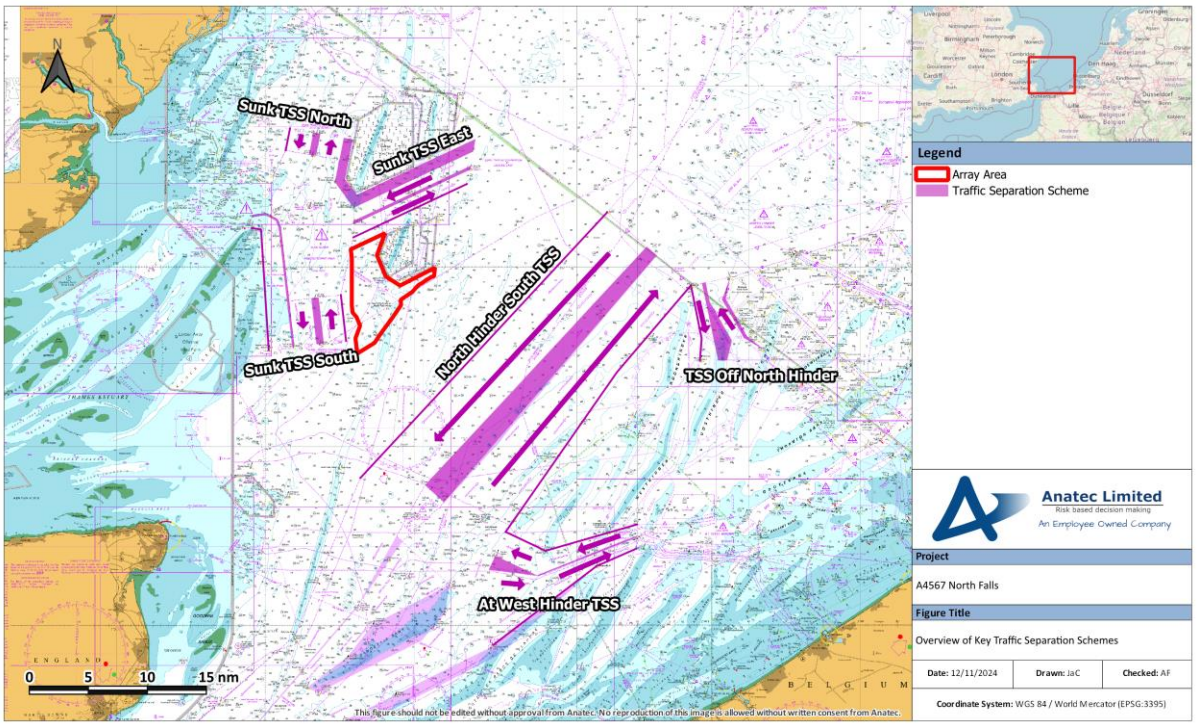


Figure 4.1 Overview of Key Traffic Separation Schemes

4.1.2 Sunk Routeing Measures

On the 1st of July 2007, the modification and extension of the existing Sunk Precautionary Area and the establishment of three TSSs, a two-way traffic route at Long Sand Head, an area to be avoided and a recommended ferry route was implemented in the northern approaches to the Thames Estuary. These changes were approved prior by the IMO (IMO, 2006) to improve the safety of navigation in the area, and were implemented with consideration to the future presence of the Greater Gabbard Offshore Wind Farm. These routeing measures are presented in Figure 4.2.

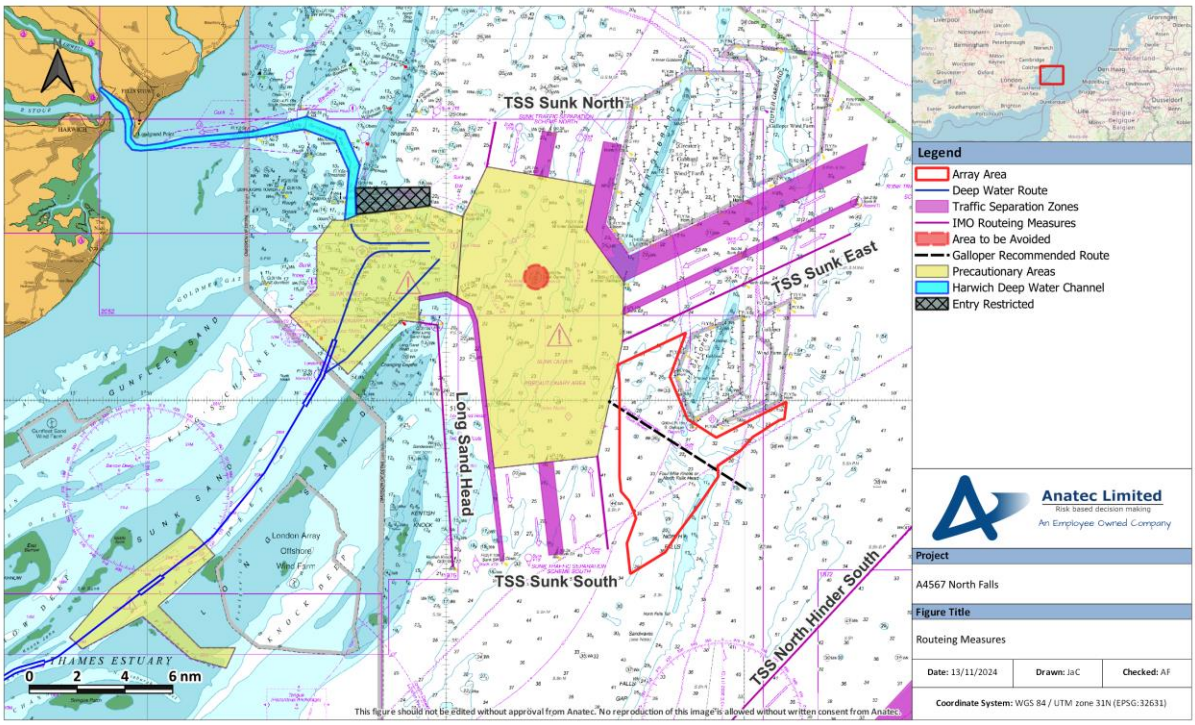


Figure 4.2 Sunk Routeing Measures

The Galloper Recommended Ferry Route was designed as a shortcut for regular ferry traffic routeing to/from the Port of Ostend in Belgium to both enter and leave the Sunk Outer Precautionary Area without having to utilise the Sunk TSS South or Sunk TSS East. The Galloper Recommended Ferry Route is illustrated in Figure 4.3. As shown, the Galloper Recommended Ferry Route intersects the array area of the Project.

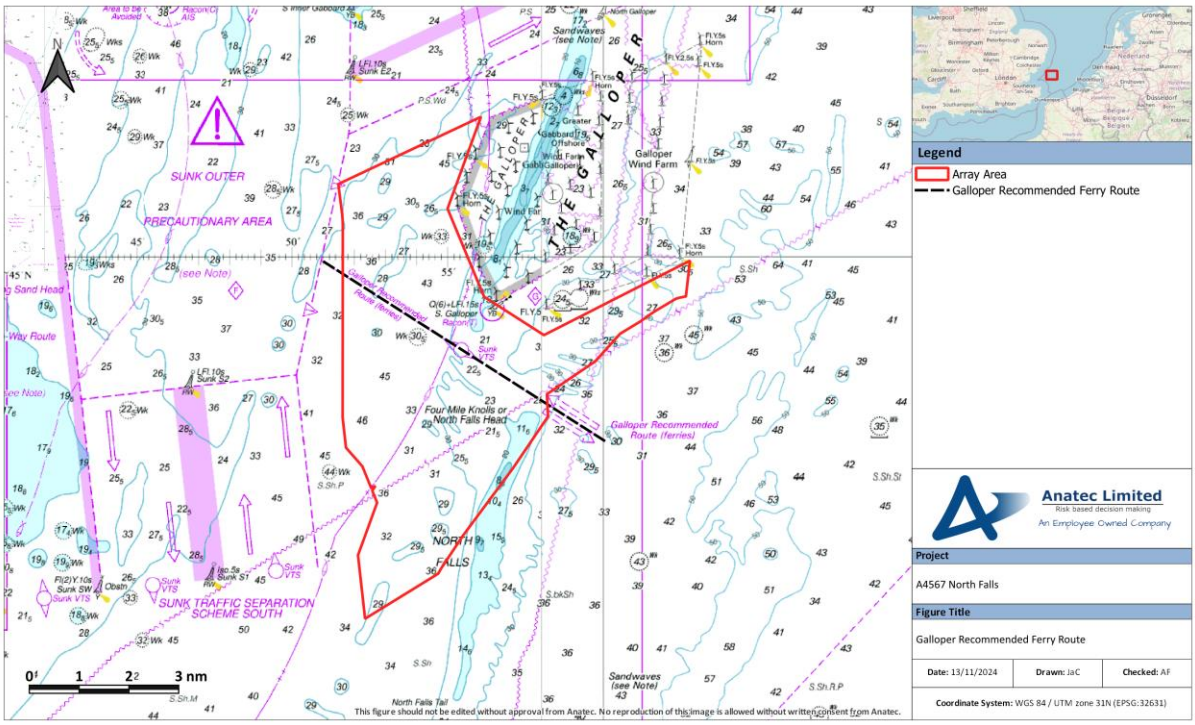


Figure 4.3 Charted Galloper Recommended Ferry Route

4.2 Shallow Banks

An important constraint to consider is the presence of shallow banks, which may pose a risk of grounding to certain vessels dependent on draught. Figure 4.4 presents an overview of the key shallow banks in the Area of Interest, i.e. the Westhinder and Oosthinder, noting both are discussed within consideration of routeing options within this report.

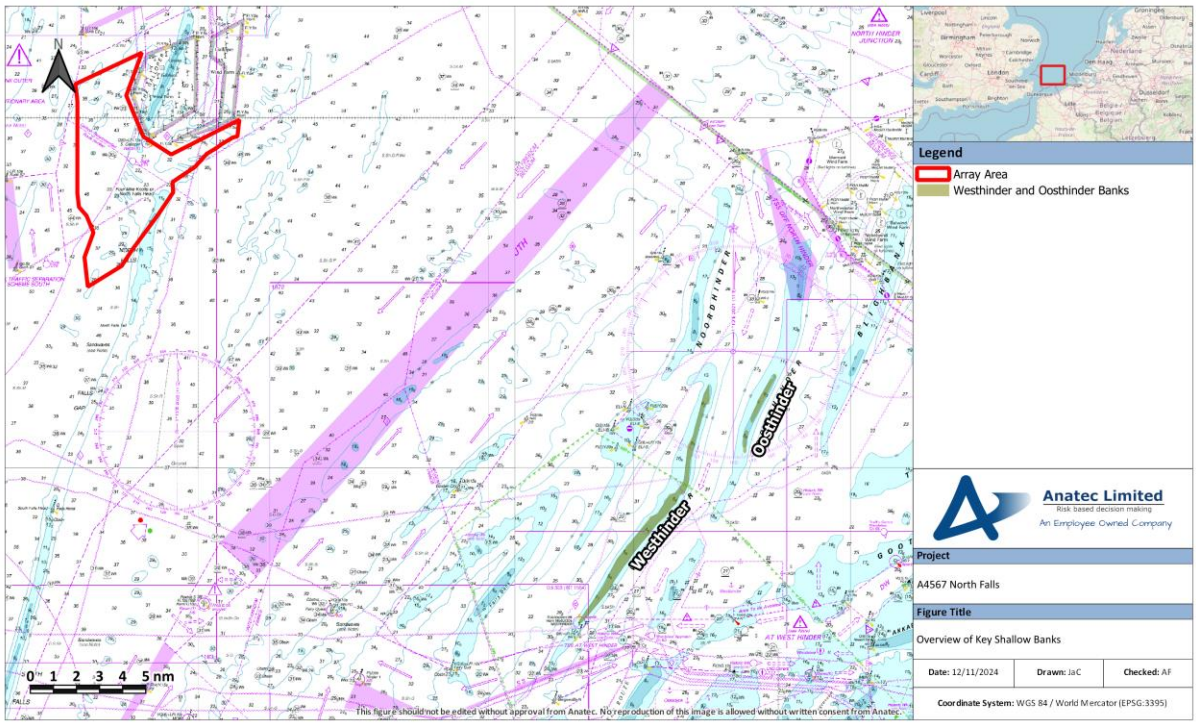


Figure 4.4 Overview of Key Shallow Banks

4.3 Offshore Wind Farms

In the event that Ostend routeing re-opens, consideration will need to be given to offshore wind farm developments present at the time. Figure 4.5 provides an overview of current and planned UK and European Union (EU) wind farms in the vicinity of the Project, colour-coded by status.

This includes the proposed Princess Elisabeth Zone within Belgian waters. The first stage of this project involves the construction of the world's first artificial energy island, the Princess Energy Island (Elia Group, 2024). Construction of the Princess Energy Island has already begun, and a demarcated zone has been established within which only vessels working on the energy island will be allowed (offshoreWIND.biz, 2024), as shown in more detail in Figure 4.6. When complete, the Princess Energy Island will stretch across an area of six hectares, and have foundations, or caissons, built of concrete and filled with sand. The Island will host a small harbour and helipad, allowing access for maintenance crews.

