FOREWIND

DOGGER BANK
TEESSIDE A & B

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Environmental Statement Chapter 16 Shipping and Navigation

Application Reference: 6.16

Cover photograph: Installation of turbine foundations in the North Sea

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1. Introduction

1.1. Background

1.1.1. This chapter of the Environmental Statement (ES) presents the work undertaken to date as part of the Navigation Risk Assessment (NRA) for Dogger Bank Teesside A & B (Anatec 2013) (see **Appendix 16A Navigation Risk Assessment Report**). The baseline vessel activities and navigational features are described, and an assessment made of the potential impacts that may be associated with the different phases of the development. Where the potential for significant impacts is identified, mitigation measures and residual impacts are presented. Navigation issues relating to commercial fisheries have also been assessed in this chapter.

1.1.2. Existing data sources, including Automatic Identification System (AIS) data and site-specific radar surveys, have been used to define the characteristics of the shipping activities in the area. Fishing vessel, recreational vessel and commercial vessel activity have all been described along with the location of oil and gas installations, aggregate dredging activity and details of maritime incidents and regional Search and Rescue (SAR) resources. In addition, the navigational features in the vicinity of Dogger Bank Teesside A & B are identified.

1.1.3. The NRA is the key component of the shipping and navigation impact assessment, and has been undertaken following guidance set out by the Department of Trade and Industry (DTI) (Guidance on the assessment of the impact of offshore wind farms: methodology for assessing the marine navigational safety risks of offshore wind farms, Department of Energy and Climate Change (DECC, 2005) and Marine Guidance Note (MGN) 371 (Maritime and Coastguard Agency (MCA) 2008a).

2. Guidance and Consultation

2.1. Legislation, policy and guidance

2.1.1. National Policy Statements (NPS) provide the primary basis on which the Secretary of State for Energy and Climate Change (hereafter referred to as "the Secretary of State") is required to make its decisions. The National Infrastructure Directorate within the Planning Inspectorate is the body responsible for examining applications for development consent under the Planning Act 2008. The Examining Authority will use the Energy Infrastructure NPS (EN-3) in its examination of applications for development consent, and Ministers will use them when making decisions (see **Table 2.1**).

Table 2.1 NPS assessment requirements

NPS requirement	NPS reference	ES reference
Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore wind farm and this should continue throughout the life of the development including during the construction, operation and decommissioning phases.	EN-3, paragraph 2.6.153	Section 2
The assessment should be underpinned by consultation with the Marine Management Organisation (MMO), Maritime and Coastguard Agency (MCA), the relevant General Lighthouse Authority, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the Royal Yachting Association (RYA), who may be affected.	EN-3, paragraph 2.6.154	Section 2
A Navigational Risk Assessment (NRA) should be carried out in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders.	EN-3, paragraphs 2.6.156 and 2.6.157	**Appendix 16A Navigational Risk Assessment Report**
The potential effect on recreational craft, such as yachts, should be considered in any assessment.	EN-3, paragraphs 2.6.160	Section 6, 7
Applicants should engage with interested parties in the potentially affected offshore sectors early in the development phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application to the Infrastructure Planning Commission (IPC).	EN-3, paragraphs 2.6.180	Section 2

2.1.2. In addition to the requirements under the NPS, the assessment includes:

- Overview of base case environment;
- Marine Traffic Survey;
- Implications of Offshore Renewable Energy Installations (OREIs) to navigation and collision risk;
- Assessment of navigational risk pre and post development of Dogger Bank Teesside A & B;

- Formal Safety Assessment (FSA);
- Implications on marine navigation and communication equipment;
- Identification of mitigation measures;
- Emergency Response (ER) planning; and
- Through life safety management.

2.1.3. The principal guidance documents used to inform the assessment of potential impacts on shipping and navigation are as follows:

- MGN 371 Merchant and Fishing - OREIs Guidance on UK Navigational Practice, Safety and Emergency Response Issues (MCA 2008a);
- DECC (in association with MCA) Guidance on the Assessment of Offshore Wind Farms – Methodology for Assessing Marine Navigational Safety Risks of Offshore Wind Farms (2005) (DECC 2005); and
- Guidelines for Formal Safety Assessment (FSA) – MSC/Circ. 1023 (International Maritime Organisation (IMO) 2002).

2.1.4. MGN 371 highlights issues that shall be taken into consideration when assessing the effect on navigational safety from offshore renewable energy developments, proposed within United Kingdom internal waters, territorial sea or Renewable Energy Zone (REZ).

2.1.5. The MCA requires that its methodology is used as a template for preparing navigation risk assessments. It is centred on risk management and requires a submission that shows sufficient controls are, or will be, implemented for the assessed risk (base case and future case). This is done so that the residual risk is judged as Broadly Acceptable or Tolerable, on the basis of As Low As Reasonably Practicable (ALARP) declarations, in line with regulatory requirements.

2.1.6. Other guidance documents used during the assessment are listed below:

- MCA Marine Guidance Notice 372 (MGN 372 Merchant and Fishing) OREIs Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA 2008b);
- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) – 0139 the Marking of Man-Made Offshore Structures, Edition one (IALA 2008);
- RYA – The RYA's Position on Offshore Energy Developments (RYA 2012);
- DECC Standard Marking Schedule for Offshore Installations (2011); and
- European Council Directive 94/25/EC and 2003/44/EC on the approximation of the laws, regulations and administrative provision of the Member States relating to recreational craft (recreational Craft Directive) – implemented into UK law by the Recreational Craft Regulations 2004 (SI No. 2004/1464). These Directives apply to recreational craft and are intended to ensure the free movement of goods on the European Economic Area (EEA) market.

Consultation

2.1.7. To inform the ES, Forewind has undertaken a thorough pre-application consultation process, which has included the following key stages:

- Scoping report submitted to the Planning Inspectorate in May 2012;
- Scoping opinion received from the Planning Inspectorate in June 2012;
- First stage of statutory consultation (in accordance with sections 42 and 47 of the Planning Act 2008) on Preliminary Environmental Information (PEI) 1 (report published May 2012; and
- Second stage of statutory consultation (in accordance with sections 42, 47 and 48 of the Planning Act) on the draft ES designed to allow for comments before final application to the Planning Inspectorate.

2.1.8. Outside of the statutory consultation process, Forewind has also consulted specific groups of stakeholders on a non-statutory basis to ensure that they had an opportunity to inform and influence the development proposals. Consultation undertaken throughout the pre-application development phase has informed Forewind's decision making and design process, which is presented in this document. Further information detailing the consultation process is presented in **Chapter 7 Consultation**. A Consultation Report is also provided alongside this ES, as part of the overall planning submission.

2.1.9. A hazard workshop was also undertaken in May 2013 to create a hazard log that was project and site specific in order to identify the navigational hazards associated with the development.

2.1.10. A summary of the consultation carried out at key stages throughout the project, of particular relevance to shipping and navigation, is presented in **Table 2.2**. This table only includes the key items of consultation that have defined the assessment. A considerable number of comments, issues and concerns raised during consultation have been addressed in meetings with consultees and hence have not resulted in changes to the content of the ES. In these cases, the issue in question has not been captured in **Table 2.2**. A full explanation of how the consultation process has shaped the ES, as well as tables of all responses received during the statutory consultation periods, is provided in the Consultation Report.

Table 2.2 Summary of consultation and issues raised by consultees

Date	Consultee	Summary of Issue	ES Reference
23/01/2014	**Marine and Coastguard Agency, Trinity House Lighthouse Services**	Review of S42 comments on draft ES. Ongoing zonal consultation.	Section 5 covers site layout options, layout rules and embedded mitigation measures. Section 10 covers cumulative effects. Forewind have committed to change the name of the wind farms.
08/01/2014 (S42 comment on draft ES)	**Chamber of Shipping**	The chamber is generally satisfied that the development will impact minimally upon shipping and navigation in the area due to the relatively low levels of commercial traffic present. The chamber are concerned that when the wind farms are assessed in combination with other proposed projects in the area, both within the Dogger Bank Zone and elsewhere, the potential impacts may be higher than those assessed in isolation. The chamber view the update to the SNSOWF work, and addition co-operation between developers, as vital to ensuring that the cumulative impacts on shipping and navigation are assessed in a holistic manner. The chamber remains concerned over the proposed layouts of the wind farms in the Dogger Bank Zone, both in terms of the site boundaries and potential inconsistencies in turbine layouts. The chamber recommends that any export cables are buried to a minimum of one metre below the seabed as recommended by the MCA. Where burial is not possible and protection is required, navigable water depth should not be reduced by more than 5% of chart datum. The chamber shares the concerns of the MCA and THLS over the proposal to name the wind farms “Teesside”. The chamber would support any action by Forewind to change the name of the wind farms.	Section 5 covers site layout options, layout rules and embedded mitigation measures. Section 10 covers cumulative effects. Forewind have committed to change the name of the wind farms.
19/12/2013 (S42 comment on draft ES)	**Trinity House Lighthouse Service (THLS)**	THLS have significant concerns regarding the layout of turbines at the Dogger Bank site in general but particularly in Dogger Bank Teesside B. THLS advise that a linear turbine layout design with no standalone structures would help reduce the risk to the	Section 5 covers site layout options and layout rules. Section 10 covers cumulative effects. Forewind have committed to change

Date	Consultee	Summary of Issue	ES Reference
		mariner to ALARP. THLS stated that offshore site construction plans should be carefully considered to ensure the wind farm "grows" from a single location rather than fragments into multiple work sites that join up at a later date. THLS reiterated the need to consider the cumulative impact of other wind farms within the southern North Sea, particularly development of the Hornsea Zone to the south, on the Dogger Bank Zone. Given the proximity, size and shape of Dogger Bank Teesside B in relation to surrounding wind farms within the Dogger Bank Zone, THLS are concerned with the proposed Dogger Bank Teesside B wind farm area as the risk to the mariner may be particularly difficult to mitigate sufficiently with the use of aids to navigation. THLS request that the name "Teesside" be changed to reflect the geographical location of this wind farm.	the name of the wind farms.
12/12/2013 (S42 comment on draft ES)	**Maritime Coastguard Agency (MCA)**	The MCA is satisfied that all aspects of the NRA have been properly addressed. The MCA welcome the layout rules that have been identified and are comfortable that a layout plan can be agreed within these parameters, which appear to take account of concern that have been raised over curved layout proposals. MCA reiterate concern of the naming choice and use of the word "Teesside" noting there is already a Teesside Wind Farm, and how both development names Creyke Beck and Teesside can be geographically referenced and are therefore potentially confusing. MCA acknowledge and welcome Forewind's agreement to address this concern (post application). MCA highlight the need to achieve uniformity of layout across the individual wind farms within the Dogger Bank Zone, layout rules, principles and agreement will be a key issue in taking this forward. MCA wish to see some form of linear progression of the construction programme avoiding disparate sites across the development area. MCA stress the need for agreed layout and construction programming to be	Section 5 covers site layout options, layout rules and embedded mitigation measures. Section 10 covers cumulative effects. **Appendix 16A Navigational Risk Assessment Report** contains further details of additional mitigation measures.

Date	Consultee	Summary of Issue	ES Reference
		embedded within the DML. The cumulative impacts associated with the site are considered to have been adequately addressed. The requirement and use of safety zones as detailed in the application is noted and supported. MCA state that an approved ERCoP will need to be in place prior to construction being undertaken, this will be included as a formal condition of the DCO. MCA state that the scale of the development and distance offshore will require a high level of 'self-help' capability to be developed, outline proposals, or at least support to this statement should be made very clear to application within the ES. MCA require that a single marine controller is established that ensures a multi-disciplined activity, has an effective overall maritime coordination process in place, again this should be highlighted within the ES.	
20/12/2013 (S42 comment on draft ES)	**EPIC Regeneration (representing the Hartlepool Fishermen's Society)**	There is a high likelihood that this development will have significant cumulative impacts when taken in conjunction with those already created by the Teesside Offshore Wind Farm and the Breagh pipeline. There is concern that this development will lead to yet further displacement of anchorages for Teesport-bound shipping onto traditional fishing grounds. Should Hartlepool be selected as the construction port it would have a significant impact on the fishermen of Hartlepool, as they could anticipate having their access into and out of port hampered by the need to accommodate shipping movements for over three and a half years. It is essential that Forewind consider the cumulative impact of any development and growth plans for Teesport, particularly where these will lead to either an increase in the volume of shipping or the average tonnage of vessels using the port.	Section 10 covers cumulative effects. Section 5 covers embedded mitigation measures. **Appendix 16A Navigational Risk Assessment Report** contains further details of additional mitigation measures.
19/12/2013 (S42 comment on draft ES)	**Ministry of Defence (MOD)**	MoD referred to previous response provided on 25th July 2013 which was considered to still be valid. No objection to the proposals. Request that all perimeter turbines are fitted with 200 candela omni-directional aviation lighting. Request to be advised, upon	Section 5 covers site layout options and rules. **Chapter 5 Project Description** describes the project in full detail.

Date	Consultee	Summary of Issue	ES Reference
		consent, of construction dates, maximum height of construction equipment, lat and long of every turbine. Also stated that MoD must be consulted again if the application is altered in any way.	
20/11/2013 (S42 comment on draft ES)	**Royal Yachting Association (RYA)**	The RYA is content that the issues raised in its PEI3 response are adequately described in chapter 16 of the Draft Environmental Statement. The RYA notes that rules have been developed that will apply to the final proposed array layout which restrict the array patterns employed and that these rules will be implemented into the final Development Consent Order.	Section 5 covers site layout options and layout rules.
25/07/2013 (Statutory Response)	**MOD**	Statutory response from MoD to Dogger Bank Teesside A & B stating no objection to the proposals. Request that all perimeter turbines are fitted with 200 candela omni-directional aviation lighting. Request to be advised, upon consent, of construction dates, maximum height of construction equipment, lat and long of every turbine. Also stated that MoD must be consulted again if the application is altered in any way.	Section 5 covers site layout options and rules. **Chapter 5 Project Description** describes the project in full detail.
02/07/2013 (Meeting)	**MCA, THLS and Chamber of Shipping**	Agreed traffic levels were low and that individual users were not a significant concern in the Dogger Bank Area. Project naming discussed highlighting MCAs requirement for geographical reference within the name. Confirmed MCA and THLS opinions on curved grids. MCA would like to see a visualisation of dense parameter and curved parameter grids. Noted that traffic levels were low and that individual users were not a significant concern in the Dogger Bank Area. MCA noted that they will want to see a central control centre for emergency response that will cover all sites within Dogger Bank. MCA and THLS confirmed that they do not consider curved internal layouts a feasible option due to implication on SAR helicopters.	Section 5 covers site layout options, layout rules and embedded mitigation measures.
12/06/2013 (Dogger Bank Creyke Beck A and B – S42 comment on	**Royal Norwegian Ministry of the Environment**	Safety Zones – It is the Coastal Administration's understanding that 500m safety zones can be established around wind farm installations in accordance with Article 60 in the UN	**Appendix 16A Navigational Risk Assessment Report** contains further information on the

Date	Consultee	Summary of Issue	ES Reference
draft ES)		Convention on the Law of the Sea. Further there are measures such as 'Area to be Avoided' that can be implemented in accordance with the IMO general provisions on shipping routes. The concept proposed for use within the Dogger Bank Zone, "Charted Advisory Safety Areas" is probably less known to mariners than measures in the IMO provisions and their legal basis may be unclear. An advantage by having a measure adopted by IMO may be that these are promulgated by an IMO circular and binding for all nations. Shipping Routes - It follows from the consultation that vessels will have a high tolerance and adaptability to the impact of the Dogger Bank Creyke Beck wind development. We find this to be credible, but would like to point out that a further development of wind farms on part of or on the whole of Dogger Bank will have an adverse effect on vessel traffic unless there are established 'shipping routes' that are broadly acceptable (cfr. Maritime and Coastguard Agency – Marine Guidance Note 371).	embedded mitigation and additional mitigation measures
12/06/2013 (Dogger Bank Creyke Beck - PEI3 Response)	**Chamber of Shipping**	CIA – Forewind should continue to exchange shipping and navigation data and information between Hornsea and East Anglia. Curved Layouts – Strong concerns over curved layouts on SAR operations. Dense Perimeters – No objections to perimeter weighted layouts (which may act as an aid to navigation), however strongly believe that these should be straight and combined with a regular grid layout for internal turbines. Steps should be taken to ensure that layouts are aligned to assist both normal navigation and SAR operations.	Section 5.2 defines the Layout Rules and design envelope
12/06/2013 (Dogger Bank Creyke Beck - PEI3 Response)	**THLS**	Considered curved layouts to be unacceptable. A linear design with no standalone structures would help reduce the risk to mariners ALARP. Reservations regarding the dense perimeter as this could cause navigational confusion. Request consultation as soon as construction plan has been finalised in order to determine the necessary construction phase marking requirements.	Section 5.2 defines the Layout Rules and design envelope

Date	Consultee	Summary of Issue	ES Reference
		CIA – Forewind must remain mindful of the Hornsea OWF project to the south and continue to monitor the cumulative impacts. Site boundaries – The boundaries of these sites are of concern in relation to that of future sites. Project naming – Name of Teesside projects should be changed to reflect the geographical location.	
12/06/2013 (Dogger Bank Creyke Beck - PEI3 Response)	**MCA**	"*The use of landfall naming is considered confusing - could be confusing to SAR response and reporting. Dogger Bank focused naming should be considered.*" Project boundaries - Creyke Beck A and B does have some logic and in isolation could be comfortably marked and mitigated, however the TS A&B orientation and positioning does not lend itself to a logical approach. Should Tranche C also have individual projects and not provide 100% density coverage of the area this will further impact boundary concerns. *Note: It is noted that project boundaries will not be amended, however Forewind are committed to working with MCA and THLS on lighting, marking and alignment concerns.* Project layouts – Curved layouts have now been reviewed in detail and MCA have formally stated that they cannot be supported. The packed boundary concept is of concern as it does not lend itself to the conventional marking approach. In order to consider support to this approach, some form of 3D visualisation is requested. Fishing Activity – The potential exclusion of Seine Netting is of concern. Forewind should ensure that this is fully explored and any concerns dealt with at an early stage.	Section 5.2 defines the Layout Rules and design envelope. **Appendix 16A Navigational Risk Assessment Report** outlines the embedded mitigation and details the maritime traffic survey used to prepare this assessment.
11/06/2013 (Dogger Bank Creyke Beck - PEI3 Response)	**Cruising Association**	"*Landfall location - acceptable but very near to the harbour of Bridlington which is a drying harbour with access limited to high waters. This means that yachts may have to anchor nearby to wait for the tide with some risk that anchoring will be near or over landfall. Cabling will need to be well buried out to 10m with no 'hump'. Also suggest consideration to physical marking as well as charting.*" Turbine spacing – CA seek the widest spacing possible since this simplifies	Section 5.2 defines the Layout Rules and design envelope **Appendix 16A Navigational Risk Assessment Report** outlines the embedded mitigation measures.

Date	Consultee	Summary of Issue	ES Reference
		and makes safest the passage of small boats between them. Mitigation – As well as temporary 500m moving safety zones, consideration should be given to mobile guard vessels if needed. No objection to the use of compulsory 50m exclusion zones round each turbine or to temporary 500m moving zones around construction or maintenance activities when required.	
10/06/2013 (Meeting)	**MCA, THLS and Chamber of Shipping**	Discussions on Zonal development plans and individual projects for the Dogger Bank Zone. Overview of traffic and traffic densities in the Dogger Bank area, traffic noted as lower levels compared to other development areas. Review of dense perimeters and curved layouts. Feedback from MCA SAR representative on issues with curved grids and helicopter/vessel search patterns. ATBAs and operational safety zones noted not required, although safety zones could be considered post-construction if safety case is present. CIA issues noted.	Considered throughout. Section 5.2 defines the layout rules.
29/05/2013 (Dogger Bank Creyke Beck - PEI3 Response)	**RYA**	"*The Royal Yachting Association thanks Forewind for the opportunity to respond to the final statutory consultation period for Dogger Bank Creyke Beck. The RYA is content that its concerns and position on operational safety zones and export cable landfall are reflected in Table 2.2 of Chapter 16 of the Environmental Statement on Shipping and Navigation. In respect to this consultation, the RYA recognises that the layout of the turbines will be finalised in consultation with relevant stakeholders (MCA and THLS) after consent is granted, though a number of options have been considered using criteria agreed in liaison with other marine users. Four turbine layout options are shown in the final consultation document, all of which involve dense boundaries and two involve curved arrays. Such an approach is novel and those involved in shipping and navigation have until now not had the opportunity to consider the implications of such layouts on navigational safety. Whilst we would*	The considerations of the layout and layout rules are covered in Section 5

Date	Consultee	Summary of Issue	ES Reference
		commend Forewind for developing its own Wind Turbine Array Layout Rules at Chapter 5 of the draft Environmental Statement these do not have the authority of the Methodology for Assessing the Marine Navigational Safety & Emergency Response Risks of OREI or MGN 371. For that reason we are not convinced that a curved array provides a readily understandable pattern within the site layout for either the mariner or for Search and Rescue assets. Curved layouts also have the potential to be confusing for any vessel that is not restricted from navigating within the wind farm. The RYA notes that the worst case layout that is risk assessed in the Navigational Risk Assessment at figure 10.2 is based on a regular straight line grid, thus the uncertainties of curved lines and any risks that these induce have not been specifically considered. It would therefore be prudent to risk assess".	
22/05/2013 (Dogger Bank Creyke Beck - PEI3 Response)	**Individual**	"*I have read through the consultation documentation. There is some mention of discussion with fishing interests, but there is nothing about the combined impact of bad weather and the additional obstructions posed by the turbines on the safety of fishing activities. The Dogger Banks are notorious for bad weather, and there is already general unease about the increasing number of man-made obstructions in the North Sea. While it may be reasonable for fishing activities to be kept at a safe distance from well-marked and compact oil and gas installations, the much wider dispersion of the turbine arrays will be far harder to avoid in adverse conditions. A full risk assessment should be undertaken."*	A full NRA has been carried out which includes the compilation of a hazard log **Appendix 16A Navigational Risk Assessment Report**
01/05/2013 (Hazard Workshop**)**	**Dogger Bank Teesside Hazard Workshop – Relevant Comments**	The Cygnus project has new coordinates. The Cygnus B platform has moved location, which has moved the route for the infield pipeline. Coordinates for this move have been provided. Potential mitigation could be agreement with fishing and commercial stakeholders of a vessel route for construction vessels to use. Due to the distance offshore and the variety of routes which could be taken to reach the wind farms, it was not thought that	Section 5.2 defines the Layout Rules and design envelope **Appendix 16A Navigational Risk Assessment Report** outlines the embedded mitigation measures.

Date	Consultee	Summary of Issue	ES Reference
		this would be necessary. However, construction vessel entry and exit points to the wind farm could be defined by Forewind. Potential for accommodation platforms to have 500m safety zones during operation. If accommodation method is a vessel, there is the possibility that it could be located outside of the zone if it is not moored. Curved layout recognised as being worst case due to difficulty with visual navigation and SAR. Order of installation of turbines was mentioned as potential mitigation. The preference, to reduce allision risk, will be that structures on the periphery will be installed first.	
March 2013 (Electronic communication)	**Regular Operators and European Shipping Association (Cumulative Impact Assessment)**	No major concerns raised by the regular operators other than waiting to hear from other Round 3 Development Zone representatives A suggestion was made to ensure safety of ships and that the wind farm be situated in such a way that corridors are not necessary (i.e. not favourable to have wind turbines on each side). Re-routing of shipping routes would increase shipping journeys and increase CO2 emissions. Refer to **Appendix 16A Navigational Risk Assessment Report** for more detail on the comments above.	**Chapter 5 Project Description** Considered throughout. Section 5.2 defines the layout rules.
11/12/2012 (Meeting)	**MCA and THLS**	Confirmed that it is possible that the areas will not be completely filled with turbines and hence the gaps between turbines and projects could be larger than the gaps shown in the NRA. THLS have concerns about marking the multiple site layout and agreed to work with Forewind to look at options in future meetings. Agreed that navigation activity in the area is low. However, it's individual vessels not used to the area that were the concern. MCA agreed that this site will require managing shipping in a different way to other sites. MCA questioned variations in foundation types and that they would prefer foundations to be consistent across a project. Forewind stated that this may not always be possible for engineering reasons as foundations are largely governed by the underlying	**Chapter 5 Project Description**

Date	Consultee	Summary of Issue	ES Reference
		geology. Noted that a SAR document has been produced to show how we will mitigate, MCA confirmed this approach as they know their own procedures, it's what the operator is going to do that is of interest to them.	
23/07/2012 (Meeting)	**MCA and THLS**	Concerns were raised over the layout options for Dogger Bank Creyke Beck. THLS discussed the difficulties in knowing how and when to mark up the individual projects, or whether the projects would be marked as one. Both MCA and THLS raised concerns over variations in design between different projects and stated that they should be aligned to aid the mariner. Concerns over how leisure users would understand the marking system, although the level of leisure activity is extremely low. No concerns raised over mooring buoys at this stage. MCA and THLS commented that operational safety zones would not usually be approved. The idea of marking 'precautionary safety zones' on charts was discussed.	Considered throughout. Section 5.2 defines the layout rules.
29/06/2012 (Scoping Opinion)	**THLS**	Wind farm will need to be marked by the developer/operator in accordance with general principles outlined in IALA Recommendation O-139. Cumulative and in-combination effects should be taken into account. When considering impacts with decommissioning, it should extend to a situation where it is not possible to remove all the obstructions. The possible requirement for navigational marking of the export and inter array cables and the vessels laying them. If it is necessary for the cables to be protected by rock armour, concrete mattresses or similar protection which lies clear of the surrounding seabed, the impact on navigation and the requirement for appropriate risk mitigation measures must be assessed.	**Chapter 5 Project Description**
29/06/12 (Scoping Opinion)	**Secretary of State**	The NRA should fully consider the cumulative impacts of the development on shipping routes, vessel traffic and the implications due to potential multiple marine navigational markings from other offshore wind farms. The impact on navigation as a result of the construction works within the	Section 10 **Appendix 16A Navigational Risk Assessment Report**

Date	Consultee	Summary of Issue	ES Reference
		offshore cable corridor should be assessed and appropriate mitigation measures identified within the ES.	
15/05/2012 (Meeting)	**Chamber of Shipping**	CoS would be concerned if a shipping channel was to be developed within the Dogger Bank Zone given the length of any such channel and the inherent risks associated with it. The only way they may have an issue with Dogger Bank is if traffic from the Hornsea Zone was rerouted through Dogger Bank.	Section 4 Section 10
04/05/2012 (Meeting)	**RYA**	The change from MHWS to HAT would have no impact on the proposed projects within the Dogger Bank Zone. From a recreational vessel perspective, the RYA does not see the need for safety zones during operation. More information needs to be presented on cable burial and the potential impact of rock dumping/mattressing on water depths. It was stated that due to the distance offshore, recreational sailors around Dogger Bank are expected to be competent and on well-equipped vessels. A key issue for the developer will be to try and avoid differing sizes of wind turbines within a site as well as having different spacing.	This has been noted. Although this is relevant it is not specifically covered in this chapter. Section 7
24/04/2012 (Meeting)	**Shell (Pipeline)**	Preference would be for 1km gaps either side of the Shearwater Elgin Area Line (SEAL) pipeline. Main concern was cable crossing.	Section 10.3 of **Appendix 16A Navigational Risk Assessment Report Chapter 17 Other Marine Users**
03/04/2012 (Meeting)	**MCA and THLS**	THLS raised concerns over excessive rock dumping on the export cable and the navigational safety issues for vessels restricted by their draughts. Consideration should be given to the future life of developments especially Search and Rescue (SAR), Emergency Response Cooperation Plan (ERCoPs), Health, Safety and Environment documents and Aids to Navigation. Concerns over different sizing of wind turbines within developments. Lighting, numbering and marking should be synchronised between each site. Structures should not be out of line on the periphery. There is the potential for the use of floating Aids to Navigation.	Section 6 **Chapter 5 Project Description** Section 6 Section 10.3 of **Appendix 16A Navigational Risk Assessment Report**

Date	Consultee	Summary of Issue	ES Reference
		Sites should be clearly defined to aid SAR.	
21/02/2012 (Meeting)	**MCA**	Concern regarding emergency response should a vessel get into difficulty inside an offshore wind farm. A discussion was held regarding the consideration given to channels and why no channels are being proposed for the Dogger Bank Zone. Guidance to be issued on the naming conventions to be used in an offshore wind farm for SAR issues. If the change from 22m above Mean High Water Spring (MHWS) to 22m above Highest Astronomical Tide (HAT) goes ahead this will make very little difference to projects within the Dogger Bank Zone due to the small tidal range. Agreement that the collated data looks comprehensive and dedicated surveys are not required. Content with on-going data collection from survey vessels and Met Masts.	Section 6
23/06/2011 and 20/07/2012 (Letter/email)	**Regular Operators and European Shipping Association (Cumulative Impact Assessment)**	No major concerns raised by the regular operators other than waiting to hear from other Round 3 Development Zone representatives. A suggestion was made to ensure safety of ships and that the wind farm be situated in such a way that corridors are not necessary (i.e. not favourable to have wind turbines on each side). Re-routing of shipping routes would increase shipping journeys and increase CO2 emissions.	Project location considerations are covered in **Chapter 6 Site Selection and Alternatives**. Section 5.2 defines the layout rules.
05/05/2011 (Meeting)	**Chamber of Shipping**	National Ship Owners' Association should be consulted. Consideration should be given to the planned offshore wind farm developments in other countries such as The Netherlands, Belgium and Germany which could have an impact on the overall routes being considered.	Appendix C of **Appendix 16A Navigational Risk Assessment Report** Sections 10 and 11
07/04/2011 (Meeting)	**MCA and THLS**	They would be concerned if there were an excessive amount of cables between the Dogger Bank Zone and the coast particularly near anchorage/port areas. Concerns raised over emergency response issues.	Section 4 **Chapter 5 Project Description**

3. Methodology

3.1. Study area

3.1.1. Dogger Bank Teesside A & B project sites lie within the overall Dogger Bank Zone which is located approximately 125km off the east coast of England in the southern North Sea (**Figure 3.1**). All of the Dogger Bank Teesside A site and the majority of Dogger Bank Teesside B site are located within part of the zone defined as Tranche B, with a small part of Dogger Bank Teesside B located within the part of the zone defined as Tranche A.

3.1.2. The project-specific survey work undertaken for Dogger Bank Teesside A & B Environmental Impact Assessment (EIA) focussed on Tranche B. However, data from Tranche A of relevance to the section of Dogger Bank Teesside B project area that lies within this area has also been used to inform this assessment (data for Tranche A was collected to inform the EIA for the Dogger Bank Creyke Beck A & B EIA).

3.1.3. The study area also comprises Dogger Bank Teesside A & B Export Cable Corridor from where it exits the Dogger Bank Zone to landfall near Marske-by-the-Sea.

3.1.4. The Study Area considered for the NRA includes Dogger Bank Teesside A & B and a 10 nautical mile (nm) (18.5km) buffer around these two sites (see **Figure 3.1**). The Dogger Bank Teesside A & B Export Cable Corridor has a 5nm (9km) buffer along its proposed alignment from Dogger Bank Teesside A & B to the landfall which is 4.7nm southeast of the mouth of the River Tees (see **Figure 3.2**).

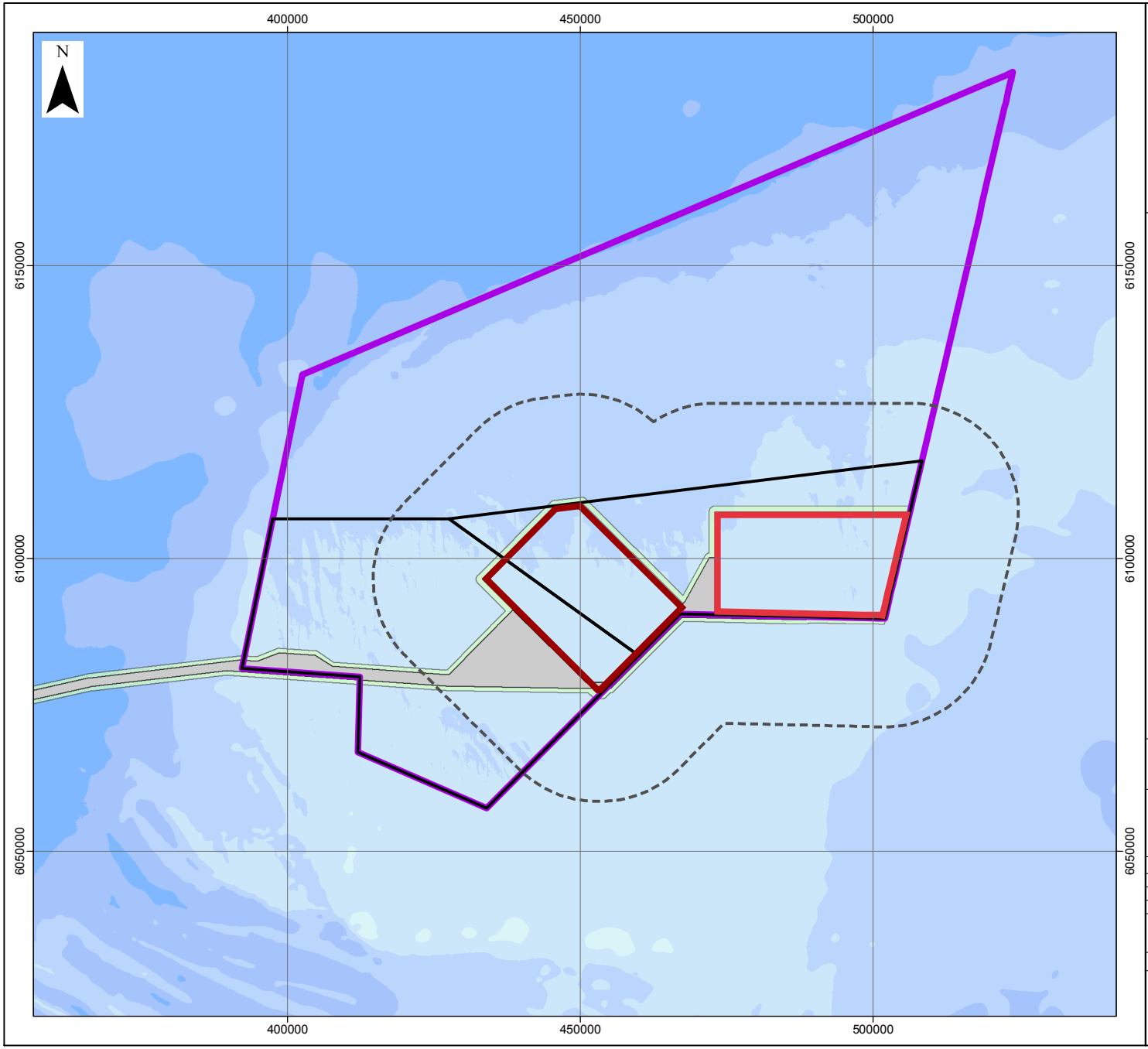
3.1.5. Dogger Bank Teesside A & B are located approximately 89nm (164.9km) east of the Yorkshire coast at their nearest point. The total area of Dogger Bank Teesside A is approximately 163.1nm^2 (560.1km^2) and the total area of Dogger Bank Teesside B is approximately 173.9nm^2 (593.1km^2) (see **Figure 3.1**). Water depths range from approximately 21m to 32m.

