FOREWIND

DOGGER BANK
TEESSIDE A & B

March
2014

Environmental Statement
Chapter 19
Military Activity and Civil Aviation

Application Reference: 6.19

Cover photograph: Installation of turbine foundations in the North Sea

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1. Introduction

1.1.1. This chapter of the Environmental Statement (ES) describes the existing environment with regard to military activities and civil aviation, and assesses the potential impacts of Dogger Bank Teesside A & B during the construction, operation and decommissioning phases. Where the potential for significant impacts is identified, mitigation measures and residual impacts are presented.

1.1.2. Military activities and civil aviation encapsulates potential impacts upon Royal Air Force (RAF), Royal Navy (RN), Army and other Ministry of Defence (MOD) activities. The chapter also considers impacts upon the interests of the Civil Aviation Authority (CAA) (as the UK's specialist aviation regulator), National Air Traffic Services (NATS), NATS (En-Route) Limited (NERL), Meteorological (Met) Office weather radar, offshore helicopter operators, coastguard Search and Rescue (SAR) operations and airports closest to the development site.

2. Guidance and Consultation

2.1. Policy and guidance

2.1.1. The assessment of potential impacts upon military activities and civil aviation has been undertaken with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those documents relevant to Dogger Bank Teesside A & B are:

- Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a); and
- NPS for Renewable Energy Infrastructure (EN-3) (DECC 2011b).

2.1.2. The specific assessment requirements pertaining to military activities and civil aviation are summarised in **Table 2.1**, together with an indication of the paragraph numbers of the ES chapters where each is addressed. Where any part of the NPS has not been followed within the assessment, an explanation as to why the requirement was not deemed relevant, or has been met in another manner, is provided.

Table 2.1 NPS Assessment Requirements

NPS requirement	NPS reference	ES reference
If the proposed development may have an effect on aviation the applicant should consult the MOD, CAA, NATS and any aerodrome likely to be affected by the proposed development in preparing an assessment of the proposal on aviation or other defence interests.	EN-1 (Paragraphs 5.4.11 to 5.4.12)	**Chapter 19 Military Activities and Civil Aviation**, Section 4
Any assessment of aviation or other defence interests should include potential impacts of the project upon the operation of CNS (Communications, Navigation & Surveillance) infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures.	EN-1 (Section 20.6-20)	**Chapter 19 Military Activities and Civil Aviation**, Section 4
The assessment should also assess the cumulative effects of the project with other relevant projects in relation to aviation and defence	EN-1 (Section 20.6-20)	**Chapter 19 Military Activities and Civil Aviation**, Section 10
If there are any relevant changes made to proposals during the pre-application and determination period, it is the responsibility of the applicant to ensure that the relevant consultees are informed.	EN-3 (Section 25.4.13)	Noted, and not applicable to this chapter
There may be constraints imposed on the siting or design of offshore wind farms because of restrictions resulting from the presence of other offshore infrastructure or activities.	EN-3 (Paragraph 2.6.180)	**Chapter 19 Military Activities and Civil Aviation**, Section 4
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.	EN-3 (Paragraph 2.6.180)	**Chapter 19 Military Activities and Civil Aviation**, Section 2, **Table 2.2**

2.1.3. EN-1 (DECC 2011a) states that civilian and military aerodromes, aviation technical sites and CNS infrastructure (both onshore and offshore) can be affected by new energy developments.

2.1.4. The CAA produce Civil Aviation Publications (CAP) that detail regulations, guidance and information related to the spectrum of aeronautical activities undertaken in the United Kingdom (UK). A number of these publications relate to renewable energy infrastructure and its potential impacts upon aviation.

2.1.5. CAP764 – CAA Policy and Guidelines on Wind Turbines (CAA 2012a) provides assistance to developers and aviation stakeholders to aid the understanding of wind energy and aviation-related issues. The guidance set out within it has informed the approach taken throughout this chapter.

2.1.6. In December 2010, the CAA announced that they would no longer process pre-planning enquiries for proposed wind farm developments. The information provided in CAP764, and associated resources, is deemed to provide sufficient detail for developers to undertake comprehensive stakeholder consultation - and ensure suitable, relevant mitigation is detailed in ES's for wind farm developments and eventually implemented. CAP764 clearly states the special circumstances in which the CAA should still be consulted.

2.1.7. CAP670 – Air Traffic Services Safety Requirements (CAA 2013a), Part B, Section 4, sub-section 3 notes "*wind farms need to be considered as a safeguarding activity. The Air Traffic Service (ATS) provider is responsible for ensuring, as far as is reasonably practicable, that such development does not impact on the safety of the ATS environment. The ATS provider is responsible for deciding whether or not it can accept any degradation to the ATS environment. If the ATS provider predicts that the degradation is unacceptable then it should make representations to the appropriate local authority. The CAA does not have the power to veto wind farm development (other than on land actually owned by the CAA). The ATS provider is responsible for militating against any deterioration to the ATS environment caused by wind farms. The CAA may request to examine any mitigation measures taken and may vary approvals for ATS where the deterioration, caused by wind farms, affects safety.*"

2.1.8. CAP493 - Manual of Air Traffic Services Part 1 (CAA 2013b) provides guidance on Air Traffic Control (ATC) services and discusses the issues of radar clutter and suggested mitigation measures – see also Section 4.5.

2.1.9. Guidance for the developers of offshore wind farms provided in 'Health and Safety in the Wind Energy Industry Sector', Chapter 7.5, Paragraph 7.5.7 (RenewableUK 2010), states that the contractor must "*ensure that the site is not affected by regular aviation by:*

- *Taking account of local civil/military airfields and notifying the appropriate bodies; and*
- *Checking that it is not subject to low-flying aircraft*".

2.2. Consultation

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

- Scoping Report submitted to the Planning Inspectorate (May 2012);
- Scoping Opinion received from the Planning Inspectorate (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) (Forewind 2012a); and
- Second stage of statutory consultation (in accordance with sections 42, 47 and 48 of the Planning Act 2008) on the draft ES designed to allow for comments before final application to the Planning Inspectorate (December 2013).

2.2.2. In between the statutory consultation periods, Forewind 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 design decision making and the information presented in this document. In addition, consultation responses received following the PEI3 submission for the Dogger Bank Creyke Beck A & B offshore wind farms has informed the development of this chapter. The similarities between the two projects, particularly from the perspective of aeronautical receptors, means that comments received in relation to Creyke Beck will in all likelihood be applicable to Dogger Bank Teesside A & B also. 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.

2.2.3. Consultation to inform this chapter has been undertaken with the CAA, NATS (including their subsidiary NERL), the MOD and Maritime and Coastguard Agency (MCA) in accordance with Wind Energy and Aviation Interests Interim Guidelines (Department of Trade and Industry (DTI) *et al*., 2002) and the British Wind Energy Association (BWEA) (now RenewableUK). Consultation with the MOD has been undertaken through a standard proforma (industry standard consultation document) and subsequent direct correspondence.

2.2.4. **Table 2.2** summarises issues that have been highlighted by the consultees throughout the consultation process and indicates which sections of this chapter address each issue. 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 responses

Date and form of consultation	Consultee	Summary of issue	ES reference
December 2013 (section 42 consultation on the draft Teesside A & B ES, statutory)	MOD	Response received from the MOD following assessment of the Dogger Bank Teesside A & B proposals confirms that they have no concerns with the proposals.	Discussion of potential impacts upon MOD-related infrastructure covered in Sections 4.2, 4.3, 4.5.9, 4.6, 4.7, 4.9 & 4.10.
June 2012 (Scoping Opinion)	CAA	Owing to the range of potential impacts upon aviation, the CAA requested that the findings of all aviation-related consultation should be presented as well as the consideration of all potential issues.	Responses to consultation are included in the respective sections of this chapter where individual receptors and potential issues are considered in detail.
	CAA	The CAA highlighted that consultation needs to be undertaken with aviation operators and service providers, specifically the MOD, NERL and offshore helicopter operators in order to identify any potential aviation concerns.	Consultation has been undertaken with a number of stakeholders, with further consultation anticipated as the project progresses. Refer to this section and Section 4.
	CAA	Highlighting the need to ensure maximum conspicuity of the turbines by night, the CAA stated that some or all of the turbines will need to be equipped with warning lighting. The relevant legal requirements are documented within Article 220 of the UK Air Navigation Order.	Section 9.1.2 and **Chapter 5 Project Description.**
	CAA	The CAA highlighted that meteorological masts are difficult to acquire [detect] visually and consideration should be given to lighting and marking of any masts required.	Meteorological masts will be lit in accordance with the requirements of the ANO, and notified to the CAA and DGC for charting and marking purposes. Refer also to section 9.1.2 and **Chapter 5 Project Description.**
	CAA	There is a requirement for turbines to be charted for aviation purposes. The Defence Geographic Centre (DGC) and CAA should be kept fully appraised of the wind farm's development.	All turbines in the Dogger Bank will be charted for aviation purposes and the DGC and CAA will be kept fully appraised of the wind farm's development. Further details are provided in Section 4 of this chapter.

2.2.5. Responses from the CAA and NATS as part of the section 42 consultation on the draft ES had not been received as of mid-January 2014.