The first offshore wind turbines within the Princess Elisabeth Zone are expected to be installed by 2028 (Economie, 2024). One of the factors considered within the definition of the Princess Elisabeth Zone areas was shipping, and a corridor for transit has been maintained south of Area 1 and North of Areas 2 and 3.

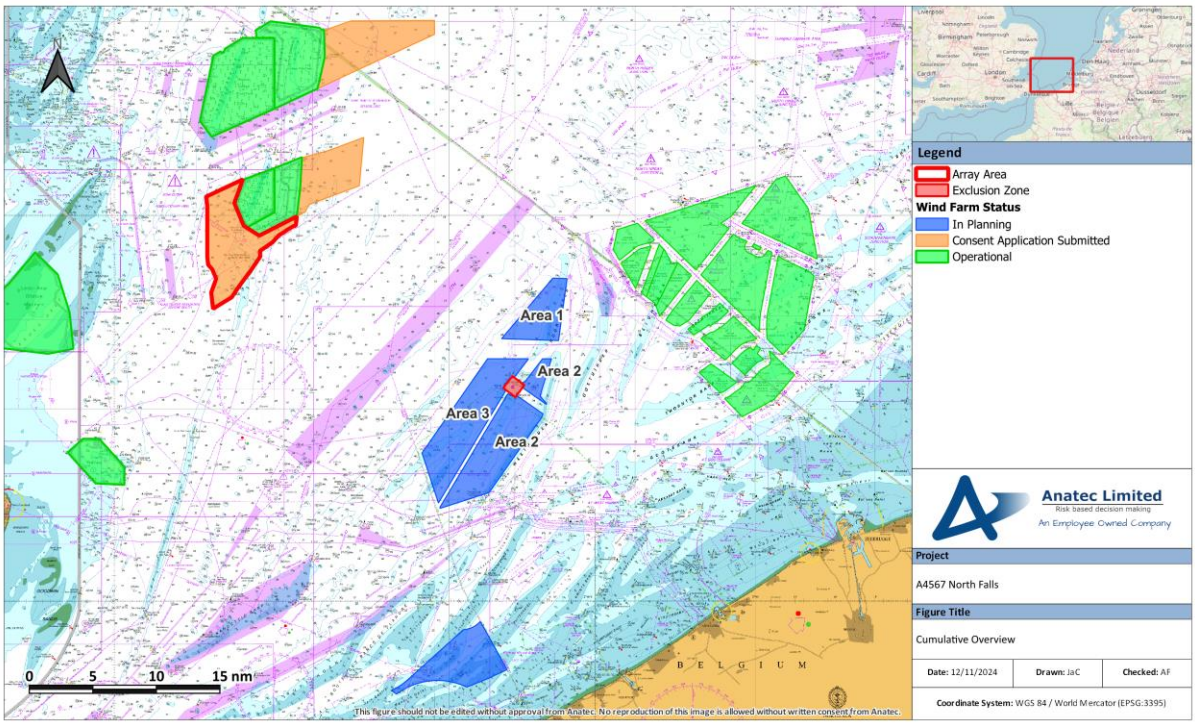


Figure 4.5 Cumulative Overview

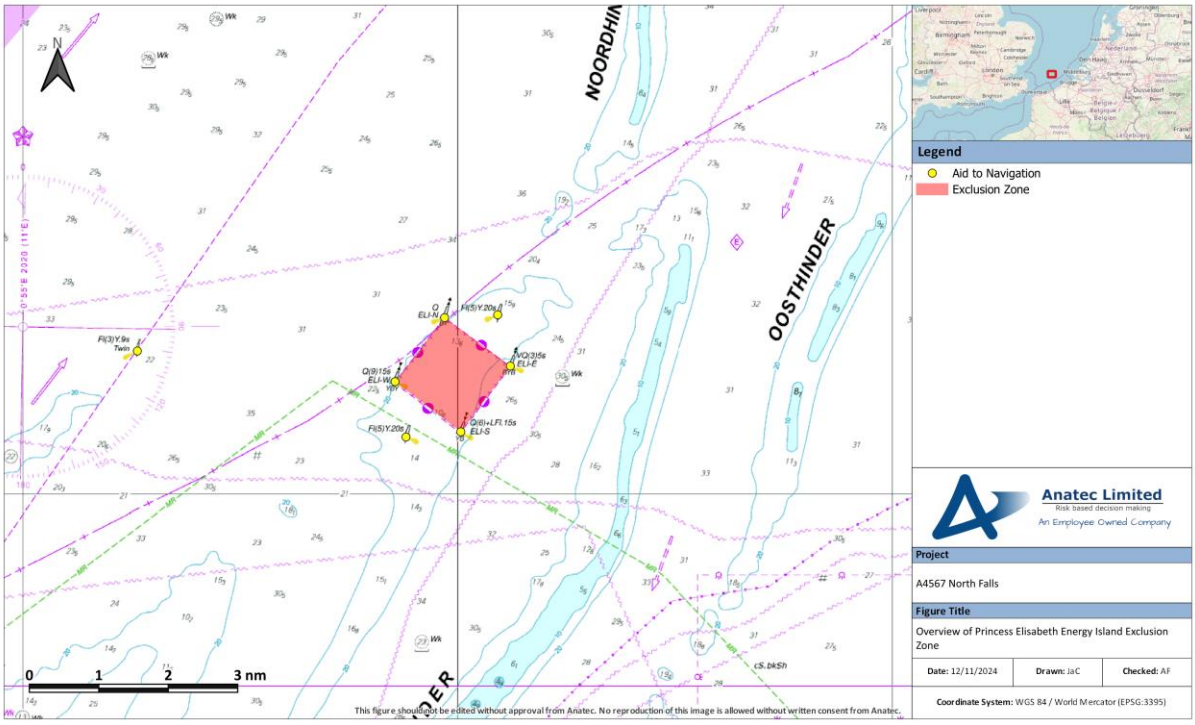


Figure 4.6 Overview of Princess Elisabeth Energy Island Exclusion Zone

5 Galloper Recommended Ferry Route Usage

This section assesses past and current usage of the Galloper Recommended Ferry Route, as identified via study of the AIS datasets (Section 2.2) and desktop research.

5.1 Past Use

The use of the Galloper Recommended Ferry Route was initially intended for use by commercial ferries routeing between Ostend (Belgium) and Harwich Haven ports on the east coast of England (primarily Ipswich and Harwich). An overview of this historic route is presented in Figure 5.1, based on Anatec's ShipRoutes database (Anatec, 2024). The presence of shallow banks in the area mean that two historic routes were identified, one passing through the Westhinder bank, and one passing north of both the Westhinder and Oosthinder banks. The use of the latter results in a longer distance, however may have been preferable in certain tidal or weather conditions, and is the option used by current ferry routeing between Zeebrugge and London ports (see Section 6.1.3).

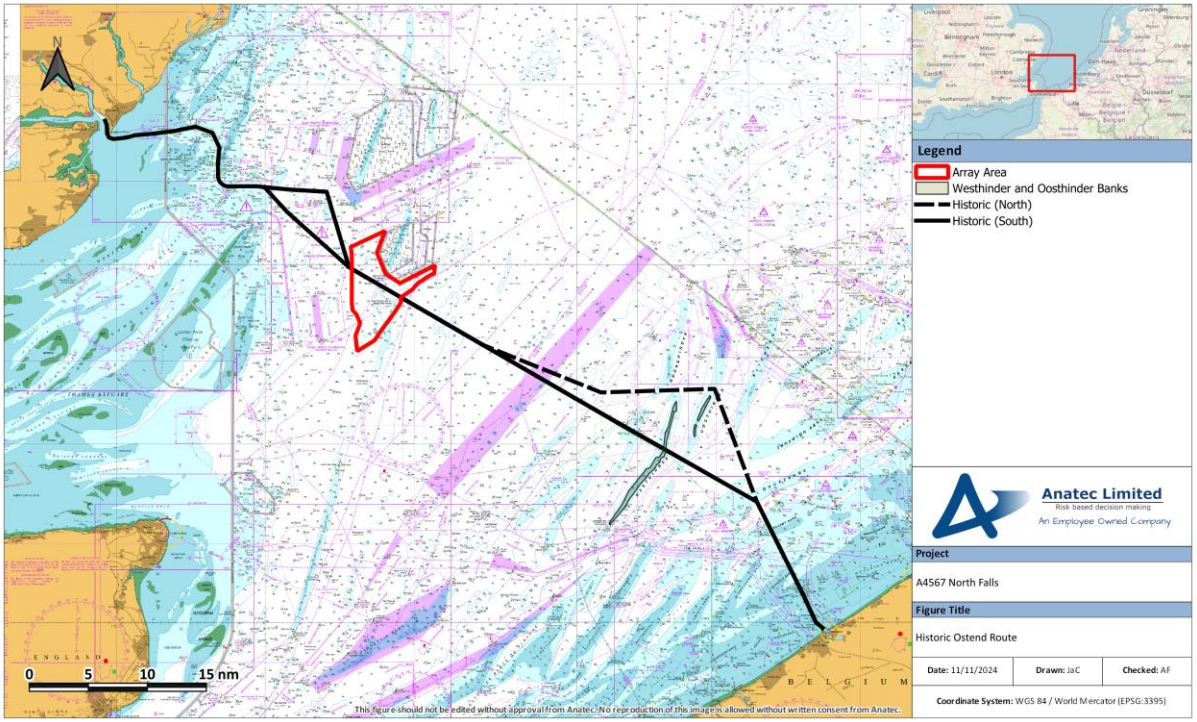


Figure 5.1 Historic Ostend Routes

Between 2000 and 2007, Ferryways, a Belgium Roll-on/Roll-off (RoRo) cargo vessel operator, operated a commercial ferry route between Ostend (Belgium) and Ipswich (UK) on a three-sailings-a-day schedule. Vessels on this route, at the time named *Sapphire/Ostend Way, Flanders Way, Ipswich Way* and *Anglian Way,* were sold to Cobelfret (now CLdN) in 2007 when Ferryways ceased commercial operations. Scheduled routeing between Ostend and Ipswich officially ceased for these vessels in June 2007, but limited irregular transits still occurred until 2009 under operation by Cobelfret, which also included transits to Harwich by

these vessels. While on these routes, the vessels will likely have utilised the Galloper Recommended Ferry Route.

In February 2009, the route was re-opened by Associated British Ports (owner of Ipswich Port) in a joint venture with Belgian firm Dart Line NV (which was owned by Cobelfret since 2006) (Ipswich Star, 2008). This route was then utilised twice daily by the chartered *Anglian Way* RoRo before ceasing and changing name in April 2009 to *Taurine*. The *Ranine* (formerly known as *Flanders Way*) was also seen utilising the route twice daily in June 2009.

Based on available published information at the time of research, there has been no record of any usage of this route to/from Ostend since 2009.

However, it is noted that between April 2009 and April 2010 the RoRo *Taurine* utilised the recommended route while routeing between Ipswich (UK) and Zeebrugge (Belgium)[1]. As of 2024, this vessel is named *Barbat* and a photograph of this vessel, taken in 2021, is presented in Figure 5.2.

Figure 5.2 Barbat (Copyright: MarineTraffic.com, 2021)

5.2 Current Use

The Galloper Recommended Ferry Route is no longer used for its original purpose i.e., for use by ferry routes from Ostend. This has been confirmed via assessment and consultation as part of the NRA process (Anatec, 2024). A summary of the other commercial vessel activity (cargo, tanker and passenger) that has been identified is provided below.

[1] Based on review of Anatec in-house AIS data.

As part of the NRA (Anatec, 2024), an analysis of three years of AIS vessel traffic data was undertaken from July 2020 to June 2023, within the array area. Commercial vessel tracks that were on north-west/south-east transits through the array area and could have potentially been utilising the Galloper Recommended Ferry Route were identified.

Such vessel tracks have also been identified for the subsequent year using the combined July 2023 to December 2023 and January 2024 to June 2024 datasets (see Section 2.2).

Figure 5.3, Figure 5.4, Figure 5.5 and Figure 5.6 present these vessel tracks during each 12 month period between July and June of the overall four year period. Following this, Table 5.1 presents a breakdown of these vessel tracks in terms of average frequencies.