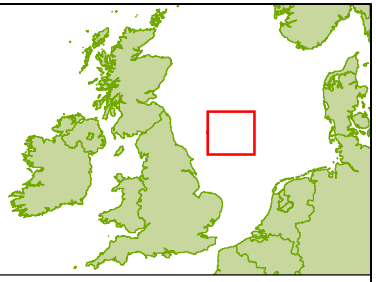
3.1.6. The proposed Dogger Bank Teesside A & B Export Cable Corridor runs from Dogger Bank Teesside A & B to a landfall site between Redcar and Marske-by-the-Sea, south of the River Tees (see **Figure 3.2)**. Water depths range from 0m close to shore to approximately 80m at 90km offshore. Between the shore and the Dogger Bank, the depth decreases when approaching the Dogger Bank.

3.1.7. With respect to the cumulative impact assessment (CIA) (**Chapter 33 Cumulative Impact Assessment**), the Study Area requires a consideration of the impacts arising from Dogger Bank Teesside A & B with other offshore wind farm developments within the southern North Sea. Cumulative navigation issues have been assessed as part of the Southern North Sea Offshore Wind Forum (SNSOWF) remit. The Round 3 Zones in this region (Dogger Bank, Hornsea and East Anglia) established the SNSOWF to extend the principles of the Zone Appraisal and Planning (ZAP) process beyond the boundaries of their

respective zones to help manage wider cumulative effects between these zones. An overview of this work in relation to shipping and navigation is detailed in Section 5 of the NRA (**Appendix 16A**).

3.1.8. The impact on shipping and navigation from Dogger Bank Teesside A & B, the Dogger Bank Teesside A & B Export Cable Corridor and other existing or proposed offshore users/projects in the vicinity which may be relevant to the shipping and navigation assessment was also considered as part of the CIA.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer

0 10 20
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 3.1 Dogger Bank Teesside A & B study area (10nm (18.5km) buffer)

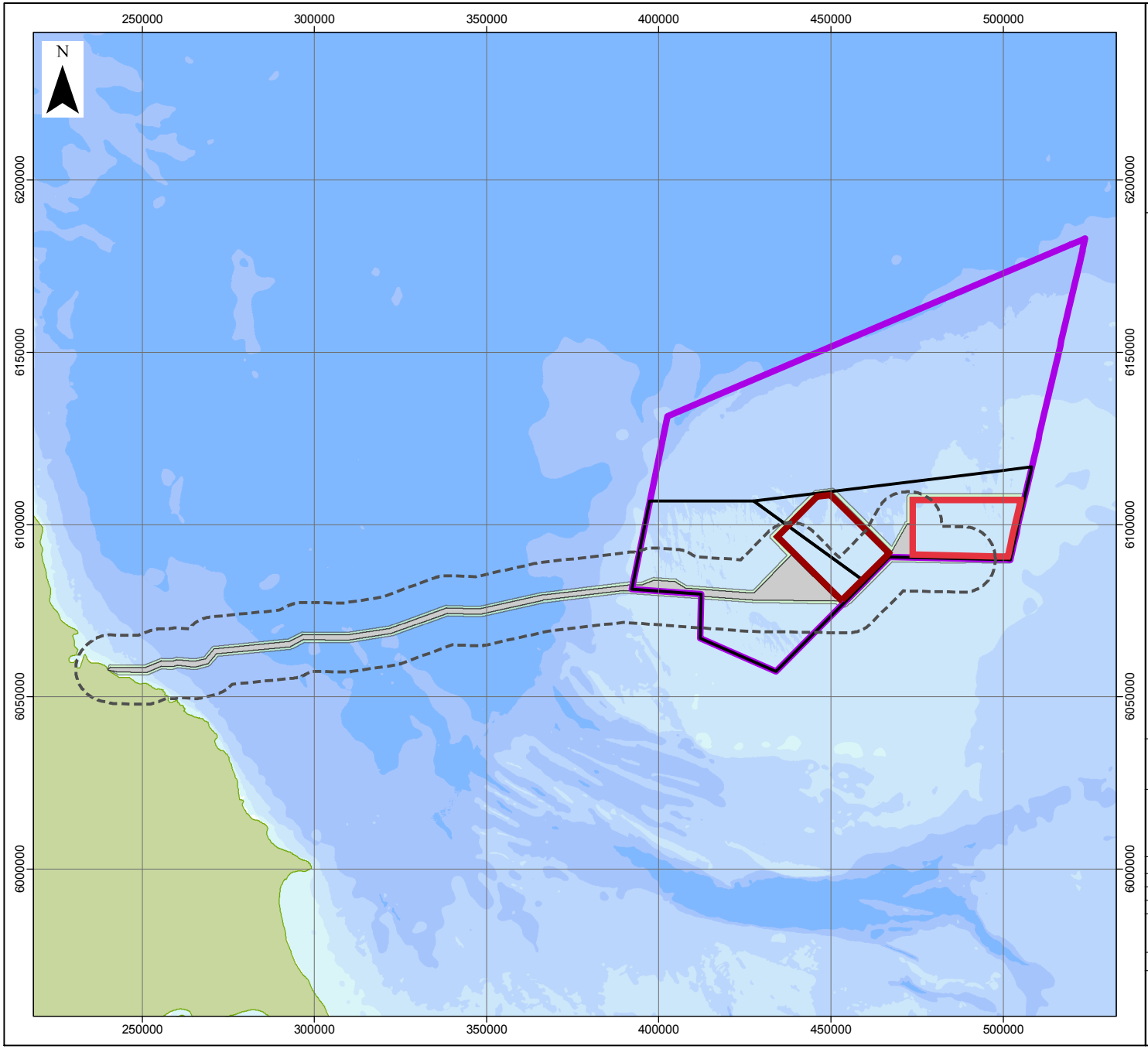
VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

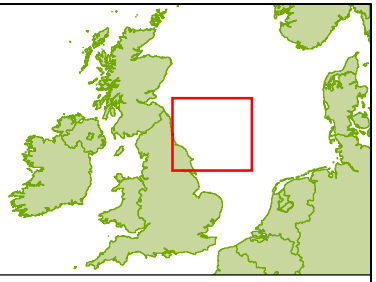
DRAWING NUMBER:

F-OFL-MA-584

SCALE	1:1,000,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Export cable corridor 5nm buffer

0 20 40
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 3.2 Export cable corridor study area (5nm (9.3km) buffer)

VER	DATE	REMARKS	Drawn	Checked
1	10/07/2013	Draft	FK	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-585**

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

3.2. Characterisation of the existing environment – methodology

3.2.1. The existing environment for shipping activity was defined using a range of different data sources, including site-specific AIS and radar data collected on-site by survey vessels. A full list of all data sources used to characterise the existing environment is provided below:

- Marine Traffic Survey Data – 28 Days winter 2011/12 (November 2011 – January 2012) using the vessel Vigilant;
- Marine Traffic Survey Data – 14 Days spring/summer (May – June 2012) using the vessels Tridens-1 and Vigilant;
- Marine Traffic Survey Data – 14 Days spring (10 – 25 April 2013) using vessels Vigilant and Jubilee Spirit;
- Shore based AIS data collection 1 – 7 April 2013;
- Fishing surveillance satellite data from the Marine Management Organisation (MMO) (2009) which was converted to fishing vessel density grid;
- Maritime Incident Data from Marine Accident Investigation Branch (MAIB) (2001 –2010) and Royal National Lifeboat Institution (RNLI) (2001 – 2010);
- Marine aggregate dredging data (licence areas and active areas) and transit routes from The Crown Estate and British Marine Aggregate Producers Association (BMAPA);
- Oil and gas platforms (UK Deal);
- Admiralty Sailing Directions – North Sea (West) Pilot, NP 54 (United Kingdom Hydrographic Office (UKHO) 2009);
- UK Admiralty Chart 2182B, 1191-0 and 1190-0; and
- UK Coastal Atlas of Recreational Boating, 2009 and 2010 GIS Shapefiles (RYA 2010).

3.2.2. The AIS surveys for the Dogger Bank Zone were carried out by the Vigilant, Tridens-1 and Jubilee Spirit.

3.2.3. The AIS surveys for the Dogger Bank Teesside A & B Export Cable Corridor were carried out by the vessels, Vigilant and Tridens-1 during bird, mammal, geophysical and geotechnical survey work in the area. The data collected from these vessels were supplemented by other AIS data available from coastal and offshore stations

3.3. Assessment of impacts - methodology

3.3.1. The following sections provide an overview of the process of assessing the risks to navigational receptors and how the outputs of the NRA were carried forward to assess the significance of the effect.

3.3.2. Although commercial fishing related impacts are considered in more detail within **Chapter 15 Commercial Fisheries**, there are navigational and safety risks to commercial fishing vessels that have been identified and, therefore, considered within this chapter.

3.3.3. As set out in Section 2, in order to understand stakeholder expert opinion and local knowledge, a hazard workshop was initiated to create and capture a hazard log that was specific to the NRA Study. The hazard log identified direct or indirect hazards relating to the development of Dogger Bank Teesside A & B and the Dogger Bank Teesside A & B Export Cable Corridor, along with the level of risk associated with the hazard.

3.3.4. The hazard log (see Appendix C of **Appendix 16A**) also identified embedded and additional mitigation measures required to show that the residual risk of the hazards associated with the Dogger Bank Teesside A & B are Broadly Acceptable or Tolerable on the basis of ALARP. This information was then fed into the Formal Safety Assessment (FSA) process to identify impacts associated with the development.

3.3.5. The IMO FSA process (IMO 2002) is the process that has been applied to the NRA. This is a structured and systematic methodology based on risk. As part of the FSA, the impact of Dogger Bank Teesside A & B was considered against the existing environment data sets outlined in paragraph 3.2.1.

3.3.6. The receptors referred to in this chapter are considered to include the owners and operators of fishing vessels, recreational and commercial vessels.

3.3.7. The methodology used in assessing the magnitude, sensitivity and significance of an impact in this section is slightly different to that set out in **Chapter 4 EIA Process** of this ES.

3.3.8. Determining the overall magnitude (see **Table 3.1**) of shipping and navigation effects incorporates a degree of subjectivity, as decisions are based on expert judgement in combination with baseline data and assessments already undertaken in the NRA.

3.3.9. It should be noted that the descriptions given below are examples of what could constitute each level of magnitude. Therefore, not all of the examples given against each level of magnitude will necessarily apply. This is also the case for the definitions of sensitivity given in **Table 3.2**.

Table 3.1 Description of magnitude

Magnitude of effect	Description
Negligible	Minor temporary deviation of shipping routes; Temporary impact on current area of construction or limited project area; Exceptionally unlikely probability of occurrence; or Very low degree of change relative to the baseline.
Low	Minor permanent or temporary deviation of shipping routes; Temporary impact on receptors in Dogger Bank Teesside A & B development area; Unlikely or very unlikely probability of occurrence; or Low degree of change relative to the baseline.

Magnitude of effect	Description
Medium	Permanent or temporary deviation of shipping routes; Permanent impact on receptors in Dogger Bank Teesside A & B development area; About as likely as not probability of occurrence; or Medium degree of change relative to the baseline.
High	Permanent deviation or large temporary deviation of shipping routes (i.e. the impacts can be managed by the operators without mitigation); Permanent impact on receptors in Dogger Bank Teesside A & B and vicinity i.e. southern North Sea; Very likely or likely probability of occurrence; or High degree of change relative to the baseline.
Very High	Permanent and large deviation of shipping routes including international operators on shipping routes (i.e. the impacts cannot be managed by the operator without mitigation); Permanent impact on receptors in North Sea area; Virtually certain of occurrence; or Very high degree of change relative to the baseline.

3.3.10. Tolerance/sensitivity for shipping and navigation is difficult to assess. The sensitivity of a receptor to an impact is dependent on the type of operation that receptor undertakes. For example, a commercial vessel operator may be affected by a deviation whilst on a port to port transit via the Dogger Bank area which could result in a time delay, where as a commercial fishing vessel bound to a fishing ground within or near Dogger Bank would not be similarly affected (see **Table 3.2**).

3.3.11. In the majority of cases the receptors in this chapter have high or very high sensitivity due to the possibilities of vessel damage and injury of personnel or loss of life.

Table 3.2 Definition of terms relating to the sensitivity of generic receptors

Sensitivity of receptor	Description
Negligible	Minor temporary effects on tolerance, but not resulting in damage to vessels or injury to personnel; Negligible level of commercial impact; or Full ability to adapt to new effect.
Low	Limited permanent or temporary effects on tolerance, but not resulting in damage to vessels or injury to personnel; Low level of commercial impact; or Ability to adapt to majority of new effect.
Medium	Permanent or temporary effects on tolerance, resulting in minor damage to vessel or structure; Medium level of commercial impacts potentially resulting in permanent effects on business operations; or Ability to adapt to new effect.
High	Permanent or temporary effects on tolerance, resulting in injury to personnel and/or damage to vessel or structure; High level of commercial impacts potentially resulting in permanent effects on business operations; or Limited ability to adapt to new effect.

Sensitivity of receptor	Description
Very High	Permanent or temporary effects on tolerance, resulting in loss of life, injury to personnel and/or serious damage to vessel or structure; Very high level of commercial impacts potentially resulting in permanent effects on business operations; or Very limited ability to adapt to new effect.

3.3.12. Significance of impact has been determined through the comparison of predicted magnitude of effect and the sensitivity of the shipping and navigation receptor to that effect. **Table 3.3** illustrates the impact matrix used to assess the significance of impact.

Table 3.3 Overall significance of impact resulting from each combination of receptor sensitivity and magnitude of effect

Receptor sensitivity	Magnitude of effect				
	Very High	High	Medium	Low	Negligible
Very High	Major	Major	Moderate	Moderate	Minor
High	Major	Moderate	Moderate	Minor	Minor
Medium	Moderate	Moderate	Minor	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

3.3.13. Potential impacts identified within the NRA as ‘Major’ or ‘Moderate’ are regarded as significant in terms of the EIA regulations and have been avoided or reduced through mitigation, where possible.

4. Existing Environment

4.1. General

4.1.1. The dominant wind direction is south westerly, with a mean wind speed (at 10m based on one hour averages) of 8.5m/s; while the maximum wind speed recorded was 30.6m/s, from the period 1958 – 2008 (Statoil 2011).

4.1.2. The projects are situated in an open location, exposed to relatively high wave energy. The predominant wave direction is from the north, with the mean and maximum significant wave heights of 1.71m and 10.6m respectively (Statoil 2011).

4.1.3. Historically, visibility has been shown to have a major influence on the risk of ship collision. The annual average probability of bad visibility for the UK North Sea is approximately 3% of the year (UKHO 2009).

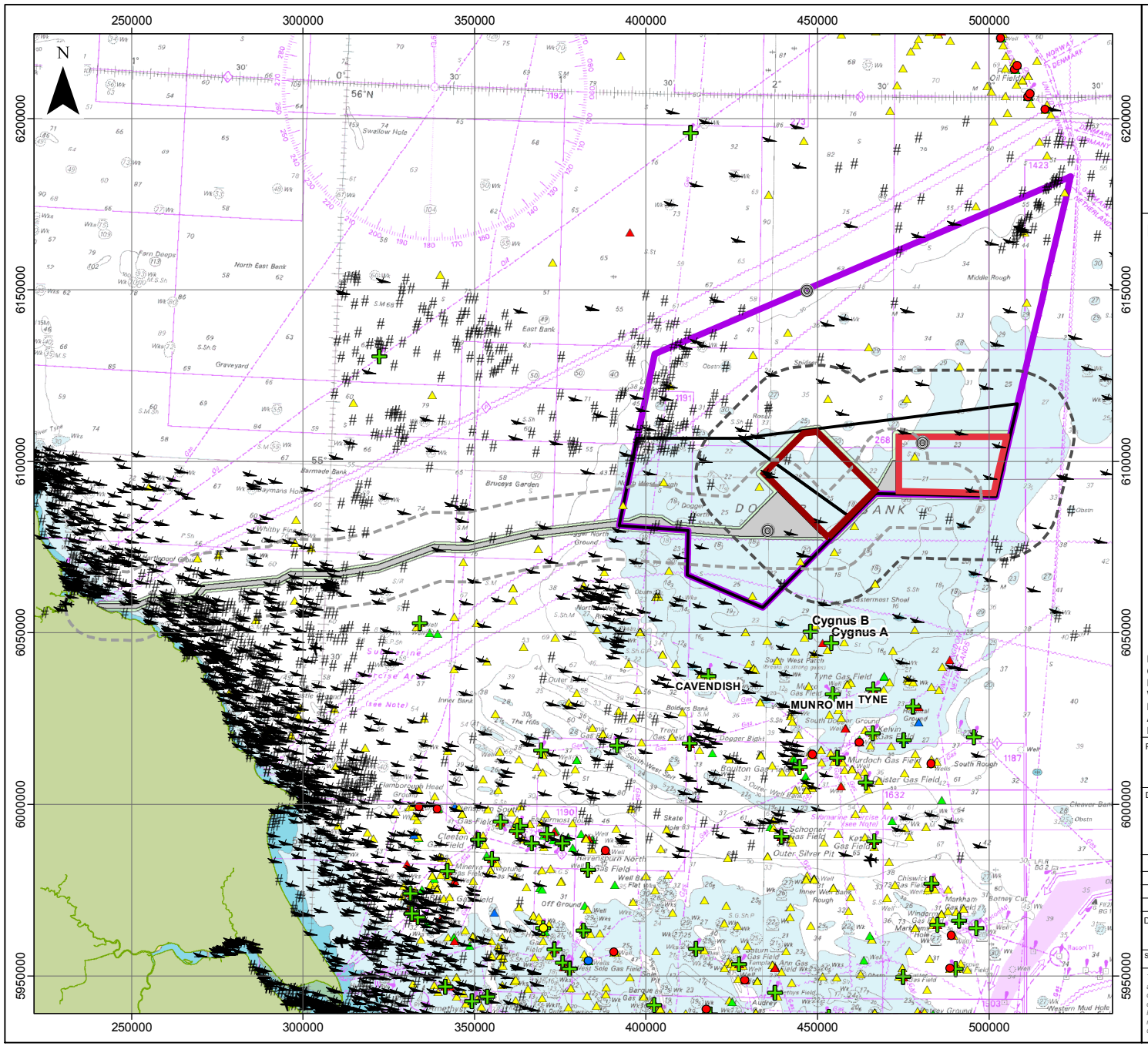
4.1.4. The tidal currents in and around Dogger Bank Teesside A & B are relatively weak, with a maximum value of 0.58 – 0.97 knots (0.3 – 0.5m/s) and are spatially variable in direction. Using Admiralty Chart 2182B, the tidal diamond "P", approximately 40nm (74.1km) south of Dogger Bank Teesside A indicates that currents in the area set in a generally south east to north east direction on the flood and north west to south west on the ebb. A peak spring tidal rate of 0.6 knots (0.3 m/s) and peak neap rate of 0.3 knots (0.15m/s) have been identified.

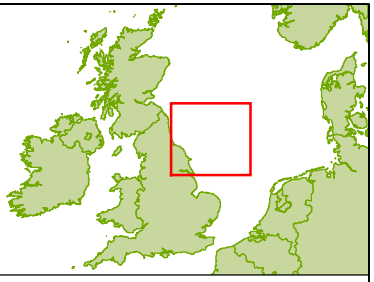
4.2. Navigational features

4.2.1. There are a number of navigational features in proximity to the Study Area and the Dogger Bank Teesside A & B Export Cable Corridor.

4.2.2. The following were identified within the NRA Study Area (see **Figure 4.1**):

- One oil and gas well is located within Dogger Bank Teesside A: towards the north western corner of the development boundary. A number of wells fall within the buffer zone surrounding Dogger Bank Teesside A & B sites and within the Dogger Bank Teesside A & B Export Cable Corridor; and
- There is one charted wreck in Dogger Bank Teesside A and one lying on the northern boundary of Dogger Bank Teesside A. The chart shows a relatively high concentration of wrecks to the south of the area where the Dogger Bank Teesside A & B Export Cable Corridor joins the Dogger Bank Zone.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer
- Obstruction
- Wreck
- Wreck - Aircraft
- Buoy
- Offshore platform

Oil & gas well

- Completed
- Drilling
- Plugged & abandoned
- Suspended

Subsurface infrastructure

- Debris
- Manifold
- Pipe junction
- Protection
- Template
- Wellhead

0 20 40
Kilometres

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.1 Navigational features relative to Dogger Bank Teesside A & B 10nm (18.5km) buffer

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-588**

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

4.2.3. Although there are no surface platforms within Dogger Bank Teesside A & B, a number of oil and gas platforms are worth noting, the closest platforms are:

- Cavendish platform approximately 28nm (51.9km) south west of Dogger Bank Teesside B;
- Munro platform approximately 24nm (44.5km) south of Dogger Bank Teesside B;
- Tyne platform approximately 24nm (44.5km) south of Dogger Bank Teesside A & B; and
- Although no fixed position is known at the time of assessment, the Katy platform is expected to be located approximately 33nm (61.2km) south of Dogger Bank Teesside A.

4.2.4. The planned Cygnus gas field development which, comprises Cygnus Alpha platform (16.3nm (30.2km) south from Dogger Bank Teesside B) and Cygnus Bravo platforms (18.6nm (29.5km) south from Dogger Bank Teesside A).

4.2.5. There is an aggregate dredging application area (Area 466/1) approximately 15nm (27.8km) to the north west of Dogger Bank Teesside B, licenced to CEMEX UK Marine Ltd. There are also application areas (Area 485/1 and 485/2) approximately 17.7nm (32.8km) south of the Dogger Bank Teesside A & B Export Cable Corridor, 29.1nm (54km) south west of Dogger Bank Teesside B.

4.2.6. The proposed BMAPA transit routes associated with these application areas were generated to assist developers when considering the potential transit routes to ports from production areas. It should be noted these are estimates and are not actual vessel tracks.

4.2.7. The BMAPA passage plans of dredgers show that no potential routes intersect Dogger Bank Teesside A & B when transiting to and from 466/1.

4.2.8. A number of routes from application Areas 466/1 and 485 cross the Dogger Bank Teesside A & B Export Cable Corridor (Figure 11.7, Section 11, in **Appendix 16A**).

4.2.9. Marine Environmental High Risk Areas (MEHRAs) are areas that have been identified by the UK Government as areas of environmental sensitivity and at high risk of pollution from ships. The MEHRA in closest proximity to the Dogger Bank Teesside A & B Export Cable Corridor is the Tees MEHRA. This MEHRA is located approximately 1.1nm (2km) north west of the Dogger Bank Teesside A & B Export Cable Corridor and was designated on wildlife, landscape and geological grounds.

4.2.10. In December 2007, the Strategic Environmental Assessment (SEA) of up to 25GW worth of wind farm offshore sites for Round 3 development was initiated. These proposed sites are in addition to the 8GW worth of sites already awarded in the 2 earlier rounds of site allocations, Round 1 in 2001 and Round 2 in 2003. There are a number of offshore wind farm development sites in the vicinity of the Dogger Bank Zone.

4.2.11. Hornsea and East Anglia Round 3 Zones lie south of Dogger Bank Teesside B, at approximately 51nm (94.5km) and 99.5nm (184.4km) respectively. There are also a number of Round 2 offshore wind farm sites to the south of the zone.

4.2.12. The Teesside Round 1 site is approximately 107nm (198km) west-south-west of Dogger Bank Teesside B and approximately 2.5nm (4.6km) north west of the proposed Dogger Bank Teesside A & B Export Cable Corridor, and Blyth Demonstration site is approximately 112nm (207.5km) west-north west of Dogger Bank Teesside B.

4.3. Shipping analysis

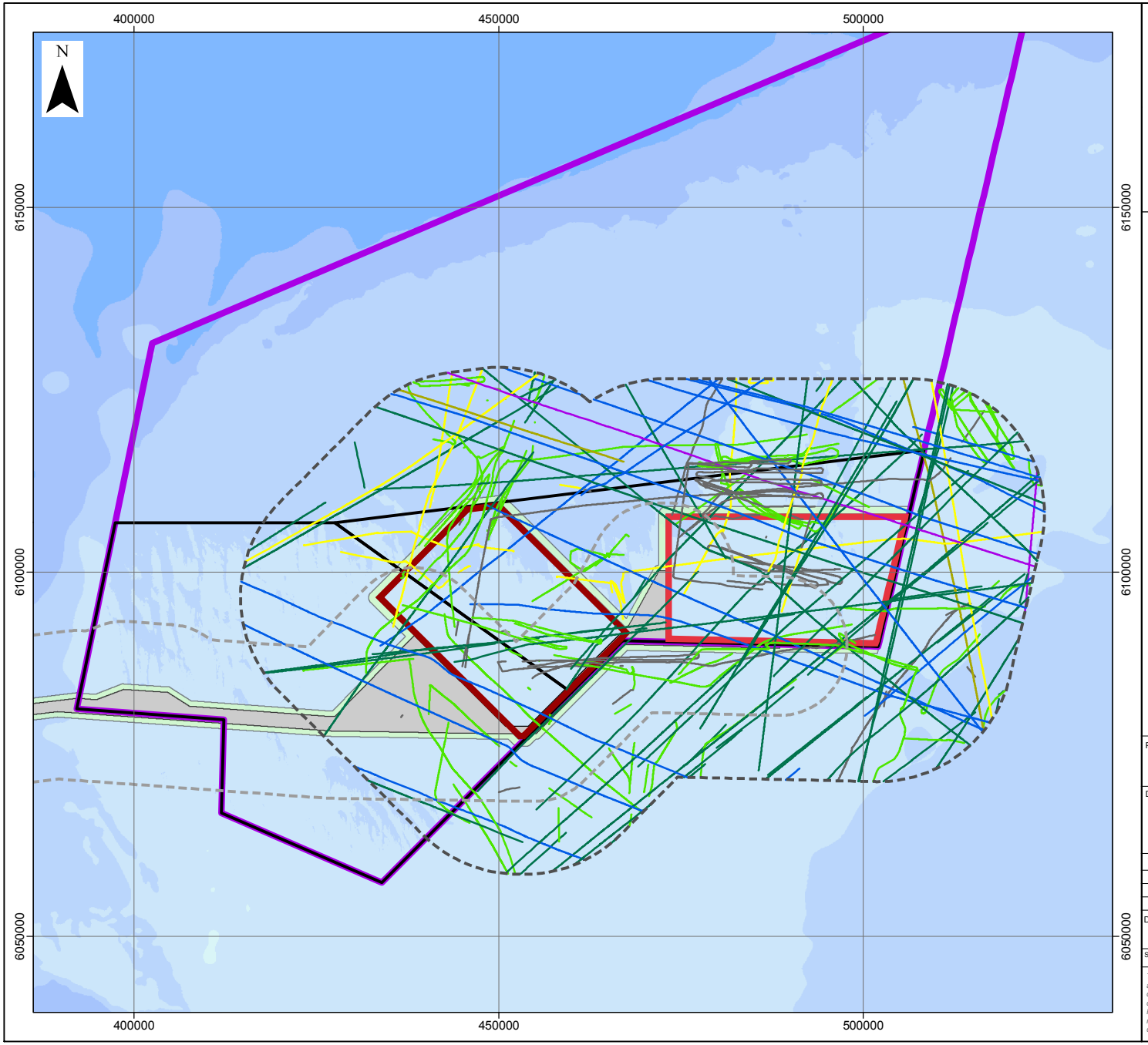
Dogger Bank Teesside A & B

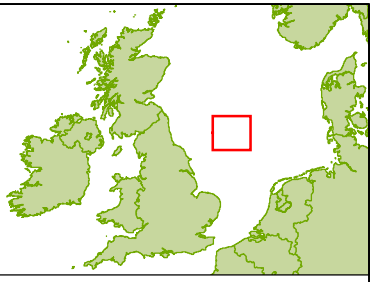
4.3.1. This section presents marine traffic survey data within 10nm of Dogger Bank Teesside A & B, recorded by AIS and Radar (28 days in winter 2011 / 2012 and 14 days in spring / summer 2012 and 14 days in spring 2013).

4.3.2. The majority of vessels were recorded on AIS. AIS is now fitted on all commercial ships operating in UK waters over 300 Gross Register Tonnage (GRT) engaged on international voyages, over 500 GRT on domestic voyages, passenger vessels carrying 12 or more persons and fishing vessels over 45m. Small vessels not carrying AIS have been captured by Radar and visual observations where possible.

4.3.3. Plots of the AIS and Radar vessel tracks recorded during a 28 day survey period in winter 2011/2012 and a 28 day survey period in spring/summer 2012 and spring 2013, thematically mapped by vessel type, are presented in **Figure 4.2** and **Figure 4.3** (colour coded by vessel type).

4.3.4. A number of tracks recorded during the survey periods were classified as temporary (non-routine), such as the tracks of the survey vessels and other vessels engaged in survey work. These tracks have therefore been excluded from further analysis. Oil & Gas vessels supporting permanent installations were retained in the analysis





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

AIS 14 days spring summer 2012

Vessel type

- Cargo
- Fishing
- Other
- Passenger
- Tanker
- Tug
- Unspecified

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.2 AIS and radar data excluding temporary traffic (14 days spring/summer 2012)

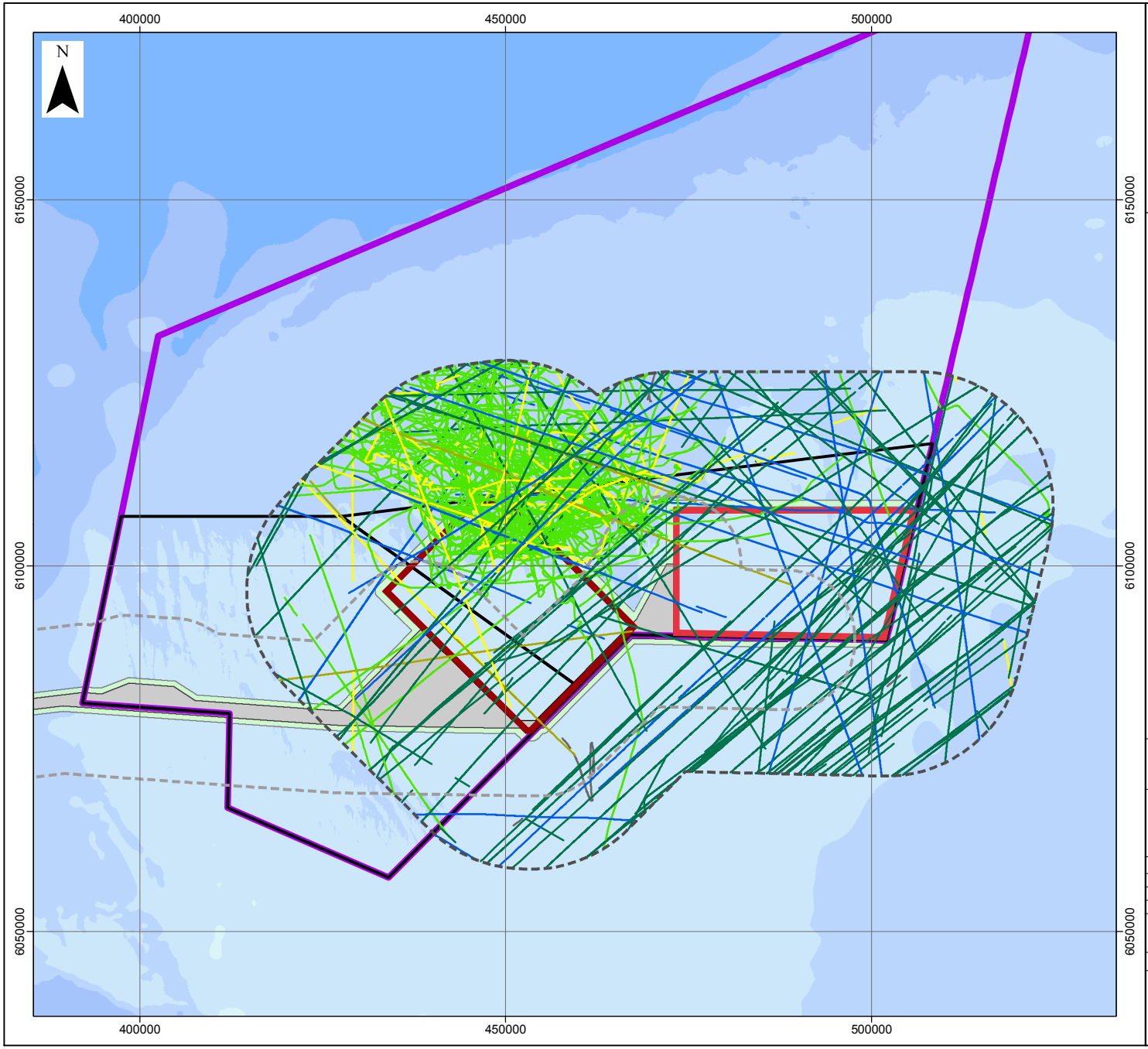
VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
1	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

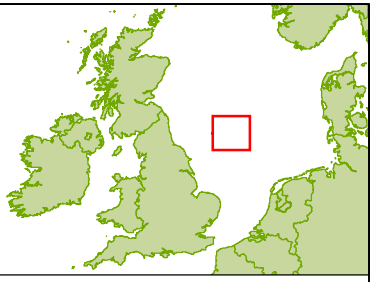
DRAWING NUMBER:

F-OFL-MA-586

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

AIS 28 days autumn winter 2011/2012

Vessel type

- Cargo
- Fishing
- Other
- Tanker
- Tug
- Unspecified

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.3 AIS data excluding temporary traffic (28 days autumn/winter 2011/2012)

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-587**

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Vessel type

4.3.5. The average number of vessels recorded on AIS and Radar per day passing within 10nm of Dogger Bank Teesside A & B was seven vessels during the winter 2011/2012 survey period and ten vessels during the spring/summer 2012 survey period. In terms of vessels actually intersecting Dogger Bank Teesside A, there were approximately one to two vessels per day during winter 2011/2012 and approximately three during spring/summer 2012. The average number of vessels recorded on AIS and Radar intersecting Dogger Bank Teesside B was two to three vessels per day during both winter 2011/2012 and spring/summer 2012.