3. Methodology

3.1. Study area

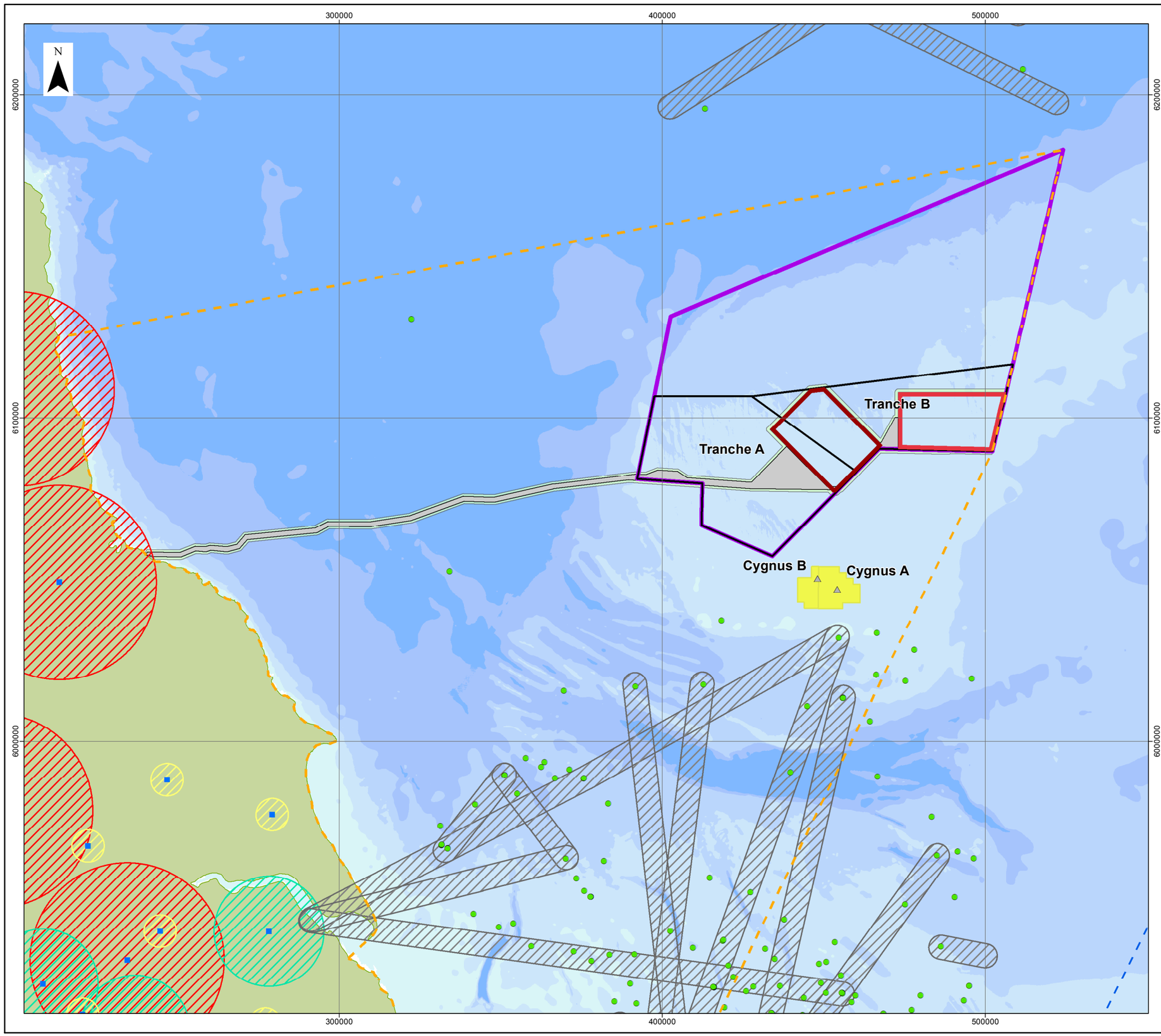
3.1.1. The study area for the assessment of military activities and civil aviation has a wide geographic scope, covering the extent of the Dogger Bank Teesside Offshore Zone Development Envelope (ZDE), as shown in **Figure 3.1**. This ensures that any potential constraints which may be present and related to activities undertaken by the CAA, NATS, NERL, MOD and other operators are taken into consideration. The study area includes shore-based aeronautical installations, including radar sites as well as Helicopter Main Routes (HMRs) and oil and gas platforms (where associated with offshore helicopter operations). The study area includes the airspace above the development, and the subsurface environment below, thus ensuring that the activities of the RAF, RN and Army are all taken into account. It also encompasses land-based MOD assets such as military aerodromes and defence radar installations whose activities and equipment could be affected.

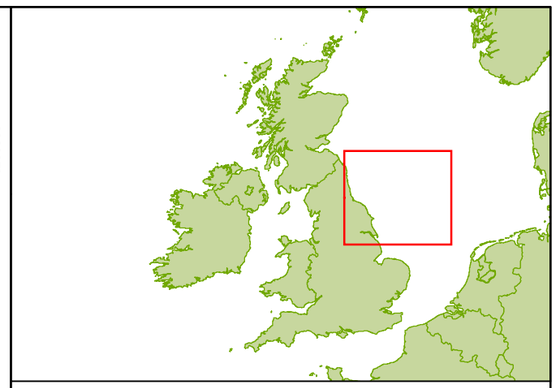
3.2. Characterisation of the existing environment methodology

3.2.1. Characterisation of the existing environment has been informed through a desk-based study of available data and information from the consultation process. The proximity of the proposed development site to shore-based aeronautical installations, including aerodromes and CNS sites, has been examined. The following sources of information have been consulted:

- NERL 'Self-Assessment' tool for determining (indicatively) the range at which a wind farm development could cause interference for Primary and Secondary Surveillance Radar systems, navigation aids and air-ground-air communication stations;
- CAA and other aeronautical charts of the proposed development area;
- NATS Integrated Aeronautical Information Publication (AIP); and
- Relevant CAA Aeronautical Publications (CAP), namely CAP764, CAP670, CAP493.

3.2.2. **Figure 3.1** provides an overview of civil aviation interests in the Offshore ZDE as well as civil aviation aerodromes and their respective consultation zones. **Figures 3.2** and **3.3** show military Practice & Exercise Areas (PEXAs) used by the RAF, and RN and Army respectively.





LEGEND

- Dogger Bank offshore zone development envelope
- Dogger Bank zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Flight Information Region (FIR) boundary
- North Sea helicopter main route with 2nm buffer
- Cygnus gas field development
- Cygnus proposed subsurface infrastructure
- Offshore platform
- Civil aviation aerodrome

Civil aviation aerodrome consultancy zone

- 5km suggested zone
- 17km suggested zone
- 30km suggested zone

0 10 20 40
Kilometres

Data Source:
Civil Aviation Aerodrome from DECC, 2012, Oil and Gas licence blocks from DECC, 2012,
Cygnus platform locations supplied by GDF Suez, 2012, Surface Infrastructure © UKDeal, 2012
Round 3 offshore wind farm boundary © Crown Copyright, 2012,
Flight Information Region and Helicopter Main Route from NATS Aeronautical Information Service, 2012,
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 3.1 Civil aviation interests in proximity to Dogger Bank Teesside A & B

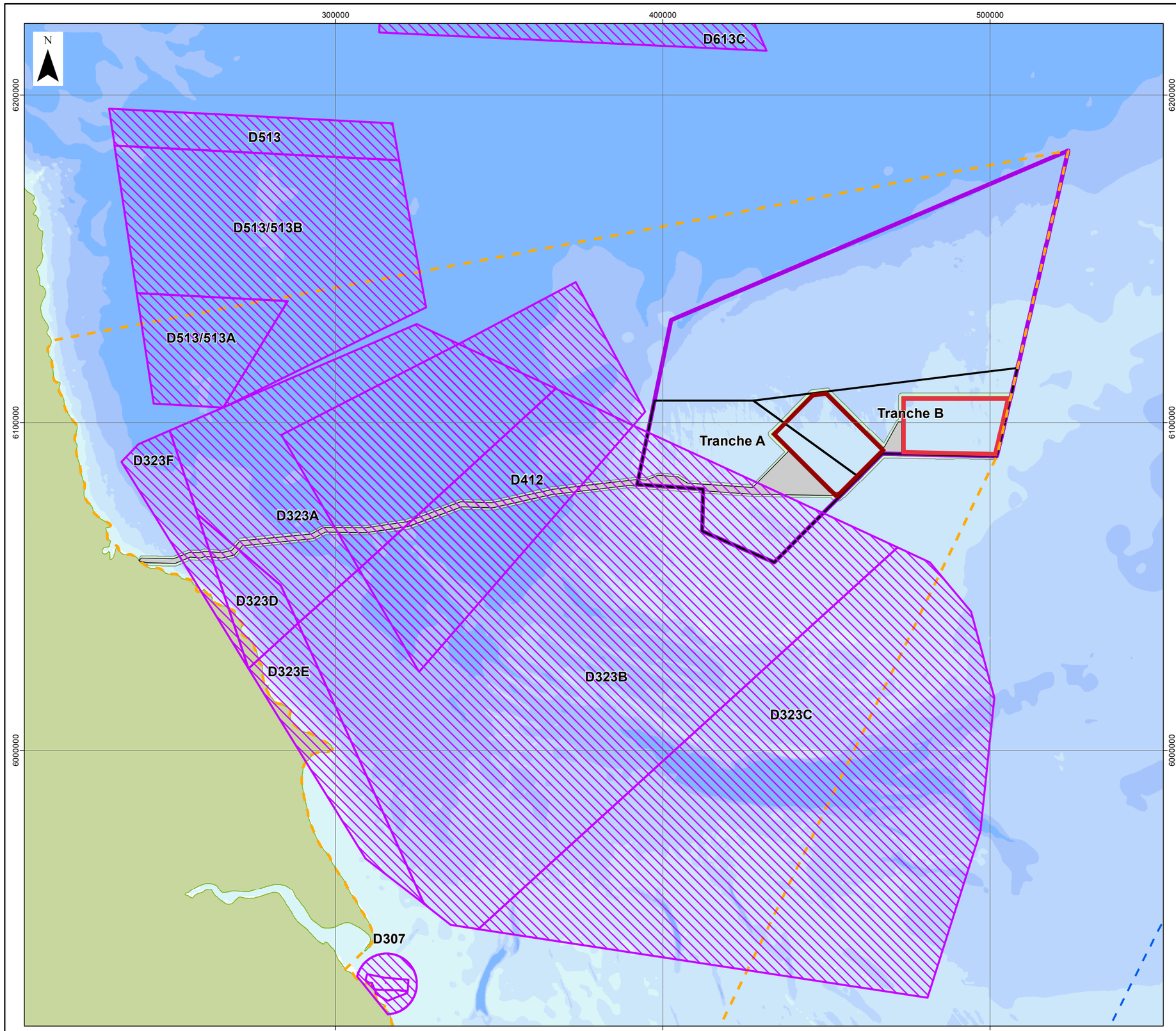
VER	DATE	REMARKS	Drawn	Checked
1	13/06/2013	Draft	FK	DB
2	04/10/2013	PEI3	JE	DB
2	05/02/2014	DCO Submission	GC	DB