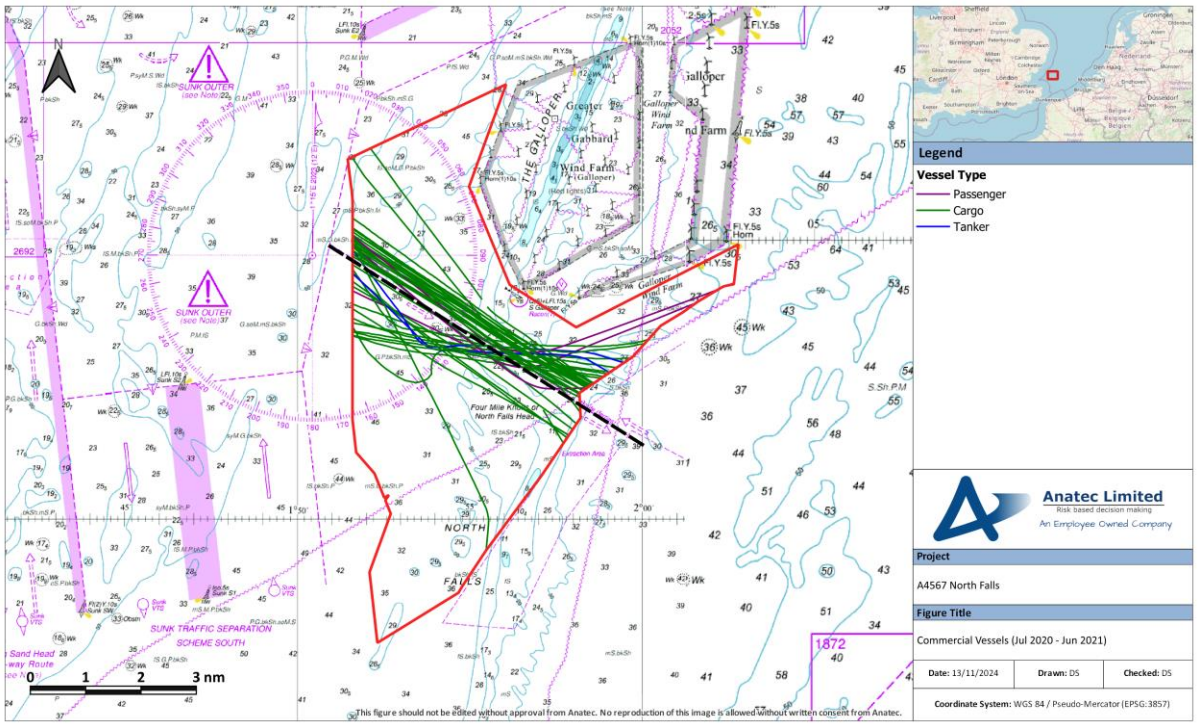


Figure 5.3 Commercial Vessels Potentially Using Galloper Recommended Ferry Route (July 2020 – June 2021)

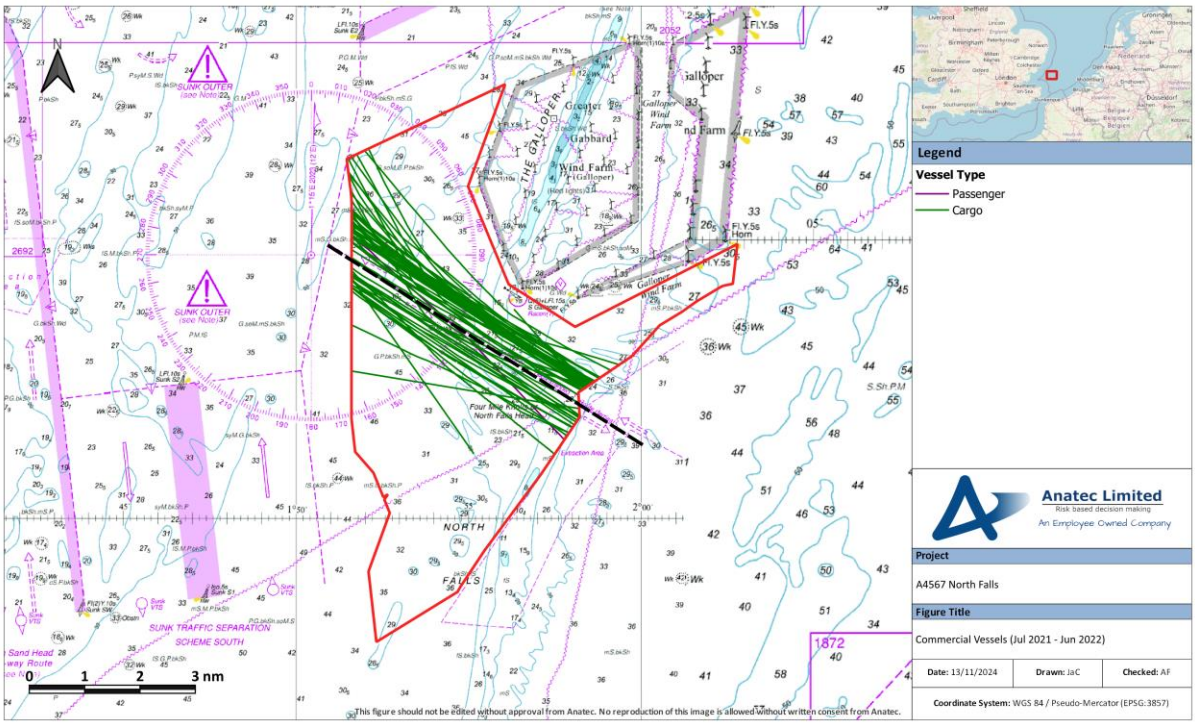


Figure 5.4 Commercial Vessels Potentially Using Galloper Recommended Ferry Route (July 2021 – June 2022)

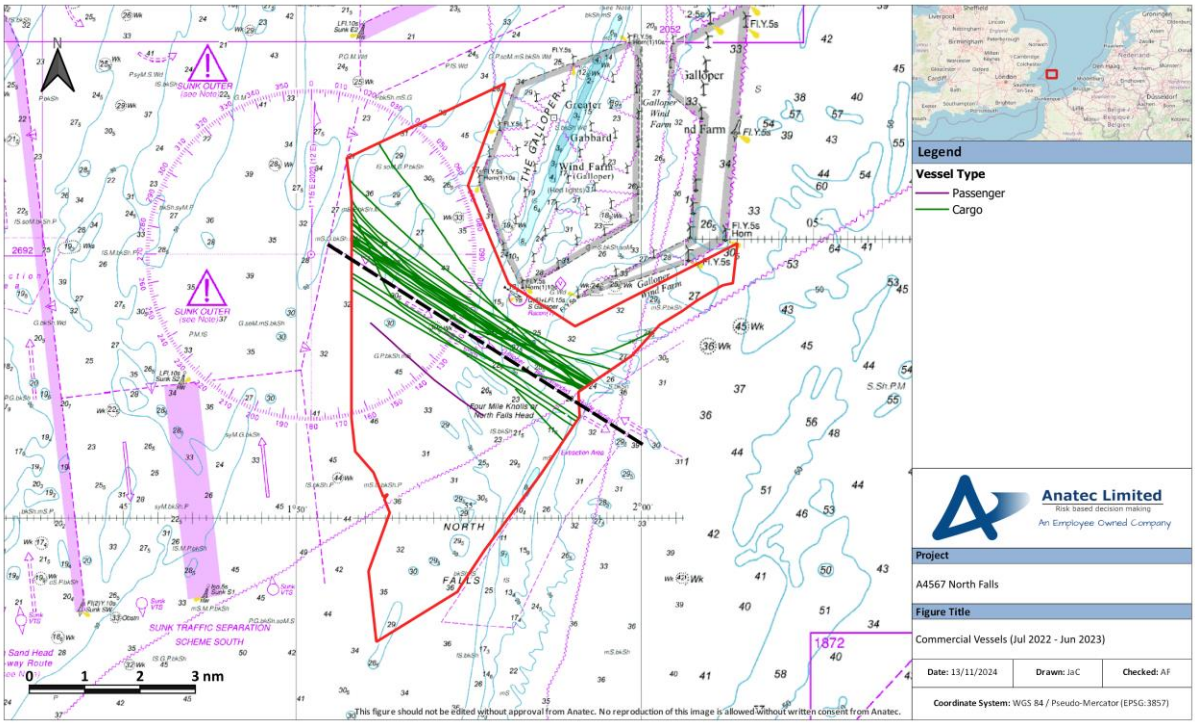


Figure 5.5 Commercial Vessels Potentially Using Galloper Recommended Ferry Route (July 2022 – June 2023)

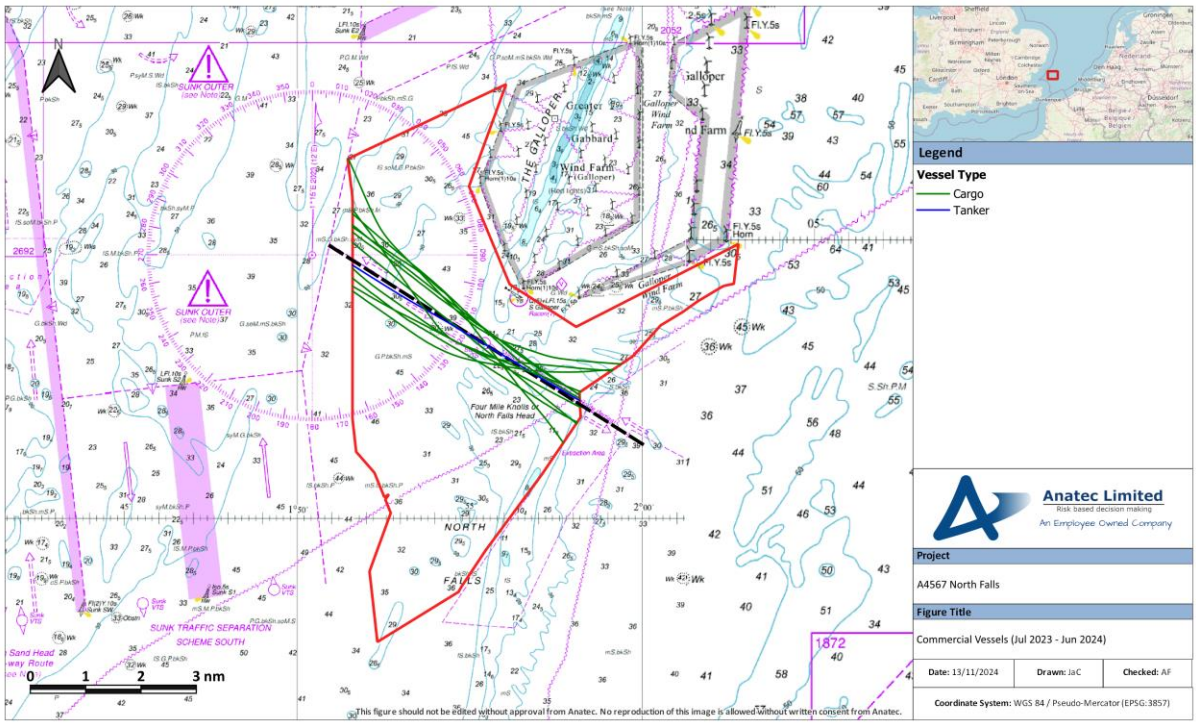


Figure 5.6 Commercial Vessels Potentially Using Galloper Recommended Ferry Route (July 2023 – June 2024)

Table 5.1 Average Number of Commercial Vessels Potentially Using Galloper Recommended Ferry Route

Period	Average Number of Commercial Vessels
July 2020 – June 2021	One per week
July 2021 – June 2022	One per week
July 2022 – June 2023	One per fortnight
July 2023 – June 2024	One per month

It can be seen that commercial vessel traffic undertaking transits on the Galloper Recommended Ferry Route has declined over the four year period studied. A total of 14 commercial ferry transits were identified using the Galloper Recommended Ferry Route over the four years (an average of one very four months), all of which were transiting to or from ports in the Netherlands. The typical routeing undertaken by the identified ferries does not use the Galloper Recommended Ferry Route, with these vessels usually using the Sunk TSS South or Sunk TSS East. A number of these ferries were operated by Stena Line, who were consulted as part of the NRA process (Anatec, 2024). They confirmed that use of the Sunk TSS lanes would be a safe alternative.

Based on the four years of AIS data studied, the Galloper Recommended Ferry Route is therefore not being used for its intended purpose as initially set out by the IMO (IMO, 2006).

6 Alternative Routeing

This section uses the six months of 2024 AIS data in combination with Anatec's ShipRoutes Database (Anatec, 2024) to identify alternate routeing options that could be used by ferries if the routeing to/from Ostend re-opens.

6.1 AIS Analysis

At a meeting with the Directorate General of Shipping on the 9th September 2024, analysis of the six months of 2023 AIS data was presented to indicate the current routes that vessels between Belgium and the Sunk routeing measures currently take. Cases of cargo vessels, tankers or passenger vessels broadcasting a destination of Ostend, Zeebrugge, or Antwerp were identified within the study area. The output of the assessment shared with the Directorate General of Shipping is shown in Figure 6.1.