4.3.6. The busiest days during the 28 day winter 2011/2012 survey were 11 and 12 November 2011 when 21 vessels were recorded within 10nm (18.5km) of Dogger Bank Teesside A & B. The busiest day during the 14 day spring/summer 2012 survey period was 26 June 2012 when 15 vessels were recorded (see **Appendix 16A**).

4.3.7. The busiest day in terms of fishing vessel activity was 11 November 2011 when 15 vessels were recorded within the 10nm (18.5km) buffer around Dogger Bank Teesside A & B.

4.3.8. Analyses of the vessel types recorded within the 10nm (18.5km) buffer around Dogger Bank Teesside A & B during the two survey periods are presented in **Figure 4.4** and **Figure 4.5**. This excludes types which were unspecified. In winter 2011/2012, 2% of vessels were unspecified, with 12% in spring/summer 2012.

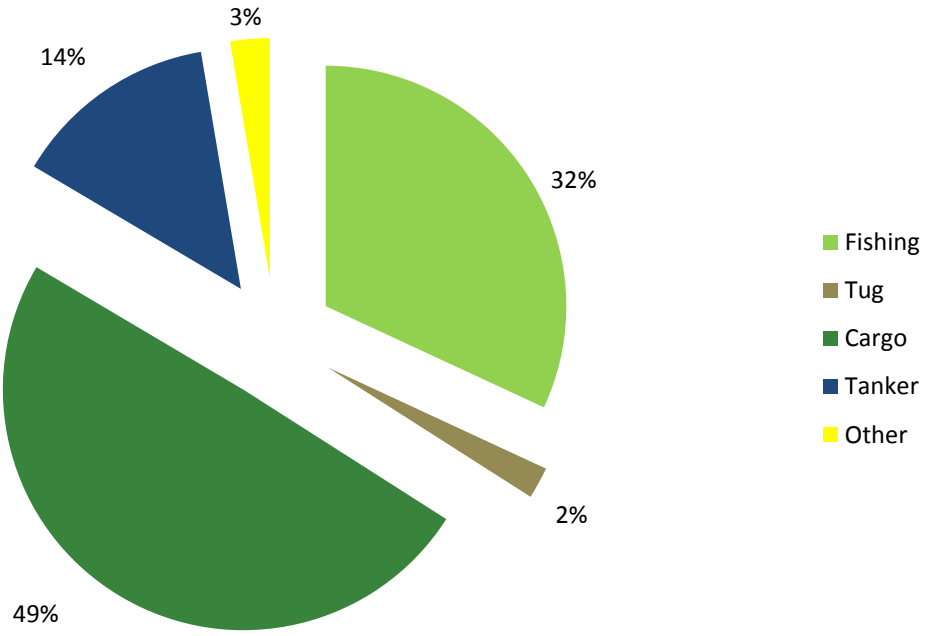


Figure 4.4 Vessel types identified within 10nm (18.5km) buffer (28 Days winter 2011/2012)

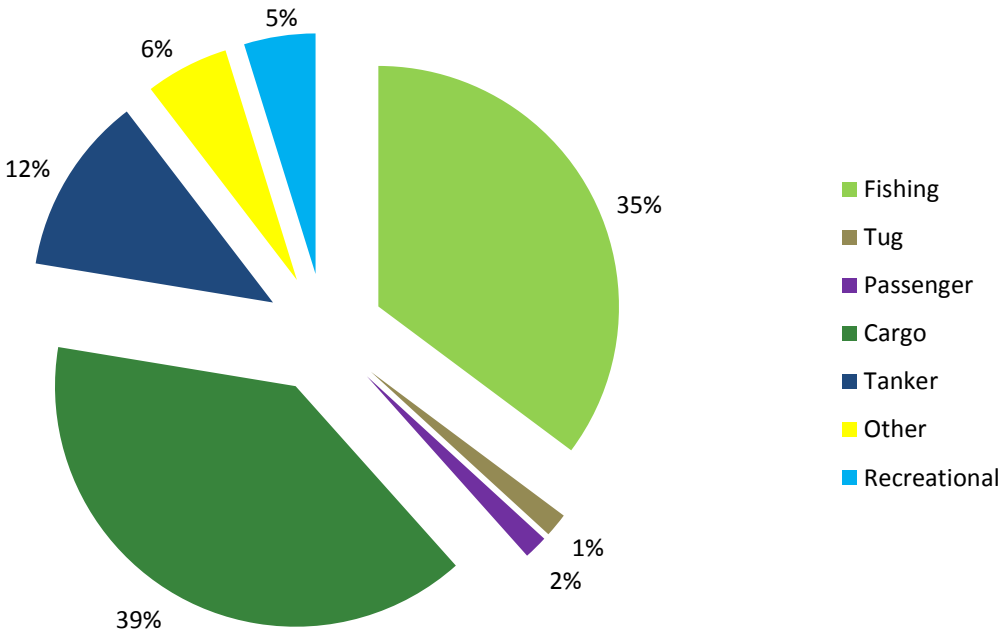


Figure 4.5 Vessel Types within 10nm (18.5km) Buffer (14 Days spring/summer 2012)

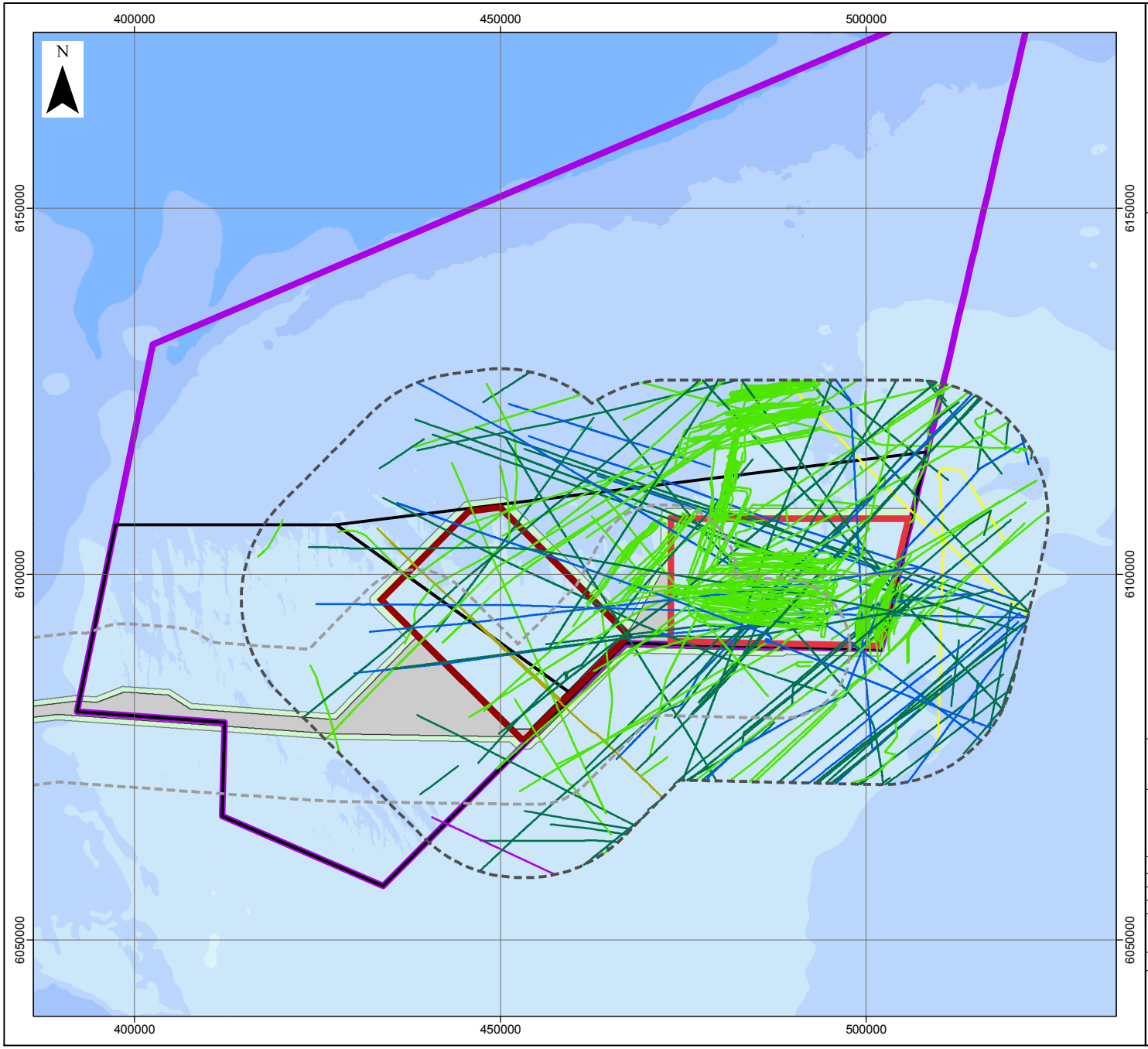
4.3.9. In winter 2011/2012, 49% of the vessels recorded were cargo vessels, 32% were fishing vessels and 14% were tankers. In summer 2012, cargo vessels accounted for 39% of the vessels recorded, with fishing vessels comprising 35% of traffic and tankers 12%.

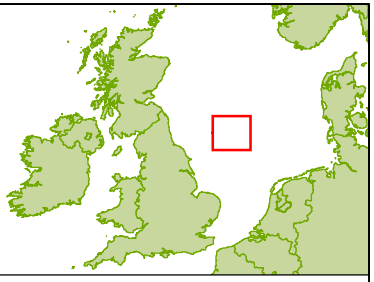
4.3.10. Additional marine traffic survey data (AIS and Radar,) was collected in 14 days in spring 2013 to add to the data collected in 2011 and 2012 (see **Figure 4.6**). The data was collected within 10nm (18.5km) of Dogger Bank Teesside A & B. A number of tracks recorded during the survey periods were classified as temporary traffic, such as the tracks of the survey vessels. These tracks have been excluded from further analysis.

4.3.11. The average number of vessels (excluding temporary traffic) recorded on AIS and Radar per day passing within 10nm (18.5km) of Dogger Bank Teesside A & B was ten vessels throughout the survey period. The busiest day recorded during the survey period was 23 and 25 April 2013, when 18 vessels were recorded. The quietest full days were 14 and 21 April 2013, when five vessels were recorded.

4.3.12. In terms of vessels actually intersecting Dogger Bank Teesside A, there were approximately four vessels per day. The busiest day was also 23 April 2013, when 11 vessels were recorded intersecting the site boundary. The quietest full day was also 14 April 2013, when no vessels were recorded.

4.3.13. The average number of vessels recorded on AIS and Radar intersecting Dogger Bank Teesside B was two to three vessels per day. The busiest day was 25 April 2013, when seven vessels were recorded. The quietest full days were 10, 12, 13, 14 and 19 April 2013, when no vessels were recorded.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

AIS 14 days spring 2013

Vessel type

- Cargo
- Fishing
- Other
- Passenger
- Tanker
- Tug

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.6 AIS and radar data excluding temporary traffic (14 days spring 2013)

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

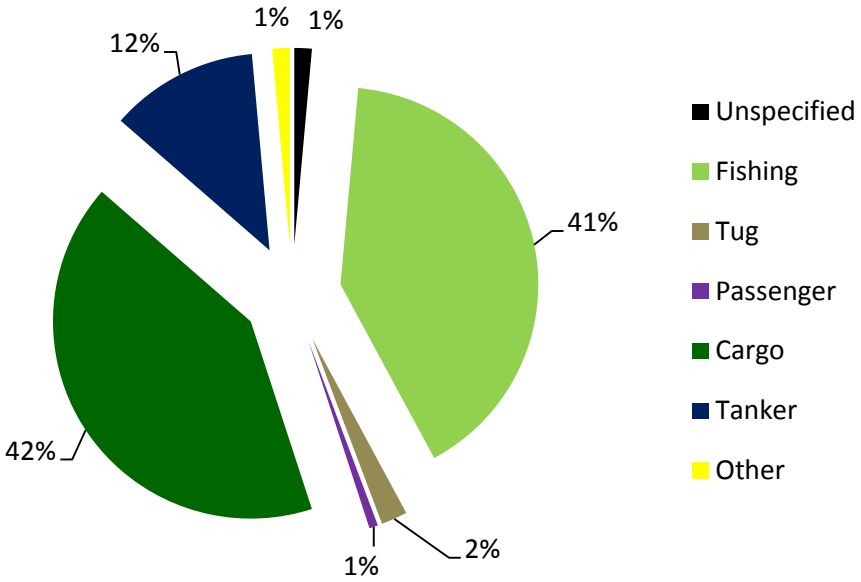
DRAWING NUMBER: **F-OFL-MA-589**

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

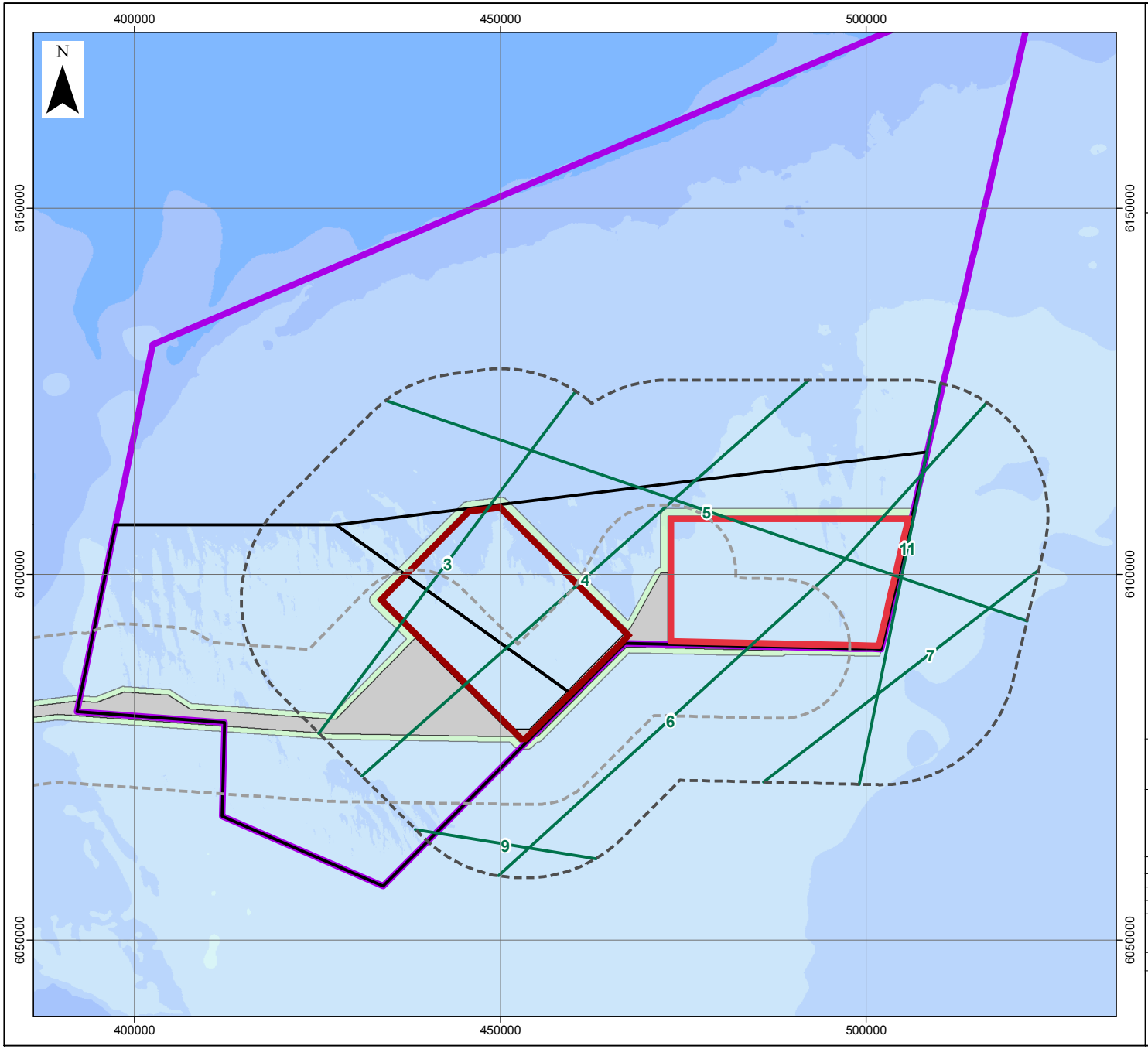
4.3.15. **Figure 4.7** represents the analyses of vessel types recorded within the 10nm (18.5km) buffer around Dogger Bank Teesside A & B during this survey period.

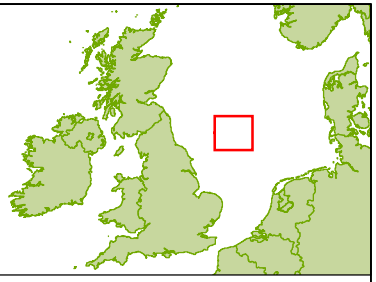
Figure 4.7 Vessel Types within 10nm (18.5km) Buffer (14 Days spring 2013)



4.3.16. Throughout the survey period, 41% of the vessels recorded were fishing vessels, 42% were cargo vessels and 12% were tankers.

4.3.17. In total, 11 main commercial vessel routes have been identified as transiting within 10nm (18.5km) of the Dogger Bank Zone, seven of which intersect the buffer around Dogger Bank Teesside A & B. A brief description of the traffic on each of the seven routes is given in **Figure 4.8** and **Table 4.1**.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Dogger Bank Teesside A & B Export Cable Corridor 5nm buffer
- Main route

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.8 Main routes intersecting the Dogger Bank Teesside A & B (1.5km) buffer

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-590**

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Table 4.1 Description of the seven main routes identified which intersect Dogger Bank Teesside A & B 10nm (18.5km) buffer, separated from the ten main routes identified which intersect the Dogger Bank Zone.

Route number	Route description	Vessel numbers	Vessel types
3	Immingham, UK and Egersund, Norway	One vessel every 13 days	Vessels on this route consist of cargo vessels and tankers.
4	Hull/Grimsby, UK and Helsinki, Finland	One vessel every 12 days	The majority of vessels on this route are cargo vessels.
5	Forth, UK and Germany	One vessel every six days	Cargo, Tanker
6	Immingham, UK and Moss, Norway	One vessel every three days	Vessels on this route mainly comprise cargo vessels and tankers
7	Humber, UK and Baltic	One vessel every day	Cargo, Tanker
9	Newcastle, UK and Hamburg, Germany	One vessel every 13 days	The majority of vessels on this route are cargo vessels.
11	Thames, UK and Norway	One vessel every nine days	The majority of vessels on this route are cargo vessels.

4.3.18. The most frequently used route (Route 7) is that between the Humber, UK and Baltic with Cargo vessels and Tankers, transiting through the south of the Dogger Bank Teesside A & B buffer zone, once a day.

Recreational vessel activity

4.3.19. Recreational vessel activity around the UK is highly seasonal and highly diurnal (RYA 2009).

4.3.20. Based on data presented in the UK Coastal Atlas of Recreational Boating (RYA 2009), two routes, classified as “medium use recreational routes”, transect the Dogger Bank Zone, with one intersecting the southern corner of Dogger Bank Teesside B. This route can be described as a “popular route” on which some recreational craft will be seen at most times during the summer daylight hours and has been defined by the RYA and the Cruising Association (CA).

4.3.21. Six recreational vessels were recorded on AIS and Radar during the survey, all of which were identified as being yachts. Four of these yachts intersected the boundary of Dogger Bank Teesside A, with none recorded within the boundary of Dogger Bank Teesside B (see **Appendix 16A**).

4.3.22. The biennial North Sea Triangle Challenge takes place during June of every odd year. Recreational vessels race between Den Helder in The Netherlands, Lerwick in Shetland and Farsund in Norway, with the race then finishing back in Den Helder. The likely route of the race between these locations could potentially pass through the Dogger Bank Zone but this depends largely on the weather and tidal conditions at the time of the race.

Fishing vessel activity

4.3.23. The AIS and radar surveys recorded fishing activity throughout the 10nm (18.5km) buffer and within the boundary of Dogger Bank Teesside A & B (**Figure 4.9** and **4.10**). It should be noted that the AIS data may be an underestimate of fishing activity in this area, as it only records fishing vessels of >45ft (15m), and it is also possible that AIS may be switched off during fishing. The radar data are also likely to be an underestimation of the level of fishing activity in the area due to the fact that many of the 'unspecified' vessels are also likely to be fishing vessels (see Section 18; **Appendix 16A**).

4.3.24. The busiest day in terms of fishing vessel activity was 11 November 2011 when 15 vessels were recorded within the 10nm (18.5km) buffer around Dogger Bank Teesside A & B (see **Appendix 16A**).

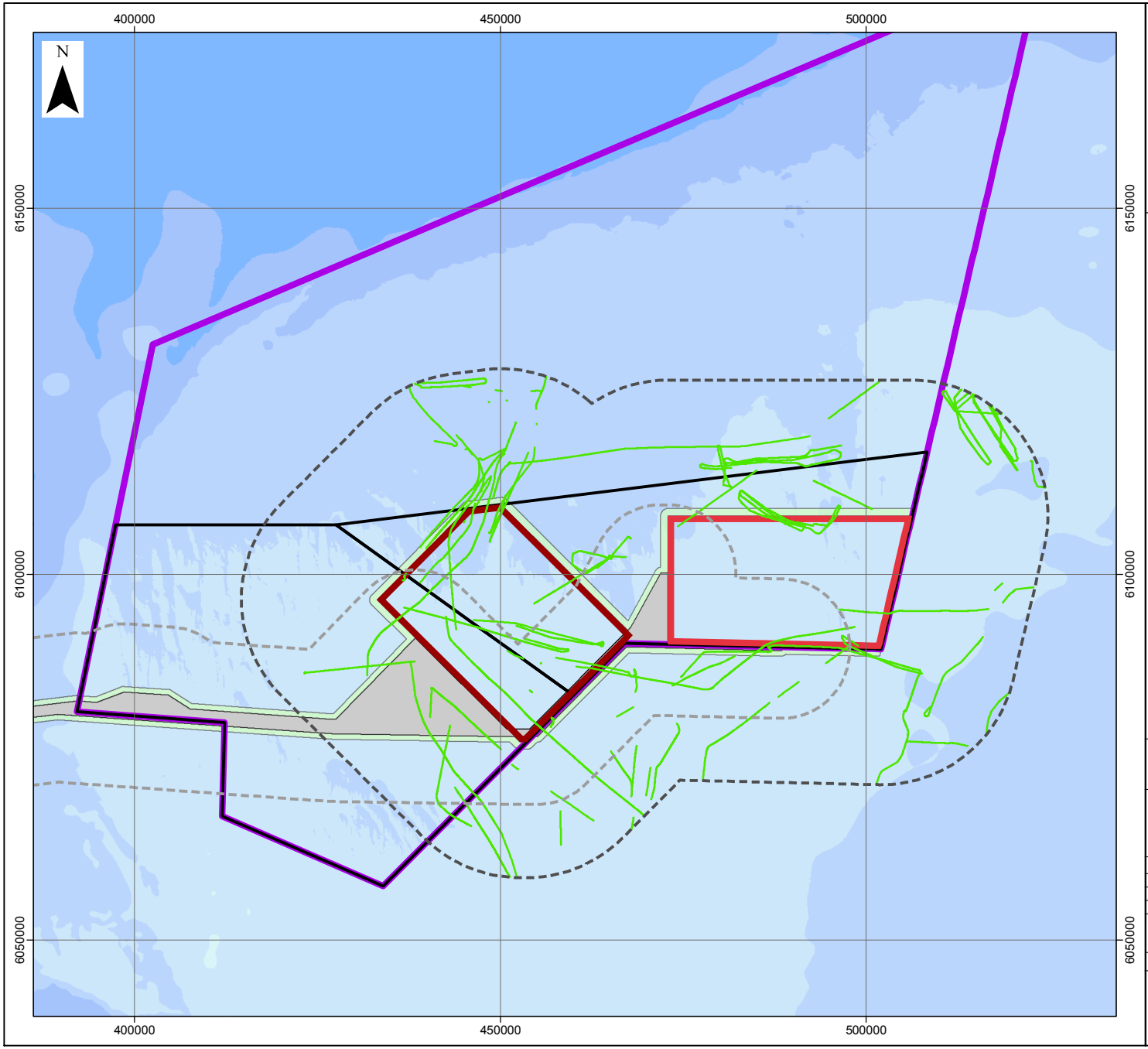
4.3.25. In spring 2013, the level of fishing activity was greatest throughout the final four days of the survey (22 – 25 April 2013). The busiest day was 23 April 2013 when 12 vessels were recorded within the 10nm (18.5km) buffer around Dogger Bank Teesside A & B (see **Appendix 16A**).

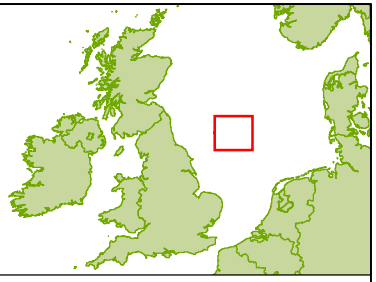
4.3.26. High levels of sandeel fishing activity occur within certain areas of the Dogger Bank, with one of the areas of most concentrated activity being to the north west of Dogger Bank Teesside B, on the western boundary of the Dogger Bank Zone. Analysis of data for the area has shown that up to 11 vessels can be in the Dogger Bank Teesside A & B areas within one day (excluding those vessels which disable their AIS whilst fishing). **Figure 4.11** presents AIS data of fishing vessels within a 10nm (18.5km) buffer around the Dogger Bank Zone (during the sandeel fishing season) to highlight the area where sandeel fishing is concentrated (see **Chapter 15**).

4.3.27. Data on the activity of fishing vessels of 15m in length and over can also be obtained via satellite tracking which interrogates on-board Vessel Monitoring Systems (VMS). The latest satellite data set analysed is from 2009 and the data includes both UK and foreign vessels of 15m length and over. Plots of these vessel positions (received every two hours) have been converted to a 0.5 x 0.5nm density grid (see **Figure 4.12**). See **Chapter 15** for more information.

4.3.28. The overall distribution of vessel nationality showed that the majority of the vessels were registered in Denmark (63%), with UK (12%), Norway (9%) and Sweden (6%) making up the top four. Gear type information was available for approximately 21% of satellite fishing vessel positions within 10nm of Dogger Bank Teesside A & B. The most common fishing methods identified were beam trawling, accounting for 12% of the overall total and bottom seining 5% (see **Chapter 15** and **Appendix 16A**).

4.3.29. Based on the analysis of the speed of the vessels recorded, approximately 67% of the vessels within the 10nm (18.5km) buffer were engaged in fishing (any vessel at a speed of five knots or less is assumed to be fishing).





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer
- Fishing AIS 14 days spring summer 2012

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.9 Fishing vessels (14 days spring/summer 2012)

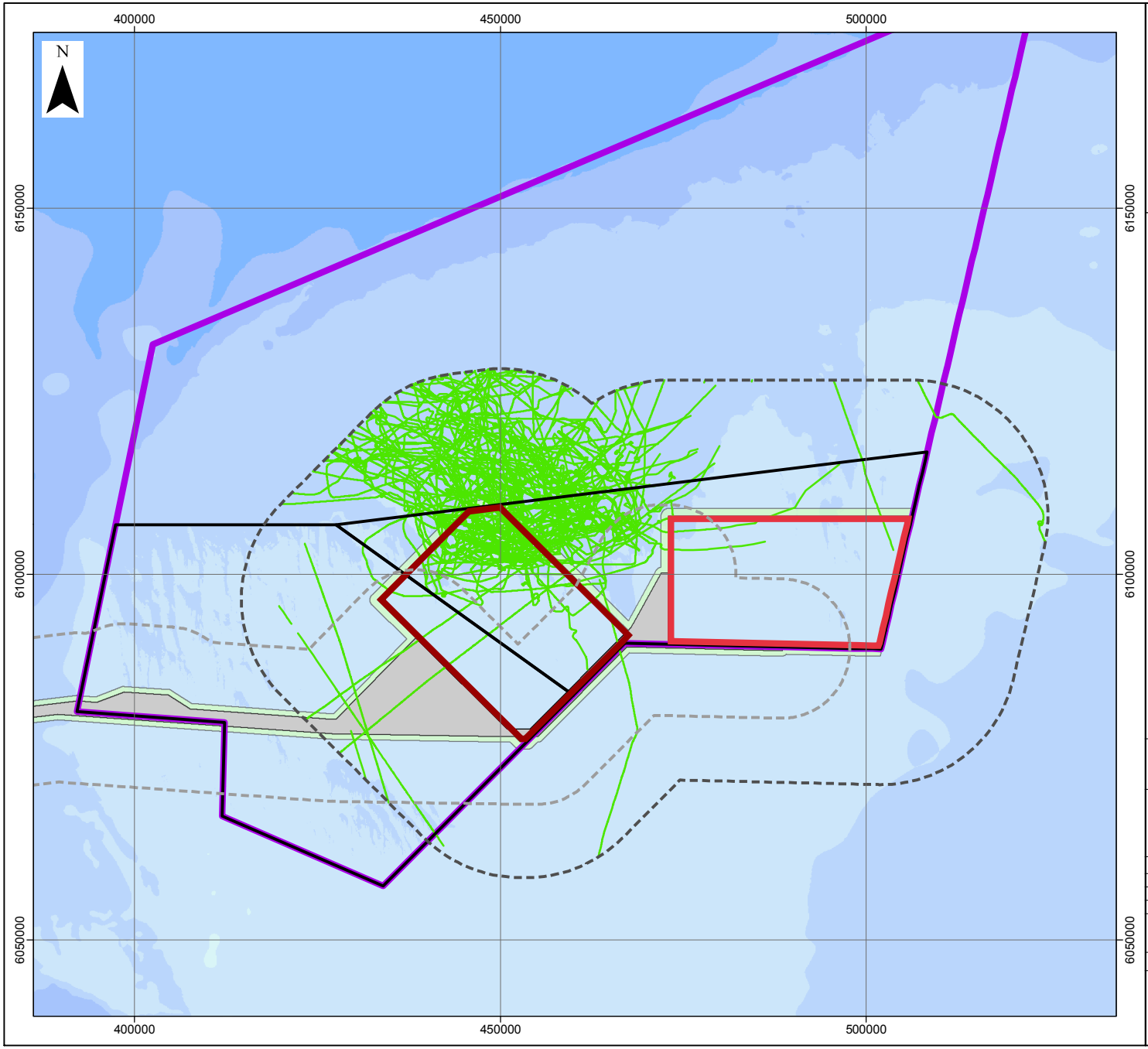
VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

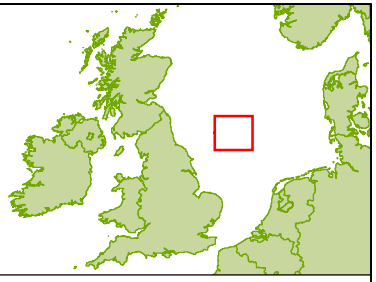
DRAWING NUMBER:

F-OFL-MA-591

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer
- Fishing AIS 28 days winter 2011/2012

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

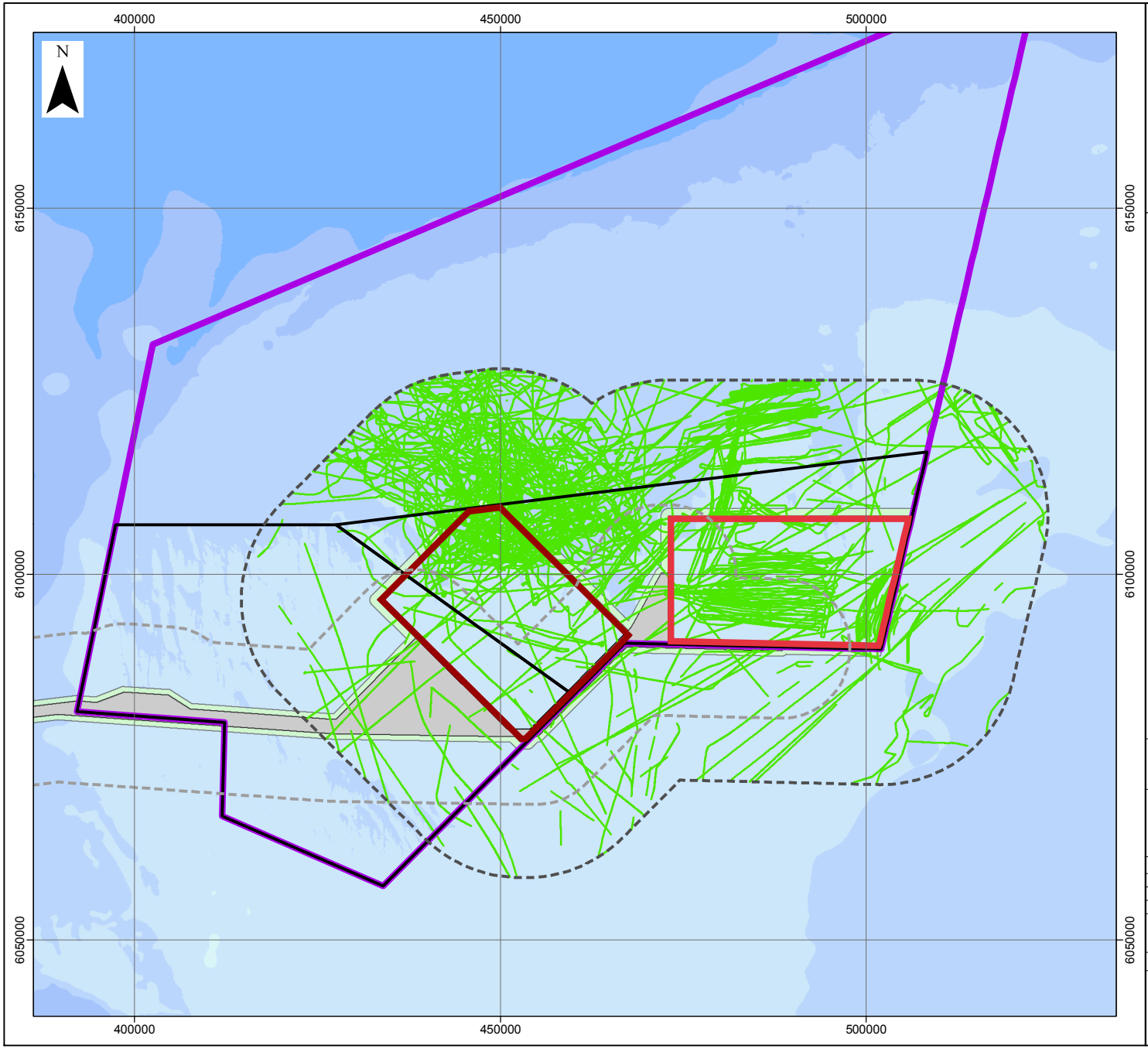
Figure 4.10 Fishing vessels (28 days winter 2011/2012)