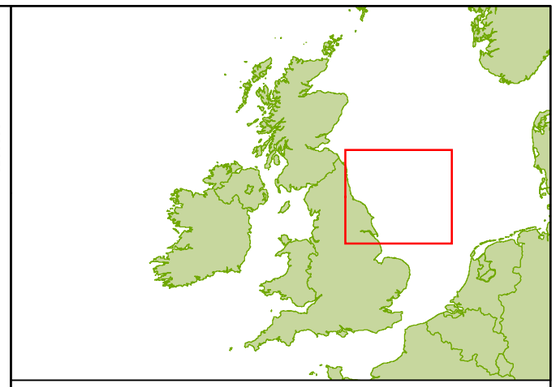
DRAWING NUMBER:

F-OFL-MA-300

SCALE	PLOT SIZE	DATUM	PROJECTION
1:1,200,000	A3	WGS84	UTM31N

FOREWIND





LEGEND

- Dogger Bank offshore zone development envelope
- Dogger Bank zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Flight Information Region (FIR) boundary

UKHO Military Firing Practice & Exercise Area (PEXA)

- Royal Air Force

0 10 20 40
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2012,
Flight Information Region Boundary from NATS Aeronautical Information Service, 2012,
Military practice and exercise areas © British Crown Copyright, 2013. All rights reserved.
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Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 3.2 Military interests - Royal Air Force PEXA's in proximity to Dogger Bank Teesside A & B

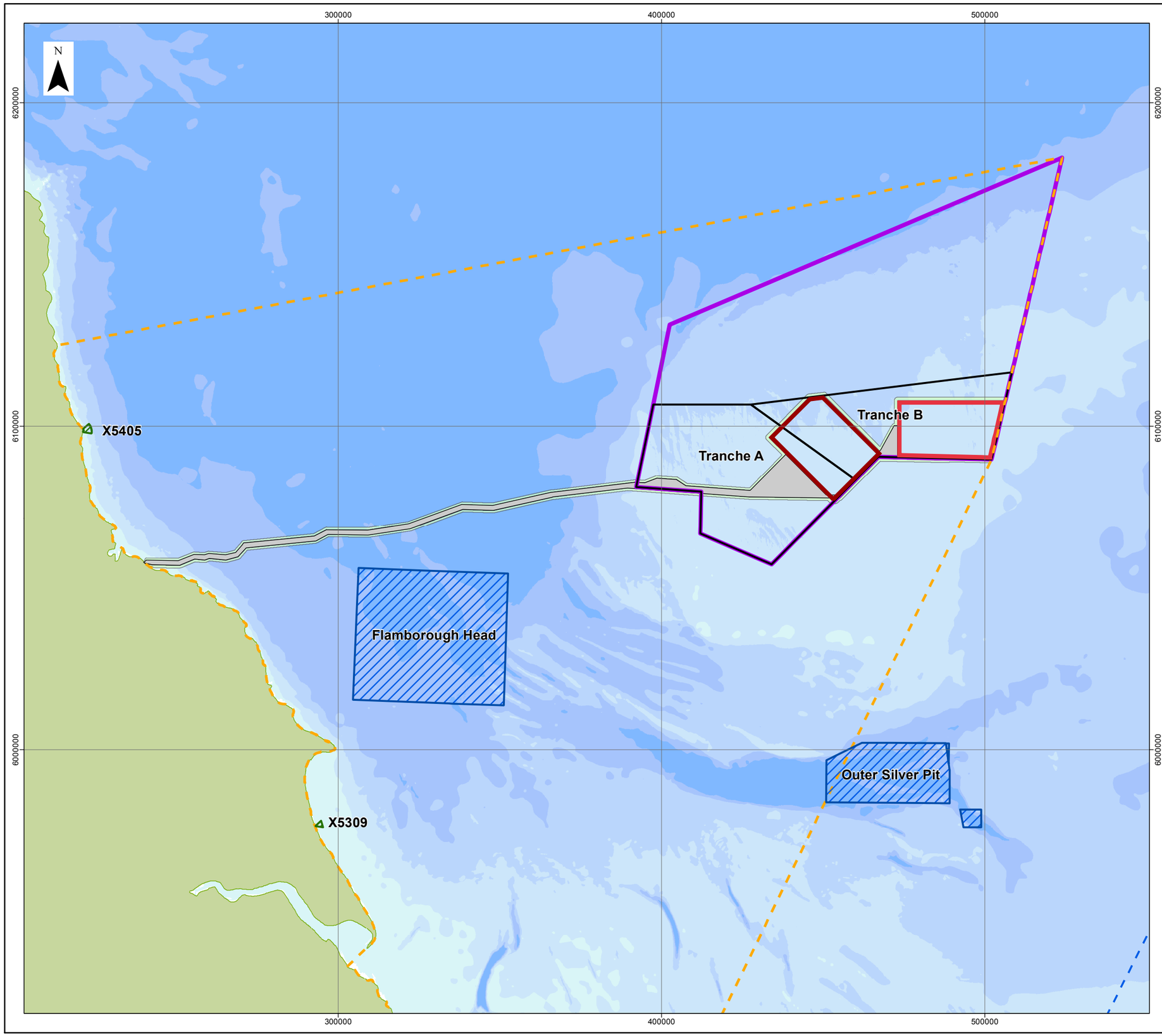
VER	DATE	REMARKS	Drawn	Checked
1	13/06/2013	Draft	FK	DB
2	04/10/2013	PEI3	JE	DB
3	24/01/2014	DCO Submission	GC	DB

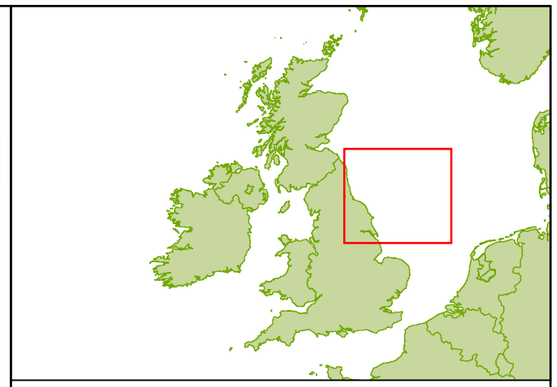
DRAWING NUMBER:

F-OFL-MA-301

SCALE	PLOT SIZE	DATUM	PROJECTION
1:1,200,000	A3	WGS84	UTM31N

FOREWIND





LEGEND

- Dogger Bank offshore zone development envelope
- Dogger Bank zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area
- Flight Information Region (FIR) boundary

UKHO Military Firing Practice & Exercise Area (PEXA)

- Army
- Navy

0 10 20 40

Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2012,
Flight Information Region Boundary from NATS Aeronautical Information Service, 2012,
Military practice and exercise areas © British Crown Copyright, 2013. All rights reserved.
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PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 3.3 Military interests - Army and Navy PEXA's in proximity to Dogger Bank Teesside A & B

VER	DATE	REMARKS	Drawn	Checked
1	13/06/2013	Draft	FK	DB
2	04/10/2013	PEI3	JE	DB
3	05/02/2013	DCO Submission	GC	DB

DRAWING NUMBER:

F-OFL-MA-302

SCALE	PLOT SIZE	DATUM	PROJECTION
1:1,200,000	A3	WGS84	UTM31N

FOREWIND

3.3. Assessment of impacts – methodology

Offshore wind farms and military and aviation receptors

3.3.1. The distance between an offshore wind farm development and airfields, the routes flown by inbound and outbound aircraft, military training areas and CNS infrastructure sites are of critical importance to whether or not the wind farm will impact these activities, and what the extent of these impacts will be. Impacts upon military and civil aviation receptors are typically related to radar systems or the creation of a physical obstruction and the related flight safety implications. However, numerous other impacts can and do occur, as discussed in Section 4.