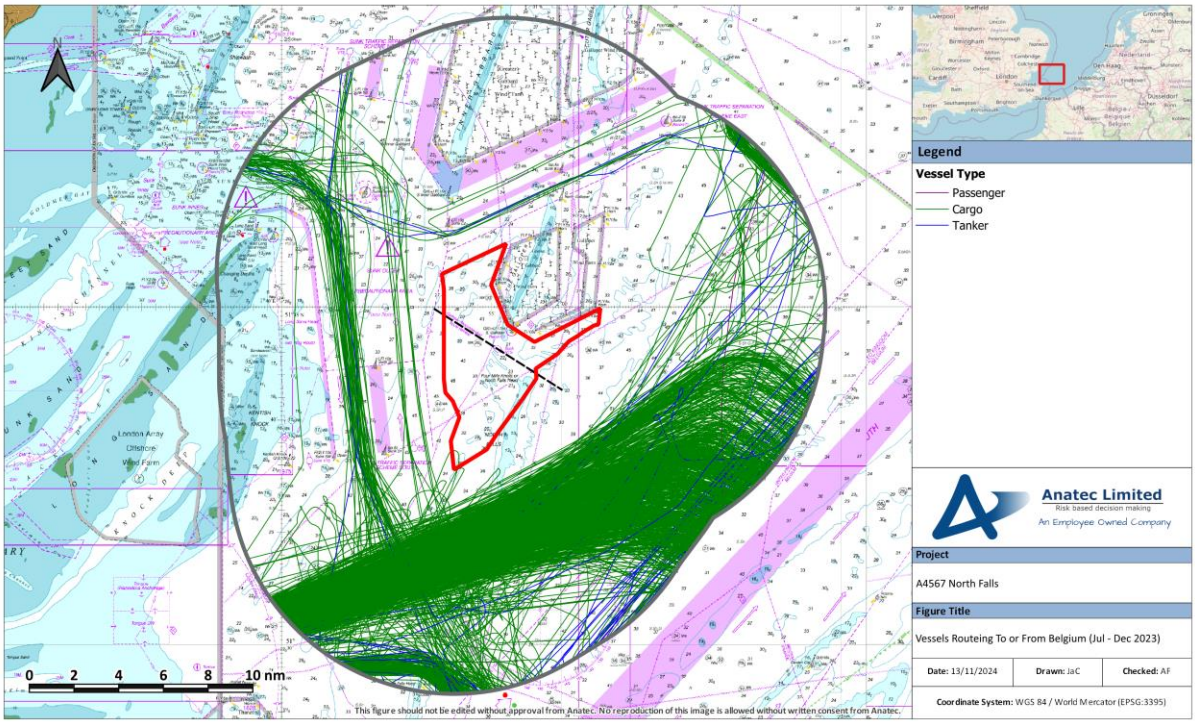


Figure 6.1 Vessels Routeing To/From Belgium (July 2023 – December 2023)

As shown, no cargo vessels, tankers or passenger vessels identified utilised the Galloper Recommended Ferry Route[2] when direct transit from Zeebrugge, Antwerp or Ostend. Instead, the identified vessels used either the Sunk TSS South or the Sunk TSS East. Vessels running between Zeebrugge and Thames Estuary ports (Tilbury and Purfleet) were also recorded passing south of the array area (and by extension south of the Galloper Recommended Ferry Route) to cross the North Hinder South TSS perpendicular to the traffic flow as required under

[2] A single vessel was noted transiting along the Galloper Recommended Ferry Route, however a review of its general track behaviour indicated it was waiting for berth as opposed to transiting directly between a Belgian and UK port. This track has therefore not been shown.

Convention on the International Regulations for Preventing Collisions at Sea (COLREGs) (IMO, 1972/1977).

The following subsections use the six months of 2024 data to study the routes taken by vessels routeing to/from select Belgian ports (Ostend, Antwerp, Zeebrugge and Ghent) in more detail within the Area of Interest. This includes vessels choosing to use the Sunk TSS East, Sunk TSS South, and vessels choosing to cross the North Hinder South TSS.

6.1.1 Sunk TSS South

Figure 6.2 presents the vessels recorded within the six months of 2024 data that were broadcasting Ostend, Antwerp, Zeebrugge or Ghent as their origin/destination and routeing via Sunk TSS South.

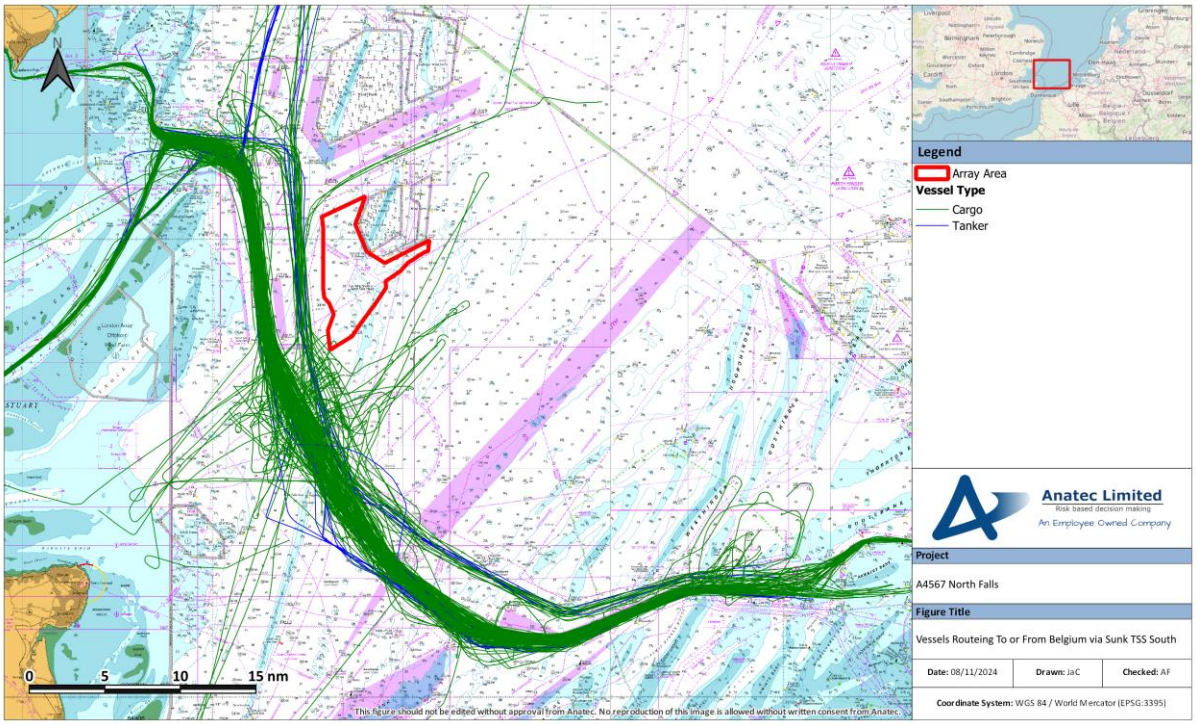


Figure 6.2 Vessels Routeing To/From Belgium Via Sunk TSS South (January 2024 – June 2024)

The significant majority of identified vessels using the Sunk TSS South also utilised the At West Hinder TSS. None were transiting to Ostend based on the AIS broadcast destinations, however use of the At West Hinder TSS does result in passage in proximity to the approach to Ostend. Therefore, transit through both the At West Hinder TSS and the Sunk TSS South could be used as a route between Ostend and the Sunk.

A routeing option has therefore been identified that utilises the At West Hinder TSS and the Sunk TSS South.

6.1.2 Sunk TSS East

Figure 6.3 presents the vessels recorded within the six months of 2024 data that were broadcasting Ostend, Antwerp, Zeebrugge or Ghent as their origin/destination and routeing via the Sunk TSS East.

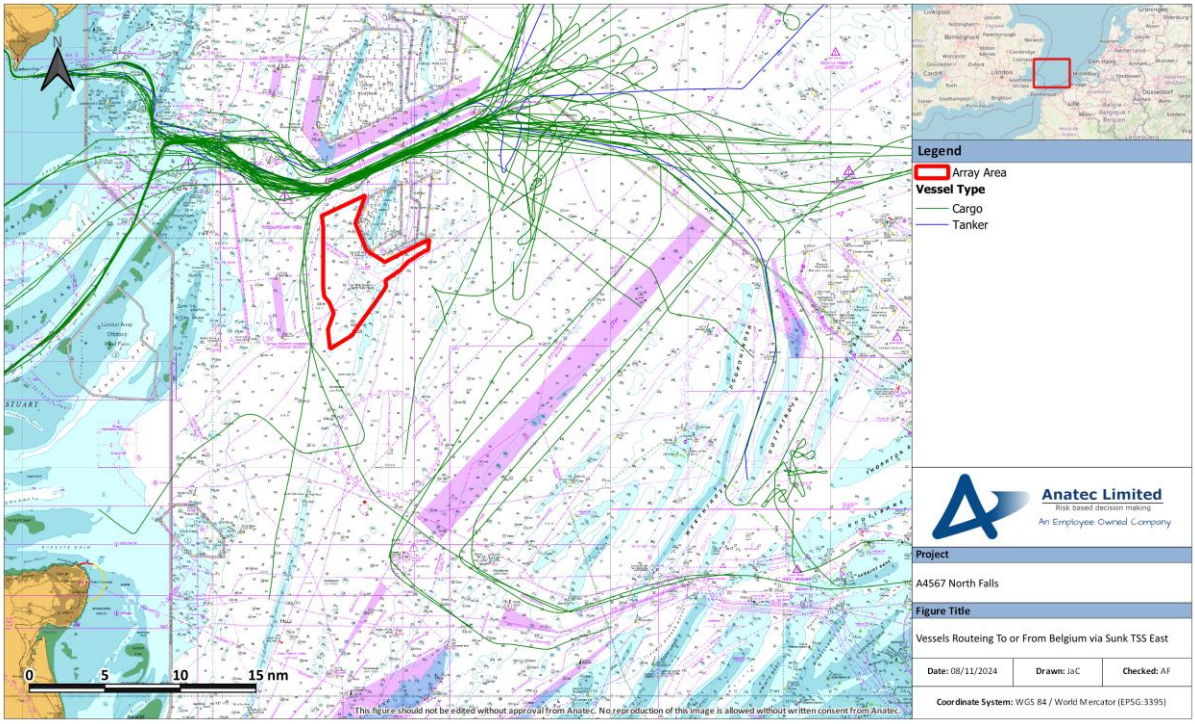


Figure 6.3 Vessels Routeing To/From Belgium Via Sunk TSS East (January 2024 – June 2024)

The majority of vessels identified utilising the Sunk TSS East were broadcasting an origin/destination port of Antwerp. These vessels tended to enter or depart the north-east extent of the Area of Interest. However, a minority were also noted to use the TSS Off North Hinder or the North Hinder South TSS. It is considered most likely that a vessel choosing to use the Sunk TSS East to transit to or from Ostend would use the TSS Off North Hinder given that it would result in a shorter overall transit time than the North Hinder South TSS.

A routeing option has therefore been identified that utilises the Sunk TSS East and the TSS Off North Hinder.

6.1.3 Vessels crossing the North Hinder South TSS

Figure 6.4 presents the vessels recorded within the six months of 2024 data that were broadcasting Ostend, Antwerp, Zeebrugge or Ghent as their origin/destination and routeing via crossing the North Hinder South TSS.

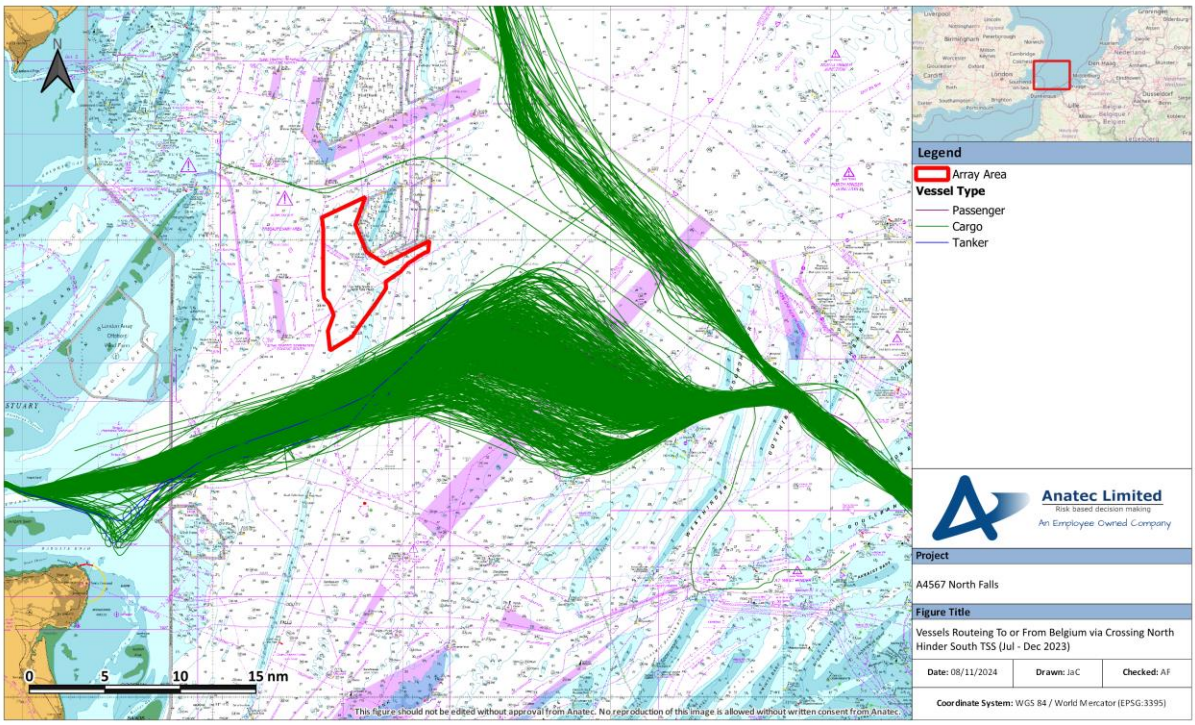


Figure 6.4 Vessels Routeing To/From Belgium Crossing the North Hinder South TSS (January 2024 – June 2024)

It can be seen that vessels crossed the North Hinder South TSS either at its centre or at its eastern portion. The majority of identified vessels were broadcasting an origin/destination port of Zeebrugge. Those crossing the centre of the North Hinder South TSS were entering/exiting the Thames Estuary (travelling to/from either Tilbury or Purfleet). The majority of crossings of the eastern portion of the North Hinder South TSS were from a single vehicle carrier routeing to/from Grimsby.