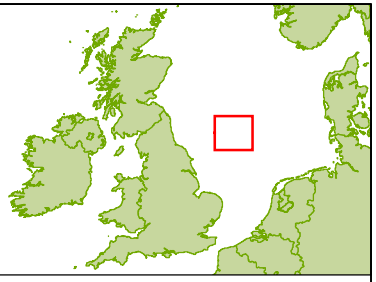
VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-592**

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer
- Fishing AIS 56 days

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

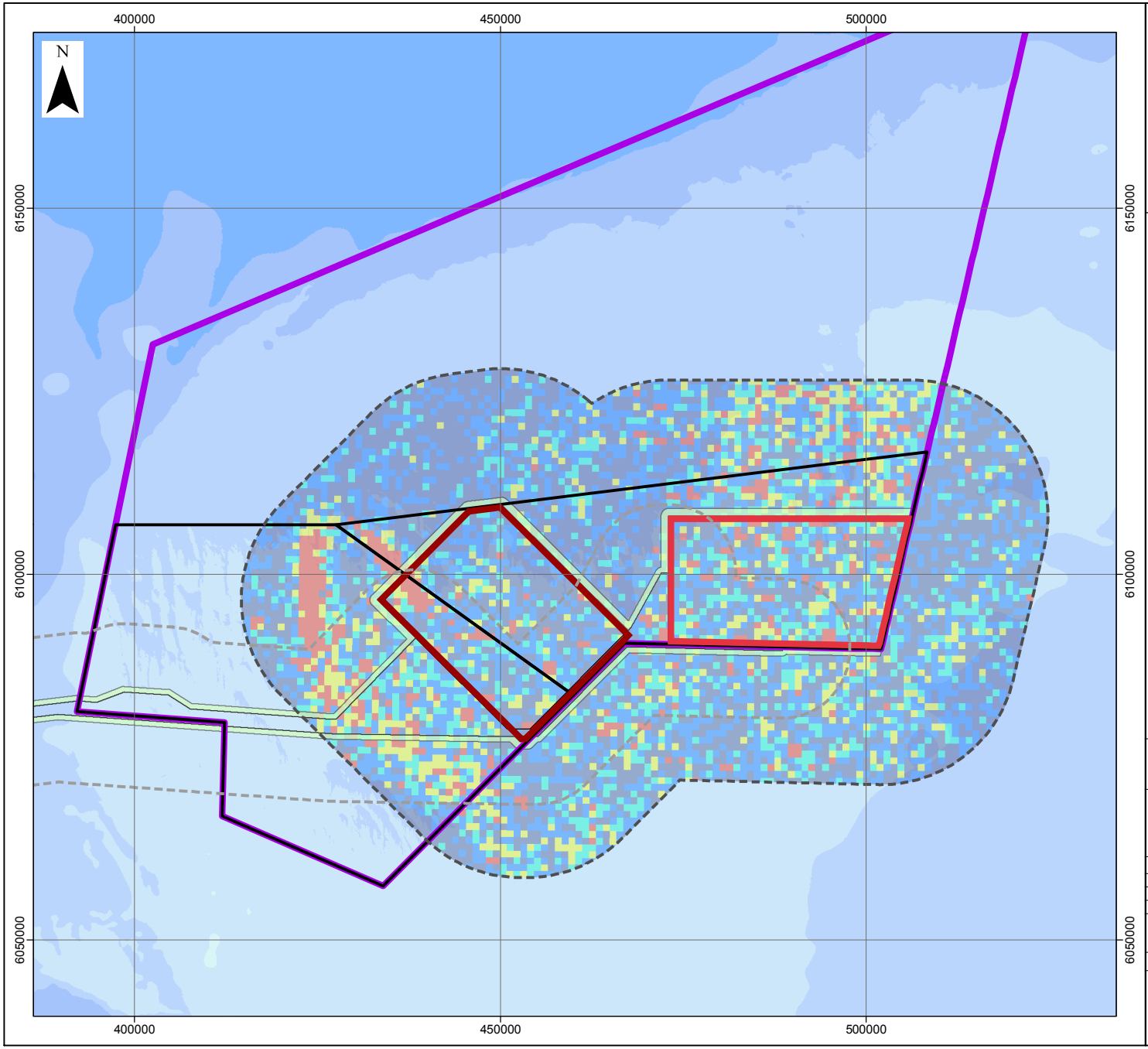
Figure 4.11 Fishing vessels (56 days)

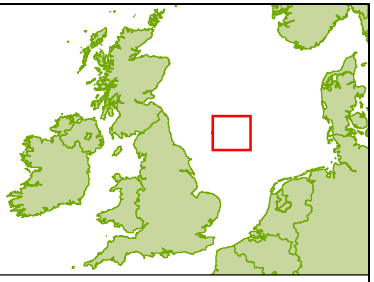
VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-593**

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

Fishing satellite density 2009

- 5 (High)
- 4
- 3
- 2
- 1 (Low)

0 10 20
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.12 Fishing vessel density (from satellite data 2009)

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-594**

SCALE	1:800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

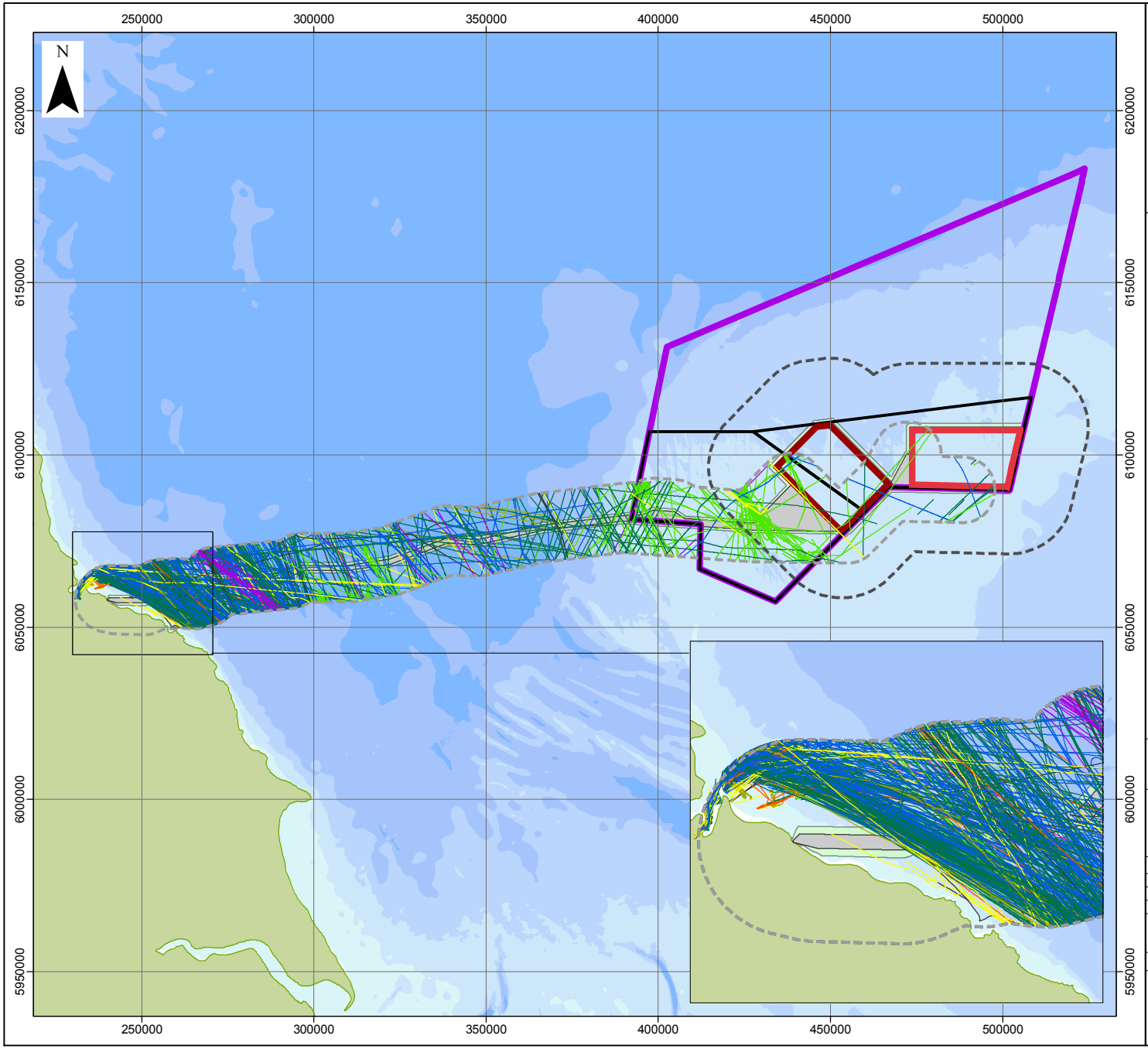
FOREWIND

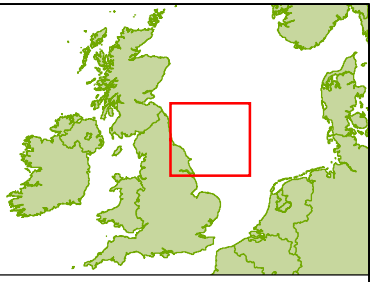
Dogger Bank Teesside A & B Export Cable Corridor

4.3.30. This section presents shipping data for the Dogger Bank Teesside A & B Export Cable Corridor recorded on AIS during surveys in June 2011 (seven days) and June 2012 (seven days) (see **Figure 4.13**).

4.3.31. A number of tracks recorded during the survey were classified as temporary (non-routine), such as the tracks of the survey vessels and research vessels operating in the area. These tracks have been excluded from further analysis.

4.3.32. In total, there was an average of 78 vessels per day recorded on AIS passing within 5nm (9.3km) of the Dogger Bank Teesside A & B Export Cable Corridor during the combined 14 day survey period.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

Vessel type

- Cargo
- Dredging/underwater ops
- Fishing
- Military
- Other
- Passenger
- Tanker
- Tug
- Unspecified

0 20 40
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.13 All vessels within 5nm (9.3km) of export cable corridor

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-595**

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Vessel types

4.3.33. The majority of tracked vessels were cargo vessels (38%) and tankers (32%). The remaining 30% was made by a range of vessel types (see **Figure 4.14**).

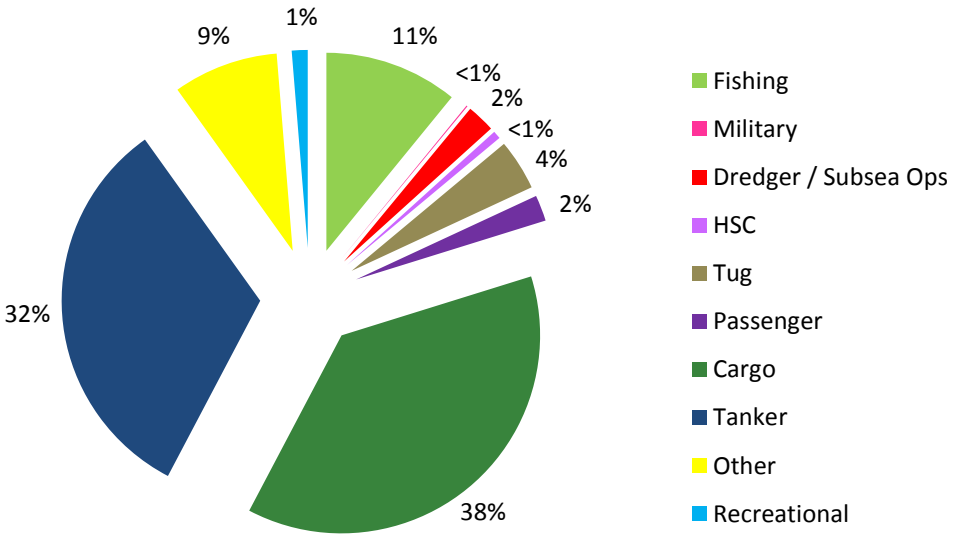


Figure 4.14 Vessel Types within 5nm (9.3km) of the Dogger Bank Teesside A & B Export Cable Corridor (14 Days summer 2011 and summer 2012)

4.3.34. The average draught of vessels passing within 5nm (9.3km) of the export cable was 5.7m.

4.3.35. The water depth decreases close to the shore where the cable makes landfall. The entrance to Teesport is encompassed by the Dogger Bank Teesside A & B Export Cable Corridor 5nm (9.3km) buffer, meaning that a number of vessels tracked within the study area are entering or exiting Teesport. As a result of this, the average draught of vessels does not significantly change closer to the shore.

4.3.36. No vessels were recorded at anchor within the Dogger Bank Teesside A & B Export Cable Corridor. The majority of vessels (54%) which anchored within the export cable corridor buffer were located 4 to 5nm away from the export cable. 43% of vessels were recorded anchoring 3 to 4nm from the export cable and no vessels were recorded anchoring closer than 2-3nm away. See **Appendix 16A** for further details of the vessels which anchored within the buffer during the survey.

Recreational vessel activity

4.3.37. This section reviews recreational vessel activity in the vicinity of Dogger Bank Teesside A & B Export Cable Corridor, based on information published by the RYA.

4.3.38. Similarly to the situation described for Dogger Bank Teesside A & B sites, recreational activity is based on the latest RYA Cruising Routes (2010) (see **Figure 4.15**). The Dogger Bank Teesside A & B Export Cable Corridor is intersected by three medium use cruising routes. There is a general sailing area extending approximately 14nm (25.9km) from the coast in the export cable route. A general racing area is located, at its closest point, approximately 0.3nm (0.6km) northwest of the Dogger Bank Teesside A & B Export Cable Corridor, in the vicinity of the landfall point. South Gare Marine Club is located within 5nm (9.3km) of the Dogger Bank Teesside A & B Export Cable Corridor.

Fishing vessel activity

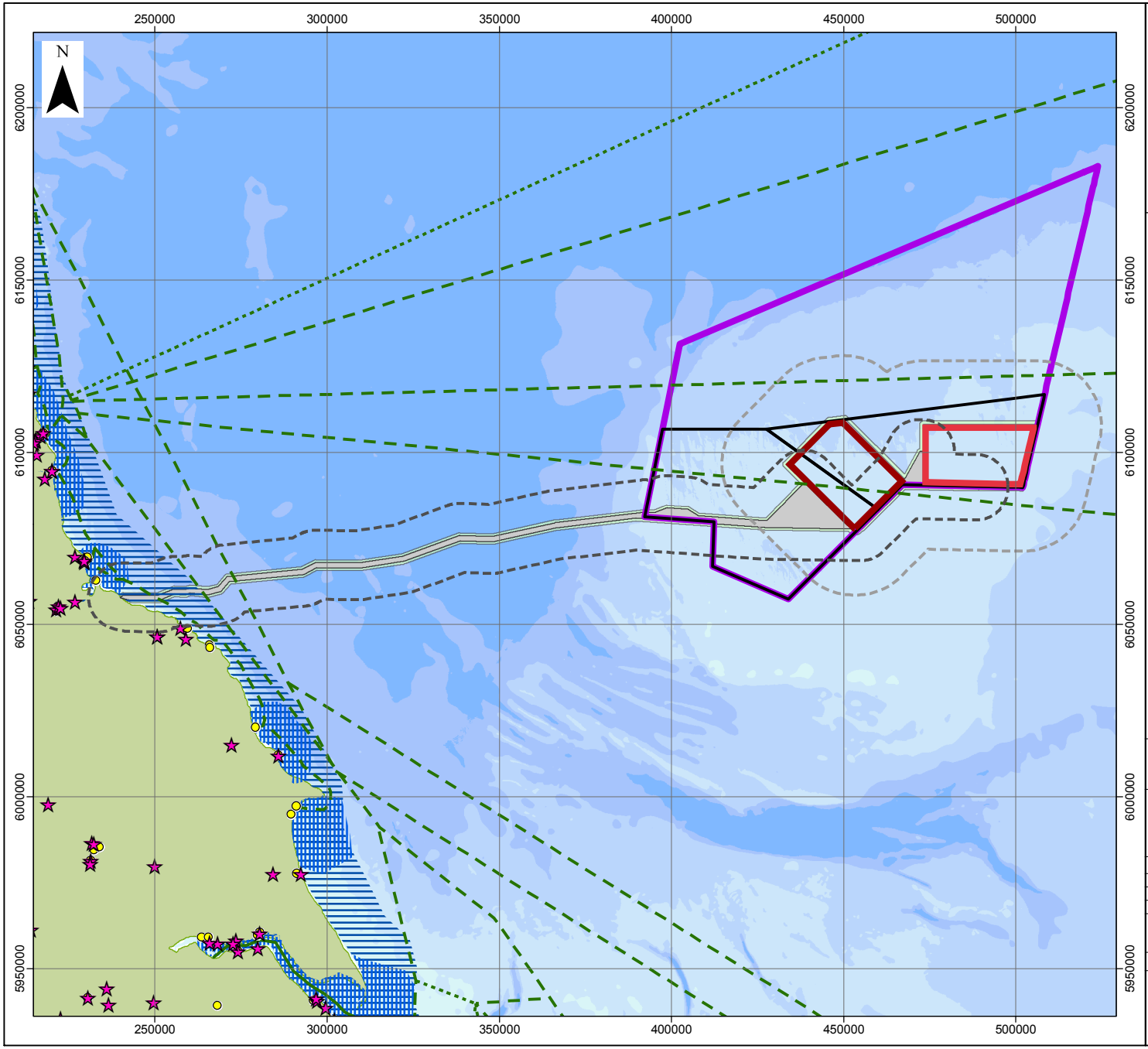
4.3.39. Fishing vessel activity was recorded during the previously mentioned AIS and Radar surveys during a combined 14 day survey period (**Figure 4.16**).

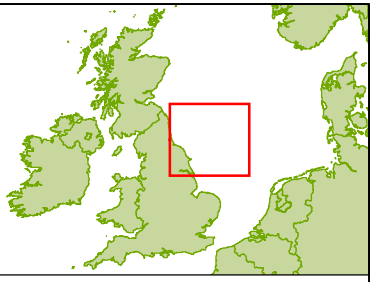
4.3.40. A breakdown of the vessel types recorded in the 2009 satellite data (the latest publically available data set) within 5nm (9.3km) of the Dogger Bank Teesside A & B Export Cable Corridor, indicated that the majority of the fishing vessels were unspecified trawlers (51%) and demersal trawlers (45%).

4.3.41. It is evident that the highest fishing vessel densities are located in proximity to the western boundary of the Dogger Bank Zone and to the west of the Dogger Bank Teesside A & B Export Cable Corridor route in proximity to the coast (**Figure 4.17**).

4.3.42. Although the majority (78%) of the vessels were UK-registered the owners are more than likely to be from different countries. The Danish registered vessels were the next most common recorded at 13%.

4.3.43. For further information on commercial fisheries please refer to **Chapter 15** of this ES.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer
- RYA training centre
- RYA sailing club
- RYA racing area
- RYA sailing area

RYA cruising route

- Heavy use
- Medium use
- Light use

0 20 40
Kilometres

Data Source:
Recreational Data © RYA, 2011
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.15 RYA cruising routes and facilities in proximity to export cable corridor

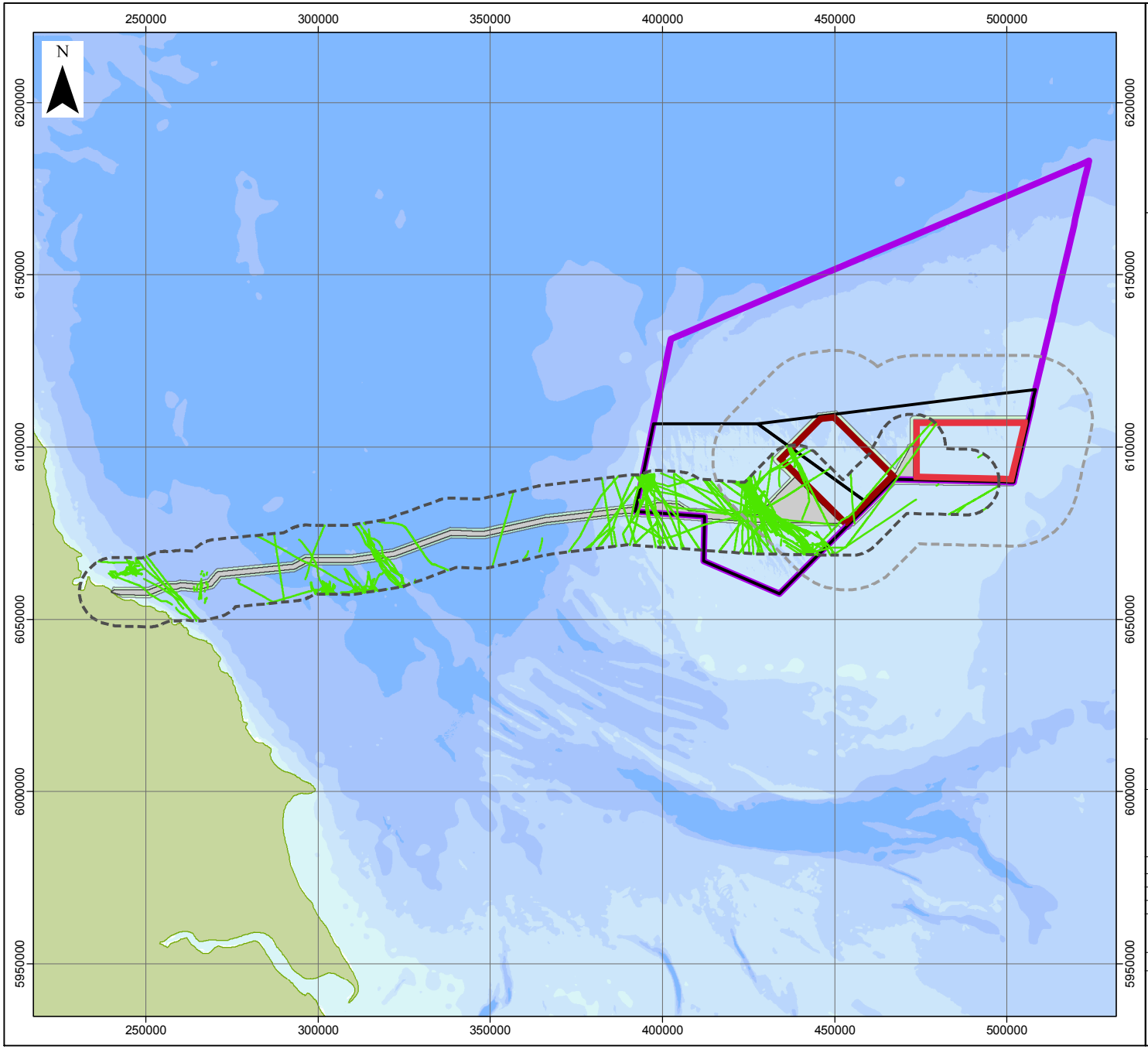
VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

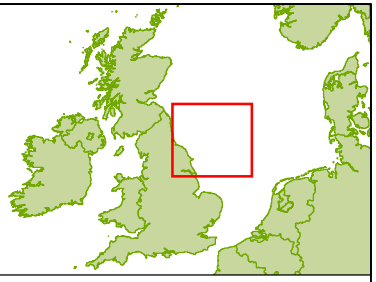
DRAWING NUMBER:

F-OFL-MA-596

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer
- Fishing AIS 14 days summer 2011/summer 2012

0 20 40
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

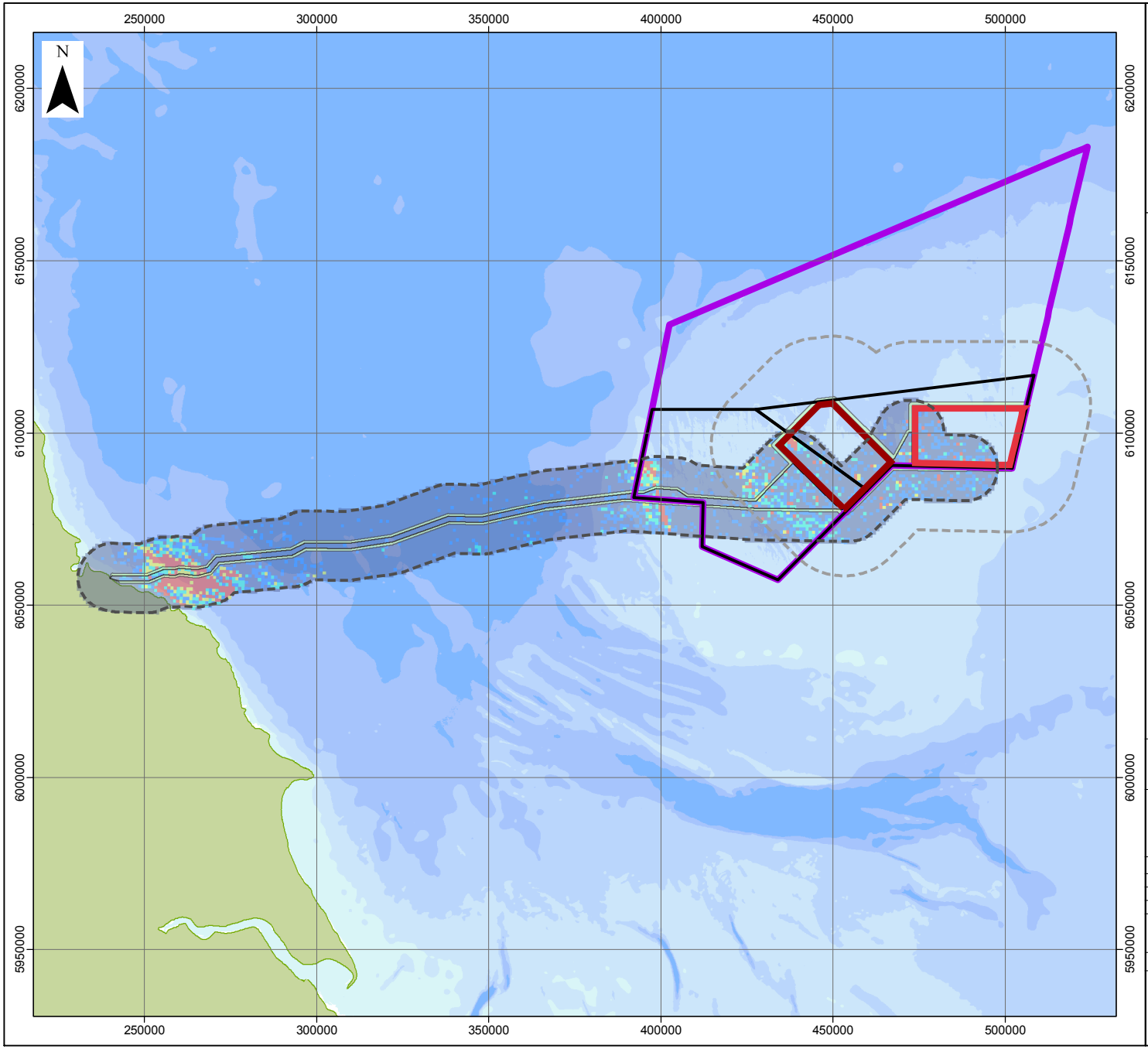
Figure 4.16 Fishing vessels (14 days summer 2011/summer 2012)

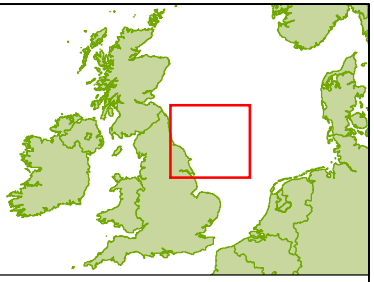
VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-597**

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

RANK

- 5 (High)
- 4
- 3
- 2
- 1 (Low)

0 20 40
Kilometres

Data Source:
Shipping Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.17 Fishing vessel density (using satellite data 2009)

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
1	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-598**

SCALE	PLOT SIZE	DATUM	PROJECTION
1:1,700,000	A4	WGS84	UTM31N

FOREWIND

Maritime Incidents

4.3.44. All UK-flagged commercial vessels are required to report accidents to the MAIB. Non-UK vessels do not have to report unless they are in a UK port or are within the 12nm (22.2km) territorial water limit and carrying passengers to a UK port. Therefore, non-UK registered vessels outside of 12nm (22.2km) are not included in the MAIB data analysed in this section. There are no requirements for recreational craft to report accidents to MAIB.

4.3.45. The locations of accidents, injuries and hazardous incidents reported to MAIB within 10nm (18.5km) of Dogger Bank Teesside A & B for the ten year period between January 2002 and December 2011, are presented in **Figure 4.18** colour-coded by type.

4.3.46. Two incidents occurred within 10nm (18.5km) of Dogger Bank Teesside A & B which are described in more detail below:

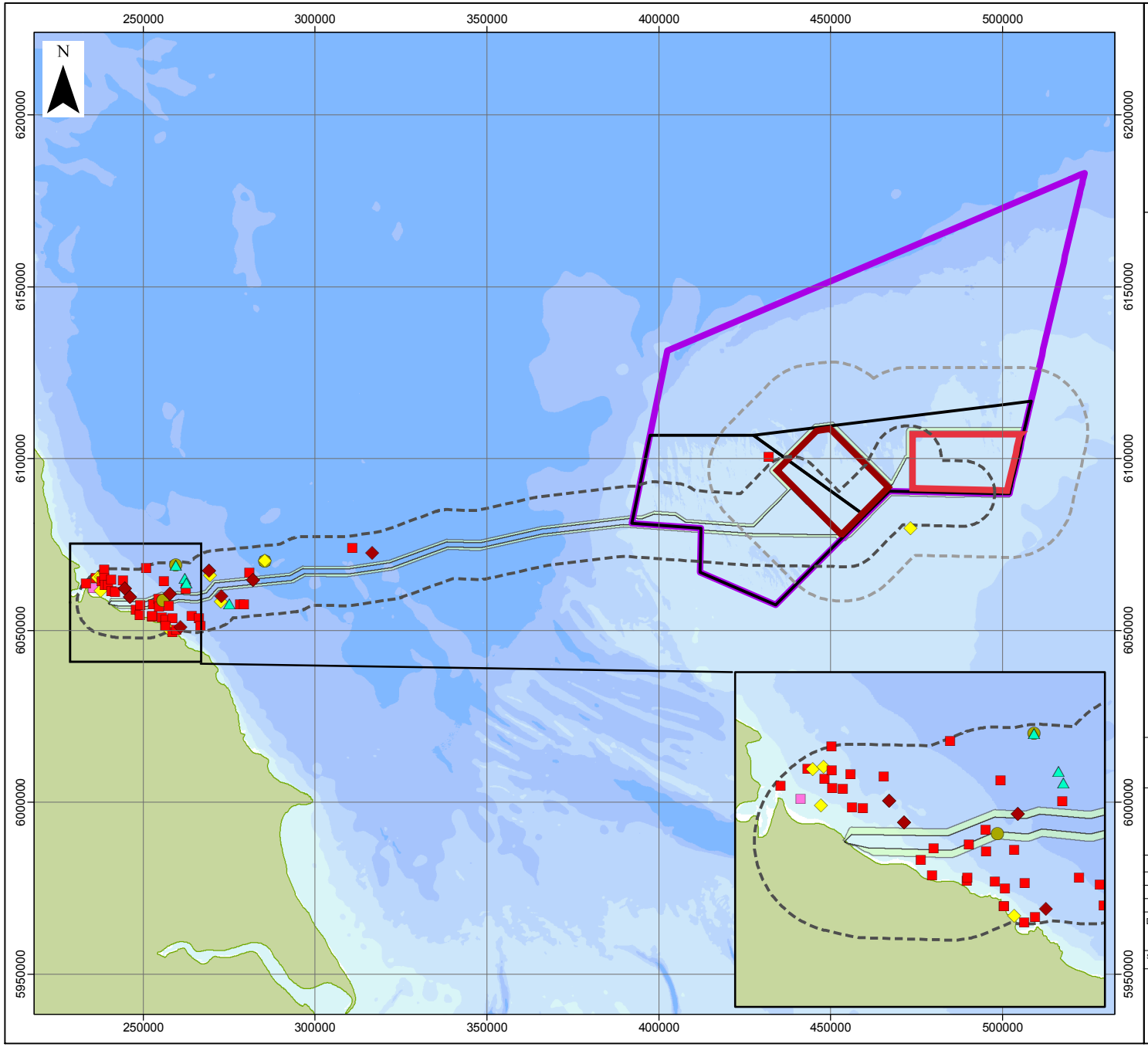
- On 11 February 2004 a vessel suffered Machinery Failure, which occurred in daylight in high seas. This incident happened approximately 2nm (3.7km) northwest of Dogger Bank Teesside B; and
- On 31 July 2008 an Accident to Person on-board a fishing vessel occurred in daylight in high seas approximately 5.6nm (10.4km) south of Dogger Bank Teesside A.