3.3.2. To aid in the identification of potential impacts NATS provide a range of downloadable 'self-assessment' maps, which show (indicatively) the distance offshore that a proposed development would be expected to be detected by shore-based radar. The greater the tip height of the proposed wind turbine(s), the greater the likelihood that it will be visible on radar at a given distance from that radar. Where there is a risk that a development could be visible on radar, line of site modelling is undertaken for each proposed wind turbine to assess the extent to which it would impact land-based radar installation(s).

3.3.3. The NATS-produced map showing the range at which wind turbines with a 200m tip height (the highest catered for in the self-assessment maps) would be detectable on radar clearly illustrates that Dogger Bank will be beyond this range. As the height of wind turbines increase (units with a tip height of 315m are being considered in this case), the range at which they will be detectable offshore increases. In the absence of NATS-produced maps for turbines of this height, determination of impacts comes from consultation with NATS. The distance of this development offshore means that line-of-site modelling to determine impacts upon radar systems was not undertaken.

General process

3.3.4. The assessment process for military activities and civil aviation has highlighted that the systematic matrix based approach that defines levels of sensitivity and magnitude (as outlined in **Chapter 4 EIA Process**) leads to ambiguity for the types of impacts under consideration. Furthermore, determining the level of impact upon the type of receptors in question incorporates a high degree of subjectivity.

3.3.5. Where the potential for adverse impacts upon these receptors has been identified, it is because the development may adversely impact flight safety, the performance of a radar system or the ability of the military to effectively use a training site, regardless of the perceived magnitude of effect or any subjective assessment of the sensitivity of the receptor.

3.3.6. If a proposed offshore wind farm development is likely to be detected on ATC radar, for example, it is an adverse impact that will have to be addressed. The radar allows controllers to direct the safe movement of aircraft and management of airspace and if the radar's ability to do this is jeopardised (i.e. through clutter generated by wind turbines), remedial action must be taken. Similarly, if an offshore wind development was deemed likely to compromise the safety of

helicopters landing at a nearby offshore platform, the project could only proceed once a resolution had been agreed with the appropriate stakeholders.

3.3.7. Therefore, the impact assessment for this chapter takes a descriptive approach based upon expert opinion of the anticipated impacts upon the specified receptors. It draws upon guidance as produced by the CAA and other regulators and consultation undertaken to date. The narrative provided ensures that the reader can follow the approach taken and is able to clearly determine the reasons for any given receptor being scoped out of the assessment.

3.3.8. Using a wide variety of resources, full consideration has been given to the position of Dogger Bank Teesside A & B in relation to offshore aviation constraints in addition to those linked to radar impacts (as set out in CAP764); HMRs[1], offshore helicopter platforms, SAR activities, military training and exercise areas, shore-based radar installations and shore-based military CNS infrastructure.

[1] Helicopter Main Routes are commonly used routes for civilian helicopters which run between airfields and platforms, and between platforms (see also **Figure 3.1**).

4. Existing Environment

4.1. Commercial and other civil aviation activity

4.1.1. The airspace above and adjacent to Dogger Bank Teesside A & B is utilised by both military and civil aircraft. The airspace is uncontrolled (i.e. it is not under the radar control of an aeronautical station) and is said to be in the 'open FIR' (Flight Information Region), meaning the airspace is essentially open to anyone who wishes to use it and without requiring a clearance. This is the case up to and above Flight Level 195 (FL195) which equates roughly to 19,500ft; well above the point at which Dogger Bank Teesside A & B could have any effect. European and intercontinental commercial flights above FL195 are in controlled airspace and may be following one of a number of airways or routeings under the control of either the London or Scottish airspace sectors.

4.1.2. CAP764 provides specific guidance for developments associated with later rounds of offshore wind projects, as these projects are typically further away from the coast. In some cases, these sites may be located close to the boundary of UK airspace – the aeronautical equivalent of the limit of territorial waters. This is known as the FIR boundary, and marks the limit of UK airspace. Beyond the boundary could be international airspace or the airspace of another territory. In the case of the North Sea, the UK FIR boundary borders airspace belonging to the Netherlands, Germany and Denmark, amongst others. If a site is going to be in proximity to the FIR boundary (the CAA do not dictate a distance, so common sense prevails), it is important that the CAA are consulted on so-called 'cross-boundary' issues.

4.1.3. Dogger Bank Teesside A & B are sufficiently far from the FIR boundary that this specific consultation is not required (although the CAA will continue to be consulted with regard to the development proposals as a whole). **Figure 3.1** shows part of the FIR boundary which continues to run in a north-easterly direction off the figure. At its closest, the FIR boundary is 109km east of Teesside A and the Dogger Bank Zone (note that the FIR boundary does not follow the median line which denotes the UK continental shelf boundary and runs along the eastern boundary of the Dogger Bank Zone).

4.1.4. Whilst high altitude commercial traffic will regularly transit the area, other aircraft operating at lower altitudes are expected to be in the area only very occasionally. Where such aircraft are present, good airmanship dictates that they will not be flying at an altitude at which the presence of an offshore wind farm could pose any problems. Flying higher offers increased contingency time in the event of an emergency and allows aircraft to remain in contact with shore-based ATC units for the maximum time whilst over water. The only aircraft that could be reasonably expected to be operating at low level in the area, other than those associated with the project itself would be infrequent fisheries patrols and/or Her Majesty's Coastguard SAR operations.

4.1.5. As is required by the CAA, Dogger Bank Teesside A & B will be marked on appropriate aeronautical charts. In addition, the development will have to be lit in accordance with CAA lighting requirements, as well as with those set out by the MOD and maritime authorities. Exact lighting requirements are the subject of continuing discussions between regulators and Forewind.

4.1.6. No impacts upon commercial and other civil aviation activity are anticipated as a result of Dogger Bank Teesside A & B. As a result, they are scoped out of the assessment at this point and are not discussed further.

4.2. MOD practice and exercise areas (PEXAs)

4.2.1. The MOD has rights to practice aerial, surface and sub-surface operations, which occur both inside and outside of defined PEXAs, as well as the operation of CNS infrastructure (e.g. radar and technical sites) to monitor airspace. Wind turbines have the potential to affect military activities either through their physical dimensions limiting access and affecting safeguarding or safe passage, or through their effects on CNS infrastructure due to electromagnetic interference.

4.2.2. PEXAs are sites available for training use primarily by the UK armed forces but also those of overseas nations. They can be over land or water, or both, and may involve the firing of live ammunition.

4.2.3. There are a number of PEXAs located within the study area as shown in **Figure 3.2** and **Figure 3.3**. A full list of these areas is provided in **Table 4.1**. Where these areas have the potential for impacts upon civilian aviation activity they are detailed in the UK AIP which is produced by NATS. Such areas are usually designated 'Danger Areas' but can also be designated as 'Restricted' or 'Prohibited' airspace, depending upon the nature of the activities undertaken. Detailed information regarding each of these sites is contained in the UK AIP.

4.2.4. RAF SAR helicopters may need to operate in the area; however such activity could reasonably be expected to be highly infrequent considering the extent of UK territorial waters and the chances of an emergency requiring SAR assistance being in the vicinity of Dogger Bank Teesside A or B. A complete discussion of SAR activities, impacts and mitigation is contained within Section 4.9.

4.2.5. RN activity in the area comprises transiting warships, submarine and helicopter operations. The RN has two submarine training areas within the offshore ZDE: Flamborough Head and Outer Silver Pit (see **Figure 3.3** and **Table 4.1**). Outer Silver Pit lies approximately 88km south of Dogger Bank Teesside B and is not on the route of future construction-related vessel movements. For both these reasons, the Outer Silver Pit submarine training area is scoped out of the assessment at this point and not discussed further.

4.2.6. Whilst information on the specific nature of the activities undertaken is not publically available, Flamborough Head submarine exercise area is a square of approximately 50km by 50km which at its closest point is around 16km north-east of Flamborough Head. This PEXA is 126km south-west of Dogger Bank Teesside B and 10km south of the Dogger Bank Teesside A & B export cable corridor. Impacts upon Flamborough Head submarine training area are not

anticipated as a result of the development and as such, the site is scoped out of the assessment at this point and not discussed further.

4.2.7. Danger areas used by the Army within the offshore cable area are for the land-based practice firing of artillery and other projectiles. The danger areas form a small 'cone' with the base of the cone out to sea, creating a restricted zone to ensure that no vessels are inadvertently struck. Due to the distance of the development offshore, no impacts upon offshore Danger Areas used primarily by the Army for live firing activities are anticipated during any phase of Dogger Bank Teesside A & B. As a result, they are scoped out of the assessment at this point and are not discussed further.