The vast majority of vessels crossing the North Hinder South TSS were not entering or departing the Sunk routeing measures, however two instances were identified of vessels using the outbound Sunk TSS East lane (prior to crossing the North Hinder South TSS). Further, the passage of the single vehicle carrier routeing to/from Grimsby passes in close proximity to the Sunk TSS east. On this basis, a routeing option to / from Ostend where the North Hinder South TSS is crossed prior to or after use of the Sunk TSS East has been identified. It should be considered that the vessel using the Grimsby route crossed the Noordhinder Bank (estimated depth of 10-12m based on charted depths), and broadcast a maximum draught of 5.5m. Therefore, use of this route may be dependent on the size of ferry utilised.

The majority of vessels passing south of the Sunk routeing measures before or after crossing the central part of the North Hinder South TSS were observed to be associated with commercial ferry routes between the Thames ports and Zeebrugge, and therefore these vessels did not enter into the Sunk. However, the transits did pass in proximity to the Sunk TSS South, and it is also noted that the section of the North Hinder South TSS crossed broadly aligns with where the historic Ostend routeing crossed. Therefore, a routeing option to / from

Ostend where the North Hinder South TSS is crossed prior to or after use of the Sunk TSS South has been identified.

6.2 Routeing Options

This section presents the potential alternate routeing options to use of the Galloper Recommended Ferry Route that have been identified. The routeing is indicative only, and designed to provide preliminary details around potential routeing options, noting that if the Ostend routeing were to re-open, the operator would define their own routeing based on their own risk assessments and passage planning.

Based on the AIS analysis undertaken in Section 6.1, the following potential routeing options have been identified:

- Routeing option 1: Sunk TSS South and At West Hinder TSS;
- Routeing option 2: Sunk TSS East and TSS Off North Hinder;
- Routeing option 3: Crossing North Hinder South TSS and using Sunk TSS South; and
- Routeing option 4: Crossing North Hinder South TSS and using Sunk TSS East.

A route has been defined for each option, with the following factors all considered as part of the route definition process:

- Use of established routeing patterns used by existing commercial vessel traffic (Section 6.1);
- Presence of shallow banks within the Area of Interest (see Section 4.2);
- Presence of existing offshore development (see Section 4.3); and
- Potential future offshore development (discussed further in Section 4.3).

6.2.1 Consideration of Routeing Constraints

This assessment has considered both an up-to-date current base case and potential future case for establishing potential routeing options. When the original Ostend routeing was running, the key constraint on routeing was the presence of shallow banks in the area (Westhinder and Oosthinder). However, new and future constraints mean that depending on when the route were to re-open, it is very likely that different routeing patterns would be established regardless of the presence of the Galloper Recommended Ferry Route.

The southern of the two original Ostend routeing options (see Figure 5.1) intersects the Princess Elisabeth Island demarcated exclusion zone (see Section 4.3). As such, the Ostend route would require a deviation in the event that it were to re-open under current conditions. The charted water depths in the area where the southern of the two historic routeing crossed the Westhinder Banks are shallow, and it is therefore considered possible that any vessels on new Ostend routeing would choose to pass north of the Oosthinder bank depending on the size of the vessel (this transit aligns with the northern of the two original Ostend routeing options). Further, ferries current transiting between Zeebrugge and London ports exclusively pass north of the Oosthinder bank.

Figure 6.5 presents the base case (i.e., without the Princess Elisabeth Zone) routeing options, accounting for the exclusion zone and shallow banks.

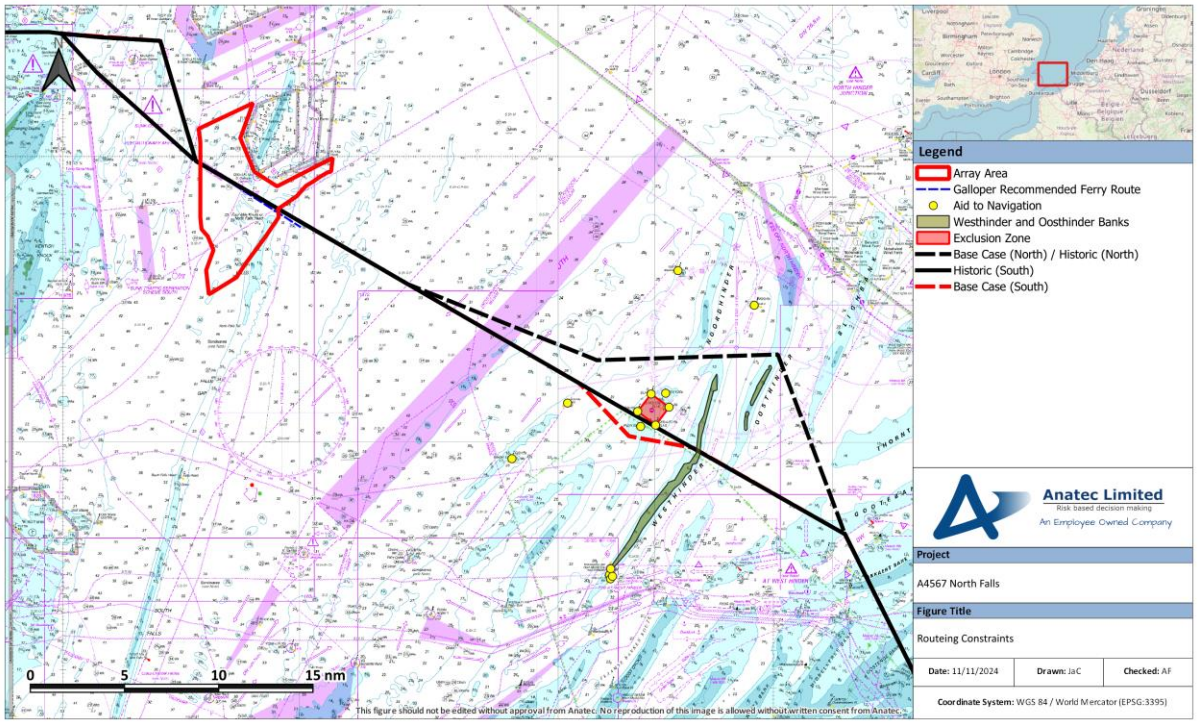


Figure 6.5 Routeing Constraints – Base Case (i.e., without Princess Elisabeth Zone)

Build out of the wider Princess Elisabeth Zone with wind turbines means that any future routeing through would be required to use the maintained corridor. This routeing would broadly align with the northern of the two original Ostend routeing options, however a change would still be required to ensure a suitable distance was maintained from the wind turbines either side of the corridor and that the North Hinder South TSS was crossed at right angles. This is illustrated in Figure 6.6.

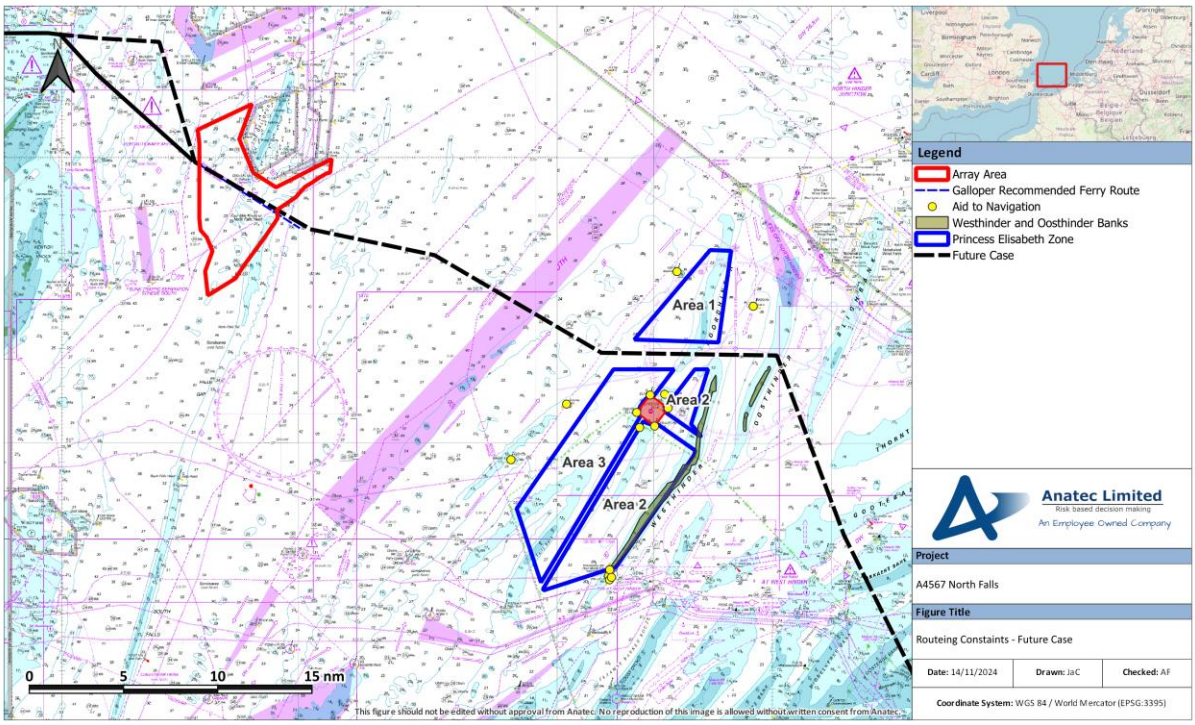


Figure 6.6 Routeing Constraints – Future Case (i.e., with Princess Elisabeth Zone)

Given the potential change in future baseline conditions, both a base case i.e., without the Princess Elisabeth Zone (Figure 6.5) and future case i.e., with the Princess Elisabeth Zone (Figure 6.6) scenario route has been defined for each of the four identified routeing options. As per Section 4.3, based on current understanding of timelines, the first turbines could be installed in the Princess Elisabeth Zone in 2028.

The following assumptions have been made within the future case routeing:

- Final build out of the Princess Elisabeth Zone will be such that the corridor between Areas 1 and 3 is wide enough to safely accommodate the expected number of users; and
- The Mean Route Position of vessels will be central within the corridor.

6.2.2 Routeing Option 1 – Sunk TSS South and At West Hinder TSS

6.2.2.1 Base Case

Figure 6.7 presents the base case route (i.e., without Princess Elisabeth Zone) identified for routeing option 1 (Sunk TSS South and At West Hinder TSS). The total estimated distances of each direction are as follows:

- Outbound from Ostend: 90.2nm; and
- Inbound to Ostend: 90.0nm.

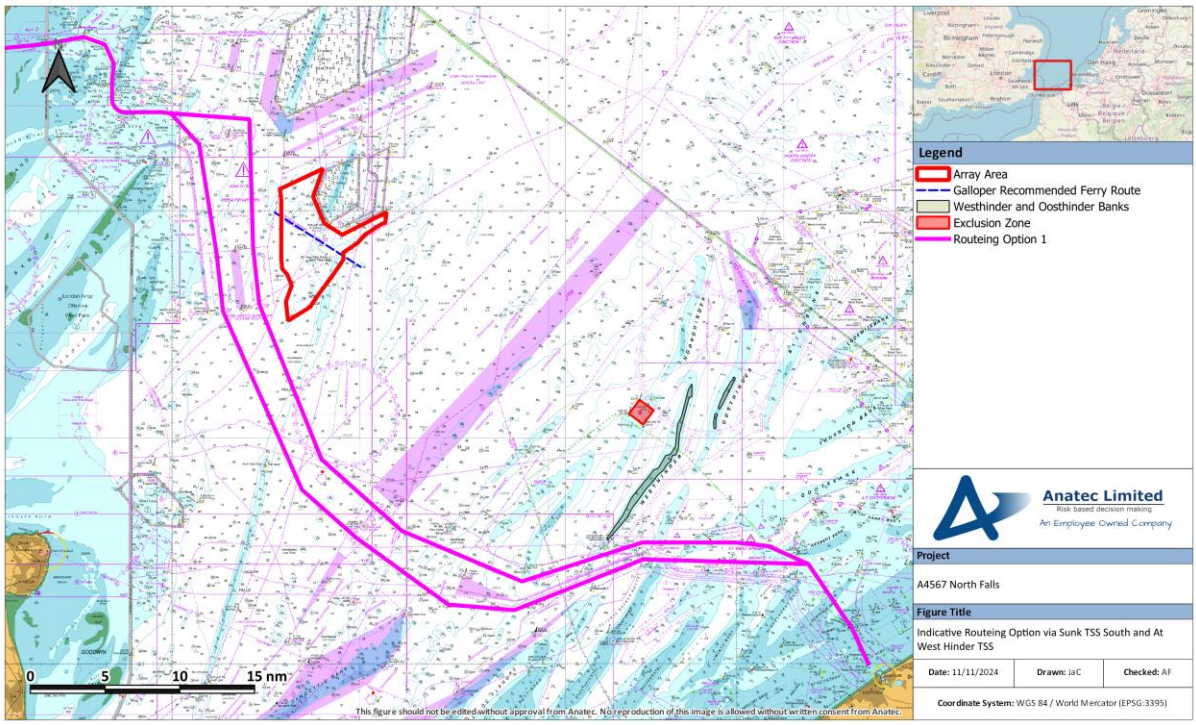


Figure 6.7 Indicative Routeing Option 1 (Base Case i.e., without Princess Elisabeth Zone)

6.2.2.2 Future Case

Given that routeing option 1 uses the Sunk TSS South and At West Hinder TSS, it is unaffected by the identified future case developments in particular the Princess Elisabeth Zone. The base case and future case are therefore equivalent.