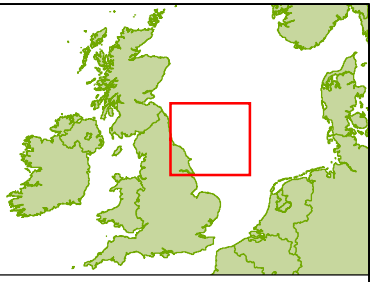
4.3.47. A total of 67 incidents were recorded within in 5nm (9.3km) of the Dogger Bank Teesside A & B Export Cable Corridor over the 10 years analysed, involving 72 vessels (or persons), corresponding to an average of just under seven incidents per year.

4.3.48. Two incidents were recorded within the Dogger Bank Teesside A & B Export Cable Corridor. A summary of these are provided below:

- On 23 January 2004 two vessels were involved in a Hazardous Incident, which occurred in darkness with moderate (2-5nm; 3.7-9.3km) visibility and wind force 4-6 in coastal waters. A vehicle carrier vessel from Vanuatu (61m long, 27,565 Gross Tonnage (GT)) collided with a British fishing vessel (39m long, 390GT) approximately 23nm (42.6km) along the cable corridor from the coast; and
- On 1 January 2011 a Machinery Failure occurred in daylight with wind force 4-6 in coastal waters. The vessel was 100m long 4,100GT Danish chemical tanker. This incident occurred approximately 4.5nm (8.3km) from the coast within the proposed Dogger Bank Teesside A & B Export Cable Corridor.

4.3.49. The most common incident type recorded within 5nm (9.3km) of Dogger Bank Teesside A & B Export Cable Corridor was Machinery Failure, representing 57% of all incidents over the ten year period. Emergency anchoring can occur during a machinery failure (e.g. engine failure, steering gear problems or fouled propeller), which could pose an anchor snagging risk.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

MAIB incident 2002 to 2010

Incident type

- Accident to person
- Contact
- Flooding/foundering
- Grounding
- Hazardous incident
- Machinery failure

0 20 40
Kilometres

Data Source:
MAIB Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.18 MAIB incidents by type within 10nm (18.5km) of Dogger Bank Teesside A & B and 5nm (9.3km) for the export cable corridor

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER:

F-OFL-MA-599

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

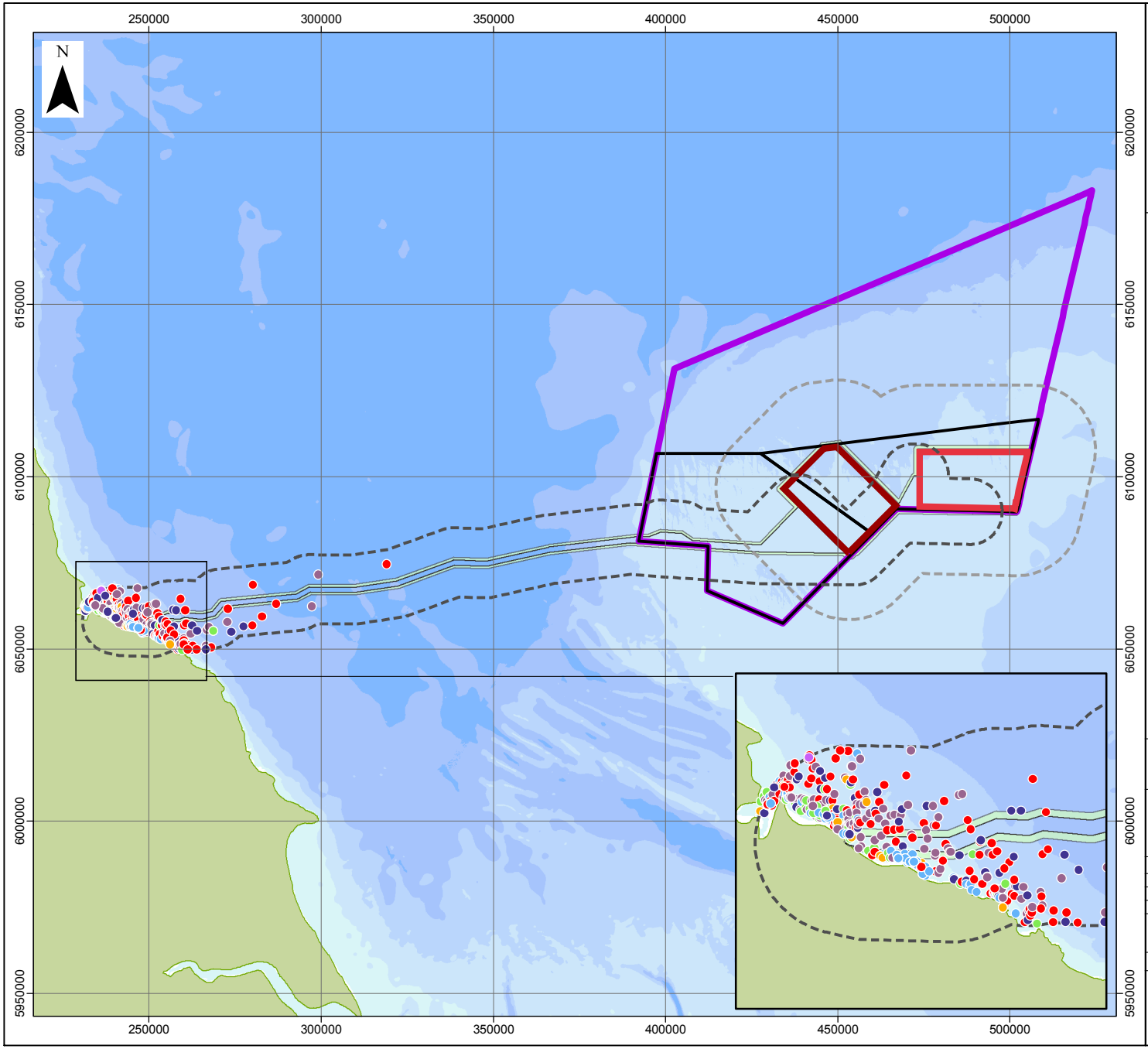
FOREWIND

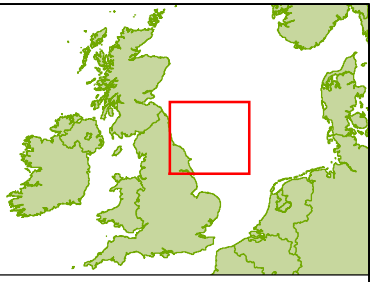
Royal National Lifeboat Institution

4.3.51. No RNLI responses have been reported for the area analysed during the 10 year period between 2001 and 2010. Similar analysis of RNLI responses within 5nm (9.3km) of the Dogger Bank Teesside A & B Export Cable Corridor in the ten-year period between 2001 and 2010 indicated that a total of 406 incidents had occurred over this period, corresponding to an average of approximately 40 incidents per year.

4.3.52. A total of 18 incidents were recorded within the Dogger Bank Teesside A & B Export Cable Corridor over the survey period. The vast majority of incidents occurred near the coast, with relatively few further out to sea. The most common vessel types involved were power boats (26%). The remainder of incidents involved mainly fishing vessels (23%), accidents to people (20%) and personal craft (12%).

4.3.53. The two main causes (**Figure 4.19**) were Machinery Failure (38%) and person in danger (32%), with the majority of the incidents within 5nm (9.3km) of the Dogger Bank Teesside A & B Export Cable Corridor responded to by Redcar Inshore Lifeboat (ILB) (52%), Staithes and Runswick ILB (16%), Teesmouth ALB (10%) and Hartlepool ALB (10%).





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer

RNLI incident 2001 to 2010

Casualty type

- Fishing vessel
- Other sail
- Other vessel
- Person
- Personal craft
- Power boat
- Yacht

0 20 40
Kilometres

Data Source:
RNLI Data © Anatec, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.19 RNLI incidents (2001-2010) by vessel type within 5nm (9.3km) of the export cable corridor

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-600**

SCALE	1:1,700,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Search and rescue

Search and rescue helicopters

4.3.54. The closest SAR helicopter base to the Dogger Bank Zone is located at Leconfield, approximately 105nm (194.6km) south west of Dogger Bank Teesside B and approximately 123nm (227.9km) south west of the boundary of Dogger Bank Teesside A. This base has Westland HA3 Sea King helicopters with a maximum endurance of six hours and maximum speed of 125knts (equivalent to 140mph). This gives a radius of action of approximately 250nm (463km), which easily covers Dogger Bank Teesside A & B. One helicopter is available at 15 minutes readiness between 0800 and 2200 hours. Between 2200 and 0800 hours, one helicopter is held at 45 minutes readiness. Royal Air Force (RAF) Boulmer is located approximately 125nm (231.7km) north-west of Dogger Bank Teesside B, but is due to be phased out from 2016.

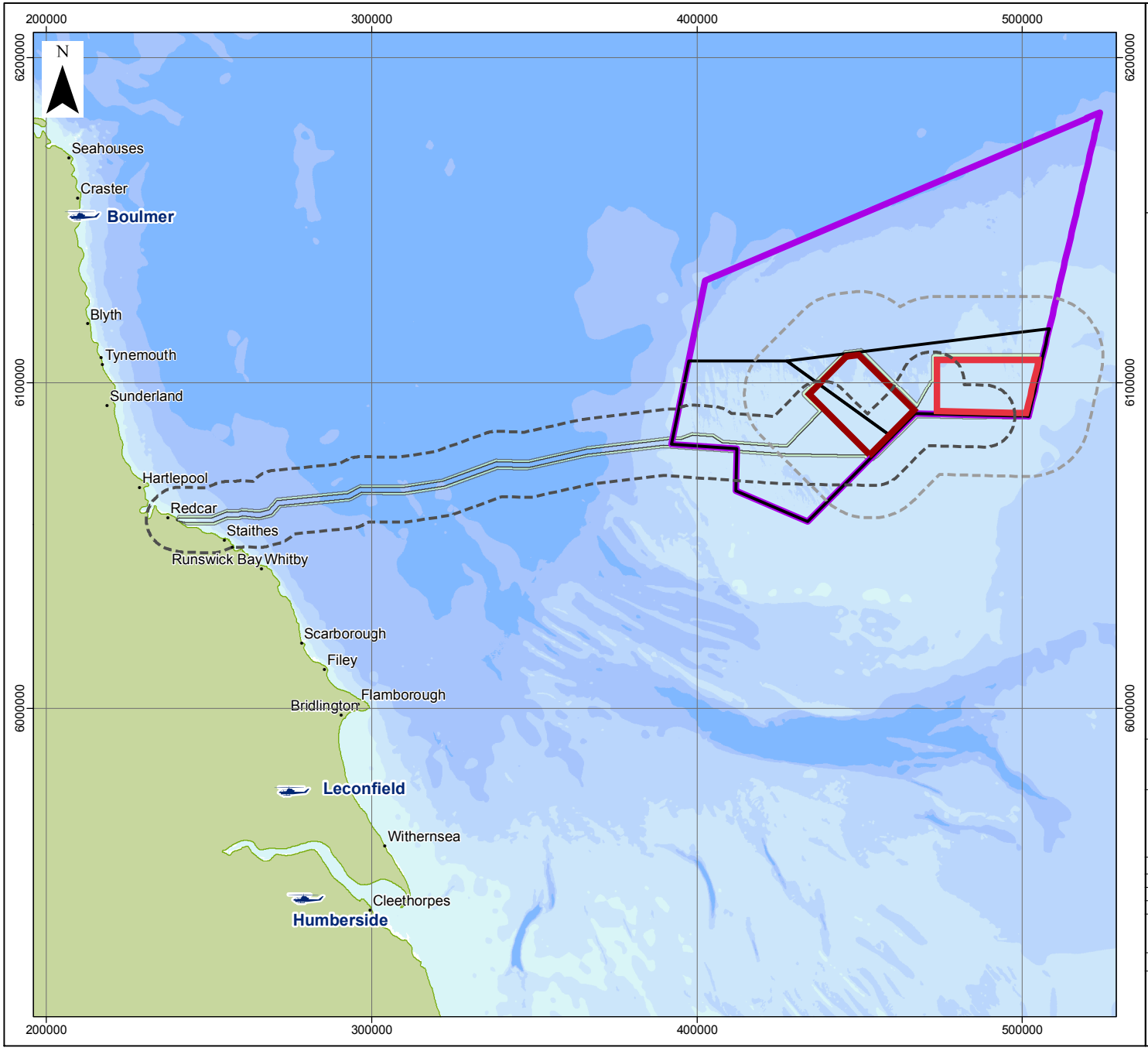
4.3.55. Based on the above information, the day-time response time from RAF Leconfield will be 1 hour 38 minutes to the middle of Dogger Bank Teesside A and 1 hour 27 minutes to the middle of Dogger Bank Teesside B. At night time this will increase by 30 minutes to approximately 2 hour 08 minutes for Dogger Bank Teesside A and 1 hour 57 minutes for Dogger Bank Teesside B due to the additional response time at the base. It is noted that these calculations are based on calm conditions and response times will vary depending on the prevailing conditions.

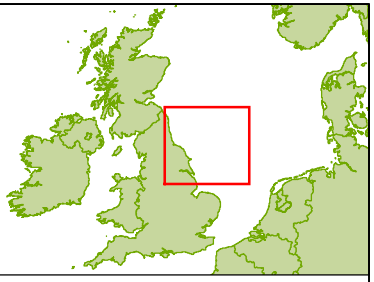
4.3.56. Under new helicopter SAR plans both of these bases are due to close and be replaced with a new service by summer 2017. The Bristow Group will take over helicopter SAR operations, with a contract running for ten years from 2015. **Figure 4.20** presents the location of future assets adjacent to Dogger Bank Teesside A & B. Humberside is located approximately 120nm (222.4km) southwest of the boundary of Dogger Bank Teesside B and 133nm (246.5km) southwest of the boundary of Dogger Bank Teesside A. This base will operate two Sikorsky S-92s which have a maximum speed of 150knts (equivalent to 174mph) and range of 539nm (998.9km). This will cover Dogger Bank Teesside A & B.

Royal National Lifeboat Institution lifeboats

4.3.57. The RNLI maintains a fleet of over 400 lifeboats of various types at 235 stations around the coast of the UK and Ireland.

4.3.58. At each of these stations, crew, ILB and/or ALB are available on a 24-hour basis throughout the year (see **Table 4.2**).





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Dogger Bank Teesside A & B 10nm buffer
- Export cable corridor 5nm buffer
- SAR helicopter base

0 20 40
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.20 Future SAR helicopter bases relative to Dogger Bank Teesside A & B

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	LW	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-601**

SCALE	1:1,800,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Table 4.2 RNLI lifeboat stations in proximity to Dogger Bank Teesside A & B

Station	Lifeboats	ALB Class	ILB Class	Distance to centre of Dogger Bank Teesside A	Distance to centre of Dogger Bank Teesside B
Staithes and Runswick	ILB	--	B Class	127nm (235.4km)	108nm (200.1km)
Whitby	ALB/ILB	Trent	D Class	123nm (227.9km)	103nm (190.88km)
Scarborough	ALB/ILB	Mersey	D Class	120nm (222.4km)	101nm (187.2km)
Filey	ALB/ILB	Mersey	D Class	119nm (220.5km)	99nm (183.5km)
Flamborough	ILB	--	B Class	116nm (215km)	98nm (181.6km)
Bridlington	ALB/ILB	Mersey	D Class	119nm (220.5km)	100nm (185.3km)

4.3.59. The nearest RNLI station with an ALB relative to both Dogger Bank Teesside A & B is Filey where a Mersey class ALB lifeboat is available. The Mersey class lifeboat, the *Keep Fit Association*, is 12m in length and has a maximum speed of 17 knots. The average response time declared by the RNLI for an ALB is 14 minutes. This is the time from callout (i.e., first contact from the Coastguard to the lifeboat station) to launch of the lifeboat.

4.3.60. The time for an ALB from Filey to reach the centre of Dogger Bank Teesside A would be approximately seven hours, and the time to Dogger Bank Teesside B would be approximately six hours (taking into account a 14 minute call out time).

First response by Dogger Bank resources

4.3.61. Forewind will, using its own on-site personnel, vessels, structures and facilities, initiate procedures for first response to all emergencies within and in proximity to Dogger Bank Teesside A & B.

4.3.62. Details of an initial study into emergency response within the Dogger Bank Zone is provided in **Appendix 16A** this includes potential resources that could be used to provide first response capability for shipping and navigation incidents medical, salvage and pollution events.

Coastguard stations

4.3.63. HM Coastguard, a division of the MCA, is responsible for requesting and tasking SAR resources made available by other authorities and for co-ordinating the subsequent SAR operations (unless they fall within military jurisdiction).

4.3.64. At the time of writing (June 2013), HM Coastguard co-ordinates SAR through a network of 17 Maritime Rescue Co-ordination Centres (MRCC). This includes a corps of over 3,100 volunteer Auxiliary Coastguards around the UK coast from over 380 local Coastguard Rescue Teams (CRT) involved in coastal rescue, searches and surveillance.

4.3.65. All of the MCA's operations, including SAR, are divided into three geographical regions. The East of England Region covers the east and south coasts of England from the Scottish border down to the Dorset/Devon border and, therefore, covers the area around Dogger Bank Teesside A & B.

4.3.66. Each region is divided into six districts with its own MRCC, which co-ordinates the SAR response for maritime and coastal emergencies within its district boundaries. The nearest rescue coordination centre to Dogger Bank Teesside A & B is the Humber MRCC (located in Bridlington).

4.3.67. The MCA published a consultation document (MCA 2010), regarding modernisation of HM Coastguard. The main part of the document proposes the reduction in the number of MRCC stations around the UK coastline.

4.3.68. Revised plans were released by the UK Government mid-way through 2011, with a second consultation period from 14 July 2011 to 6 October 2011. Under the revised proposals the MCA intends to:

- Establish a single 24 hour Maritime Operations Centre (MOC) based in the Southampton/Portsmouth area, with 96 operational coastguards. The MOC will act as a national strategic centre to manage Coastguard operations across the entire UK network, as well as co-ordinating incidents on a day to day basis. The MOC will also generate a maritime picture using information from a variety of sources;
- Dover will be configured to act as a stand-by MOC for contingency purposes. Dover would have 28 staff and would retain its responsibilities for the Channel Navigation Information Service (CNIS); and
- In addition to the MOC and Dover, there will be eight further Maritime Rescue Sub-Centres (MRSC), all of which would be connected to the national network and the MOC. All would be open 24 hours a day, with a total staffing of 23 in each. These would be based at the following stations:
  - MRSC Aberdeen
  - MRSC Shetland
  - MRSC Stornoway
  - MRSC Belfast
  - MRSC Holyhead
  - MRSC Milford Haven
  - MRSC Falmouth; and
  - MRSC Humber.
- Dogger Bank Teesside A & B currently lie within the East of England region, with the nearest rescue coordination centre being MRSC Humber. MRSC Humber's area of responsibility provides search and rescue coverage from Haile Sand Fort to the Scottish/English Border; and

- The proposed changes to the UK MRCC structure will result in MRSC Humber covering a much wider area; however, it will continue to respond to any incidents in the vicinity of Dogger Bank Teesside A & B.

Salvage

4.3.69. Each MRCC holds comprehensive databases of harbour tugs available locally. Procedures are also in place with brokers and Lloyd's Casualty Reporting Service to quickly obtain information on towing vessels that may be able to respond to an incident.

4.3.70. Emergency tug provision will generally be a contracted agreement between the vessel owners and tug operators. Coastguard Agreement on Salvage and Towage (CAST) will be invoked when owners are either unable or unwilling to engage in a commercial tow contract. MCA will pursue costs through arbitrators on a cost recovery basis.

4.3.71. Tug assistance may also be available from vessels supporting gas fields in the area.

4.3.72. Details of an initial study into emergency response within Dogger Bank is provided in **Appendix 16A** this includes potential resources that could be used to provide salvage capability for shipping and navigation incidents.

5. Assessment of Impacts – Worst Case Definition

5.1. General

5.1.1. This section establishes the realistic worst case scenario for each category of impact as a basis for the subsequent impact assessment. There are a number of key principles relating to how the projects will be built, and that form the basis of the Rochdale Envelope[1] (see **Chapter 5**). These are:

- The two projects may be constructed at the same time, or at different times;
- If built at different times, either project could be built first;
- Offshore construction will commence no sooner than 18 months post consent, but must start within seven years of consent (as an anticipated condition of the development consent order); and
- Assuming a maximum construction period per project of six years, and taking the above into account, the maximum construction period over which the construction of Dogger Bank Teesside A & B could take place is 11 years and six months.

5.1.2. To determine which offshore construction scenario is the worst realistic case for a given receptor, two types of effect exist with the potential to cause a maximum level of impact on a given receptor:

- Maximum duration effects; and
- Maximum peak effects.

5.1.3. To ensure that the Rochdale Envelope incorporates all of the possible construction scenarios (as outlined in **Chapter 5**), both the maximum duration effects and the maximum peak effects have been considered for each receptor. Furthermore, the option to construct each project in isolation is also considered ('Build A in isolation' and 'Build B in isolation'), enabling the assessment to identify any differences between the two projects. The three construction scenarios for Dogger Bank Teesside A & B considered within the shipping and navigation assessment are, therefore:

- Build A or Build B in isolation;
- Build A and B concurrently – provides the worst 'peak' impact and maximum working footprint; and

[1] As described in **Chapter 5** the term 'Rochdale Envelope' refers to case law (R.V. Rochdale MBC Ex Part C Tew 1999 "the Rochdale case"). The 'Rochdale Envelope' for a project outlines the realistic worst case scenario or option for each individual impact, so that it can be safely assumed that all lesser options will have less impact.

- Build A taking six years, with a six month overlap after 5.5 years to build B taking another six years, so 11.5 years in total.

5.1.4. Any differences between the two projects, or differences that could result from the manner in which the first and the second projects are built (concurrent or sequential and the length of any gap) are identified and discussed in the impact assessment section of this chapter (Section 6).

5.1.5. For each potential impact only the worst case construction scenario for two projects is presented, i.e. either concurrent or sequential. The justification for what constitutes the worst case is provided, where necessary, in Section 6.

5.1.6. As such, the construction scenarios presented within the impact assessment are:

- Single project (Dogger Bank Teesside A or Dogger Bank Teesside B in isolation); and
- Two projects – concurrent or sequential (Dogger Bank Teesside A & B together).

5.2. Operation scenario

5.2.1. **Chapter 5** provides details of the operational scenarios for Dogger Bank Teesside A & B. Flexibility is required to allow for the following three scenarios:

- Dogger Bank Teesside A to operate on its own;
- Dogger Bank Teesside B to operate on its own; and
- For the two projects to operate concurrently.

5.2.2. Only one assessment is presented for the single project scenario, although any differences between Dogger Bank Teesside A & B are clearly identified in the discussion.

5.3. Decommissioning scenarios

5.3.1. **Chapter 5** provides details of the decommissioning scenarios for Dogger Bank Teesside A & B. Exact decommissioning arrangements will be detailed in a Decommissioning Plan (which will be drawn up and agreed with DECC and The Crown Estate prior to construction); however, for the purpose of this assessment it is assumed that decommissioning of Dogger Bank Teesside A & B could be conducted separately, or at the same time.

5.3.2. For the purpose of the shipping and navigation impact assessment, the realistic worst case scenarios, taking these options into consideration, are set out in **Table 5.1** and **Appendix 16A**.

5.3.3. It is noted that only those design parameters detailed under each specific impact have the potential to influence the level of impact experienced by the relevant receptor. Therefore, if the design parameter is not discussed, then it is considered not to have a material bearing on the outcome of the assessment.

5.3.4. The realistic worst case scenarios identified below are also applied to the CIA. When the realistic worst case scenarios for the project in isolation do not result

in the worst case for cumulative impacts, this is addressed within the cumulative section of this chapter (see Section 10) and summarised in **Chapter 33**.

5.3.5. The type of potential impacts during the construction and decommissioning phases are similar and are therefore combined in **Table 5.1**.

Table 5.1 Worst case factors by receptor impacts

Impact	Worst case	Rationale
Construction and decommissioning		
Presence of construction and decommissioning activities in the development areas for Dogger Bank Teesside A & B may affect existing marine vessel transit routes by deviating and increasing journey times.	• Maximum duration of active construction 6 years running simultaneously due to the number of activities on-going and therefore hazards to shipping. • Total number of vessels associated with construction - peak of 66 per project (excluding potential for 18 Operation and Maintenance (O&M) vessels). • 5,150 vessel round trips per 3 year construction period - this value is based on 3 years to complete construction and would still be the same value if it was to take 6 years to build • 5,150 vessel round trips for the decommissioning period	Multiple active construction and decommissioning activities, creating maximum extent of effects.
Presence of construction and decommissioning vessels and the displacement of existing vessel transit routes may increase encounters and therefore lead to increased vessel to vessel collision risk.	• Maximum duration of active construction 6 years running simultaneously. • Total vessels associated with construction peak - 66 per project. • 5,150 vessel round trips per 3 year construction period - this value is based on 3 years to complete construction and would still be the same value if it was to take 6 years to build • Decommissioning values have not been identified.	Multiple active construction and decommissioning activities, creating maximum extent and maximum duration of effects.
Presence of partially constructed structures in previously open sea areas may increase vessel to structure allision.	Partially constructed wind turbines not marked for extended periods i.e. not marked with navigational aids.	
Commercial fishing vessel allision and/or gear snagging due to the presence of partially constructed structures in previously open sea areas.	Partially constructed wind turbines not marked for extended periods i.e. not marked with navigational aids which may cause additional gear interaction with structures, including increased snagging risk for commercial fishing. Total length of inter-array cables within Dogger Bank Teesside A & B is 1,900km.	
Construction and decommissioning activities at Dogger Bank Teesside A & B may diminish emergency response (including Search &	Increased number of vessels and personnel on site that do not have self-response facilities to deal with emergencies and are outside of response ranges for established emergency response services.	

Impact	Worst case	Rationale
Rescue and pollution control) capability within the southern North Sea during construction.		
Construction and decommissioning activities at Dogger Bank Teesside A & B may increase emergency response (including Search & Rescue and pollution control) capability within the southern North Sea during construction.	Independent Emergency Response study is being undertaken.	
Operation and maintenance		
Physical presence of wind turbines, converter stations, collector stations, Met Masts, single point mooring buoys and accommodation platforms may displace commercial shipping, fishing vessels and recreational vessels leading to increased deviations and effects on vessel transit time.	Full development within Dogger Bank Teesside A & B.	Presents the largest area of development creating the potential for maximum number of routes affected for the maximum duration.
Physical presence of wind turbines, converter stations, collector stations, Met Masts, single point mooring buoys and accommodation platforms may displace commercial shipping, fishing vessels and recreational vessels leading to an increase in encounters and therefore vessel to vessel collision risk.	- Full development within Dogger Bank Teesside A & B. Per Project Structures: - 200 x 6 MW turbines. - 5 x Met Masts. - 4 x Offshore Collector Station. - 1 x Offshore Convertor Station. - 2 x Accommodation Platform. - 10 x Single Mooring Buoys. - O&M Vessels.	Presents the largest area of development and maximum geometric factor for collision risk and creating the maximum number of routes to encounter another vessel or structure including those Not Under Command (NUC).
Physical presence of wind turbines, converter stations, collector stations, Met Masts, single point mooring buoys and accommodation platforms may cause additional vessel to structure allision risk for commercial vessels, recreational users, commercial fishing vessels and wind farm operators.		
Physical presence of wind turbines, converter stations, collector stations, Met Masts and accommodation platforms may cause adverse interference with the navigational position fixing aids (such as radar and Magnetic Compasses).		
Physical presence of wind turbines, converter stations, collector stations, Met Masts, accommodation platforms and single point mooring buoys in previously open sea areas may adversely increase allision risk to vessels NUC (including vessels NUC due to mechanical or navigational system errors).		

Impact	Worst case	Rationale
Physical presence of inter-array cables (and cable protection) which are exposed or incorrectly buried may cause additional anchor snagging risk for commercial vessels and commercial fishing vessels.	- Minimum burial depth of 0 meters	The potential for incorrectly or unburied cables to impact on navigational safety.
Physical presence of inter-array cables (and cable protection) which are exposed or incorrectly buried may increase the risk of gear snagging for commercial fishing vessels.		
Manoeuvring within sea between individual projects or OREI could create manoeuvring risk for fishing vessels including vertical and horizontal allision risk.	Minimum spacing of 750m between turbines, Met Masts and mooring buoys will have a minimum separation of 334m	With a minimum spacing of 750 metres between structures, fishing vessels are likely to fish in these areas.
Physical presence of wind turbines, converter stations, collector stations, Met Masts, accommodation platforms and single point mooring buoys may diminish emergency response (including SAR and pollution control) capability within the southern North Sea during operational phase.	Increased number of vessels and personnel on site that do not have self-response facilities to deal with emergencies and are outside of response ranges for established emergency response services. However increased vessels on site with self-help and SAR capability may also increase the availability of emergency response.	
Physical presence of wind turbines, converter stations, collector stations, accommodation platforms and single point mooring buoys may increase emergency response (including SAR and pollution control) capability within the southern North Sea during operational phase.		
Export cables		
Physical presence of export cables (and cable protection) (including exposed or incorrectly buried cables) may cause additional anchor snagging risk for commercial vessels and commercial fishing vessels.	- Minimum burial depth of 0 metres. - Maximum length of cable is 1,057km	Snagging risk when cables are not buried.
Physical presence of export cables may cause electromagnetic interference for vessels using magnetic compasses.	- Magnetic compass deviations caused by Dogger Bank Teesside A & B offshore cables will be kept to values of less than 5 degrees, with the possible exception of a small number of specific locations (such as the vicinity of the cable landfall).	Greatest compass deviation when cables are unbundled.

5.3.6. Due to the extensive potential area for development within the Dogger Bank Zone, Forewind has taken an improved approach to previous developments to allow them to maintain navigational safety. At the same time, this also permits flexibility during the consent process to allow for the large variations in potential shape, size and content of the projects. This method has been noted and

approved by both the MCA and THLS. In order to ensure that navigational safety is not only maintained but paramount within this process, Forewind, in conjunction with Anatec, have established Development Rules. These rules will allow the flexibility that is required but maintain the key elements, such as alignment, to ensure that the final design does not increase navigational safety risk (see Section 5.2 below and Section 10 in **Appendix 16A**).

5.3.7. It is noted that these rules do not remove the requirement for regulators to sign off the final site design at the end of the development process but do ensure that the route to that point continually considers factors that are important for navigational safety.

5.4. Final site layout rules

5.4.1. During the development of the project, rules have been developed in consultation with stakeholders that will apply to the final proposed array layout, and which restrict the array patterns employed in order to address particular issues or environmental sensitivities. The following list identifies the development rules that will be implemented into the final Development Consent Order (DCO).

5.4.2. **Pattern and Regularity** - The position of all wind turbines, collector substation platforms, converter substation platforms and accommodation platforms shall, so far as is practicable, be arranged in straight lines (to a tolerance of ±150m) in an easily understandable pattern within individual wind farm site layouts, avoiding structures which break this pattern and without any dangerously projecting peripheral structures. *Reason: To facilitate safe navigation, aid location of casualties or incidents during emergency response, and to avoid creating an isolated hazard in or around the wind farm, while allowing the flexibility to optimise wind turbine arrays allowing for issues such as local geology, seabed obstacles, and energy capture.*

5.4.3. **Perimeter-Type Layouts** - The position of all wind turbines, collector substation platforms, convertor substation platforms and accommodation platforms forming a line of perimeter structures around a wind farm area shall, so far as is practicable, be arranged in straight lines (to a tolerance of ±150m) in an easily understandable pattern, avoiding structures which beak this pattern and without any dangerously projecting peripheral structures. *Reason: To facilitate safe navigation, aid location of casualties or incidents during emergency response, and to avoid creating an isolated hazard in or around the wind farm, while allowing the flexibility to optimise wind turbine arrays allowing for issues such as local geology, seabed obstacles, and energy capture.*

5.4.4. **Layout Clarity** - Any changes in wind turbine size and separation distance within a wind farm project will be introduced so as to minimise potential visual confusion for any vessel navigating through the wind farm. *Reason: To facilitate safe navigation for vessels which are working within the Dogger Bank Zone, (noting an assumption of no significant levels of passing traffic within the zone)*.

5.4.5. **Boundary Clarity** - Opposing site boundaries which approach closer than 2.7nm (5km) to each other shall be aligned broadly parallel with one another and marked to distinguish between separate wind farms. Boundary

requirements between wind farms will meet shipping template requirements detailed in Annex 3 of MGN371. *Reason: To facilitate safe navigation for vessels which are working within the Dogger Bank Zone, (noting an assumption of no significant levels of passing traffic within the zone).*

5.4.6. **Existing Infrastructure** - Space will be left for maintenance vessels to access existing active telecommunication cables within the projects (details to be agreed on a case-by-case basis). *Reason: To enable safe operation of existing infrastructure.*

5.4.7. **Proximity to Project Boundaries** - All wind farm surface and sub-surface structures, including rotor swept areas, will be located wholly within the relevant wind farm or cable corridor work area boundaries (see **DCO Offshore Works Plan**). No permanent surface infrastructure will be located in Dogger Bank Teesside A & B Export Cable Corridor outside of the project areas. There is a possibility that within project areas and where the cable corridor is within the Dogger Bank Zone, surface infrastructure may be present within the Dogger Bank Teesside A & B Export Cable Corridor. All temporary construction works will be within the order limit boundaries (also see **DCO Offshore Works Plan**). *Reason: To ensure all aspects of the development are within the assessed areas.*

5.5. Embedded mitigation measures

5.5.1. Mitigation and safety measures will be applied to Dogger Bank Teesside A & B development as appropriate to the level and type of risk determined during the EIA. The specific measures to be employed will be selected in consultation with the MCA Navigation Safety Branch and other relevant statutory stakeholders where required.