4.2.8. The Dogger Bank Teesside export cable corridor underlies Danger Areas 323A and B (D323A, D323B) which are used by North Atlantic Treaty Organisation (NATO) air forces for air combat and supersonic flight training. The Danger Areas form a three-dimensional 'block' of airspace with specific upper and lower height limits, in this case starting at Flight Level 50 (approximately 5,000 feet (ft.) above mean sea level (AMSL)) and extending up to Flight Level 660 (approximately 66,000ft AMSL) (see **Figure 3.2**). D323B will likely (although this is ultimately dependent upon the selected base for helicopter operations) overlie the route used for helicopter traffic supporting the development (i.e. the route between Humberside Airport and Dogger Bank Teesside A & B). With a 5,000ft base height it is expected that all aircraft using the Danger Area will not be operating below this height. Direct construction and construction-support activities (i.e. helicopter traffic delivering personnel and equipment) involved with Dogger Bank Teesside A & B and the Dogger Bank Teesside export cable corridor will all be below 5000ft AMSL. As a result there should be no interaction between low-level helicopter activity and military activity taking place in the overlying D323B.

4.2.9. In addition, D323D and D323F overlie the Dogger Bank Teesside export cable corridor. However, due to their base height (approx. 25,000ft) there is no mechanism through which impacts could occur. No MOD danger areas overlie Dogger Bank Teesside A or B; at its closest D323B (the closest to either of the Teesside developments) is 26km from the southern tip of Dogger Bank Teesside B.

4.2.10. Danger Area 412 (D412) Staxton lies to the west of the Dogger Bank Zone and also overlies much of the Teesside export cable corridor. It is used for air-to-air firing practice (see **Figure 3.2**) by the RAF and other NATO air arms. D412 extends from the surface to 10,000ft AMSL and is only active as notified by the appropriate agencies (MOD and CAA through the issue of a 'NOTAM' (Notice to Airmen)).

4.2.11. With respect to Danger Area 412 Staxton, the potential for impacts to arise during construction was identified, owing to possible interactions between cable installation vessels operating in this area and training (air-to-air live firing) activity. In order to assess the nature of any impact, it is important to have an understanding of baseline vessel activity and compare how forecast construction-related vessel numbers would affect this total. This is covered in

detail in **Chapter 16 Shipping and Navigation**, with only an overview provided here.

4.2.12. Using Automatic Identification Systems (AIS), marine radar and observers, an assessment was undertaken to determine the number of vessels operating within the vicinity of the export cable corridor, during June 2011, June 2012 and April 2013. The assessment indicated that there are as many as 73 unique vessels per day travelling within 5 nautical miles (nm) of the export cable corridor, the majority of which are cargo and passenger vessels.

4.2.13. The forecast vessel movements associated with the construction of Dogger Bank Teesside were considered in the context of ongoing vessel activity as above. The maximum number of vessels associated with the construction of either Dogger Bank Teesside A & B (not both together) is 66 over a period of three years. The actual number of vessels at sea at any given time will vary according to the construction programme. The total vessel movements expected to be required to support construction and initial operation (a total of three years) is 5,150. Averaged across this period, this equates to 4.7 movements per day although in reality there will be days of relatively intensive traffic and others of very little, depending upon the construction phase.

4.2.14. Discussions with the Defence Infrastructure Organisation (DIO), who manage MOD assets and infrastructure, have been undertaken to gain a clearer picture of activity undertaken within D412. Detailed information is understandably not publically available however the details provided by the DIO allow D412, and consequently all PEXAs, to be scoped out of the impact assessment. D412 is used for air-to-air gunnery practice whereby a target 'banner' towed behind one aircraft (the 'target tug') is used for live firing practice by other aircraft. There is no interface between aircraft using this range and surface (boat) traffic as the target remains attached to the target tug and spent shell casings are collected by the firing aircraft. The DIO confirmed that when D412 is active, aircrew operate on a 'see and be seen' basis whereby a visual inspection of the sea surface environment by aircrew is undertaken prior to the start of firing. If any vessels are present they will typically reposition or use an alternative range.

4.2.15. A review of MOD PEXAs used by the RAF, Navy and Army has not identified any mechanism through which they could be impacted by the proposed development of Dogger Bank Teesside A & B. Construction activities will be co-ordinated with the relevant agencies as required, including the MOD. MOD PEXAs are therefore scoped out of the impact assessment and are not considered further.

Table 4.1 Overview of PEXAs of relevance to the baseline assessment. All sites have been scoped out of the impact assessment.

Name	Detail	Location (Figures 3.1 & 3.2)
Danger Area D323A-C Southern	Air combat and supersonic flight training. Base altitude Flight Level 50 (approximately 5,000ft AMSL).	From the English coast and terminating west of Dogger Bank Teesside B.
Danger Area D323D-F Southern	Air combat and supersonic flight training. Base altitude Flight Level 250 (approximately 25,000ft AMSL).	Narrow wedge running approximately from Spurn Head to Hartlepool, largely offshore but also overland between Flamborough Head and Whitby.
Danger Area D412 Staxton	Air to air live firing (gunnery) (RAF). Site extends from the surface to 10,000ft.	Overlying the Dogger Bank Teesside A & B export cable corridor and extending to just west of the Dogger Bank Zone.
Danger Area D513, 513A-B Druridge Bay	Live firing (RAF).	Between the coast and the Dogger Bank Zone and well north of the export cable corridor.
Danger Area D307 Donna Nook	Used for a range of air to surface firing and bombing activities, as well as for the demolition of unexploded ordnance.	In The Wash, and a significant distance to the south of the export cable corridor.
Outer Silver Pit	RN submarine practice area.	South of the Dogger Bank Zone and beneath D323C.
Flamborough Head	RN submarine practice area.	North-east of Flamborough Head and to the south of the proposed export cable corridor.
Rowlston army PEXA (X5309)	Used for surface firing exercises (land to sea).	Far south of the cable landfall and extending only a short distance offshore.

Source: Enroute Information (ENR) section of UK Aeronautical Information Publication and correct as at 11/06/13

4.3. MOD 'highly surveyed routes'

4.3.1. Consultation with the MOD has highlighted the presence of areas of the seabed that have been subject to highly detailed surveying for defence and national security purposes. The potential for the proposed export cable corridor to cross an area that has been subject to this surveying was identified. It was anticipated that the MOD may require that where the features of the seabed are altered along a highly surveyed route, they would have to be reinstated to their previous condition. Recent consultation on this subject however, confirmed that the MOD has no concerns over the proposed development. The receptor is subsequently scoped out of the assessment and not considered further.

4.4. Meteorological Office weather radar

4.4.1. The Met Office operates a network of radar sites across the UK known as the UK weather radar network. The network comprises 16 safeguarded sites which contribute to forecasting and precipitation monitoring, aiding not only domestic

forecasting operations but also playing an important role for the MOD, NATS, aviation operators and other organisations.

4.4.2. Guidance provided by the Met Office includes information on the distances from a radar antennae that a wind turbine could be anticipated to have an impact:

- Within 5km of a radar, placement of turbines needs to be avoided as there will inevitably be adverse effects upon the antennae; and
- Within 20km of a radar, an impact study must be undertaken to determine the extent of adverse effects upon it.

4.4.3. The Met Office recommend that developers consider impacts of proposed projects on radar installation beyond 20km distances as adverse effects may still arise. At over 195km offshore however, it can be concluded that Dogger Bank Teesside A & B will not adversely impact the UK weather radar network. Such installations are therefore not considered further within this assessment.

4.5. Military and civilian aviation radar

4.5.1. Radar is a very important part of military and civilian CNS infrastructure. A radar operates by transmitting a stream of high powered radio pulses and then 'listening' for any reflections which will be bounced off an object (i.e. an aircraft) that is within range. The return signal is interpreted by the radar to provide information such as target range, height, bearing and direction of travel (depending on radar type). Two main types of radar are in use. Primary Surveillance Radar (PSR) is able to determine the range to a target from the radar receiver as well as azimuth, but it is not able to determine target height. Secondary Surveillance Radar (SSR) interrogates a unit on-board the aircraft known as the transponder which, when interrogated by a radar signal, responds with information including the aircraft's height, thus providing ATCs with a three-dimensional picture of aircraft velocity and height.

Effect of turbines upon Primary and Secondary Surveillance Radar

4.5.2. Wind turbines can generate false returns or 'clutter' on an ATC screen as the rotating blades trigger what is known as the 'Doppler Threshold' of the radar; in essence tricking the radar receiver into thinking that it is receiving signals from an airborne and moving target. The size of modern turbines means they can potentially generate a radar cross section larger than that of a commercial airliner. In doing so, the false return creates a blind spot on the radar that masks the area behind the turbine along with any 'genuine' aircraft that may be there.

4.5.3. This may present an unacceptable hazard to flight safety and compromise the ability of an Air Traffic Service Unit (ATSU) to safely manage the flow of air traffic for which it is responsible.

4.5.4. As highlighted above, SSR interrogates the transponder on-board the aircraft. The information received provides the controller with the aircraft's height, in addition to the information received from the primary radar return indicating target bearing and range. If a wind turbine is sufficiently close to an SSR and within its line of sight, reflections from the turbine can generate false signals.

Additionally, the presence of obstructions within the radar line of sight may result in a shadowing effect in the lee of the obstruction, thus potentially masking the presence of aircraft within that area.

4.5.5. The CAA advises that a distance of 13nm (24km) (between the wind turbine(s) and the radar receiver) should be used as the threshold distance, within which further discussion between the appropriate aeronautical service provider and wind farm developer should be undertaken.