6.2.3 Routeing Option 2 - Sunk TSS East and TSS Off North Hinder

6.2.3.1 Base Case

Figure 6.8 presents the base case (i.e., without Princess Elisabeth Zone) route identified for routeing option 2 (Sunk TSS East and TSS Off North Hinder). The total estimated distances of each direction are as follows:

- Outbound from Ostend: 93.0nm; and
- Inbound to Ostend: 92.2nm.

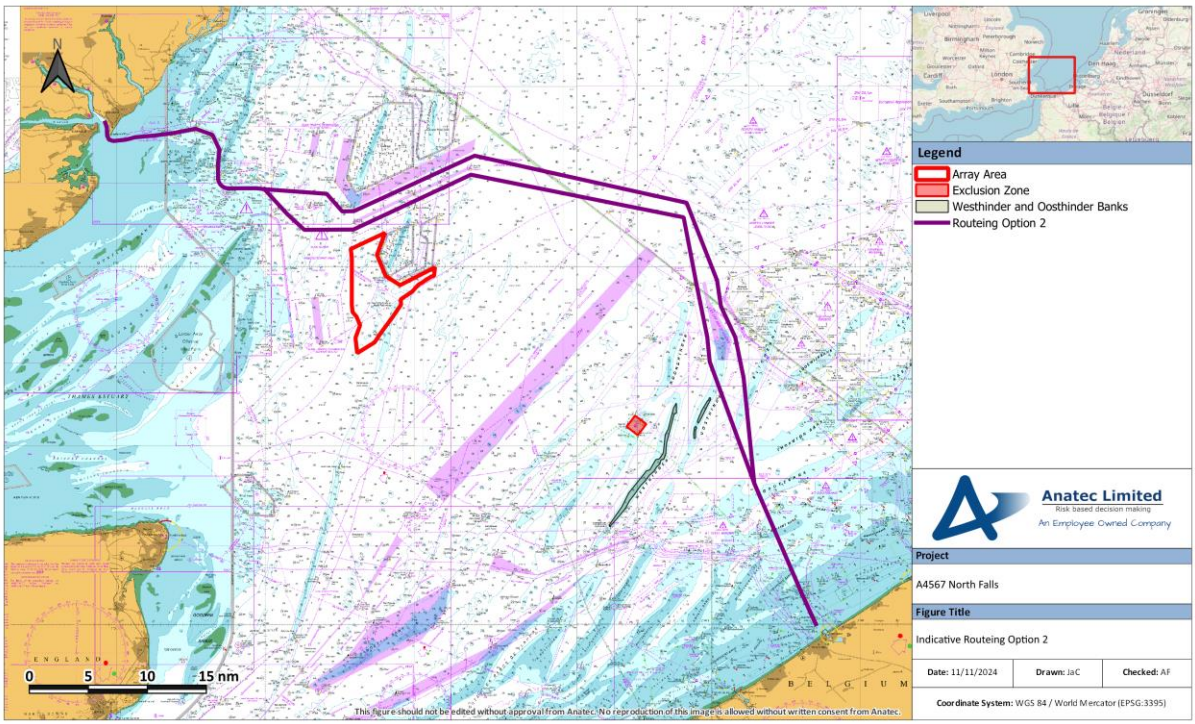


Figure 6.8 Indicative Routeing Option 2 (Base Case i.e., without Princess Elisabeth Zone)

6.2.3.2 Future Case

Given that routeing option 2 uses the Sunk TSS East and TSS Off North Hinder, it is unaffected by the identified future case developments in particular the Princess Elisabeth Zone. The base case and future case are therefore equivalent.

6.2.4 Routeing Option 3 – Crossing North Hinder South TSS and Sunk TSS South

6.2.4.1 Base Case

Figure 6.9 presents the base case (i.e., without Princess Elisabeth Zone) routeing identified for routeing option 3 (Crossing North Hinder South TSS and using Sunk TSS South). Two routeing options are identified; 3 North, which passes north of the Oosthinder bank and exclusion zone, and 3 South, which passes south.

The total estimated distances of each direction of routeing option 3 North are as follows:

- Outbound from Ostend: 92.5nm; and
- Inbound to Ostend: 91.6nm.

The total estimated distances of each direction of routeing option 3 South are as follows:

- Outbound from Ostend: 89.0nm; and
- Inbound to Ostend: 88.1nm.

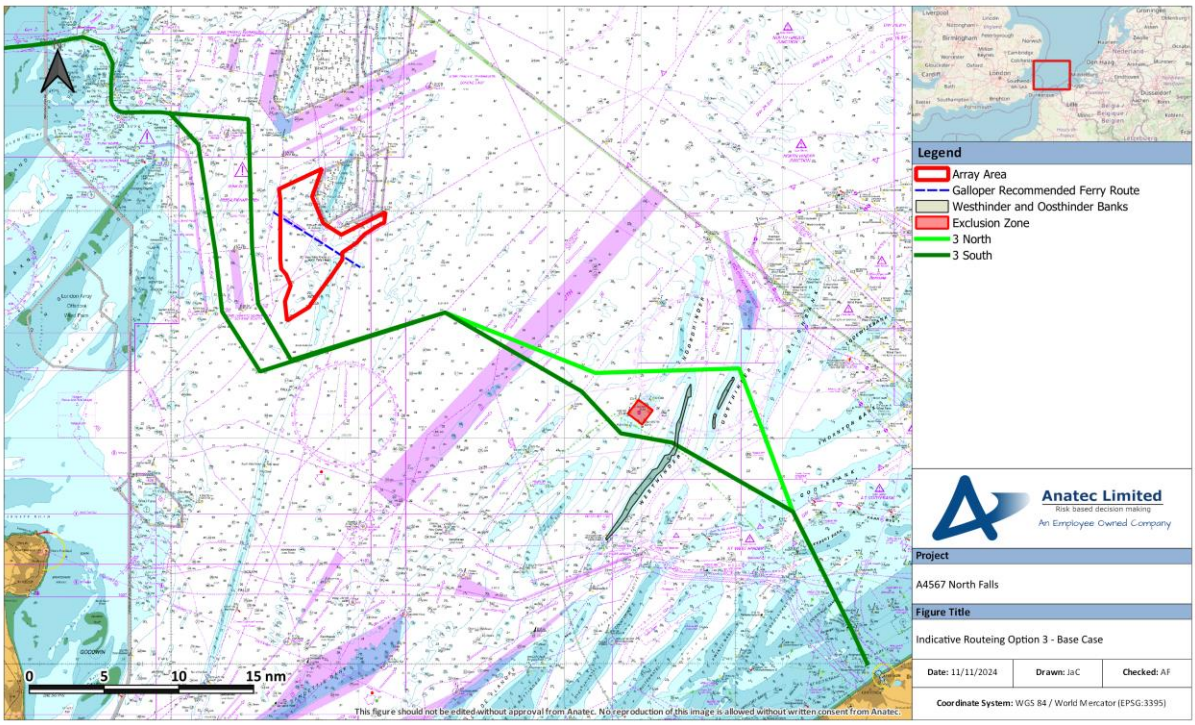


Figure 6.9 Indicative Routeing Options 3 (Base Case i.e., without Princess Elisabeth Zone)

It is noted that use of this route option 3 south may be dependent on the size in particular draught of ferries used if the route re-opens, as it crosses the Westhinder bank.

6.2.4.2 Future Case

In a future case scenario, routeing option 3 South would no longer be feasible due to the presence of the Princess Elisabeth Zone. For routeing option 3 North, a deviation would be required to ensure sufficient distance from wind turbines on either side (similar to the deviation required for the historic route (north) illustrated in Figure 6.6). The future case adjustment (i.e., with the Princess Elisabeth Zone) for routeing option 3 North is illustrated in Figure 6.10.

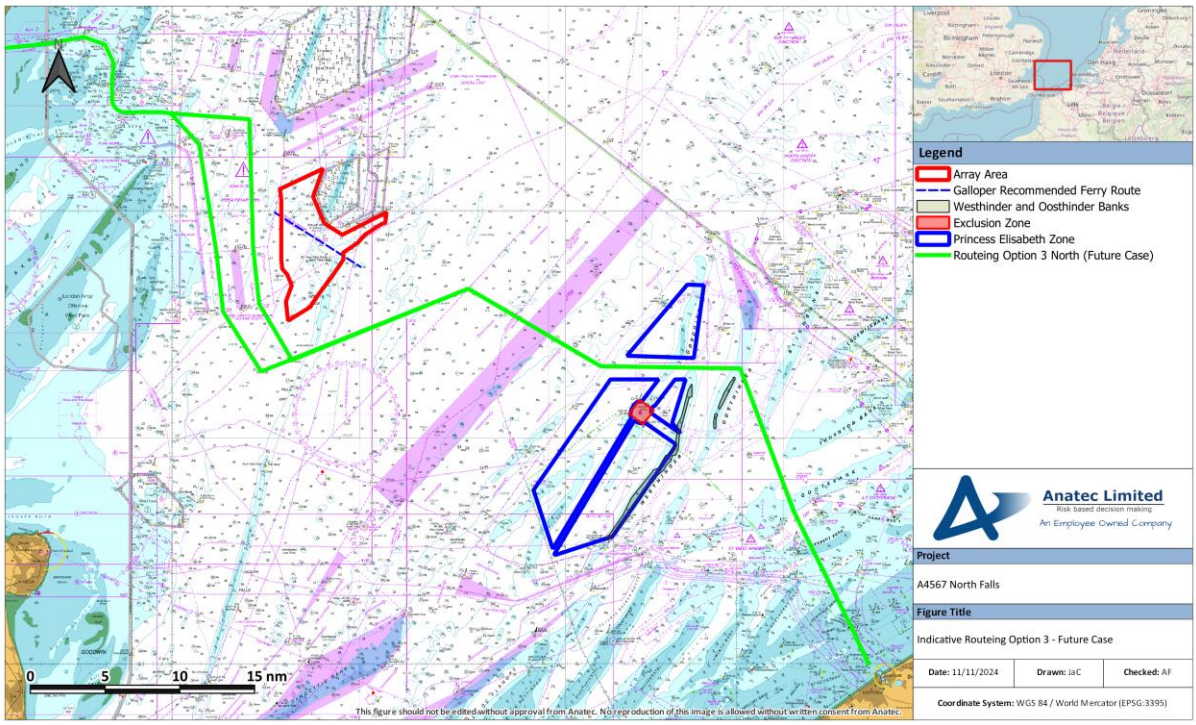


Figure 6.10 Indicative Routeing Option 3 (Future Case i.e., with Princess Elisabeth Zone)

6.2.5 Routeing Option 4 – Crossing North Hinder South TSS and Sunk TSS East

6.2.5.1 Base Case

Figure 6.11 presents the base case (i.e., without Princess Elisabeth Zone) routeing identified for routeing option 4 (Crossing North Hinder South TSS and using Sunk TSS East). The total estimated distances of each direction are as follows:

- Outbound from Ostend: 87.7nm; and
- Inbound to Ostend: 88.4nm.