5.5.2. For further descriptions of the embedded mitigation measures, see Section 25 in **Appendix 16A**.

Marine Aids to Navigation

5.5.3. Throughout the construction, operation and maintenance of Dogger Bank Teesside A & B, Marine Aids to Navigation (AtoN) will be provided in accordance with Trinity House requirements, which will comply with IALA standard O-139 on the Marking of Offshore Wind Farms (IALA 2008) and the DECC Standard Marking Schedule for Offshore Installations (2011).

5.5.4. During the construction/decommissioning of Dogger Bank Teesside A & B, working areas will be established and marked, where required, in accordance with the IALA Maritime Buoyage System. In addition to this, temporary AtoN (if required by THLS) will be used to mark potential hazards to navigation safety where applicable and agreed with THLS, this may include alternative methods of AtoN such as the use of AIS transmitters or Radars and beacons (RACONs).

5.5.5. Notices to Mariners, Radio Navigational Warnings, Navigational Telex (NAVTEX) and/or broadcast warnings as well as Notices to Airmen will be promulgated in advance of any proposed works, where required.

5.5.6. A Significant Peripheral Structure (SPS) is the 'corner' or other significant point on the periphery of the wind farm. Every individual SPS would be fitted with lights visible from all directions in the horizontal plane.

5.5.7. Selected intermediate structures on the periphery of a wind farm other than the SPS's, are expected to be marked with flashing yellow lights which are visible to the mariner.

5.5.8. Structures should also include omnidirectional fog signals as appropriate and where prescribed by THLS.

5.5.9. The markings for Dogger Bank Teesside A & B will be agreed in consultation with THLS once the final wind turbine layout has been selected.

5.5.10. Where possible, individual markings on structures in Dogger Bank Teesside A & B would conform to a spread sheet layout, i.e. lettered on the horizontal axis, and numbered on the vertical axis. The MCA will advise, following consent, on the specific requirements for Dogger Bank Teesside A & B.

5.5.11. Following a meeting with THLS in March 2013 it was noted that the IALA 0-139 guidance (i.e. marking of structures) does not have to be followed and the THLS may request additional or alternative mitigations in addition to agreement of a lighting scheme.

Buoyage

5.5.12. Dogger Bank Teesside A & B will be designed to ensure that the overall design of peripheral wind turbines does not increase risk by creating high risk areas. This may include the use of buoyage to aid traffic flow around a site. The requirements will be discussed in consultation with THLS.

Construction and decommissioning safety zones

5.5.13. These are 500m 'rolling' safety zones will exist around structures being constructed / decommissioned and vessels engaged in construction / decommissioning activities in order to minimise disruption to mariners and other users of the sea. Safety zones for the construction, major maintenance and eventual decommissioning phases of an offshore wind farm's life will be established on a 'rolling' basis, covering only those areas of the total site in which such activities are actually taking place at a given time. Once that activity has been completed in that specific location, the safety zone will then 'roll on' to cover the next specific location within the site in which such activity is taking place.

5.5.14. The location and status of active safety zones will be communicated in the construction phase via issue of weekly Notice to Mariners.

Search and rescue emergency response cooperation plan

5.5.15. Operators of Dogger Bank Teesside A & B will formulate a SAR ERCoP. The SAR ERCoP will be developed and put in place for the construction, operation and the decommissioning phases of any structure in the offshore wind farms. The ERCoP will be completed following the MCA template and initially in discussion with the MCA SAR and Navigation Safety Branches. Detailed completion of the plan will then be in cooperation with the MRCC responsible for

maritime emergency response in the area that the wind farm is to be sited (MCA 2008a).

5.5.16. The creation of an ERCoP will include details on the Marine Pollution Contingency Plan, with coordination with the relevant Maritime Rescue Coordination Centre from Construction Phase onwards. This would include cooperation with UK National Contingency Plan.

Cable burial

5.5.17. Dogger Bank Teesside A & B offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. The assessment will include consideration of operating characteristics, sediment type, and risk of damage to the cable from mobile sediments or external activities such as fishing or vessel anchors.

5.5.18. Following guidance issued by the MCA in 2013, Dogger Bank Teesside A & B will also consider under keel water clearance when identifying cable protection methods where burial is not feasible. Forewind has committed to cable burial, but where burial is not feasible there is a commitment to make cable protection over trawlable, with the aim to ensure that Chart Datum water depths are not reduced by more than 5%, with flexibility dependent on transiting traffic types, surrounding water depths and in consultation with the MCA and THLS.

5.5.19. The offshore cables will be buried wherever it is feasible to do so, with additional or alternative protection measures only applied if necessary. Possible burial methodologies include ploughing, mechanical trenching/cutting and/or jetting techniques, as appropriate to the location. The use of different cable burial techniques will vary depending on the site conditions and the technology available at the time (see **Chapter 5**).

5.5.20. Cables will also be marked on nautical charts in line with UKHO standards.

5.5.21. The subsea cables will be subject to periodic inspection to ensure they remain buried and do not become a hazard to marine navigation. This will include ad hoc inspections after potential anchor interactions.

OREI design specifications as per MGN 371

5.5.22. Dogger Bank Teesside A & B will be designed to satisfy the design requirements for emergency response in the event of a SAR, counter pollution or salvage operation in or around a wind farm (as per MGN 371 guidance - MCA 2008a).

Operational requirements as per MGN 371

5.5.23. The Central Control Room, or mutually agreed single contact point, should be manned 24 hours a day, with access to GPS positions of all OREIs. This information will be distributed to MRCCs and the CAA (see **Appendix 16A**).

6. Assessment of Impacts during Construction

6.1. General

6.1.1. This section details the construction impacts and effects identified from work undertaken as part of the NRA on vessels navigating in the vicinity of Dogger Bank Teesside A & B and the Dogger Bank Teesside A & B Export Cable Corridor. All vessels have been considered including commercial fishing vessels, recreational craft and vessels associated with the development of the wind farms.

6.2. Presence of construction activities: impacts on existing marine vessels transit routes

6.2.1. The presence of construction activities within Dogger Bank Teesside A & B may have an influence on powered vessels transiting in the vicinity of Dogger Bank Teesside A and/or Dogger Bank Teesside B by preventing them from continuing on current routes transited (see Figure 21.3 in **Appendix 16A**).

6.2.2. The spatial extent of construction will be restricted to the area of activity within the development area and limited to the construction period of a maximum of six years per project. Following stakeholder and regular operator consultation (see Section 2) it was identified that, due to the available navigable sea room around the development areas and the passage planning undertaken by vessels prior to leaving port, vessels are expected to make early course alterations to avoid the current area of activities, resulting in minimal differences in journey times (see Table 21.3 in **Appendix 16A**). The combination of available navigable sea room and a low degree of change relative to the existing baseline results in low a magnitude of the effect. In addition, very few vessels transit in the vicinity of Dogger Bank.

6.2.3. Marine vessels (receptors) will have a high tolerance (i.e. low sensitivity) to this impact due to the number of methods used for establishing safe routes as part of their passage plans including the use of NAVTEX and on-board navigational equipment to ensure they can adapt passage plans to avoid areas of increased navigational risk within this open sea area.

6.2.4. A low sensitivity combined with the low magnitude of effect results in a **negligible** impact on existing marine vessel routes from construction activities in Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B is predicted .

6.2.5. Due to the knowledge of vessel routeing, passage planning and the feedback from consultation, there is low uncertainty in this assessment.

6.3. Presence of construction vessels: displacement of existing vessel transit routes leading to increased vessel to vessel collision risk

6.3.1. During the hazard workshop, limited potential impacts, relating to commercial vessels transiting through Dogger Bank Teesside A & B were identified by the stakeholders. However, future case studies have identified a peak of up to 66 vessels operating in the project area. This may increase the collision risk (see Section 22.2 in **Appendix 16A**), given that the current busiest period is nine commercial vessels per day.

6.3.2. As with the effects associated with increased transit distances, vessels will have a high tolerance to this impact due to the number of methods used for establishing safe routes as part of their passage plans and by adapting their transits to reduce the number of expected encounters. Vessels associated with construction activities will have marine vessel coordination in place to ensure working zones are effectively managed and the risk of impacts associated with multiple areas of activity occurring simultaneously are minimised. It should be noted that this is not a form of Vessel Traffic Services (VTS).

6.3.3. The spatial extent of this effect is likely to be limited to those areas associated with the construction activities. Transit routes will be temporarily deviated throughout the phases and, therefore, collisions are not considered likely to occur. The extent of effect is likely to be limited to the current area of construction (or decommissioning) activities, areas of temporarily deviated routes and will be temporary throughout the phases and considered about as likely as not to occur resulting in a low magnitude.

6.3.4. Although the receptors (i.e. vessel owners and operators) have a high tolerance to deviations in transit routes, they are still considered to have a high sensitivity due to the potential for damage to vessels and injury to personnel.

6.3.5. Therefore, a **minor adverse** impact for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B is expected.

6.3.6. Due to the knowledge of vessel routeing, fishing vessel activity, passage planning and the feedback from consultation, there is low uncertainty in this assessment.

6.4. Presence of partially constructed or deconstructed structures: increased vessel to structure allision

6.4.1. As with the impact of increased vessel to vessel collisions associated with the presence of construction activities, outputs from the hazard workshop and knowledge from lessons learnt within the industry indicate a potential impact of allision with partially constructed OREI.

6.4.2. This potential impact is likely to be limited to the periphery of construction activities for commercial vessels (see Section 22.2 in **Appendix 16A**); however, stakeholder feedback indicates that fishing vessels may enter Dogger Bank Teesside A &/or Dogger Bank Teesside B, increasing the likelihood of occurrence across the full development area.

6.4.3. Together with the increased likelihood of the allision, this effect will be of temporary duration throughout the phases and is considered unlikely to occur in Dogger Bank Teesside A & B, resulting in an effect of low magnitude.

6.4.4. The activities are limited to the construction phase. This receptor has been ranked as having a high sensitivity due to the potential for damage to vessels and injury to personnel. Due to the combination of a low magnitude effect and a high sensitivity receptor, a **minor adverse** impact is anticipated for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

6.4.5. Due to the knowledge of vessel routeing and activity, along with the feedback from consultation, there is low uncertainty in this assessment.

6.5. Presence of partially constructed or deconstructed structures: increased risk of commercial fishing vessel allision

6.5.1. Structural collisions associated with fishing vessels are likely to be low speed and result in minimum damage. However, snagging of gear on partially constructed structures has the potential to cause major damage to the vessel and the crew resulting in a high sensitivity (see Section 22.2 in **Appendix 16A**).

6.5.2. This effect will not be limited to the periphery of the construction or deconstruction areas, as there is potential for fishing vessels to transit into areas of partial development to fish. Therefore it is considered that the magnitude of the effect is medium.

6.5.3. Due to the sensitivity of commercial fishing vessels and the potential for vessels to transit through areas of construction a moderate adverse impact for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B is anticipated.

6.5.4. Although this impact is considered unlikely to occur in Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B, there is potential for a slight increase in likelihood during periods of adverse weather conditions. Reduced visibility may make it more difficult for vessels to navigate within the development area.

6.5.5. There is good knowledge of vessel activities and feedback from consultation, when combined with the variation in structural design including foundations and wind turbine types there is low uncertainty in this assessment.

Mitigation

6.5.6. This effect can be reduced to through the implementation of the following mitigations:

- Advanced promulgation of information (i.e. issuing of Notice to Mariners (NTM));
- Fisheries liaison officers will carry out targeted communication (see **Chapter 15**);
- Safety zones around partially developed structures;

- Use of guard vessels (where required) to protect vulnerable areas of construction or decommissioning;
- Use of vessels own fenders to protect from low energy impacts; and
- Temporary aids to navigation to mark potential hazards to navigation safety.

Residual impacts

6.5.7. Through effective management, and promulgation of information on construction activities by implementing the recognised mitigation measures, the residual impact is expected to be **minor adverse** for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

6.6. Presence of construction activities at Dogger Bank Teesside A & B: decrease in emergency response (including search and rescue and pollution control)

6.6.1. This impact will be very likely to occur, as a result of there being an increased number of vessels and personnel on site during the construction phase. When the distance offshore is considered along with the presence of structures, there will be the potential for a decrease in the capability of emergency response. Feedback from emergency response providers and outputs from the hazard workshop confirmed that there is a high level of concern regarding a decrease in emergency response within the North Sea area which may impact all receptors. Section 4 of this chapter also identifies the limitations and future reductions in the UK emergency response capability that will further indirectly impact on the effects for these receptors.

6.6.2. Due to the increase in the number of vessels on site and the likelihood of occurrence for construction phases of the project, this effect is considered to have a high magnitude.

6.6.3. Stakeholder consultation noted that the presence of construction vessels on site may also provide additional emergency response capabilities that had not previously existed. For example, construction vessels may be in a position to aid vessels in an emergency situation or structures may provide a place of refuge. However, at this stage, the exact capability of vessels is not fully understood and, therefore, cannot be assessed in isolation. It has been considered as mitigation to reduce the impact associated with diminished emergency response capability.

6.6.4. The receptor is considered to have a very high sensitivity due to the potential for major damage to vessels, loss of life, a major pollution incident and limited ability for receptors to adapt to this impact due to the isolation and distance from existing emergency response providers. The impact is, therefore, expected to be major adverse for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

6.6.5. Due to the indirect effects associated with the changes to Emergency Response in the UK, there is medium uncertainty in this assessment.

Mitigation

6.6.6. This effect can be reduced to ALARP through the implementation of the following mitigations:

- Advanced ERCoP; and
- Emergency Response Study.

6.6.7. Due to the limited information currently available regarding emergency response planning for Dogger Bank Teesside A & B, as well as the indirect effects associated with the changes to Emergency Response in the UK, there is high uncertainty in this assessment.

Residual impacts

6.6.8. An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone. Through effective management and implementation of emergency response procedures for the construction and decommissioning phase, as well as the provision of self-help capability for on-site vessels the significance of this impact can be reduced to **minor adverse**.

6.7. Presence of construction activities at Dogger Bank Teesside A & B: increase in emergency response (including search and rescue and pollution control)

6.7.1. This impact will be very likely to occur, as a result of there being an increased number of vessels and personnel on site during the construction phase. When the distance offshore is considered along with the presence of structures, there will be the potential for an increase in the capability of emergency response.

6.7.2. Stakeholder consultation noted that the presence of construction vessels on site may also provide additional emergency response capabilities that had not previously existed. For example, construction vessels may be in a position to aid vessels in an emergency situation or structures may provide a place of refuge. However, at this stage, the exact capability of vessels is not fully understood and, therefore, cannot be assessed in isolation.

6.7.3. Due to the increase in the number of vessels on site and the likelihood of occurrence for construction phases of the project, this effect is considered to have a high magnitude.

6.7.4. The receptor is considered to have a very high sensitivity due to the potential for major damage to vessels, loss of life, a major pollution incident and limited ability for receptors to adapt to this impact due to the isolation and distance from existing emergency response providers. The impact is, therefore, expected to be **major beneficial** for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

6.7.5. Due to the indirect effects associated with the changes to Emergency Response in the UK, there is medium uncertainty in this assessment.

6.7.6. It has been considered that the increase of vessels associated with the development of the Dogger Bank Teesside A & B could be considered as a mitigation measure leading to the reduction of the impact associated with diminished emergency response capability.

7. Assessment of Impacts during Operation

7.1. Physical presence of offshore infrastructure: increase deviations on vessel transit time

7.1.1. Existing data, hazard workshop outcomes and stakeholder opinion have identified that the presence of new structures within Dogger Bank Teesside A & B has the potential to displace vessels including marine aggregate dredgers (see Section 4 Existing Environment). It was also noted that there was limited recreational activity recorded within the vicinity of Dogger Bank Teesside A & B.

7.1.2. The spatial extent of this effect will be limited to vessels transiting the Dogger Bank Teesside A & B for the duration of the operational phase. The estimated operational phase is expected to be 25 years, with the option to extend the operation for a further 25 years. The lease is for 50 years. This period of time would lead to a permanent impact on the vessel operators and is considered to be of high magnitude for the duration of the operational phase.

7.1.3. Following stakeholder and regular operator consultation (see Section 2 and **Appendix 16A**), it was identified that, due to the available navigable sea room around Dogger Bank Teesside A and Dogger Bank Teesside B and the passage planning undertaken by vessels prior to leaving port, vessels are able to make early course alterations to avoid the wind farm. There will be minimal increases to journey times resulting in a low sensitivity but it is likely to occur for the vessels affected.

7.1.4. Thus, a **minor adverse** impact for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B via increased vessel transit times to avoid operational infrastructure is predicted. Due to the knowledge of vessel routeing, passage planning and the feedback from consultation, there is low uncertainty in this assessment.

7.2. Physical presence of offshore infrastructure: increase in vessel to vessel collision risk

7.2.1. Existing data, hazard workshop outcomes, stakeholder feedback and outputs of the collision risk modelling have identified that the presence of new structures within Dogger Bank Teesside A and/or Dogger Bank Teesside B have the potential to increase vessel to vessel collisions when compared to the current level (see **Appendix 16A**). This risk will be increased by the presence of operation and maintenance vessels on site, which will increase the daily vessel counts. Collision risk frequency is likely to increase further in adverse weather conditions, especially in reduced visibility, when vessels exiting the wind farm may not be easily sighted.

7.2.2. **Table 7.1** shows the vessel to vessel collision risk modelling results calculated in section 23 in **Appendix 16A**.

Table 7.1 Vessel to vessel collision results

Project	Modelled frequency of collisions	Percentage increase through risk modelling
Dogger Bank Teesside A	one major collision in 461 years	23.41% increase on base case
Dogger Bank Teesside B	one major collision in 624 years	78.31% increase on base case
Dogger Bank Teesside A & B	one major collision in 242 years	29.07% increase on base case

7.2.3. When considered within the seasonal variations associated with traffic, this risk to vessels from increased encounters is considered very likely to occur. In particular, in the vicinity of areas associated with sandeel fishing and marine aggregate dredgers; where they are likely to encounter displaced commercial routes, particularly when entering or exiting the array.

7.2.4. Following stakeholder and regular operator consultation (see Section 2 and **Appendix 16A**), it was identified that, due to the available navigable sea room around Dogger Bank Teesside A and Dogger Bank Teesside B and the passage planning undertaken by vessels prior to leaving port, vessels are able to make early course alterations to avoid the wind farm. However, vessels are considered to have a high sensitivity, due to the potential for damage to the vessels and injury to personnel.

7.2.5. The extent of the effect is likely to be limited to areas on the periphery of the sites, where vessels on displaced routes may encounter each other, and will be permanent throughout the operational phase, resulting in a medium magnitude.

7.2.6. Therefore, this impact is expected to be moderate adverse for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

7.2.7. Whilst there is good knowledge of vessel activities and feedback from consultation, when combined with the variation in structural design, including foundations and wind turbine types, there is high uncertainty in this assessment.

Mitigation

7.2.8. The significance of the impact associated with Dogger Bank Teesside A & B can be reduced to ALARP through the implementation of the following mitigations:

- Promulgation of information; and
- Marine vessel coordination including early warning procedures for vessels transiting in close proximity to the site and designated entry/exit points for the site.

Residual impacts

7.2.9. Through effective management, and promulgation of information on construction and decommissioning activities and the implementation of the recognised mitigation measures, the residual impact is expected to be **minor adverse** for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

7.3. Physical presence of offshore infrastructure: increase in vessel to structure allision risk

7.3.1. Outcomes of the hazard workshop and the collision risk models confirm that wind farm structures have the potential to increase the vessel allision risk in previously open sea areas (see **Table 7.2**).

Table 7.2 Allision return period

Project definition	Vessel to structure allision return period	Fishing vessel allision return period
Dogger Bank Teesside A	692 years	12 years
Dogger Bank Teesside B	2,728 years	12 years
Dogger Bank Teesside A & B	636 years	six years

7.3.2. It is noted that structural allisions associated with fishing vessels are likely to be low speed and result in minimum damage, with snagging having the potential to cause major damage to the vessel and thus effects on crew.

7.3.3. The presence of accommodation platforms has the potential to increase risk to personnel on these structures, especially if placed on the periphery of the sites. Single point mooring buoys could also impact collision risk if placed on the periphery. Allision risk probability is also likely to increase in adverse weather conditions including during periods of reduced visibility.

7.3.4. There will be a permanent and large degree of change on the receptors, meaning this effect is considered to have a medium magnitude for Dogger Bank Teesside A and/or Dogger Bank Teesside B.

7.3.5. Due to the potential for vessel damage and injury to personnel, the effect on the vessels is considered of high sensitivity. This sensitivity would increase if single point mooring buoys or accommodation platforms are located on the periphery of the developments and in close proximity to transit routes.

7.3.6. The impact is considered likely to occur resulting in a moderate adverse impact for Dogger Bank Teesside A and Dogger Bank Teesside B and Dogger Bank Teesside A & B. Due to the potential for collision risk and the unknown final project layout (including the location of sensitive structures such as accommodation platforms), there is high uncertainty in this assessment.

Mitigation

7.3.7. This effect can be reduced through the implementation of the following mitigations:

- Implementation of Layout Rules;
- Consultation on Aids to Navigation during operation; and
- Use of vessels own fenders as mitigation for low energy allisions.

Residual impacts

7.3.8. Through the use of the layout rules and consultation with the MCA and THLS to ensure that the final project boundaries or location are acceptable from a navigational safety perspective, the overall residual impact is assessed as **minor adverse**.

7.3.9. It is noted that an accommodation platform located in a peripheral position could increase the sensitivity for Dogger Bank Teesside A & B to very high, due to the number of personnel on board. However, implementation of the Layout Rules (Section 10 in **Appendix 16A**) aims to ensure that consideration is given to the location of these structures.

7.4. Physical presence of offshore infrastructure: increase in interference with navigational position fixing aids (such as radars).

7.4.1. Investigations into the effect of OREIs on navigation equipment by the Department for Transport (DfT) (2004), the British Wind Energy Association (now RenewableUK) (2007) and the Forewind NRA have all identified that the level of interference is low. However, when considering the development of Dogger Bank Teesside A & B, potential impacts to radar may result from the returns and shadow effects associated with any concave sections in the layout (i.e. non-linear) and any undeveloped areas between the projects.

7.4.2. Although potential exists for shadow effects the vessels are considered to have a low sensitivity due to the availability of information through alternative sources (i.e. a lookout, VHF or AIS (MCA, 2008b).

7.4.3. Due to the open sea area and a vessels ability to distance itself from the development areas, the effect is considered to have low magnitude.

7.4.4. The overall impact is, therefore, considered to be **negligible** for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B and very unlikely to occur. Given the size of the development and the requirement for further research on radar issues, there is medium uncertainty in this assessment.

7.5. Physical presence of offshore infrastructure: increase in collision risk to vessels Not Under Command (including vessels Not Under Command due to mechanical or navigational system errors).

7.5.1. Assessment of the baseline data (including MAIB/RNLI statistics), the outcomes of the hazard workshop, known collision risk methodologies and lessons learnt identified that the presence of structures may increase the risk of vessel to structure collisions during Not Under Command (NUC) situations. The frequency is likely to increase in adverse weather conditions especially in high winds and/or strong tidal conditions that may displace NUC vessels towards structures.

7.5.2. The annual allision frequencies have been estimated in **Table 7.3**.

Table 7.3 NUC vessel to structure allision

Project definition	Allision return period
Dogger Bank Teesside A	one every 13,420 years
Dogger Bank Teesside B	one every 19,292 years
Dogger Bank Teesside A & B	one every 8,934 years

7.5.3. This effect will be present for the duration of the operational phase but only in the unlikely event that an NUC vessel comes in close proximity to structures. The extent will be limited to the boundary areas of the developments. The existing environmental data (MAIB/RNLI statistics) confirm that the frequency of machinery related failures in the area causing vessels to be rendered NUC is low. However, the distance from shore and the lack of response facilities, combined with strong winds and tidal conditions, mean vessels will drift for greater distances before the situation is resolved. Therefore, the effect is considered to have a medium magnitude.

7.5.4. In the unlikely circumstances that a vessel is NUC in the vicinity of Dogger Bank Teesside A & B, effects could include increased collision risk (see Section 23 in **Appendix 16A**) and damage to the vessel/structure or injury to personnel (high sensitivity). As a result, the overall sensitivity is considered high and the increase in navigational safety is assessed as being moderate adverse for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

7.5.5. Existing marine traffic data are comprehensive and collision risk methodologies and lessons learnt are well understood; however, accident and incident data are not inclusive (due to available datasets for non-UK registered vessels) and consequently there is a medium uncertainty in this assessment.

Mitigation

7.5.6. This effect can be reduced to ALARP through the implementation of the following mitigations:

- Marine vessel coordination to monitor and provide information on NUC events;
- Vessels own fenders to protect from low energy allisions with structures;
- Advanced ERCoP; and
- Emergency Response Study.

Residual impacts

7.5.7. With the above mitigation measures in place the residual impact is considered as **minor adverse** due to intervention from other vessels, which may prevent the collision event from occurring.

7.6. Physical presence of inter-array cables and cable protection (exposed or incorrectly buried): increase in anchor snagging risk

7.6.1. Outcomes of the hazard workshop and lessons learnt confirm that the presence of inter array cables and cable burial protection will increase the risk of anchor snagging.

7.6.2. Vessels snagging a cable are considered to have medium sensitivity where there may be damage to vessels.

7.6.3. Although the cables will be laid for the duration of the operational phase (i.e. up to 50 years) snagging is considered unlikely, even in the event of an emergency situation where vessels anchor within the development. Therefore the magnitude of the effect is considered to be medium. Some types of fishing vessels use anchors to position themselves, increasing the frequency of a potential snagging event.

7.6.4. The increase in the snagging risk is anticipated to be a **minor adverse** impact.

7.6.5. Whilst there is good knowledge of vessel activities and feedback from consultation, when combined with the variation in cable burial depths and layout there is high uncertainty in this assessment.

Mitigation

7.6.6. This effect can be reduced through the implementation of the following mitigations:

- Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary. Burial methodologies include for example ploughing, mechanical trenching/cutting and/or jetting techniques, as appropriate to the location. The use of different cable burial techniques will vary depending on the site conditions and the technology available at the time;
- Implementation of inspection and maintenance regime for installed cables; and
- Inter-array cable layout to be widely promulgated.

Residual impacts

7.6.7. No further reduction of the impact is required; therefore, the residual impact is considered to be **negligible**.

7.7. Physical presence of export cables and cable protection (including exposed or incorrectly buried cables): increase anchor snagging risk

7.7.1. Feedback from attendees at the hazard workshop and lessons learnt confirm that the presence of export cables and cable protection will increase the risk of anchor snagging, although outputs of the NRA show that there is limited anchoring within the Dogger Bank Teesside A & B Export Cable Corridor.

7.7.2. Taking into account the transitory nature of construction activity along the corridor this effect is very unlikely to occur because the length of exposed cable is expected to be minimal. This will be a temporary effect for the construction and maintenance period only and particularly hazardous during the period when the cable is uncharted or exposed resulting in medium magnitude for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

7.7.3. The receptors are expected to have a low sensitivity because the major effects would be on the cable itself rather than on the anchoring vessel itself. This results in a **minor adverse** impact. Due to expert opinion and lessons learnt this assessment has low uncertainty.

7.8. Physical presence of High Voltage Direct Current (HVDC) export cables: increase in electromagnetic interference for vessels using magnetic compasses

7.8.1. The magnetic field that will be generated by the marine HVDC export cables during operation may have an effect localised to a vessel crossing the export cable. The effect could cause deviation of magnetic compasses.

7.8.2. The degree of compass deviation can vary depending on the alignment of the cable relative to the Earth's magnetic field, the proximity of the cables, and the water depth; with water less than 10m seeing the largest deviation effect of up to five degrees. There is the potential for a limited number of smaller craft operating within the 10m contour and reliant on magnetic compasses, to experience a higher effect. Vessels using inertial navigation systems and GPS as their main navigational system may not experience these deviations. Vessels are therefore considered to have low sensitivity and high tolerance.

7.8.3. The effects are expected to be temporary and only in the immediate vicinity of the export cable, resulting in a medium magnitude of effect for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

7.8.4. It is anticipated that a **minor adverse** impact would result from the presence of a HVDC export cable.

7.8.5. Further investigations into the effects have been carried out by Forewind. This together with expert opinion results in low uncertainty for this assessment.

7.9. Manoeuvring within corridors and open sea between OREI: increase in allision (vertical and horizontal) risk for fishing vessels

7.9.1. Outputs of the hazard workshop and stakeholder consultation have identified the increased risks for fishing vessels transiting and manoeuvring within areas of wind turbines, including the potential for horizontal and vertical allision, due to fishing vessels colliding with platforms and/or blades that protrude from the structures. It was noted at the hazard workshop that the 22m clearance left between HAT and the lower blade tip would not be enough clearance for some vessels in a vertical position during some manoeuvring operations and is considered likely to occur.

7.9.2. Together with the high magnitude, allision risk probability is likely to increase in adverse weather conditions, including reduced visibility. It is noted that structural allisions associated with fishing vessels are likely to be low speed and result in minimum damage which results in a medium sensitivity. In addition, fishermen are likely to adapt to navigating within the development resulting in a moderate adverse impact for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B. This impact has not considered the potential for fishing activity to increase in activities associated with potential fish aggregation within development areas and has, therefore, been given a medium level of uncertainty.

Mitigation

7.9.3. This effect can be reduced through the implementation of the following mitigations:

- Implementation of layout rules;
- Advanced promulgation of information; and
- Use of vessels own fenders to protect from low energy allisions with structures.

Residual impacts

7.9.4. Following implementation of these mitigations including consideration for fishing stakeholders concerns when designing the final project layouts, the impact is considered to be **minor adverse**.

7.10. Physical presence of offshore infrastructure: decrease in emergency response (including SAR and pollution control)

7.10.1. During operation, there will be an increased number of vessels and personnel on site when compared to baseline conditions. When the distance offshore is considered with the presence of structures, there is the potential for a decrease in emergency response capabilities. Outputs from the hazard workshop and feedback from emergency response providers confirmed that there is a high level of concern regarding such a decrease within the North Sea area that may impact all receptors.

7.10.2. It is also noted that the presence of accommodation platforms may further increase the requirements for emergency response facilities within Dogger Bank Teesside A & B. It is anticipated that, as with existing manned offshore platforms, these facilities will include self-help emergency response facilities.

7.10.3. Due to the increases in the number of vessels and personnel on site and the potential occurrence of an incident, this effect is considered virtually certain to occur for the full duration of the operational phase of the project and is, therefore, considered to have high magnitude.

7.10.4. The receptor is considered to have a very high sensitivity due to the potential for major damage to vessels, loss of life or a major pollution incident and limited ability to adapt to this impact in Dogger Bank Teesside A & B due the isolation and distance from existing emergency response providers. The impact is anticipated, therefore, to be major adverse for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

7.10.5. As a result of the indirect effects associated with the changed to Emergency Response in the UK, There is medium uncertainty in this assessment.

7.11. Mitigation

7.11.1. This significance of this effect can be reduced through the implementation of the following mitigations:

- SAR and ERCoP; and
- Use of on-site vessels to provide an early response to pollution incidents.

Residual impacts

7.11.2. Through effective management and implementation of emergency response procedures for the operational phase, as well as the provision of self-help capability for on-site vessels this impact can be reduced.

7.11.3. An Emergency Response Study is being undertaken by Forewind. This report will form part of the commitment to mitigating for the potential impact to the emergency response. This will reduce all negative impacts to within an ALARP region and of **minor adverse** impact.

7.12. Physical presence of offshore infrastructure: increase in emergency response (including SAR and pollution control)

7.12.1. This impact will be very likely to occur, as a result of there being an increased number of vessels and personnel on site during the construction phase. When the distance offshore is considered along with the presence of structures, there will be the potential for an increase in the capability of emergency response.

7.12.2. Stakeholder consultation noted that the presence of construction vessels on site may also provide additional emergency response capabilities that had not previously existed. For example, construction vessels may be in a position to aid vessels in an emergency situation or structures may provide a place of

refuge. However, at this stage, the exact capability of vessels is not fully understood and, therefore, cannot be assessed in isolation.

7.12.3. Due to the increase in the number of vessels on site and the likelihood of occurrence for construction phases of the project, this effect is considered to have a high magnitude.

7.12.4. The receptor is considered to have a very high sensitivity due to the potential for major damage to vessels, loss of life, a major pollution incident and limited ability for receptors to adapt to this impact due to the isolation and distance from existing emergency response providers. The impact is, therefore, expected to be **major beneficial** for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B.

7.12.5. Due to the indirect effects associated with the changes to Emergency Response in the UK, there is medium uncertainty in this assessment.

Mitigation

7.12.6. It has been considered that the increase of vessels would be mitigation for the impact associated with diminished emergency response capability.

Residual impacts

7.12.7. An Emergency Response Study is being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone. Through effective management and implementation of emergency response procedures for the construction and decommissioning phase, as well as the provision of self-help capability for on-site vessels the significance if this impact can be reduced to **minor adverse**.

7.13. Physical presence of export cables and cable protection (including exposed or incorrectly buried cables): increase anchor snagging risk

7.13.1. Feedback from attendees at the hazard workshop and lessons learnt confirm that the presence of export cables could increase the risk of anchor snagging, although outputs of the NRA show that there is limited anchoring within the Dogger Bank Teesside A & B Export Cable Corridor.

7.13.2. This will be a temporary impact for the construction and maintenance period only and particularly hazardous during the period when the cable is uncharted or exposed. Cables will be protected and/or buried as noted below during the operational phase of the project so as not to increase the navigational safety risk.

7.13.3. The offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. The assessment will include consideration of operating characteristics, sediment type, and risk of damage to the cable from mobile sediments or external activities such as fishing or vessel anchors.

7.13.4. The offshore cables will be buried wherever it is feasible to do so, with additional or alternative protection measures only applied if necessary. Burial methodologies include for example ploughing, mechanical trenching/cutting and/or jetting techniques, as appropriate to the location. The use of different cable burial techniques will vary depending on the site conditions and the technology available at the time

7.13.5. Due to the short duration of any export cables remaining exposed, this has been determined to be of medium magnitude for Dogger Bank Teesside A, Dogger Bank Teesside B and Dogger Bank Teesside A & B. A medium sensitivity for receptors has been defined because the major effects would be on the cable itself rather than the anchoring vessel. This results in a **minor adverse** impact with the impact being very unlikely to occur.