4.5.6. A range of site/project-specific mitigation measures can be employed where a proposed wind farm development is likely to adversely impact radar and the provision of air traffic services.

4.5.7. Given the distance between Dogger Bank Teesside A & B (the export cable corridor is not considered as the installation in this area will all be sub-surface) and the nearest military or civil aerodrome radar (over 200km), line-of-site modelling to determine impacts was not undertaken (reflecting guidance set out in CAP764). Consequently no impacts upon PRS or SSR are anticipated and as such, they are scoped out of the assessment at this point and not discussed further.

4.5.8. The response to PEI3 for the nearby Dogger Bank Creyke Beck projects from NATS (22/04/13), confirmed that they do not have any concerns over the proposed development. Acknowledging that these comments relate to Creyke Beck, the fact that Dogger Bank Teesside A & B are further offshore means that their assessment for this site should draw the same conclusion. Supporting this and in relation to possible impacts upon radars is the July 2013 response from the MOD who, having completed their assessment of the proposed Teesside A & B developments, said "*the MOD has no concerns with this phase of the Round 3 Zone 3 proposals*".

Air defence radar

4.5.9. The RAF is responsible for the UK's Air Surveillance and Control System, part of the Air Defence Radar network which is designed to provide early warning of an impending air attack, provide missile defences and the co-ordination of land, sea and air defence assets. The Air Surveillance and Control System is supported by a number of shore-based and airborne assets, including a network of radar stations located around the country. The closest Air Defence Radar to the development is at RAF Staxton Wold in North Yorkshire, which is approximately 128km west of the Dogger Bank Zone and, therefore, outside of the range at which the development could affect the radar. As highlighted in 4.5.8 above, the MOD has not raised any concerns to date in relation to anticipated impacts upon the Air Defence Radar network. The most recent correspondence received from the MOD (dated 25th July 2013) confirmed that the MOD has no concerns in relation to any element of the proposed development. As such, this impact is scoped out of the assessment at this point and is not discussed further.

4.6. UK Military Low Flying System

4.6.1. The UK Military Low Flying System (UKMLFS) was established in 1979 and enables low-level flight training for fixed and rotary winged aircraft. It is formed

by a system of low flying training areas joined by a network of corridors avoiding population centres and built up areas wherever possible. The UKMLFS extends 3nm out from the coast and whilst military aircraft do operate at low level over the sea, it is unlikely that aircraft would be doing so regularly and at distances offshore that would bring them into conflict with Dogger Bank Teesside A & B. At no point in the consultation process for Dogger Bank Teesside A & B or Dogger Bank Creyke Beck A & B has the MOD raised any concerns regarding impacts on the low flying network. The UKMLFS is therefore scoped out of the impact assessment and is not considered further.

4.7. Military and civil aerodromes

4.7.1. Many aerodromes within the UK are said to be 'officially safeguarded'. The process of safeguarding ensures that the operation of an aerodrome is not inhibited by the presence of buildings, structures or works which have the potential to infringe protected surfaces, obscure runway approach lights or adversely affect the performance of aerodrome CNS equipment. The extent of safeguarding is dependent upon the aerodrome in question (i.e. its size and the amount of traffic it handles) but it will be to a distance of 5, 17 or 30km from the site. Given the distance offshore of this development, there is no mechanism through which impacts could arise for civil or military aerodromes. Military and civil aerodromes are therefore not considered further within the assessment.

4.8. Helicopter Main Routes and offshore helicopter operations

4.8.1. Offshore oil and gas platforms in the North Sea are supported by a number of helicopter operators who ferry crews and supplies to and from the mainland. The routes taken by helicopters on such flights often follow what are known as HMRs which form a network of corridors between offshore platforms and the main support bases at Norwich Airport, North Denes (Great Yarmouth) and Humberside Airport. A large wind farm development beneath an HMR may lead to problems, by forcing a helicopter to fly higher (and thus risk entering cloud) to avoid compromising the minimum vertical separation height above the wind turbines. This is of particular significance where the 0^{o} isotherm (i.e. the level at which the air temperature reaches freezing) is at 2,000ft or below and a low cloud base is present, due to the risks associated with ice build-up on helicopter rotor blades.

4.8.2. A desk study of the existing HMRs and the location of offshore platforms reveal that none are present within the Dogger Bank Zone. Platforms to the south at Munro and Tyne are closest to the Dogger Bank Zone at 45km south of Dogger Bank Teesside B. These platforms are serviced by helicopters operating from Norwich, Humberside and North Denes. The nearest platforms to the north are Norpipe 37/4A, Fife and Ardmore (the closest being 93km from Dogger Bank Teesside A) which are served by helicopters from Aberdeen. Whether considering platforms to the north or the south, the direct routes between these platforms and their operating bases do not approach the Dogger Bank Zone. The closest HMRs to the Dogger Bank Zone are:

- HMR 2, terminating at the Murdoch Platform (south of Dogger Bank Zone); and
- HMR 116, used for flights inbound to Aberdeen from the Fife platform (north of Dogger Bank Zone).

4.8.3. In addition, two platforms are proposed as part of the Cygnus gas field development to the south of Dogger Bank Teesside B. Helicopters will supply the Cygnus platforms, and will fly close to Dogger Bank Teesside B if, as anticipated, the land base for these operations is Aberdeen airport. Located 47km from the boundary of Dogger Bank Teesside B, presence of the wind farm will not affect helicopters flying under Instrument Flight Rules procedures to and from the Cygnus platforms. The operator (GDF SUEZ) has expressed an interest in exploring the possible benefit of access to, or sharing operations with, any future platform's with facilities for helicopters that may be constructed as part of the Dogger Bank development.

4.8.4. The Dogger Bank Zone is, therefore, not expected to have any impacts upon helicopters servicing these, or indeed any other offshore oil and gas platforms in the North Sea. Helicopters usually operate in straight line routes between their base and destination, and those servicing Dogger Bank Teesside A & B will be no exception. Although the full extent and nature of services provided by helicopters for the Dogger Bank development has yet to be determined, it can reasonably be assumed that helicopters will operate from Humberside (the closest airport equipped for offshore helicopter support operations) given the distance of the development offshore. At between 185-350km from Humberside Airport, helicopters serving the landward side of the Dogger Bank Zone would be operating flights equivalent to the longest currently undertaken by southern North Sea operators (i.e. from Norwich, North Denes and Humberside). Flights serving the seaward side of the Dogger Bank Zone would be comparable in distance to the longest currently undertaken in the northern North Sea from Aberdeen. Given the distances involved and considerations of helicopter range, payload and the requirements of the operators' Air Operator's Certificate[2], basing helicopters at the nearest suitable airport is highly desirable if not essential. Forewind anticipate that helicopter transits (return flights between the mainland and project site) will number 900 annually.

4.8.5. CAP764 details the need to maintain a nine nm zone around offshore helicopter destinations that is obstacle free in all directions. This is to ensure that during inclement weather, helicopter instrument approach procedures to platforms are unimpeded. A wind farm development within this nine nm buffer will not necessarily be prohibited although appropriate consultation would be mandatory to avoid adverse impacts upon helicopter operations to nearby platforms (Forewind 2012b).

4.8.6. The ultimate requirement for helicopters and the role that they will play in the construction of Dogger Bank Teesside A & B has not yet been finalised. Whether or not helicopters are needed, and the extent of this requirement, does have an important bearing upon the physical layout of the wind farm. This is

[2] An Air Operator's Certificate is the approval granted from the CAA to an aircraft operator to allow it to use aircraft for commercial purposes.

because helicopter operations will not be possible unless strict operating conditions, dictated to offshore helicopter operators by the CAA, are adhered to. The risk of collision dictates that helicopters can only operate to offshore platforms in conditions of reduced visibility (i.e. cloud, rain, at night, other inclement conditions) by following prescribed procedures (known as flying in 'Instrument Meteorological Conditions' or 'IMC'). Adherence to these procedures places strict limits on the siting of obstacles (e.g. meteorological masts or wind turbines) in the vicinity of landing platforms. The separation which must be maintained between a proposed landing platform and nearby obstacles can be as much as 9nm which could have a significant impact on wind farm layout.

4.8.7. Forewind anticipate that in addition to the helicopter services operating between the site and the mainland (~900 annually), helicopters will be heavily utilised in the operation and maintenance phase of the project. The worst case being considered is 6,000 trips per year, comprising utility (small) helicopters to shuttle maintenance teams of 4-5 people between the offshore operating base(s) and turbines or other infrastructure that requires attention. This is an average of 16 flights a day however the nature of maintenance activities and limitations imposed by the weather means that this will be subject to significant variability.

4.8.8. The CAA will be publishing a revised CAP764 in November 2013. Amongst the updates will be guidance on the management of helicopter operations from offshore bases and within a wind farm operating environment. Beyond the range of shore-based radio and navigation infrastructure and with potentially high levels of helicopter traffic, there is clearly a need to establish operating procedures to minimise the risk of accidents. Forewind recognise that the project-specific helicopter requirements are evolving at the same time as regulator guidance is being prepared. Forewind will work with the CAA and other regulators to ensure that helicopter operations associated with the development are aligned with the latest requirements. This is an evolving issue that will be revisited as the project helicopter requirement is clarified and regulators' guidance is developed.