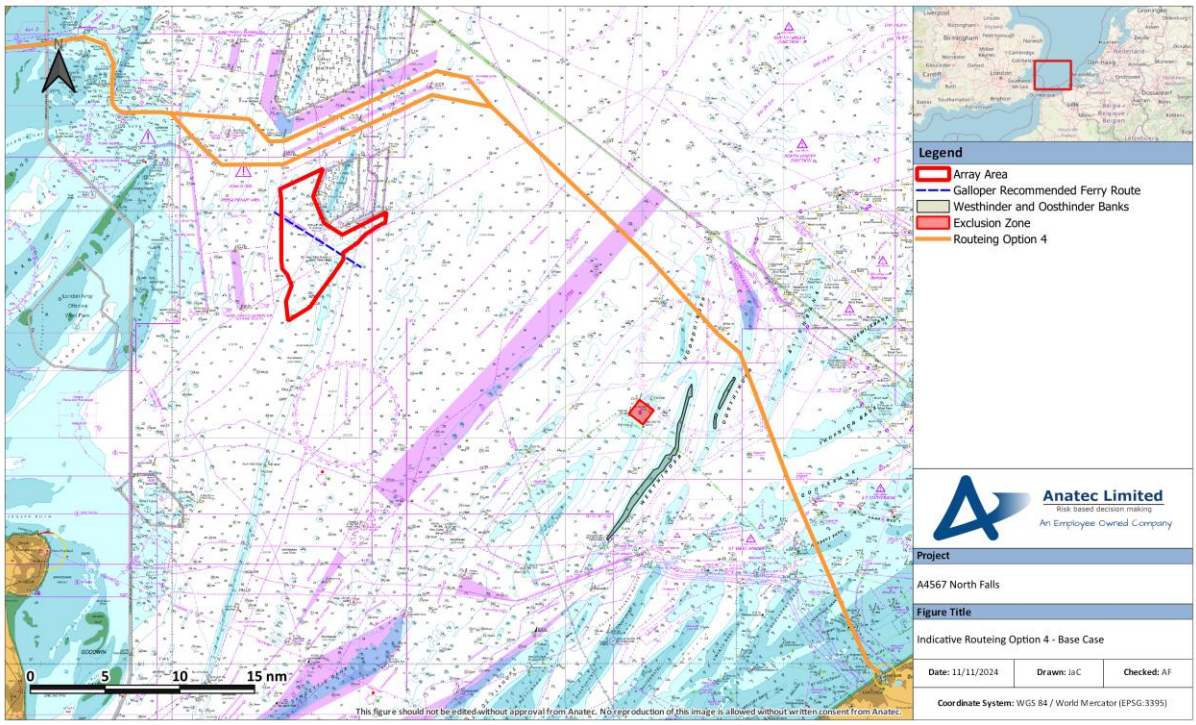


Figure 6.11 Indicative Routeing Option 4 (Base Case i.e., without Princess Elisabeth Zone)

6.2.5.2 Future Case

Given that routeing option 4 intersects the Princess Elisabeth Zones (Area 1), in a future case scenario (i.e., with the Princess Elisabeth Zone) it would have to deviate east, likely resulting in a passage similar to that of routeing option 2 (see Section 6.2.3). It is noted that as detailed in Section 6.1.3, use of this route may be dependent on the size in particular draught of ferries used if the route re-opens.

6.2.6 Summary

Figure 6.12 presents all routeing options discussed in the previous subsections. The estimated total distances of the four identified routeing options are then summarised in Table 6.1, split by base case (i.e., without Princess Elisabeth Zone) and future case (i.e., with Princess Elisabeth Zone).

For the future case scenario (i.e., with the Princess Elisabeth Zone), routeing option 3 South does not apply as per Section 6.2.4.2.

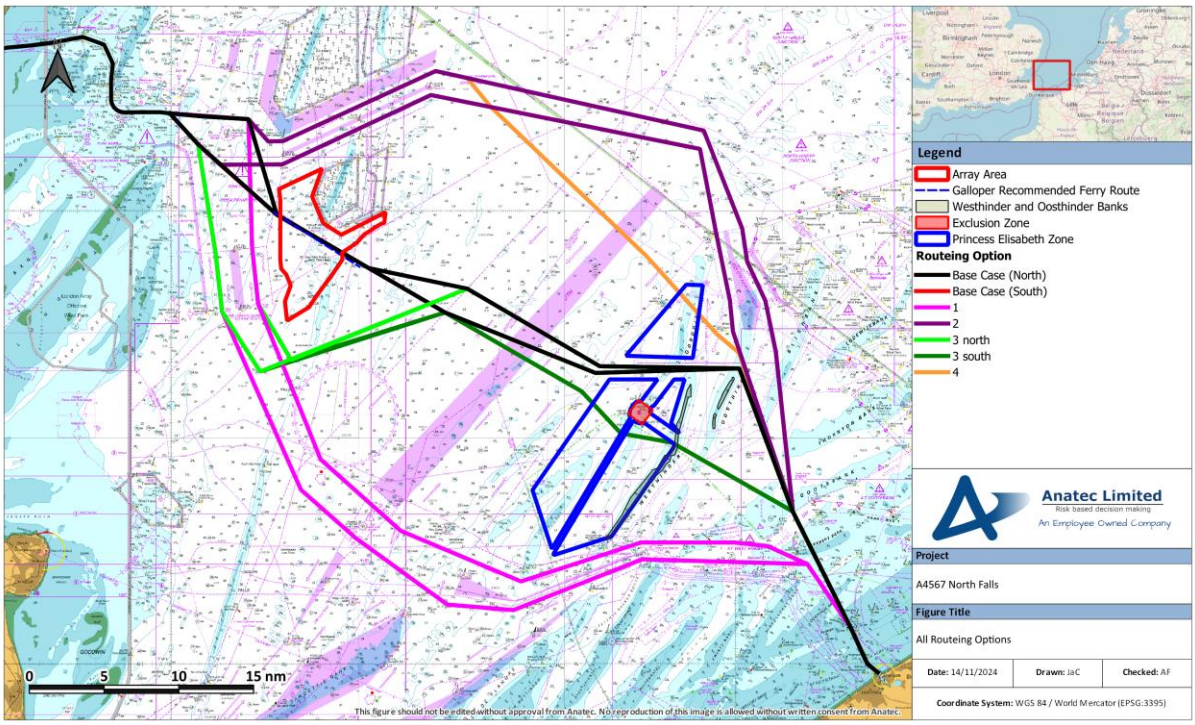


Figure 6.12 All Routeing Options

Table 6.1 Routeing Option Summary (Distances)

Routeing Option	Inbound/ Outbound to Ostend	Base Case (i.e., without Princess Elisabeth Zone)			Future Case (i.e., with Princess Elisabeth Zone)	
		Estimated Total Distance (nm)	Percentage Increase from Historic Route (South)	Percentage Increase from Historic Route (North)	Estimated Total Distance (nm)	Percentage Increase from Adapted Future Case Historic Route
Historic (South)[3]	Inbound	80.1	N/A	N/A	N/A	N/A
	Outbound	82.2	N/A	N/A	N/A	N/A
Historic (North)	Inbound	83.6	N/A	N/A	83.6	N/A
	Outbound	84.7	N/A	N/A	85.6	N/A
1	Inbound	90.0	12%	8%	90.0	8%
	Outbound	90.2	10%	7%	90.2	5%
2	Inbound	92.2	15%	10%	92.2	10%
	Outbound	93.1	13%	10%	93.1	9%

[3] This historic route is likely to be vessel size dependent as it crosses the Westhinder Bank.

Routeing Option	Inbound/ Outbound to Ostend	Base Case (i.e., without Princess Elisabeth Zone)			Future Case (i.e., with Princess Elisabeth Zone)	
		Estimated Total Distance (nm)	Percentage Increase from Historic Route (South)	Percentage Increase from Historic Route (North)	Estimated Total Distance (nm)	Percentage Increase from Adapted Future Case Historic Route
3 North	Inbound	91.6	N/A	10%	92.6	11%
	Outbound	92.5	N/A	9%	93.5	9%
3 South[4]	Inbound	88.1	10%	N/A	N/A	N/A
	Outbound	89.0	8%	N/A	N/A	N/A
4[5]	Inbound	88.5	10%	6%	92.2	10%
	Outbound	87.7	7%	3%	93.1	9%

For the base case scenario (i.e., without Princess Elisabeth Zone), routeing option 4 has the lowest percentage increase in distance compared to the historic route, regardless of whether vessels prefer to pass south or north of the exclusion zone. It is noted that as detailed in Section 6.1.3, use of this route may be dependent on the size in particular draught of ferries used if the route re-opens, given it crosses the Noordhinder bank. However, other routeing options have been identified, with increases ranging up to 15%.

For the future case scenario (i.e., with Princess Elisabeth Zone), routeing option 1 has the lowest percentage increase in distance of between 5 and 8%. Assuming an average speed of 16 knots (the average speed of the ferries using the existing Zeebrugge to London routeing based on the 2024 AIS data), an additional 5-8% increase equates to an additional 15 to 25 minutes of transit time over use of the Galloper Recommended Ferry Route.

[4] Route may be vessel size dependent as it crosses the Westhinder Bank.
[5] Route may be vessel size dependent as it crosses the Noordhinder Bank.

7 Impact Assessment

This section assesses safety, environmental and commercial impacts identified from the removal of the Galloper Recommended Ferry Route in the event that the Ostend routeing were to re-opens in the future. As the routeing is not currently active (and has not been active since 2010), the assessment has been based upon a hypothetical scenario in which the routeing re-opens.

The following potential impacts have been identified:

- Deviation – assessing an increased time at sea and the searoom available from a safety perspective arising from the changes in routeing identified;
- Collision – assessing changes in collision risk to ferries on the changes in routeing identified;
- Environmental – assessing increased ferry emissions associated with the changes in routeing identified; and
- Commercial – assessing commercial viability associated with the changes in routeing identified.

7.1 Formal Safety Assessment

7.1.1 Deviation

The removal of the Galloper Recommended Ferry Route (and subsequent construction of the Project) will lead to a need for any ferry route between Ostend and the Sunk routeing measures to utilise a different passage to the original routeing used when the route was still active. However, it is noted that current and future offshore wind farm development in Belgian waters means that the routeing would likely still need to change regardless of the Project.

In the event that the Ostend routeing were to re-open, the ferry operator would assess current routeing constraints in defining the new passage. This would include consideration of shallow banks, offshore developments including offshore wind farms, and any limitations associated with the vessels being used for the new routeing including vessel size.

Potential alternate routeing options have been identified based on both current (i.e., without the Princess Elisabeth Zone) and future case (i.e., with the Princess Elisabeth Zone) scenarios as presented in Section 6. All routeing options identified have considered these potential relevant routeing constraints including shallow banks and other surface developments, and have been based upon up-to-date AIS data of vessels transiting to/from Belgian ports and so are considered as safe and viable options given they are based upon established routeing patterns. Where a potential vessel size constraint has been identified, this has been discussed in Section 6. A future case has also been considered, with potential future developments accounted for. The inclusion of shallow banks within the assessment means grounding risk is minimal, noting that commercial ferry operators will have expertise in the Area of Interest given the routeing would be expected to be regular.

There may be some change in risk levels in the Sunk area associated with development of the Project, however the embedded mitigations assumed within the NRA (Anatec, 2024) include the following:

- Application for Safety Zones – to aid passing vessel awareness of areas where sensitive construction or maintenance operations are ongoing;
- Use of a buoyed construction area as directed by the relevant General Lighthouse Authority (Trinity House) - to aid passing vessel awareness of areas where sensitive construction operations are ongoing;
- Cable Burial Risk Assessment – to identify how cables should be suitably buried and protected to minimise risk of anchor interaction;
- Charting of infrastructure – to aid passing vessel awareness of the locations of infrastructure;
- Compliance with MGN 654 including in terms of underkeel clearance requirements – to reduce risk of subsea cable protection posing an underkeel interaction risk;
- Lighting and marking as directed by the relevant General Lighthouse Authority (Trinity House) - to aid passing vessel awareness of the locations of surface infrastructure;
- Layout Approval in liaison with MCA and Trinity House – to agree a layout that is sympathetic to surface navigation;
- Promulgation of information - to aid vessel awareness of areas where sensitive construction or maintenance operations are ongoing; and
- Navigation and Installation Plan – procedures put in place to manage impacts to navigation during cable installation and maintenance within the sensitive area of the Sunk.

As per Table 6.1, increases of distance with the routeing options assuming the Galloper Recommended Ferry Route was removed, range from 3% to 15%. However, the changes in baseline since the Ostend routeing was last active mean that a change in timetabled transit time would likely occur regardless.

Given that there will be a necessary change in routeing from the removal of the Galloper Recommended Ferry Route, in the event that the Ostend route were to re-open, the frequency of occurrence is considered to be **frequent**. However, the severity of consequence from a navigational safety perspective is considered **minor** given that the identified routeing options are based upon evidenced and viable pre-existing transits, and account has been made of future offshore wind development. The risk associated with the routeing options is therefore considered **tolerable**. With the mitigation implemented as detailed above, the risk is ALARP.

7.1.2 Collision Risk

This section assesses the potential for an increase in collision risk associated with the routeing options identified.

7.1.2.1 Sunk Area

Removal of the Galloper Recommended Ferry Route would mean any new Ostend Routeing would need to utilise either the Sunk TSS South or Sunk TSS East to access or depart the Sunk routeing measures.

The NRA included vessel to vessel collision modelling to estimate the change in collision risk associated with the re-routeing patterns assuming build out of the array area. This included a conservative worst case scenario of a 30% increase in all vessel traffic captured, including traffic utilising the Sunk TSS lanes. The results estimated that assuming a 30% increase of traffic with North Falls developed, collision risk would increase by only 0.37% within the study area compared to the equivalent scenario without North Falls.