7.13.6. Due to expert opinion and lessons learnt this assessment has low uncertainty.

8. Assessment of Impacts during Decommissioning (and Major Maintenance Activity)

8.1.1. The discussions presented on impacts during construction are considered to apply to the decommissioning phase as well as during periods where major maintenance activities are taking place (e.g. cable, gearbox replacement and repair).

8.1.2. Given the duration of the operational phase, shipping routes and information of hazards within the wind farm will be well established and documented. Operators and marine users are expected to have adapted to the presence of the wind farm and would avoid known hazards. As described previously in this chapter these receptors are considered to have high sensitivity.

8.1.3. The majority of the activity during the decommissioning phase is anticipated to take place in areas that would have been previously avoided and are expected to be limited. Although there will be an increase in vessel movements a low magnitude is expected.

8.1.4. Therefore, the potential impacts during this phase, after the application of the appropriate mitigation measures, are anticipated to be **minor adverse**.

8.1.5. There is a high uncertainty regarding this assessment and as a result a decommissioning plan will be produced and appropriate advice will be sought prior to the decommissioning phase. Any documentation produced will be agreed with the relevant authorities before any decommissioning activities commence.

9. Inter-relationships

9.1.1. In order to address the environmental impact of the proposed development as a whole, this section summarises the inter-relationships between shipping and navigation and other physical, environmental and human receptors (**Table 9.1**). The objective is to identify where the accumulation of impacts on a single receptor, and the relationship between those impacts, gives rise to a need for additional mitigation.

9.1.2. There is potential for inter-related impacts between shipping and navigation and other marine users during all phases of the development. These are related to potential restrictions on navigational routes. These impacts are assessed in this chapter and judged to be **minor adverse**.

9.1.3. There is also potential for inter-related impacts between shipping and navigation, military activities and civil aviation during the operational phase of the development. This is related to the potential for lighting of offshore structures for military and civil aviation purposes conflicting with the lighting requirements from a maritime perspective. These requirements are discussed in this chapter and are noted as being the subject of on-going consultation with the relevant stakeholders.

9.1.4. No inter-relationships have been identified where an accumulation of residual impacts on shipping and navigation and the relationship between those impacts gives rise to a need for additional mitigation.

9.1.5. Other receptors which may be affected by the effects of the development on shipping and navigation include:

- Marine and coastal ornithology;
- Marine mammals;
- Commercial fisheries;
- Landscape and seascape visual character;
- Other marine users;
- Military activities;
- Civil aviation; and
- Tourism and recreation.

Table 9.1 Inter-relationships relevant to the shipping and navigation assessment

Inter-relationship	Section where addressed	Linked chapter
All phases		
Presence of construction activities: impacts on existing marine vessels transit routes due to deviation and increased journey times	6.2, 7.1	**Chapter 11 Marine and Coastal Ornithology** **Chapter 14 Marine Mammals** **Chapter 15 Commercial Fisheries** **Chapter 17 Other Marine Users** **Chapter 19 Military Activities and Civil Aviation** **Chapter 20 Seascape and Visual Impact Assessment** **Chapter 23 Tourism and Recreation**
Presence of construction vessels: displacement of existing vessel transit routes leading to increased vessel to vessel collision risk	6.3, 7.2	**Chapter 14 Marine Mammals** **Chapter 15 Commercial Fisheries** **Chapter 17 Other Marine Users** **Chapter 19 Military Activities and Civil Aviation** **Chapter 23 Tourism and Recreation**
Presence of partially constructed or deconstructed structures: increase vessel to structure allision	6.4	**Chapter 14 Marine Mammals** **Chapter 15 Commercial Fisheries** **Chapter 17 Other Marine Users** **Chapter 19 Military Activities and Civil Aviation**
Presence of partially constructed or deconstructed structures: increased risk of commercial fishing vessel allision	6.5, 7.3	**Chapter 15 Commercial Aviation**
Presence of construction activities at Dogger Bank Teesside A & B and offshore infrastructure: decrease in emergency response (including SAR and pollution control)	6.6, 7.10	**Chapter 19 Military Activities and Civil Aviation**
Presence of offshore infrastructure: increase in interference with navigational position fixing aids (such as radars)	7.4	**Chapter 14 Marine Mammals** **Chapter 15 Commercial Fisheries** **Chapter 19 Military Activities and Civil Aviation** **Chapter 20 Seascape and Visual Impact Assessment**
Presence of offshore infrastructure: increase collision risk to vessels NUC (including vessels NUC due to mechanical or navigational system errors)	7.5	**Chapter 15 Commercial Fisheries**
Presence of export cables, cable protection and inter array cables (including exposed or incorrectly buried cables): increased anchor snagging risk	7.6, 7.8	**Chapter 15 Commercial Fisheries** **Chapter 17 Other Marine Users** **Chapter 23 Tourism and Recreation**
Presence of export cables: increase in electromagnetic interference for vessels using magnetic compasses	7.7	**Chapter 15 Commercial Fisheries** **Chapter 17 Other Marine Users** **Chapter 19 Military Activities and Civil Aviation**
Manoeuvring within corridors and open sea between OREI: increase in collision (vertical and horizontal) risk for fishing vessels	7.9	**Chapter 15 Commercial Fisheries**

10. Cumulative Impacts

10.1. CIA Strategy and screening

10.1.1. This section describes the CIA for Shipping and Navigation, taking into consideration other plans, projects and activities. A summary of the CIA is presented in **Chapter 33**.

10.1.2. CIA includes a consideration of the impacts arising from multiple offshore wind farm development activities within the southern North Sea. Forewind has developed and implemented a comprehensive strategy (the 'CIA Strategy') for the assessment of cumulative impacts from development in the Dogger Bank Zone.

10.1.3. The Forewind CIA Strategy has been developed in consultation with statutory stakeholders including the MMO, the Joint Nature Conservation Committee (JNCC), Natural England and Centre for Environment Fisheries and Aquaculture Science (Cefas). Further details of the approach to cumulative impact assessment adopted for this ES are provided in **Chapter 4**.

10.1.4. In its simplest form the strategy involves consideration of:

- Whether impacts on a receptor can occur on a cumulative basis between the wind farm project(s) subject to the application(s) and other wind farm projects, activities and plans in the Dogger Bank Zone (either consented or forthcoming); and
- Whether impacts on a receptor can occur on a cumulative basis with other activities in particular those engaged in navigation, projects and plans outwith the Dogger Bank Zone (e.g. other offshore wind farm developments), for which sufficient information regarding location and scale exist.

10.1.5. The strategy recognises that data and information sufficient to undertake an assessment will not be available for all potential projects, activities, plans and/or parameters, and seeks to establish the 'confidence' we can have in the data and information available.

10.1.6. For shipping and navigation operators, the potential for cumulative impacts is identified in relation to oil & gas activities, subsea cables, commercial fishing, recreation, military and aggregates where a receptor is engaged in an act of navigation. In all cases, data confidence is assessed as medium to high (**Table 10.1**).

Table 10.1 Cumulative Impact Assessment screening

Type of project	Project title	Project status	Predicted construction/development period	Distance from Dogger Bank Teesside A & B (km)	Confidence in project description	Confidence in project data	Carried forward to cumulative impact assessment?
Offshore Wind Farm (Round 3)	Dogger Bank Creyke Beck A & B	Pre-Application	Construction may start from 2016	Dogger Bank Teesside A approximately 35 Dogger Bank Teesside B approximately 5	High	High	Yes
Offshore Wind Farm (Round 3)	Dogger Bank Teesside C & D	Pre-Application	Post 2015	Dogger Bank Teesside A approximately 20 Dogger Bank Teesside B approximately 10	High	Medium	Yes
Offshore Wind Farm (Round 3)	Dogger Bank Zone – other future developments	Potential	Not confirmed	Not confirmed	Low	Low	No
Offshore Wind Farm (Round 3)	Hornsea Project One	Application	Project One may start construction 2015	66	High	Medium	Yes
Offshore Wind Farm (Round 3)	Hornsea Project Two	Pre-Application	Post 2015	113	Medium	Medium	Yes (for cumulative routeing)
Offshore Wind Farm (Round 3)	Hornsea Zone – other future development	Potential	Not confirmed	Not confirmed	Low	Low	No
Offshore Wind Farm (Round 3)	East Anglia Project One	Application	Post 2015	286	High	Medium	Yes

Type of project	Project title	Project status	Predicted construction/development period	Distance from Dogger Bank Teesside A & B (km)	Confidence in project description	Confidence in project data	Carried forward to cumulative impact assessment?
Offshore Wind Farm (Round 3)	East Anglia Project Three	Pre-Application	Post 2015	245	Medium	Medium	Yes (for cumulative routeing)
Offshore Wind Farm (Round 3)	East Anglia Project Four	Pre-Application	Post 2015	228	Medium	Medium	Yes (for cumulative routeing)
Offshore Wind Farm (Round 3)	East Anglia Zone – other future development	Pre-Application	Not confirmed	Not confirmed	Low	Low	No
Offshore Wind Farm (Round 3)	Firth of Forth Zone – Alpha and Bravo	Application	2015-2019	269	Medium	Medium	No
Offshore Wind Farm (Scottish Territorial Waters)	Inch Cape	Application	4-5 years	271	Medium	Medium	No
Offshore Wind Farm (Scottish Territorial Waters)	Neart na Gaoithe	Application	Expected to begin 2014	262	Medium	Medium	No
Offshore Wind Farm	German Wind Farm Sites	N/A	N/A	N/A	Medium	Medium	No
Offshore Wind Farm	Dutch Wind Farm Sites	N/A	N/A	N/A	Medium	Medium	No
Offshore Wind Farm (Round 1)	Scroby Sands	Fully Commissioned	N/A	223	Medium	High	Yes (for cumulative routeing)

Type of project	Project title	Project status	Predicted construction/development period	Distance from Dogger Bank Teesside A & B (km)	Confidence in project description	Confidence in project data	Carried forward to cumulative impact assessment?
Offshore Wind Farm (Round 1)	Teesside Offshore Windfarm	Construction completed	Construction scheduled to finish March 2013	167	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 1)	Inner Dowsing	Fully Commissioned	N/A	192	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 1)	Lynn	Fully Commissioned	N/A	194	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 2)	Triton Knoll	Consent Authorised	From 2017	143	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 2)	Humber Gateway	Consent Authorised	From 2013	145	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 2)	Lincs	Under Construction	From 2011	182	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 2)	Dudgeon	Consent Authorised	2013 – 2015	158	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 2)	Race Bank	Consent Authorised	2013 – 2014	165	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 2)	Sheringham Shoal	Fully Commissioned	N/A	175	Medium	High	Yes (for cumulative routeing)
Offshore Wind Farm (Round 2)	Westermost Rough	Consent Authorised	From 2014	139	Medium	High	Yes (for cumulative routeing)

Type of project	Project title	Project status	Predicted construction/development period	Distance from Dogger Bank Teesside A & B (km)	Confidence in project description	Confidence in project data	Carried forward to cumulative impact assessment?
Oil and Gas	Cygnus gas field development (Alpha and Bravo)	Development (pre-production)	Ongoing – production to start in 2015	23 (Cygnus Alpha) 16 (Cygnus Bravo)	High	Medium	Yes
Dredging	Area 466/1	Application	Not confirmed	3.4	High	High	Yes (addressed in main body of NRA)
Dredging	Areas 485, 485A and 485B	Option / Application	Not confirmed	19.1	High	High	Yes (addressed in main body of NRA)
MOD	Submarine Exercise Areas	N/A	N/A	Within Dogger Bank Creyke Beck A	High	High	Yes

10.1.7. Due to the potential for wide spread cumulative impacts relevant to shipping and navigation issues, these were assessed by Southern North Sea Offshore Wind Forum (SNSOWF), a group made up of representatives from the three Round 3 Zones in the southern North Sea (Dogger Bank, Hornsea and East Anglia). It has been recognised that, due to the scale and location of these Round 3 Zones in the southern North Sea, coordination is required between zones in order for developers of these zones to successfully undertake their respective ZAP process. Therefore, the three zones established the SNSOWF to extend the principles of ZAP beyond the boundaries of their respective zones to help manage wider cumulative effects between these zones. The three zones are presented in **Figure 10.1**. An overview of this work is detailed in the NRA.

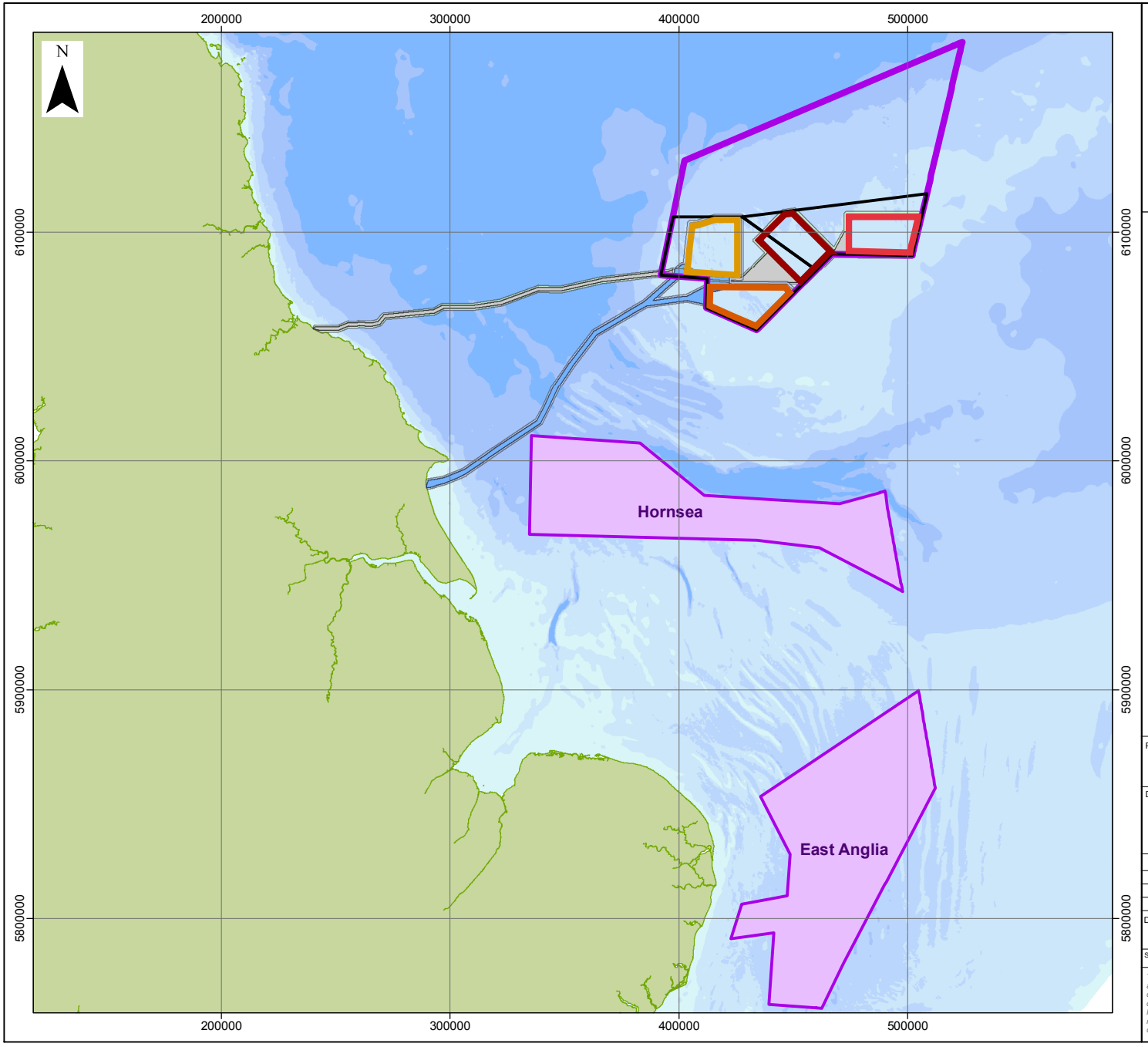
10.1.8. The following developments have been identified as having a potential cumulative effect with Dogger Bank Teesside A & B:

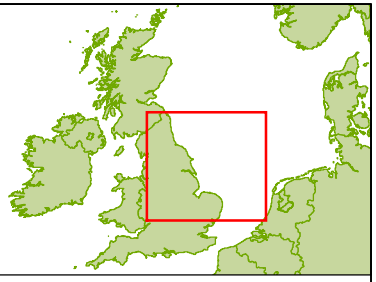
- Dogger Bank Creyke Beck;
- Dogger Bank Teesside C & D;
- The Zone Development Envelope (ZDE) is the area comprising all development associated with the Dogger Bank Zone including potential onshore grid connection corridors and infrastructure, offshore export cable corridors and the offshore wind farm areas;
- Other offshore renewable developments including projects involved in the SNSOWF;
- Existing oil and gas infrastructure; and
- MoD.

10.1.9. It is noted that other activities such as marine aggregate dredging, commercial fishing activity, activity associated with subsea cables and recreational vessel traffic have already been considered within the main section (Section 6, 7 and 8) of this chapter and the NRA and hence are not presented again here. Please refer to **Chapters 15** and **Chapter 17 Other Marine Users** in this ES for further information.

10.1.10. The following methods have been used to assess cumulative effects:

- Stakeholder consultation and expert opinion;
- Lessons learnt;
- Desk top study;
- Collision risk modelling; and
- Regular operator feedback.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Other offshore wind farm
- Teesside A & B temporary works area
- Dogger Bank Teesside A & B Export Cable Corridor
- Creyke Beck temporary works area
- Dogger Bank Creyke Beck Export Cable Corridor

0 30 60
Kilometres

Data Source:
Offshore wind farm boundaries © Crown Copyright, 2013,
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 10.1 Round 3 Zones in Southern North Sea Offshore Wind Forum (SNSOWF)

VER	DATE	REMARKS	Drawn	Checked
1	22/07/2013	Draft	GC	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER:

F-OFL-MA-602

SCALE	1:2,550,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

10.2. Dogger Bank Creyke Beck, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D

10.2.1. Following assessment of the cumulative baseline it has been identified that the development of Dogger Bank Teesside A & B in addition with Dogger Bank Creyke Beck and Dogger Bank Teesside C & D has the potential to:

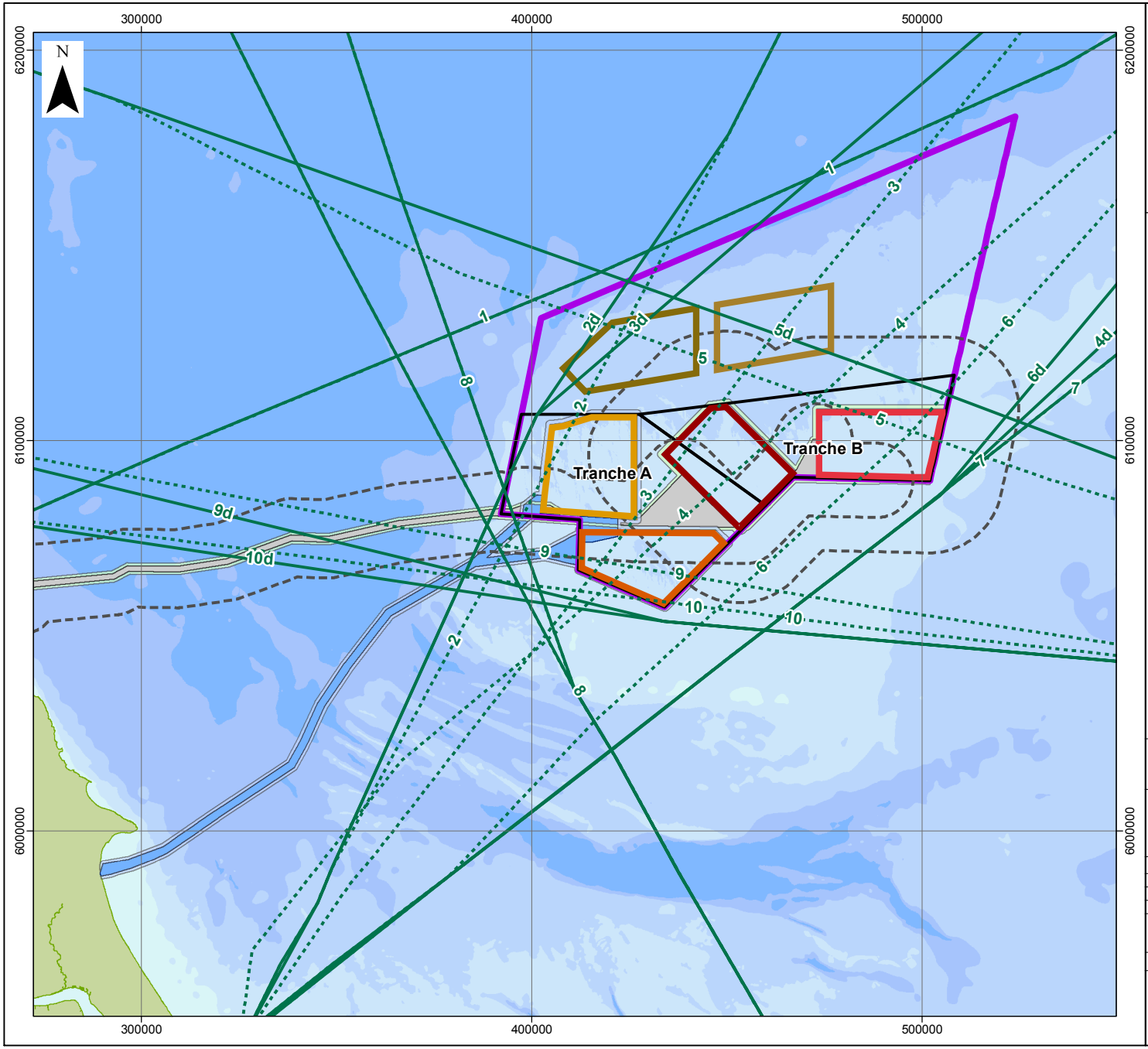
- Displace and congest vessels from existing routes;
- Cause visual confusion due to alignment of structures;
- Create cumulative impacts with other offshore renewable developments;
- Impact adverse weather routes;
- Reduce access to existing infrastructure;
- Impair vessel detection – visual or radar;
- Reduce the available sea room for defence activities; and
- Increase or diminish emergency response.

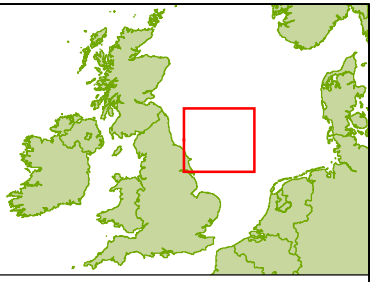
10.2.2. **Figure 10.2** shows the outputs of a review and analysis of marine traffic routeing based on the development of Dogger Bank Teesside A & B, Creyke Beck A & B and Dogger Bank Teesside C & D. This analysis indicates that vessels will be displaced further by the development of these multiple projects over and above that assessed via Dogger Bank Teesside A and Dogger Bank Teesside B in isolation. However, the analysis indicates that, the actual increase in the total journey lengths are minimal (see **Table 10.2**).

10.2.3. For each of the scenarios, the anticipated routes that vessels would be required to take in order to pass the wind farm structures at a safe distance have been identified.

Table 10.2 Increase in route distances for the cumulative scenario

Route	Increase in distance in nm, (km)	% Difference in the deviated route	Change in time for average speed vessel (minutes)
Route Two	1.8 (3.3)	0.5%	9
Route Three	7.1 (13.2)	2.0%	36.5
Route Four	-4.9 (-9)	-0.9%	-18
Route Five	1 (1.9)	0.2%	4
Route Six	1.1 (2)	0.3%	5.5
Route Nine	0.8 (1.5)	0.2%	4
Route Ten	0.1 (0.2)	0.0%	0.5
Route Eleven	0.2 (0.4)	0.0%	1





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside C
- Dogger Bank Teesside D
- Dogger Bank Teesside A & B Export Cable Corridor
- Teesside A & B temporary works area
- Creyke Beck temporary works area
- Dogger Bank Creyke Beck Export Cable Corridor
- Export cable corridor 5nm buffer
- Dogger Bank Teesside A & B 10nm buffer
- Current main route
- Anticipated route

0 20 40
Kilometres

Data Source:
Offshore wind farm boundaries © Crown Copyright, 2013,
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 10.2 Alternative routes for cumulative scenario

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	GC	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER:

F-OFL-MA-603

SCALE	1:1,500,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

10.3. The presence (construction and operation) of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck and Dogger Bank Teesside C & D: impact on navigation

10.3.1. Based on the assessment of baseline data, expert opinion and consultation with regular operators, the deviations are considered to be within acceptable limits, the largest being for route four, which increases the journey time by 2.0%, a route that is used once every 12 days (**Table 10.3**). The sensitivity is, therefore, considered low, as the receptors are adaptable to the routes. However, due to the area over which the deviations are required, and in relation to the size of Dogger Bank, the magnitude of effect is considered medium. Therefore the impact is considered to be **minor adverse**. As such, no further mitigation is required.

10.4. The presence (construction and operation) of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck and Dogger Bank Teesside C & D: increased vessel to vessel collision

10.4.1. Cumulative development of Dogger Bank Teesside A & B with Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D will impact upon the vessel-to-vessel collision risk.

10.4.2. It should be noted that the cumulative modelling takes into account only commercial vessel collisions around the periphery of the projects and does not factor in the likelihood of fishing vessel collisions between projects. The modelled collision frequency of one major collision in 656 years is considered to be unlikely and therefore carries a low magnitude.

10.4.3. The frequency of vessels transiting in close proximity to the Dogger Bank is low and therefore the interactions are likely to include vessels associated with the development of the wind farms. However, the sensitivity of the vessels is high given that a collision could result in major damage and loss of life.

10.4.4. Therefore the cumulative effect is considered to carry an impact of **minor adverse** significance.

10.4.5. Similarly, between the wind farms, interactions are likely to be commercial fishing vessels who are familiar with the navigating in the area, or wind farm support vessels, which will be monitored by Marine Traffic Control.

10.4.6. The individual wind farm layout within the Dogger Bank zone have been optimised to consider a variety of factors including requirements from commercial fishing stakeholders. This has included measures such as reducing the developable area to avoid the principle sandeel fishery on the western boundary of the Dogger Bank zone and maintaining large areas of fishing grounds between wind farms. For example, the area between Dogger Bank Creyke Beck B and Dogger Bank Teesside B has been designed with consideration of trawling and seine netting and maintains an unobstructed area of approximately 90 nm^2.

10.4.7. The overall zonal design has therefore left accessible spaces between wind farms; however these are not intended for navigational transit purposes but will allow fishing vessels to access key areas of fishing grounds, wind farm support craft to visit structures and where required allow third parties to access other infrastructure.

10.4.8. Although these spaces are not intended for navigational purposes, **Appendix 16A** shows that the space between wind farms is sufficient to allow for vessels to enter or exit between with a minimum distance of 1.3nm between Dogger Bank Creyke Beck A and Dogger Bank Creyke Beck B and up to 3.1nm between Dogger Bank Teesside B and Dogger Bank Creyke Beck B.

10.4.9. These vessels are expected to be familiar with navigating within the arrays and between wind farms with larger commercial vessels likely to choose alternate transit routes (see **Appendix 16A**) to the north and south which has shown not to increase transit distances significantly.

10.4.10. The magnitude of the effect is expected to be low with the sensitivity remaining high due to the possible damage to property and loss of life.

10.4.11. Therefore, a **minor adverse** impact is anticipated on receptors due to the cumulative effect of projects within the Dogger Bank Zone.

10.5. Presence of partially constructed or deconstructed structures of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck and Dogger Bank Teesside C & D: increased vessel to structure allision (including NUC)

10.5.1. The presence of the wind farms within the Dogger Bank zone has the potential to increase the risk of vessel to structure allision.

10.5.2. For vessels transiting the Dogger Bank zone (excluding commercial fishing vessels), it is anticipated that one collision would occur every 590 years.

10.5.3. The majority of powered allision frequency is associated with structures on the periphery of the wind farms. For the worst case scenario, the majority of the passing powered allision frequency is associated with structures on the northwest boundary of Dogger Bank Teesside D and the eastern boundary of Dogger Bank Teesside A which are the closest sides to the main commercial vessel routes.

10.5.4. Similarly, vessels Not Under Command (NUC) collision frequency is associated with structures on the periphery of the wind farms. Allisions are assessed to be less frequent (1 every 4809 years) than powered vessel allisions which reflects in the historical data. The majority of NUC vessel collision frequency is associated with structures on the northwest boundary of Dogger Bank Teesside C and the southeast corner of corner of Dogger Bank Teesside A.

10.5.5. For those vessels utilising areas between wind farms within the Dogger Bank zone, it is anticipated that they would be familiar with navigating within and between the wind farms. Fishing vessels are expected to maintain safe distance from structures and larger commercial vessels are likely to choose alternate transit routes (see **Appendix 16A**).

10.5.6. The magnitude of the effect is expected to be low given that deviations to significant shipping lanes are small.

10.5.7. The sensitivity of the receptors (i.e. vessels and operators) is high due to the possible damage to property and loss of life.

10.5.8. Therefore, a **minor adverse** impact is anticipated due to the cumulative effect of projects within the Dogger Bank Zone.

10.5.9. Consideration of wind farm lighting and marking is discussed in Section 10.8 of this chapter.

10.6. Other offshore renewable developments including projects involved in the SNSOWF: impact on navigation

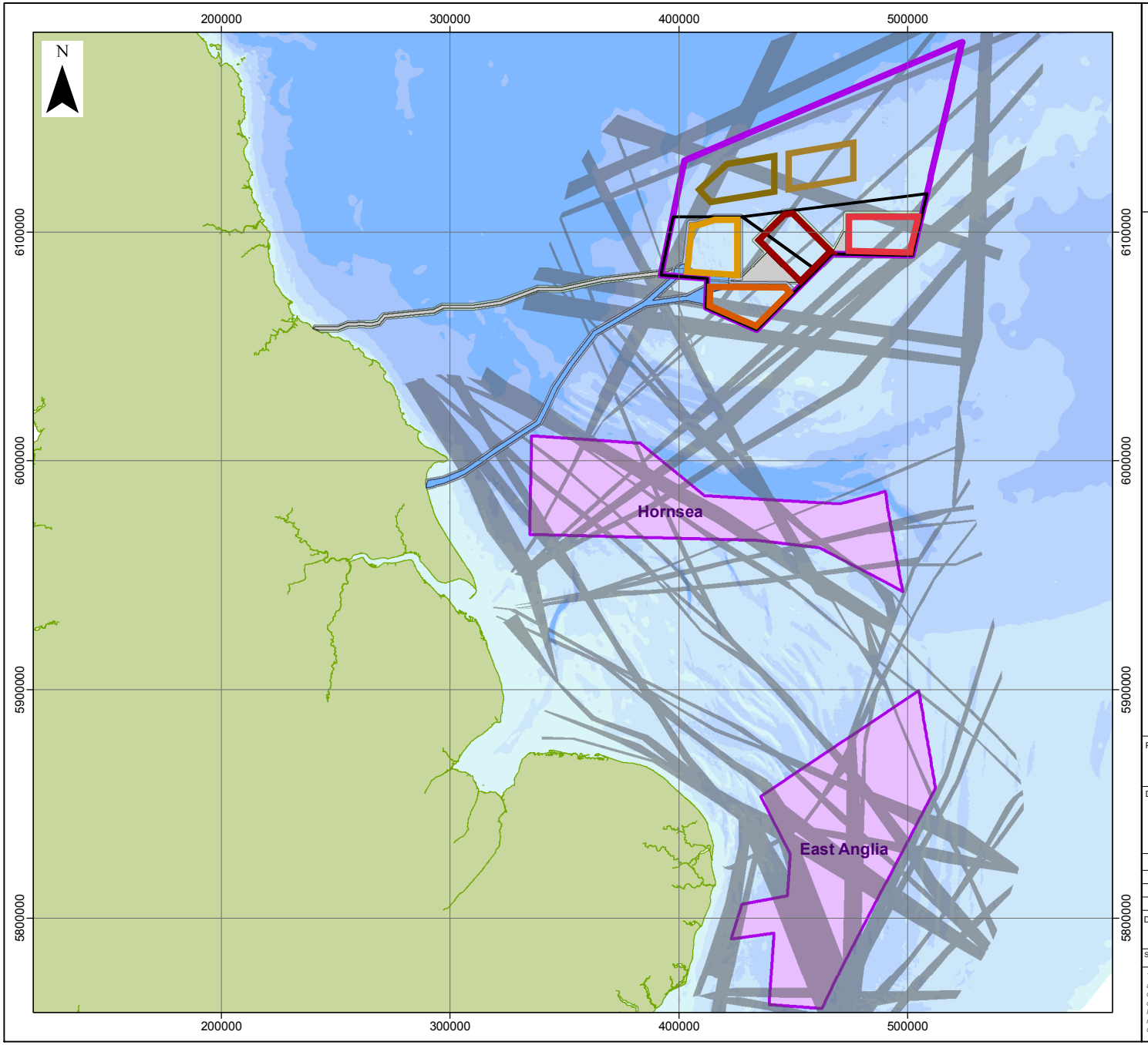
10.6.1. It was identified that issues could arise when multiple developments impact on commercial shipping routes transiting to and from ports on coasts in the North Sea.

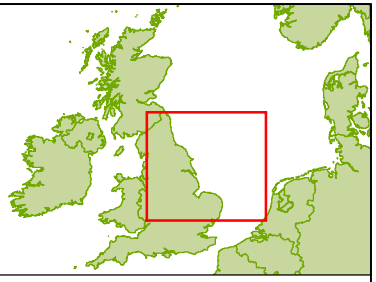
10.6.2. SNSOWF was developed to extend the principles of zone appraisal beyond the boundaries of their respective zones in order to manage wider cumulative impact issues between developments. The assessments to date have included:

- Review of current marine traffic survey data collected to date for Dogger Bank, Hornsea and East Anglia zones as well as German Shipping Priority Lanes;
- Definition and characterisation of the 90th percentile routes across the three zones and within the immediate vicinity; and
- Estimation of potential deviations for 90th percentile routes through proposed routeing measures and/or project development areas.