4.8.9. Helicopter services required for the construction, operation and maintenance (O&M) and decommissioning phases of Dogger Bank Teesside A & B will be new services, specific to this project and in addition to the ongoing helicopter operations throughout the North Sea. Intra-site (i.e. within Teesside A or Teesside B) helicopter operations during the operational phase are not expected to interact with other, un-related offshore helicopter operations; i.e. those serving offshore oil and gas platforms. Acknowledging that helicopter support during the O&M phase is subject to ongoing discussions with the CAA, Dogger Bank Teesside A & B is not anticipated to have any impacts upon existing and future North Sea helicopter operations. This receptor is therefore scoped out of the assessment at this point and is not discussed further.

4.9. Aeronautical Search and Rescue operations

4.9.1. Aeronautical SAR activities within the UK and associated waters are the responsibility of two organisations. Her Majesty's Coastguard (on behalf of the

MCA) is responsible for the initiation and co-ordination of civil maritime SAR within the UK SAR Region. In addition, the MOD provides SAR support for military operations, training and other activities within the UK SAR Region. It is, however, MOD policy that these assets will be made available to provide SAR support for non-military incidents providing resources are available (Department for Transport 2008). The retirement of the long-range Nimrod maritime patrol aircraft in 2010, and cancellation of its successor the same year, means that aeronautical SAR activity is almost exclusively undertaken by helicopters in UK waters.

4.9.2. The area for which the UK has SAR responsibility is known as the UK SAR region and covers all vessels, aircraft and persons within this area. It extends in the North Sea as far as the median line, north to between the Shetland and Faroe Islands, and west as far as the 40 degree line of longitude. Dogger Bank Teesside A & B lie within the East of England region area of MCA operations with the nearest rescue coordination centre being 'Humber'.

4.9.3. SAR activities are dealt with in two separate chapters of the ES; vessel-borne SAR activities are covered in **Chapter 16** while airborne SAR interests are covered within this chapter.

4.9.4. Tasking of SAR helicopters is undertaken by the Aeronautical Rescue Co-ordination Centre at Kinloss in Scotland. Airborne SAR assets in the UK are divided between civilian and military operators. Civilian SAR operations are undertaken by the MCA, which operates a fleet of S62 and AW139 helicopters from Sumburgh, Lee-on-Solent and Portland. Military SAR operations are undertaken by Sea King helicopters operated by the RAF from RAF Wattisham, RAF Chivenor, RAF Leconfield, RAF Lossiemouth, RAF Valley and RAF Boulmer, and the RN from Royal Naval Air Stations Culdrose and Prestwick (Ministry of Defence 2012).

4.9.5. Sea King helicopters have an endurance of approximately six hours, which enables a radius of action of around 250 miles from base. It is possible to extend this by refuelling aboard suitably equipped vessels, at forward operating locations (i.e. airfields closer to the incident) or on offshore platforms.

4.9.6. It is anticipated that by 2016, RAF and RN assets will be stood down and the helicopters retired with responsibility for all UK SAR activity passing to a civilian contractor. The Government announced in March 2013 that the new SAR contract had been awarded to Bristow Helicopters Ltd. Under the proposed changes, RAF Boulmer and RAF Leconfield will cease in their role as SAR bases with Bristow's operations being undertaken from a new base at Humberside airport. Humberside is approximately 120nm from the boundary of Dogger Bank Teesside B and 133nm from the boundary of Dogger Bank Teesside A. Using Sikorsky S92 helicopters with a higher [than the Sea King] cruising speed in the region of 150kts, anticipated flight times will be reduced. The 'readiness state' at which the helicopters will be kept and corresponding time between an emergency being alerted, and the helicopter getting airborne, is not currently known. RAF Sea King helicopters will be airborne within 15 minutes between 0800 and 2200 and within 45 minutes between 2200 and 0800. In order to gain an understanding of baseline activity levels, data

provided by the MOD which offers a detailed overview of RAF SAR activities, has been analysed. The dataset covers all RAF helicopter assets and details the date of an event (i.e. a helicopter SAR mission being initiated), unit (squadron) involved in any SAR, incident location, type of incident, and persons rescued. The data covers all of the UK and its territorial waters although for the purposes of this ES only the southern North Sea has been investigated. It is important to note that the data covers only helicopters operated by the RAF and RN and not those operated by the Coast Guard. However, with the relevant (to this study) parts of the North Sea under the coverage of RAF SAR assets, the lack of Coast Guard information should not make a difference to the assessment. RAF helicopters were scrambled 1,865 times in 2012 with the summer months of June, July and August being the busiest months, as is historically the case.

4.9.7. SAR cover for the area within and around Dogger Bank Teesside A & B is currently provided by Sea Kings operating from RAF Leconfield and RAF Boulmer. A breakdown of total annual call-outs (that resulted in the launch of a helicopter) for these two bases is provided in **Table 4.2** below.

Table 4.2 SAR missions flown by RAF Sea Kings from Boulmer and Leconfield and persons moved 2003-2012

Base	RAF helicopter SAR call outs by year									
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
RAF BOULMER	194	166	144	206	170	211	214	193	181	141
Persons moved[+]	134	134	136	132	136	185	149	169	121	129
RAF LECONFIELD	150	136	135	147	222	232	204	174	168	129
Persons moved[+]	95	114	94	125	315	163	132	120	125	97

[+]Persons rescued, transported, transferred or otherwise carried during a SAR mission. Source: Defence Analytical Services and Advice (MOD 2013).

4.9.8. The coordinates of incidents recorded in the MOD dataset have been plotted to review which, if any, occurred within the Dogger Bank Zone or within the proposed sites for Dogger Bank Teesside A & B. Of all incidents in 2012, 28 fell within the offshore ZDE (see Figure 3.1) comprising medical rescue (23), assistance (2), search and rescue (1), recalled (1) and top cover (1). None occurred within the Dogger Bank Zone itself. The majority of incidents within the offshore ZDE were responded to by Sea Kings from RAF Leconfield.

4.9.9. The RAF undertook trials using a Sea King helicopter in 2005 to investigate the extent to which operating within and in proximity to an offshore wind farm impacted their ability to perform SAR. The trials were undertaken at North Hoyle Offshore Wind Farm in Liverpool Bay. The trials revealed that:

- Tracking targets within a wind farm, and from within 0.5nm of a wind farm causes interference for the on-board radar. The impact of wind turbines

meant that vessels within 100m of a wind turbine generator were not visible to the on-board radar;

- The performance of thermal imaging equipment, Very High Frequency (VHF) radio communications, direction finding equipment and on-board compasses were unaffected by the wind farm;
- Helicopter power requirements were increased when hovering 600m downwind of the turbines at a height of 50ft but turbulence was not encountered;
- Rescue by helicopter from a wind turbine generator would be extremely, if not prohibitively, hazardous if there is no system for confirming manual locking of both the turbine blades and the rotor azimuth orientation;
- In good visibility, a helicopter could be flown safely into a regularly-spaced wind farm complex;
- Helicopter rescue from the sea surface could only be undertaken if the target was sufficiently clear of the wind turbines for the rotating blades not to pose a safety hazard; and
- In foggy conditions, it was shown that the Sea King could be navigated between the lines of turbines at North Hoyle (turbine separation distance is circa 350m) using the helicopter's on-board radar.

4.9.10. The lessons from the North Hoyle trials demonstrated that some of the problems encountered were specific to helicopter type and the on-board equipment present (Forewind 2012b). With the planned retirement of the Sea King as the RAF's role as a SAR provider comes to an end, future SAR helicopters will likely be more reliant upon satellite-based navigation and less reliant upon on-board radar as well as featuring advanced automatic flight control systems which will enable more accurate station keeping. This will ensure greater ease of navigation between wind turbines in low-visibility conditions or at night.

4.9.11. Development of Dogger Bank Teesside A & B will lead to a marked change in the existing operating environment should a SAR operation be required within or in proximity to the project site. Potential impacts upon SAR interests are therefore carried forward to the impact assessment and discussed in Sections 6, 7 and 8 of this chapter.

4.10. Unexploded ordnance

4.10.1. Unexploded ordnance (UXO) in the Dogger Bank Zone has been characterised by an Explosive Ordnance Threat Assessment (BACTEC International 2010).

4.10.2. It is possible that works related to the construction of the project will uncover UXO. The 2010 BACTEC study concluded that there is a risk from UXOs across the Dogger Bank Zone. These could originate from World War 2 mine fields (records of mine-laying activities are understandably unreliable), and there are records of military vessels having been sunk by mines in the Dogger Bank Zone. In addition, the Battle of Dogger Bank (1915) between the RN and German Navy resulted in the release of large amounts of ordnance and the sinking of at least one German warship. Ordnance could also originate from

World War 2 with the remains of any crashed aircraft or that which was jettisoned over the North Sea while returning from raids (BACTEC International 2010).

4.10.3. Whilst the likelihood of uncovering UXO is remote, the potential consequences of an accidental detonation would be substantial. Prior to the start of construction, a UXO survey will be commissioned and undertaken to detail known UXO locations and map the seabed in the appropriate areas, to ensure that previously unknown UXO locations are identified. Depending upon the outcome of this work, sites of concern can be assessed in detail, and UXO removed and disposed of as appropriate, on the advice of a specialist contractor.