Further, as part of the NRA process, the Applicant has made significant changes to its Red Line Boundary (RLB), with shipping and navigation being a key driving factor behind these changes. The RLB had previously included two separate array areas; a northern array area and a southern array area. Reductions to the RLB have comprised the entire removal of the northern array and a reduction in size of the southern array to remove overlap with the Sunk Outer Precautionary Area, and increase distance to the Sunk TSS South and Sunk TSS East. In addition to these site reductions, a Structure Exclusion Zone (SEZ) has been defined as the overlap between the array area and a 1nm buffer of the Sunk TSS lanes and Outer Precautionary Area. This area will exclude surface-piercing structures (but can still include subsea cables).

These reductions mean almost half of the original RLB will no longer be used for surface piecing structures. The additional searoom provided on this basis will increase the distance between vessels using the Sunk routeing measures and the surface piercing structures associated with the Project, reducing both vessel to vessel collision and vessel to structure allision risk. It is noted that based on the incident data studied in the NRA (Anatec, 2024), there have been no reported third party allisions with the existing wind farm structures, and no collisions associated with commercial vessel routeing.

The RLB reductions and SEZ are illustrated in Figure 7.1 and Figure 7.2.

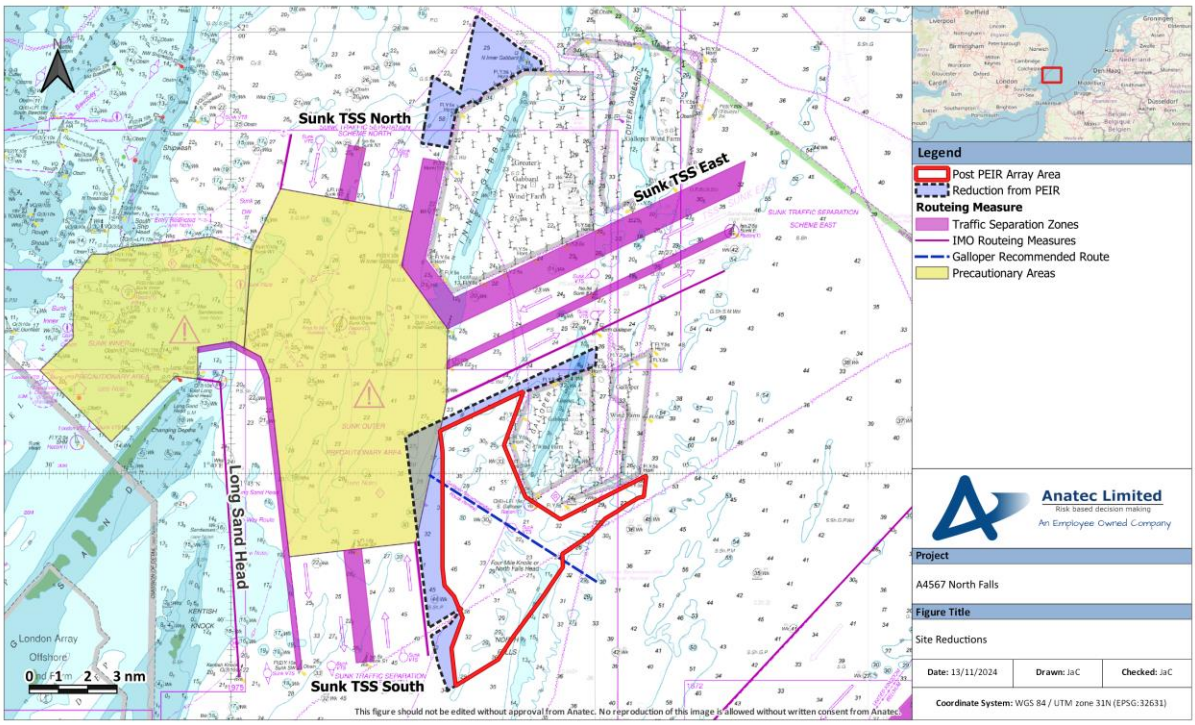


Figure 7.1 Refinement of Array Area

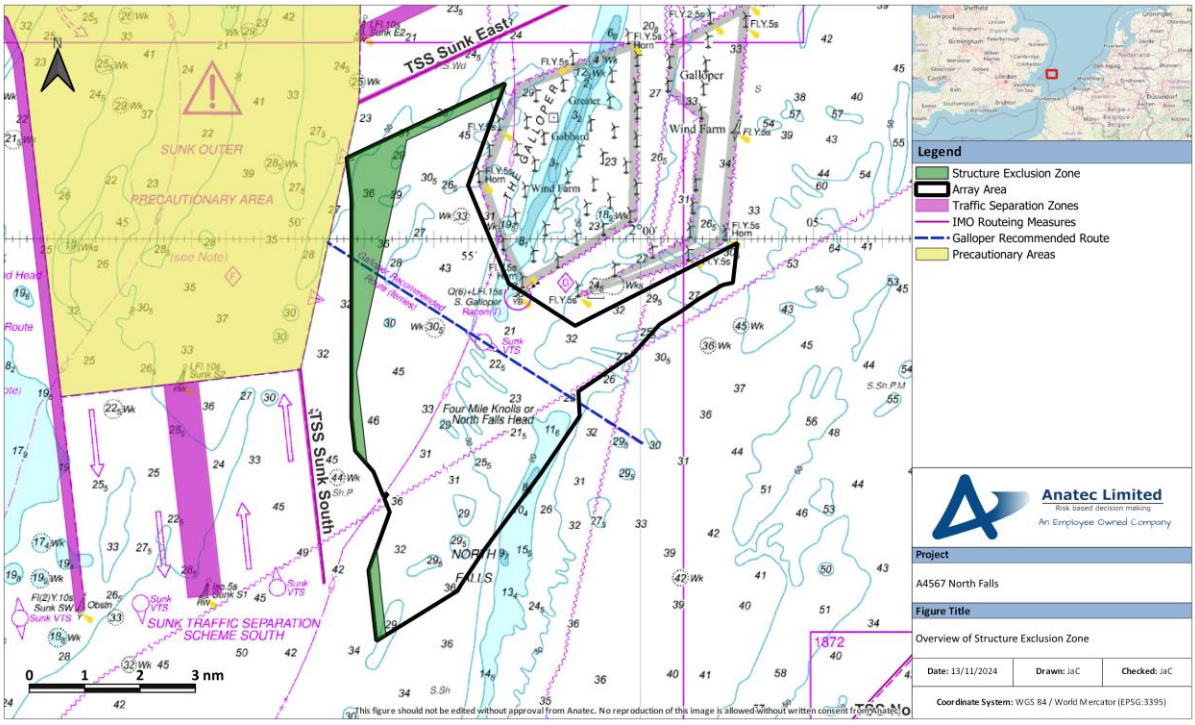


Figure 7.2 Overview of Structure Exclusion Zone

The NRA found collision and allision risk to be ALARP for all vessels assuming the implementation of the SEZ.

7.1.2.2 Area of Interest

In terms of the wider Area of Interest, all routeing options identified have either utilised existing IMO routeing measures, or established routes as evidenced via AIS. This means that:

- Traffic using TSS lanes is split by direction of travel reducing collision risk, and any encounters including with crossing vessels would be managed and governed by COLREGs;
- Any key sensitive areas of converging traffic are within IMO precautionary areas which helps to ensure vessels will navigate with particular caution and within which the direction of flow of traffic may be recommended; and
- Any use of routeing options that cross TSS lanes have considered established crossing points via AIS analysis, noting any encounters with vessels using the TSS would be governed by COLREGs.

In the event that an encounter between a ferry to or from Ostend and another vessel does occur, it is likely to be very localised and occur for only a short duration, with collision avoidance action implemented by the vessels involved, in line with the COLREGs, thus minimising the risk that the situation will develop into a collision incident.

The most likely consequences should a collision occur will likely be low, with minor contact between the vessels resulting in minor damage and no injuries to persons, with both vessels able to resume their respective passages and undertake a full inspection at the next port (the NRA (Anatec, 2024) provides details and consequences of historical collision incidents). As an unlikely worst case, one of the vessels could be foundered resulting in a Potential Loss of Life and/or pollution. However, risk of a total loss of a vessel on an individual vessel basis is considered low, with the Allianz Safety and Shipping Review 2024 indicating total worldwide vessel losses from collisions accounted for 0.1% of all casualties / incidents (Allianz, 2024). Any increase attributed to a change in the Ostend routeing if it were to re-open would be even lower (in terms of risk exposure a 3 to 15% increase if the transit distance increases are applied).

On this basis, the frequency of occurrence of the worst case of a **major** collision (i.e., multiple fatalities) is considered to be **extremely unlikely**. Therefore, the risk is considered **tolerable**. The implementation of the SEZ as additional mitigation by the Project means the risk is also ALARP.

7.2 Environmental Impacts

Carbon dioxide (CO_2) is the main greenhouse gas emitted by the shipping industry (IMO, 2020). As an offshore wind farm, North Falls will facilitate the production of clean energy (i.e., much lower carbon footprint than use of fossil fuels). However, it is acknowledged that a small proportion of the benefit would be offset by an increase in distance travelled by any future ferry route from Ostend due to increased CO_2 emissions from fuel burned.

Therefore, In order to assess the potential environmental impact in terms of vessel emissions of the removal of the Galloper Recommended Ferry Route, an analysis of currently active UK

to Belgian ferry routeing has been undertaken in terms of CO_2 emissions. The routes selected are the Zeebrugge to London routes, which currently pass south of the Galloper Recommended Ferry Route. These are considered appropriate routes to consider given that:

- They run between Belgium and the UK;
- They use a similar passage between terminus locations to the historic Ostend routeing (crossing the North Hinder South TSS); and
- They are likely representative of the types of vessels that would be used if the Ostend routeing were to re-open (noting they include CLdN vessels, and CLdN were the most recent operator of the Ostend to Sunk routeing).

Based on data made available by the European Maritime Safety Agency (EMSA), total reported CO_2 emissions from EU vessels in 2023 were approximately 127 million metric tons (EMSA, 2024). This total value has been compared against the reported emissions of ferries running on the existing Zeebrugge to London routes from the same period (2023). As per Table 6.1, the routeing options identified for the Ostend routeing would result in an increase in distance of between 3% and 15%. A 10% increase in emissions has therefore been assumed, noting this is on the upper end of the deviation range, with Table 7.1 presenting these values. The individual vessel contributions of a hypothetical 10% increase would only account for 0.002% of the total (approximately 127 million metric tons as above).

Table 7.1 Zeebrugge to London Ferry CO_2 Emissions Summary

Vessel	2023 CO_2 Emissions (metric tonnes)	10% of 2023 CO_2 Emissions (metric tonnes)
Yasmine	22,334	2,233
Pauline	24,102	2,410
Norsky	30,129	3,013
Norstream	29,441	2,944

7.3 Commercial Impacts

As shown in Section 6.2, there are multiple routeing options available. While their use may constitute an increased distance relative to the historic routeing, they do not result in substantial increases in distance or time when compared to the likely routeing that would be undertaken if the Galloper Recommended Ferry Route was still in place based on current baseline and future conditions.

As shown in Section 6.2.1, in the event that the Ostend routeing were to re-open, it would require a change in routeing and therefore timetable regardless of the presence of the array area, because of the ongoing Princess Elisabeth Zone development. It should also be considered that the re-opening of the route is likely to result in use of different vessels to those used historically, which may be working under different efficiency, cost and size restriction parameters.

Therefore, while there may be a minor commercial impact arising from the removal of the Galloper Recommended Ferry Route (resultant of increased fuel cost and / or consideration of tax on increased emissions), it is just one commercial factor that would need to be considered in the event that the route was re-opened. This combined with the fact that viable alternative routeing has been identified as discussed above mean that the removal of the Galloper Recommended Ferry Route is not considered to be a commercial barrier to the route re-opening, if a future market was identified.

8 Summary

This report has provided a summary of the Galloper Recommended Ferry Route in terms of its background, its historical/current use, alternative routeing that vessels could undertake if it was removed, and an assessment of risk associated with these alternatives.

The Galloper Recommended Ferry Route was originally designed to enable regular ferry traffic routeing to/from Ostend (Belgium) and the Sunk Outer Precautionary Area to avoid utilising the Sunk TSS South or Sunk TSS East. There has been no record of any usage of this routeing to/from Ostend since 2009.

Four years of AIS vessel traffic data was analysed to identify vessels that were utilising the Galloper Recommended Ferry Route and it was seen that commercial vessels undertaking transits on the Galloper Recommended Ferry Route has declined over the period studied, with the level of commercial ferry traffic being very low.

Four potential routeing options have been identified for the scenario where the Galloper Recommended Ferry Route is removed, based on analysis of up-to-date AIS data. These routeing options were compared to historic routeing via the Galloper Recommended Ferry Route, in both a base case (without the Princess Elisabeth Zone) and future case scenario (with the Princess Elisabeth Zone). Based on this assessment, the alternate routeing leads to changes in distance of between 3 and 15% of the original routeing.

An impact assessment has been undertaken on these routeing options, including an assessment of safety risk, environmental risk and commercial impacts. Under the FSA, all hazards assessed were deemed to be tolerable and ALARP. As the routeing is not currently active (and has not been active since 2010), the assessment has been based upon a hypothetical scenario in which the routeing re-opens.

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