10.6.3. The main routes through the Dogger Bank Zone have very limited use by commercial vessels, where less than two vessels per day have been recorded (see **Figure 10.3** and **Appendix 16A**). This routing analysis includes:

- Marine aggregates dredging areas;
- British Marine Aggregates Producers Association (BMAPA) transit routes;
- Oil and gas pipelines;
- Oil and gas installations;
- Wells (all phases);
- Oil and gas licence areas; and
- Fishing vessel transits.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside C
- Dogger Bank Teesside D
- Dogger Bank Teesside A & B Export Cable Corridor
- Teesside A & B temporary works area
- Dogger Bank Creyke Beck Export Cable Corridor
- Creyke Beck temporary works area
- Other offshore wind farm
- 90th percentile lane

0 30 60
Kilometres

Data Source:
Shipping data © Anatec, 2012
Offshore wind farm boundaries © Crown Copyright, 2013,
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 10.3 Existing percentiles within the Southern North Sea

VER	DATE	REMARKS	Drawn	Checked
1	27/08/2013	Draft	GC	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER:

F-OFL-MA-604

SCALE	1:2,550,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

10.6.4. As assessed in Section 6 of this chapter, the perceived impact relating to the deviation of the routes required to avoid Dogger Bank Teesside A & B are considered to be minor, where the operators are not sensitive to the change and, although the change is permanent, the magnitude of effect is medium.

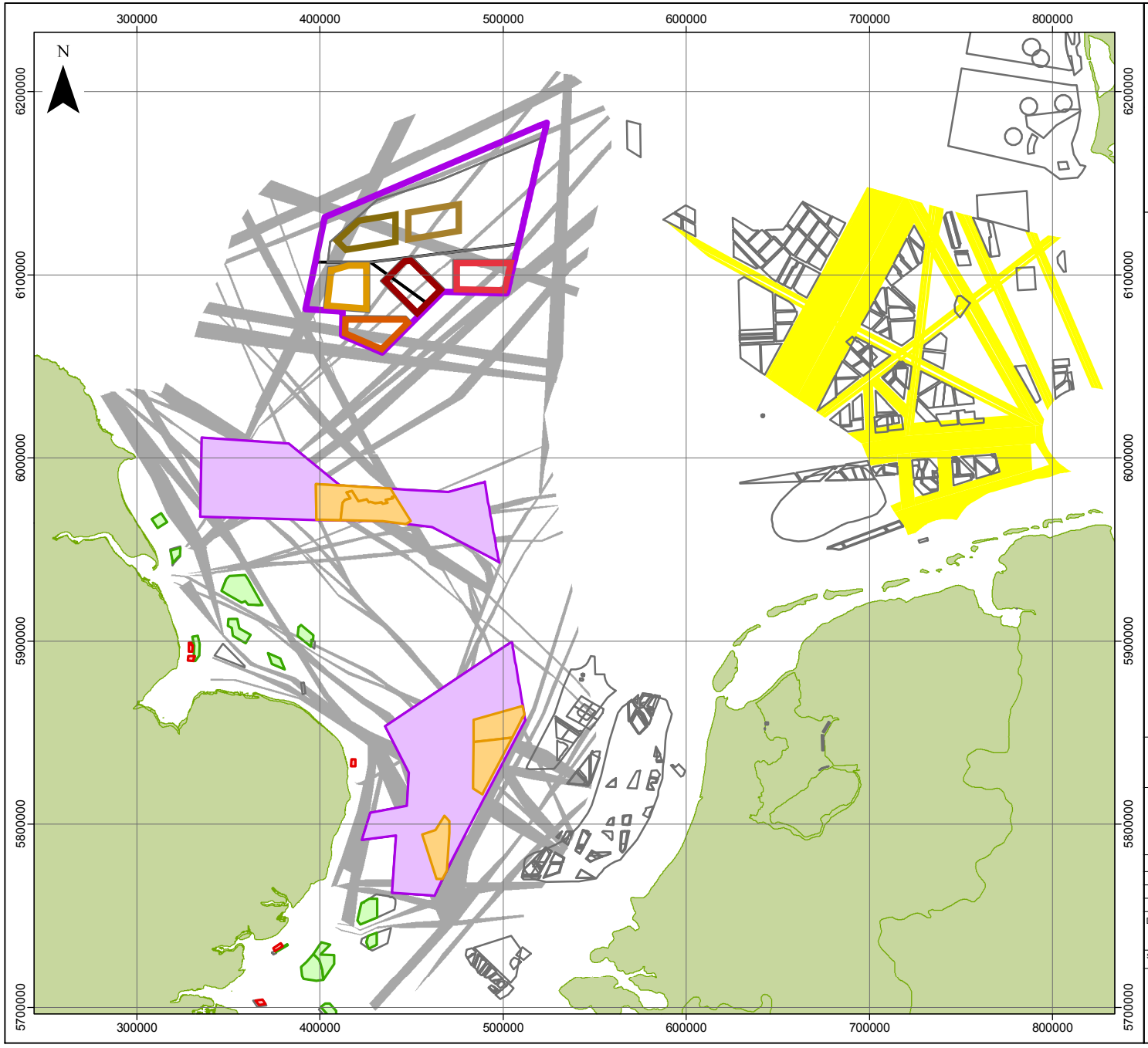
10.6.5. However, in addition with other offshore wind farms, the sensitivity of the operators depends on the deviations in routes due to development within the Hornsea and East Anglia zones as well as the German Shipping Priority Lanes. The German Shipping Priority Lanes are defined by the German authorities to define areas for development with German territorial waters.

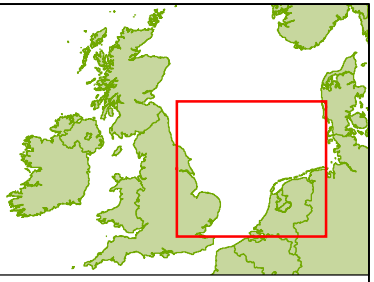
10.6.6. Due to the German shipping priority areas, a number of routeing options became aligned east and south-east of the Dogger Bank Zone. An additional shipping transit route has been introduced within the Dogger Bank Development Zone, in the northern part of the area, clear of the six proposed wind farms (see **Figure 10.4**).

10.6.7. The SNSOWF report (Anatec, 2014) identified 32 commercial routes operating within the SNSOWF buffer, nine of which are impacted by the Dogger Bank Development Zone, resulting in distance increases of less than 0.1% to 3.6% of the total route length.

10.6.8. Given the permanent cumulative deviations required for some operators the magnitude of effect is expected to be large.

10.6.9. A **moderate adverse** impact is expected on operators, when considering all other projects together and further work is being undertaken at a strategic level to address this. However, the contribution of the Dogger Bank Zone to these impacts is limited.





LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside C
- Dogger Bank Teesside D
- 90th percentile lane
- German Territorial Priority Shipping Corridors

Wind energy projects

- Round 1
- Round 2
- Round 3
- Round 3 zones

0 30 60
Kilometres

Data Source:
Shipping data © Anatec, 2012
Offshore wind farm boundaries © Crown Copyright, 2013,
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 10.4 Deviated Routing with Consideration for cumulative impacts from developments within the North sea

VER	DATE	REMARKS	Drawn	Checked
1	07/02/2014	Pre DCO Submission	JE	GS

DRAWING NUMBER:

F-OFL-MA-608

SCALE	1:3,189,472	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

Mitigation and residual impact

10.6.10. This potential impact has recently been reviewed by The Crown Estate (2012). The review indicates that by continuing to work with the SNSOWF members until a clear process is defined from the regulators, the developers will mitigate this impact through consultation with relevant organisations within the relevant EU member states. This is estimated to result in a **minor adverse** impact on receptors from Dogger Bank Teesside A & B.

10.7. The presence of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck and Dogger Bank Teesside C & D: impact on lighting and marking

10.7.1. The orientation and marking of the scheme was highlighted in consultation with THLS (July 2012) as of particular concern for on-going development, in particular vessel's ability to navigate out of areas 'enclosed' by different wind farms within the overall Dogger Bank Zone. In order to mitigate risk associated with visual navigation between wind farms, Forewind are committed to working closely with THLS to investigate alternative marking schemes for the wind farms going forward. This could include the use of buoyage (such as cardinal marks or lateral) or synchronised lighting to assist vessels in navigating within the areas between wind farms.

10.7.2. It is noted by IALA (2008) that in order to avoid confusion from a proliferation of Aids to Navigation in a high-density wind farm, full consideration should be given to the use of synchronised lighting, different light characters and varied light ranges. Mitigation will also include consultation with UKHO to define charting for the area that will clearly show mariners structures within the area. Forewind have also developed a 3D model in order to assist stakeholders with the consideration of additional mitigation such as lighting and marking.

10.8. The presence of Dogger Bank Teesside A & B, Dogger Bank Creyke Beck and Dogger Bank Teesside C & D: impact on defence activities

10.8.1. Offshore wind farms in-combination with other marine users may restrict and impact the navigational elements of MoD training exercises in defined areas. However, due to the limited defence activities that occur in the vicinity of the Dogger Bank Zone, there is expected to be **minor adverse** impact. **Table 2.2** outlines the consultation feedback from the MoD (see **Chapter 19 Military Activity and Civil Aviation** for more information).

Table 10.3 Summary table for cumulative impacts

Description of impact	Residual impact of Dogger Bank Teesside A & B	Projects with potential for cumulative impact	Cumulative impact	Details
Construction / decommissioning phase				
Impact on navigation	Negligible to minor adverse	Dogger Bank Creyke Beck, Dogger Bank Teesside C & D	**Minor adverse**	Deviations are considered to be within acceptable limits with adaptable receptors of low sensitivity.
Impact on navigation	Negligible to minor adverse	Other offshore renewable developments including projects involved in the Southern North Sea Offshore Wind Forum (SNSOWF)	**Minor adverse**	The review undertaken by the Crown Estate (2012) indicates that by continuing to work with the SNSOWF members until a clear process is defined from the regulators, developers will mitigate this impact through consultation with relevant organisations within the relevant EU member states, resulting in a minor adverse cumulative impact.
Increase in vessel to vessel collision	Negligible to minor adverse	Dogger Bank Creyke Beck, Dogger Bank Teesside C & D	**Minor Adverse**	Although the sensitivity of the receptor is high in this case the magnitude is low due to the frequency of ships transiting this area. This results in a minor adverse impact.
Increase in vessel to structure allision	Negligible to minor adverse	Other offshore renewable developments including projects involved in the Southern North Sea Offshore Wind Forum (SNSOWF)	**Minor Adverse**	It is anticipated that vessels would not transit through the Dogger Bank zone reducing the risk of a vessel encountering a structure. In addition, appropriate lighting and charting of the wind farms results in a minor adverse impact
Operation phase				
Impact on navigation	Minor adverse	Dogger Bank Creyke Beck, Dogger Bank Teesside C & D	**Minor adverse**	Route deviations are expected to be acceptable. The receptors are able to alter course early which does not result in significant transit time.
Impact on navigation	Minor adverse	Other UK offshore renewable developments including projects involved in the Southern North Sea Offshore Wind Forum (SNSOWF)	**Minor adverse**	In a similar context to the construction/decommissioning phase, continued work with the SNSOWF members would ensure that the impacts resulting from offshore wind farm developments in the North Sea are suitably mitigated.

Description of impact	Residual impact of Dogger Bank Teesside A & B	Projects with potential for cumulative impact	Cumulative impact	Details
Increase in vessel to vessel collision	Negligible to minor adverse	Dogger Bank Creyke Beck, Dogger Bank Teesside C & D	**Minor Adverse**	As with the construction/decommissioning phase, the sensitivity of the receptor is high and the magnitude is low resulting in a minor adverse impact
Increase in vessel to structure allision	Negligible to minor adverse	Other offshore renewable developments including projects involved in the Southern North Sea Offshore Wind Forum (SNSOWF)	**Minor Adverse**	Shipping lanes are expected to be established by this phase and together with vessels not transiting through the Dogger Bank zone the risk of a vessel encountering a structure is low. Therefore a minor adverse impact is anticipated.
Impact on lighting and marking	Negligible to minor adverse	Dogger Bank Creyke Beck, Dogger Bank Teesside C & D	**None identified**	The low numbers of commercial vessels that do transit in the vicinity of the Dogger Bank Zone will not navigate through, or in close proximity to the wind turbines.
Impact on defence activities	Negligible to minor adverse	Dogger Bank Creyke Beck, Dogger Bank Teesside C & D	**Minor adverse**	Based on limited defence activities that occur in the vicinity of the Dogger Bank Zone. See **Chapter 19 Military Activities and Civil Aviation** for further details.

11. Transboundary Effects

11.1.1. It was identified that transboundary issues could arise when offshore renewable energy developments impact on international ports.

11.1.2. The SNSOWF assessments to date have included:

- Review of current marine traffic survey data collected to date for Dogger Bank, Hornsea and East Anglia zones including the German Shipping Priority Lanes;
- Definition and characterisation of the 90th percentile routes across the three zones (see **Figure 11.1**) and within the immediate vicinity, including the German Shipping Priority Lanes; and
- Estimation of potential deviations for 90th percentile routes through proposed routeing measures and/or project development areas.

11.1.3. A number of existing routes were identified (**Table 11.1**) passing in proximity to the Dogger Bank zone.

Table 11.1 Existing vessel routeing in proximity to the Dogger Bank zone

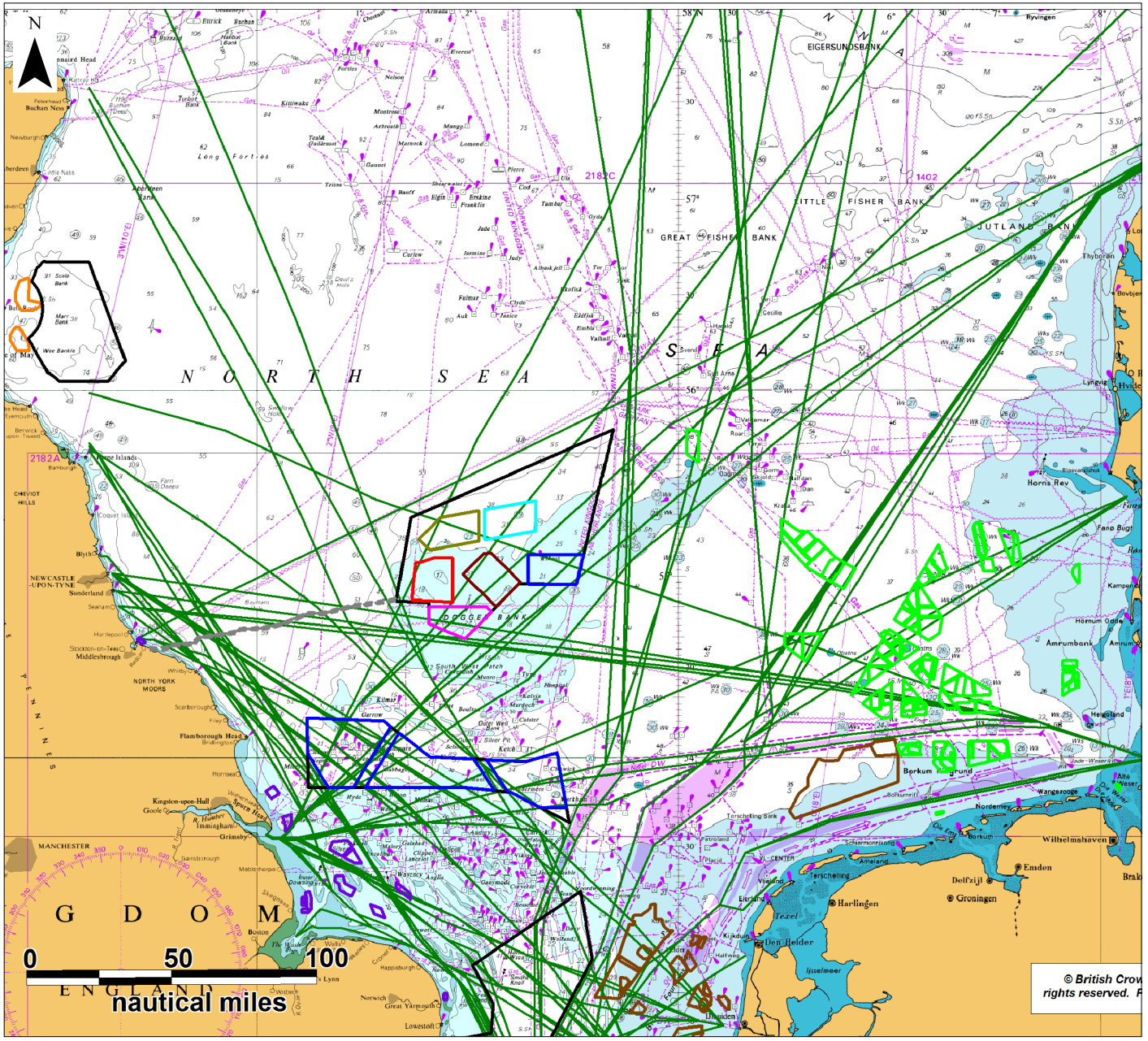
Route	Destination	Average vessels per week	Traffic characteristics
1	Forth Ports to Hamburg (Germany)	1	Cargo, Tanker
2	Tyne (UK) to Hamburg (Germany)	<1	Cargo, Tanker
3	NE UK to Germany / Kiel Canal	<1	Cargo
4	Immingham (UK) to Tananger (Norway)	2	Cargo
5	Humber (UK) to Egersund (Norway)	<1	Cargo, Tanker
6	Humber Ports (UK) and Helsinki (Finland)	1	Cargo
7	Humber Ports (UK) to Scandinavia	2	Cargo, Tanker
8	Humber Ports (UK) to Baltic	7	Cargo, Tanker
9	Thames, UK and Norway	1	Cargo, Passenger

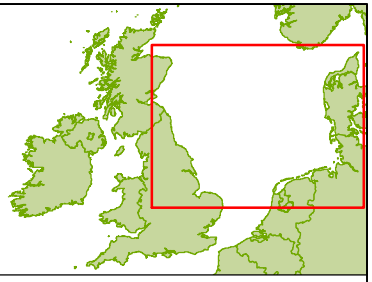
11.1.4. When consulted, DFDS Seaways (stakeholder) stated that the routes taken by their vessels around/through the Dogger Bank Zone will depend on the Hornsea wind farms.

11.1.5. This impact has recently been reviewed by The Crown Estate (2012). The review indicates that by continuing to work with the SNSOWF members until a clear process is defined from the regulators, the developers had mitigated this impact through consultation with relevant organisations with the EU member states. A **minor adverse** impact is expected to result from Dogger Bank Teesside A & B.

11.1.6. The next steps for SNSOWF include:

- Consultation with European Offshore Wind Developers; and
- Consultation with Joint SAR and Counter Pollution Resource.





LEGEND

Dogger Bank

- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside C
- Dogger Bank Teesside D
- Export Cable Corridor

Wind Farm Sites

- Hornsea Development Areas
- Round 1 and 2 Sites
- Round 3 Zones
- Scottish Territorial Water Sites
- German Wind Farm Sites
- Dutch Wind Farm Sites

Route

- Main Routes

Data Source:
Shipping Data © Anatec, 2013
Offshore wind farm boundaries © Crown Copyright, 2013

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 11.1 Existing percentiles within the Southern North Sea in a transboundary context

VER	DATE	REMARKS	Drawn	Checked
1	04/09/2013	Draft	GC	GS
2	03/10/2013	PEI3	GC	GS
3	07/02/2014	DCO Submission	JE	GS

DRAWING NUMBER: **F-OFL-MA-605**

SCALE	NOT TO SCALE	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

12. Summary

12.1.1. Following a review of the existing environment, an NRA for Dogger Bank Teesside A & B and the Dogger Bank Teesside A & B Export Cable Corridor was undertaken. The assessment included collision risk modelling and a formal safety assessment for all phases of the development as well as an assessment of cumulative effects. This chapter was based on information contained within the NRA report (**Appendix 16A**).

12.1.2. The marine traffic survey identified seven main routes operating within a 10nm (18.5km) buffer around Dogger Bank Teesside A & B with the majority of vessel types transiting on these routes being tankers and cargo vessels. Fishing activity was recorded across much of the sites with a high density of vessels to the north of Dogger Bank Teesside B. The level of recreational vessel activity was noted as being very low.

12.1.3. Deviations for the main routes due to needing to avoid structures within Dogger Bank Teesside A & B were identified where required. The maximum time increases calculated for each of the scenarios were as follows:

- Dogger Bank Teesside A – maximum of 14.5 minute increase or 0.75%;
- Dogger Bank Teesside B – maximum of 14.5 minute increase or 0.52%; and
- Dogger Bank Teesside A & B – maximum of 14.5 minute increase or 0.75%.

12.1.4. For Dogger Bank Teesside A the collision risk modelling showed an increase of 23.41% (1 every 416 years) for vessel to vessel collisions and an additional vessel to structure allision risk of 1 every 692 years. For Dogger Bank Teesside B the collision risk modelling showed an increase of 78.31% (1 every 624 years) for vessel to vessel collisions and an additional vessel to structure allision risk of 1 every 2728 years. For Dogger Bank Teesside A & B the collision risk modelling showed an increase of 29.07% (1 every 242 years) for vessel to vessel collisions and an additional vessel to structure allision risk of 1 every 636 years. Following the application of the mitigation outlined in this chapter, no residual impacts exceed **minor adverse**.

12.1.5. Risk was also addressed as part of the Hazard Workshop, which included stakeholders and regulators assessing navigational hazards that would be associated with the construction, operation, maintenance and decommissioning of Dogger Bank Teesside A & B. For the most likely consequences identified at the workshop, 23 of the risks were broadly acceptable and 13 were defined as ‘tolerable’. When the worst case consequences were assessed, there were 36 risks which were tolerable. Using appropriate mitigation measures, all impacts could be reduced to minor adverse. In line with MGN 371, impacts on navigation, collision risk and communication were identified and assessed in line

with principles laid out in the Formal Safety Assessment and were found to be tolerable.

12.1.6. Mitigation and safety measures have been identified which are suitable for application within Dogger Bank Teesside A & B and the Dogger Bank Teesside A & B Export Cable Corridor developments and which are appropriate to the level and type of risk.

12.1.7. From this assessment, it is noted that additional navigational risk associated with the development of Dogger Bank Teesside A & B and the Dogger Bank Teesside A & B Export Cable Corridor can be brought within ALARP regions following additional consultation and the on-going refinement of the Rochdale Envelope.

12.1.8. Based on the assessment of baseline data, expert opinion and consultation with regular operators, the cumulative deviations between the Dogger Bank Projects are considered to be within acceptable limits.

12.1.9. It was identified that transboundary issues could arise when developments impact on commercial shipping routes transiting to and from any non UK ports. This could also include impacts on international ports, shipping routes and/or routes being impacted by other international offshore renewable energy developments. This impact has recently been reviewed by The Crown Estate and resulted in the conclusion that continuing to work with the SNSOWF members until a clear process is defined from the regulators, that the developers had mitigated this impact through consultation with relevant organisations with the EU member states.

12.1.10. The impacts to Shipping and Navigation are summarised in **Table 12.1**, **Table 12.2**, **Table 12.3** and **Table 12.4**.

Table 12.1 Summary of impacts on shipping and navigation associated with the development of Dogger Bank Teesside A

Effect	Proposed Mitigation	Residual Impact
Construction		
Presence of construction activities: impacts on existing marine vessels transit routes due to deviation and increased journey times	No Additional Mitigation	**Negligible**
Presence of construction vessels: displacement of existing vessel transit routes leading to increased vessel to vessel collision risk	No Additional Mitigation	**Minor adverse**
Presence of partially constructed or deconstructed structures: increased vessel to structure allision	No Additional Mitigation	**Minor adverse**
Presence of partially constructed or deconstructed structures: increased risk of commercial fishing vessel allision	• Advanced promulgation of information; • Safety zones around partially developed structures and vessels engaged in construction and major maintenance activity; • Use of guard vessels (where required) to protect vulnerable areas of construction or decommissioning; • Use of vessels own fenders to protect from low energy impacts; and • Temporary aids to navigation to mark potential hazards to navigation safety.	**Minor adverse**
Presence of construction activities at Dogger Bank Teesside A: decrease in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to mitigating the potential impact to emergency response. This will reduce all negative impacts to within an ALARP region and of minor significance once plans are in place.	
Presence of construction activities at Dogger Bank Teesside A: increase in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone.	
Operation and Maintenance		
Physical presence of offshore infrastructure: increase deviations on vessel transit time	No Additional Mitigation	**Minor adverse**
Physical presence of offshore infrastructure: increase in vessel to vessel collision risk	• Promulgation of information; and • Marine vessel coordination including early warning procedures for vessels transiting in close proximity to the site and designated entry/exit points for the site.	**Minor adverse**

Effect	Proposed Mitigation	Residual Impact
Physical presence of offshore infrastructure: increase in vessel to structure allision risk	• Implementation of Layout Rules; • Consultation on Aids to Navigation during operation; and • Use of vessels own fenders as mitigation for low energy allisions.	**Minor adverse**
Physical presence of offshore infrastructure: increase in interference with navigational position fixing aids (such as radars).	No Additional Mitigation	**Negligible**
Physical presence of offshore infrastructure: increase collision risk to vessels NUC (including vessels NUC due to mechanical or navigational system errors).	• Marine vessel coordination to monitor and provide information on NUC events • Vessels own fenders to protect from low energy allisions with structures; • Advanced ERCoP; and • Emergency Response Study.	**Minor adverse**
Physical presence of inter-array cables and cable protection(exposed or incorrectly buried): increase in anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; • Implementation of inspection and maintenance regime for installed cables; and • Inter-array cable layout to be widely promulgated.	**Negligible**
Physical presence of export cables and cable burial protection (including exposed or incorrectly buried cables): increase anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; and • Implementation of inspection and maintenance regime for installed cables.	**Negligible**
Physical presence of HVDC export cables: increase in electromagnetic interference for vessels using magnetic compasses	No Additional Mitigation	**Minor adverse**
Manoeuvring within corridors and open sea between OREI: increase in collision (vertical and horizontal) risk for fishing vessels	• Implementation of layout rules; • Advanced promulgation of information; and	**Minor adverse**

Effect	Proposed Mitigation	Residual Impact
	• Use of vessels own fenders to protect from low energy allisions with structures.	
Physical presence of offshore infrastructure: decrease in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to mitigating the potential impact to emergency response. This will reduce all negative impacts to within an ALARP region and of minor significance once plans are in place.	
Physical presence of offshore infrastructure: increase in emergency response (including SAR and pollution control	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone.	
Export Cable		
Physical presence of export cables and cable protection(including exposed or incorrectly buried cables): increase anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; and • Implementation of inspection and maintenance regime for installed cables.	**Negligible**

Table 12.2 Overview of impacts on shipping and navigation associated with the development of Dogger Bank Teesside B

Effect	Proposed Mitigation	Residual Impact
Construction		
Presence of construction activities: impacts on existing marine vessels transit routes due to deviation and increased journey times	No Additional Mitigation	**Negligible**
Presence of construction vessels: displacement of existing vessel transit routes leading to increased vessel to vessel collision risk	No Additional Mitigation	**Minor adverse**
Presence of partially constructed or deconstructed structures: increased vessel to structure allision	No Additional Mitigation	**Minor adverse**
Presence of partially constructed or deconstructed structures: increased risk of commercial fishing vessel allision	• Advanced promulgation of information; • Safety zones around partially developed structures and vessels engaged in construction and major maintenance activity; • Use of guard vessels (where required) to protect vulnerable areas of construction or decommissioning; • Use of vessels own fenders to protect from low energy impacts; and • Temporary aids to navigation to mark potential hazards to navigation safety.	**Minor adverse**
Presence of construction activities at Dogger Bank Teesside B: decrease in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to mitigating the potential impact to emergency response. This will reduce all negative impacts to within an ALARP region and of minor significance once plans are in place.	
Presence of construction activities at Dogger Bank Teesside B: increase in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone.	
Operation and Maintenance		
Physical presence of offshore infrastructure: increase deviations on vessel transit time	No Additional Mitigation	**Minor adverse**
Physical presence of offshore infrastructure: increase in vessel to vessel collision risk	• Promulgation of information; and • Marine vessel coordination including early warning procedures for vessels transiting in close proximity to the site and designated entry/exit points for the site.	**Minor adverse**

Effect	Proposed Mitigation	Residual Impact
Physical presence of offshore infrastructure: increase in vessel to structure allision risk	• Implementation of Layout Rules; • Consultation on Aids to Navigation during operation; and • Use of vessels own fenders as mitigation for low energy allisions.	**Minor adverse**
Physical presence of offshore infrastructure: increase in interference with navigational position fixing aids (such as radars).	No Additional Mitigation	**Negligible**
Physical presence of offshore infrastructure: increase collision risk to vessels NUC (including vessels NUC due to mechanical or navigational system errors).	• Marine vessel coordination to monitor and provide information on NUC events • Vessels own fenders to protect from low energy allisions with structures; • Advanced ERCoP; and • Emergency Response Study.	**Minor adverse**
Physical presence of inter-array cables and cable protection(exposed or incorrectly buried): increase in anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; • Implementation of inspection and maintenance regime for installed cables; and • Inter-array cable layout to be widely promulgated.	**Negligible**
Physical presence of export cables and cable protection(including exposed or incorrectly buried cables): increase anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; and • Implementation of inspection and maintenance regime for installed cables.	**Negligible**
Physical presence of HVDC export cables: increase in electromagnetic interference for vessels using magnetic compasses	No Additional Mitigation	**Minor adverse**
Manoeuvring within corridors and open sea between OREI: increase in collision (vertical and horizontal) risk for fishing vessels	• Implementation of layout rules; • Advanced promulgation of information; and	**Minor adverse**

Effect	Proposed Mitigation	Residual Impact
	• Use of vessels own fenders to protect from low energy allisions with structures.	
Physical presence of offshore infrastructure: decrease in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to mitigating the potential impact to emergency response. This will reduce all negative impacts to within an ALARP region and of minor significance once plans are in place.	
Physical presence of offshore infrastructure: increase in emergency response (including SAR and pollution control	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone.	
Export Cable		
Physical presence of export cables and cable protection(including exposed or incorrectly buried cables): increase anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; and • Implementation of inspection and maintenance regime for installed cables.	**Negligible**

Table 12.3 Overview of Impacts on Shipping and Navigation Associated with the Development of Dogger Bank Teesside A and B

Effect	Proposed Mitigation	Residual Impact
Construction		
Presence of construction activities: impacts on existing marine vessels transit routes due to deviation and increased journey times	No Additional Mitigation	**Negligible**
Presence of construction vessels: displacement of existing vessel transit routes leading to increased vessel to vessel collision risk	No Additional Mitigation	**Minor adverse**
Presence of partially constructed or deconstructed structures: increase vessel to structure allision	No Additional Mitigation	**Minor adverse**
Presence of partially constructed or deconstructed structures: increased risk of commercial fishing vessel allision	• Advanced promulgation of information; • Safety zones around partially developed structures; • Use of guard vessels (where required) to protect vulnerable areas of construction or decommissioning; • Use of vessels own fenders to protect from low energy impacts; and • Temporary aids to navigation to mark potential hazards to navigation safety.	**Minor adverse**
Presence of construction activities at Dogger Bank Teesside A & B: decrease in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to mitigating the potential impact to emergency response. This will reduce all negative impacts to within an ALARP region and of minor significance once plans are in place.	
Presence of construction activities at Dogger Bank Teesside A & B: increase in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone.	
Operation and Maintenance		
Physical presence of offshore infrastructure: increase deviations on vessel transit time	No Additional Mitigation	**Minor adverse**
Physical presence of offshore infrastructure: increase in vessel to vessel collision risk	• Promulgation of information; and • Marine vessel coordination including early warning procedures for vessels transiting in close proximity to the site and designated entry/exit points for the site.	**Minor adverse**

Effect	Proposed Mitigation	Residual Impact
Physical presence of offshore infrastructure: increase in vessel to structure allision risk	• Implementation of Layout Rules; • Consultation on Aids to Navigation during operation; and • Use of vessels own fenders as mitigation for low energy allisions.	**Minor adverse**
Physical presence of offshore infrastructure: increase in interference with navigational position fixing aids (such as radars).	No Additional Mitigation	**Negligible**
Physical presence of offshore infrastructure: increase collision risk to vessels NUC (including vessels NUC due to mechanical or navigational system errors).	• Marine vessel coordination to monitor and provide information on NUC events • Vessels own fenders to protect from low energy allisions with structures; • Advanced ERCoP; and • Emergency Response Study.	**Minor adverse**
Physical presence of inter-array cables and cable protection(exposed or incorrectly buried): increase in anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; • Implementation of inspection and maintenance regime for installed cables; and • Inter-array cable layout to be widely promulgated.	**Negligible**
Physical presence of export cables and cable protection(including exposed or incorrectly buried cables): increase anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; and • Implementation of inspection and maintenance regime for installed cables.	**Negligible**
Physical presence of HVDC export cables: increase in electromagnetic interference for vessels using magnetic compasses	No Additional Mitigation	**Minor adverse**
Manoeuvring within corridors and open sea between OREI: increase in collision (vertical and horizontal) risk for fishing vessels	• Implementation of layout rules; • Advanced promulgation of information; and	**Minor adverse**

Effect	Proposed Mitigation	Residual Impact
	• Use of vessels own fenders to protect from low energy allisions with structures.	
Physical presence of offshore infrastructure: decrease in emergency response (including SAR and pollution control)	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to mitigating the potential impact to emergency response. This will reduce all negative impacts to within an ALARP region and of minor significance once plans are in place.	
Physical presence of offshore infrastructure: increase in emergency response (including SAR and pollution control	An Emergency Response Study is currently being undertaken by Forewind. This report will form part of the continued commitment to maintaining and potentially improving emergency response capability at sites within the Dogger Bank Zone. .	
Export Cable		
Physical presence of export cables and cable protection(including exposed or incorrectly buried cables): increase anchor snagging risk	• Offshore cables will be buried or protected appropriately along their length. A detailed cable burial and protection risk assessment will be carried out to identify the most suitable target burial depth and level of protection in each area. Additional or alternative protection measures only applied if necessary; and • Implementation of inspection and maintenance regime for installed cables.	**Negligible**

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