4.10.4. A UXO protocol will be prepared in advance of the start of construction, with appropriate specialists commissioned as necessary, to ensure that all associated risks are captured and hazards where present are mitigated in full.

4.11. Summary

4.11.1. It has been possible to eliminate the following receptors from the impact assessment:

- Commercial and other civil aviation activities due to the location of the site, the regular operating parameters of these receptors, marking of the wind farm on aeronautical charts and the installation of appropriate lighting;
- NATS radar sites due to the distance of the development offshore and therefore its location being beyond the range at which it could have an impact;
- Met Office radar installations due to the distance between the closest such installation and the wind farm;
- Military and civilian aerodromes due to the distance of Dogger Bank Teesside A & B offshore;
- MOD Practice and Exercise Areas used by the RAF, the RN, Army and other NATO forces;
- Civilian CNS infrastructure due to the distance of the development offshore and its location well beyond the range at which it could have an impact;
- HMRs and offshore helicopter operations owing to the location of the site relative to existing HMRs and onshore operating bases;
- Military airfield radar owing to the distance between Dogger Bank Teesside A & B and the nearest military airfield radar installation;
- Air Defence Radar owing to the distance between Dogger Bank Teesside A & B and the closest radar installation (all are land-based);
- UK Military Low Flying System owing to the distance offshore at which Dogger Bank Teesside A & B will be constructed and how this is well outside the boundaries of the low flying system; and

- Unexploded ordnance due to specialist surveys being undertaken prior to construction and the adoption of and adherence to the appropriate protocols and guidance.

4.11.2. **Table 4.3** summarises the narratives provided for each receptor and confirms which receptors are being carried forward to the impact assessment stage.

Table 4.3 Receptors being carried forward to the impact assessment

Receptor	Scoped into impact assessment?
Commercial & other civil aviation activity	X
MOD Practice & Exercise Areas (PEXA)	X
MOD highly surveyed routes	X
Meteorological Office weather radar	X
Military & civil aviation radar: Primary & Secondary Surveillance Radars	X
Military & civil aviation radar: Air Defense Radar	X
UK Military Low Flying System	X
Military & civilian aerodromes	X
HMR & offshore helicopter routes	X
Aeronautical SAR operations	✓
Unexploded Ordnance	X

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 effect as a basis for the subsequent impact assessment. For this assessment, it involves both a consideration of the construction scenarios (i.e. the manner in which the two projects, Dogger Bank Teesside A & B will be built out), as well as the particular design details of each project (such as the maximum construction footprint) that define the Rochdale Envelope[3].

5.1.2. Full details of the range of development options being considered by Forewind are provided within **Chapter 5 Project Description**. For the purpose of the civil aviation impact assessment, the key project parameters which form the realistic worst case are set out in **Table 5.1**.

5.1.3. Only those design parameters with the potential to influence the level of impact are identified. Therefore, if the design parameter is not described, it is not considered to have a material bearing on the outcome of the assessment.

5.1.4. The realistic worst case scenarios identified here are also applied to the Cumulative Impact Assessment (CIA). When the 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 Cumulative Impact Assessment**.

5.2. Construction scenarios

5.2.1. There are a number of key principles relating to how the projects will be built, and that form the basis of the Rochdale Envelope (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.

[3] 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.

5.2.2. 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.

5.2.3. 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 military activities and civil aviation 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
- Build A, then Build B (sequential) – provides the worst duration of impact.

5.2.4. 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).

5.2.5. 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.

5.2.6. 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).

5.3. Operation scenarios

5.3.1. **Chapter 5** provides details of the operation 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.

5.3.2. For the military activities and civil aviation assessment there is not considered to be a material difference between either Dogger Bank Teesside A or B operating on its own. As such, only one assessment for the single project scenario is

presented and is considered representative for whichever project is operating in isolation.

5.4. Decommissioning scenarios

5.4.1. **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 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.

5.5. Realistic worst case scenarios

5.5.1. **Table 5.1** identifies the key design parameters for the impact assessment. The parameters identified have been derived from a desktop review and consultation with stakeholders.

Table 5.1 Realistic worst case scenario for the assessment of impacts on military activities and civil aviation

Impact	Key design parameters forming the realistic worst case scenario	Rationale
Construction		
Impact upon aeronautical SAR operations.	**Spatial footprint** (per project unless stated): Teesside A wind farm area: 560.1km^2 (6.5% total zone area); Teesside B wind farm area: 593.2km^2 (6.9% total zone area); Largest wind turbines with a maximum tip height (above HAT) of 315m; 4 Collector Stations; 1 Convertor Station; 2 Accommodation Platforms; 5 meteorological masts; Minimum wind turbine spacing: 750m; 10 mooring buoys; Safety zones of 500m radius from any construction activity (to be applied for); 2 High Voltage Direct Current (HVDC) cables; and Construction of Dogger Bank Teesside A & B occurs concurrently.	The worst case scenario represents the construction scenario which would create the maximum disruption for the longest period of time. This includes activities which could adversely affect the operation of civil aviation receptors through: • Construction of an offshore wind farm and associated structures [obstacles] at sea which pose risks to SAR helicopter activities; and • Undertaking of significant construction and engineering project offshore which increases the likelihood of an incident requiring SAR support. Maximum spatial footprint is the same regardless of the size of turbine selected; the worst case therefore considers the largest wind turbines, which have a maximum tip height of 315m.
	Temporal footprint (per project unless stated): Maximum duration of offshore construction: 11 years and 6 months.	
	Vessel movements (per project unless stated): Number of construction vessels on site at any one time: 66; and Construction vessel trips to port: 5,150 over 3 years. **Helicopter movements** Helicopter accommodation and turbine transfers per year: 900	
Operation		
Impact upon aeronautical SAR operations.	**Vessel movements** – routine operation and maintenance activities (per project) Number of vessels on site at any given time: approx. 28; and Total vessel round trips between site and O&M port per year: 730.	The worst case scenario is influenced by the height of the wind turbines installed and to a lesser extent, the layout and density of the wind farm. Therefore the greatest number of the tallest

Impact	Key design parameters forming the realistic worst case scenario	Rationale
	Helicopter movements Helicopter accommodation and turbine transfers per year: 900 Helicopter movements facilitating maintenance activities per site per year: 6,000	wind turbines over the maximum spatial extent represents the greatest potential for impacting upon SAR operations.
	Spatial footprint (per project unless stated): Teesside A wind farm area: 560.1km^2 (6.5% total zone area); Teesside B wind farm area: 593.2km^2 (6.9% total zone Largest wind turbines with a maximum tip height (above HAT) of 315m; Minimum wind turbine spacing: 750m; 4 Collector Stations; 1 Convertor Station; 2 Accommodation Platforms; 5 meteorological masts; 10 mooring buoys; Safety zones of 500m radius from any major O&M activity (to be applied for); 2 HVDC cables.	
Decommissioning		
Impact upon aeronautical SAR operations.	Anticipated removal of built structures such as turbines and platform topsides above the waterline (where relevant based on the worst case scenarios detailed under construction). It is anticipated that subsea cables and scour protection will remain in-situ following decommissioning.	Decommissioning arrangements will be detailed in a Decommissioning Plan, which will be drawn up and agreed with DECC prior to construction.
	Spatial footprint (per project unless stated): Teesside A wind farm area: 560.1km^2 (6% total zone area); Teesside B wind farm area: 593.2km^2 (6.9% total zone 200 wind turbines; Minimum wind turbine spacing: 750m; 4 Collector Stations; 1 Convertor Station; 2 Accommodation Platforms; 5 meteorological masts; 10 mooring buoys; Safety zones of 500m radius from any decommissioning activity (to be applied for); 2 HVDC cables	

6. Assessment of Impacts – During Construction

6.1. Aeronautical Search and Rescue operations

6.1.1. Aeronautical SAR operations could be affected during construction by:

- General interference of operations from the presence of a growing number of obstructions (wind turbines, meteorological masts, accommodation platforms, cranes, etc.) in an area of formerly open water; and
- Introduction of a collision hazard in the event of a helicopter undertaking SAR activity, especially at night, in poor weather or other low visibility conditions.

Dogger Bank Teesside A or B in isolation

6.1.2. The presence of a large number of physical obstructions, the hazards unique to wind farms and the known impacts upon on-board systems such as radar will increase the difficulty in undertaking SAR activities within the site. Additionally, the increase in vessel movements and human activity associated with the construction of an offshore wind farm will raise the risk of incidents and consequently the likelihood of requiring assistance from SAR agencies.

6.1.3. It is important that a distinction is drawn between baseline SAR activity in the area today (as discussed in Section 4), and how that baseline may change following the start of construction. This reflects how the residual risk of an incident within the areas that construction works will be undertaken will increase once works begin, owing to the increase in people, vessels and equipment.

6.1.4. The distance from RAF Leconfield to the approximate centre of Dogger Bank Teesside B is 102nm. The distance to the centre of Teesside A is slightly further; meaning a SAR operation within or in proximity to Teesside A will be slightly more restricted by endurance (fuel/range) limitations.

6.1.5. In the absence of any mitigation, it is recognised that impacts on aeronautical SAR operations could occur. However, a number of mitigation measures can be applied to ensure that SAR capability is maintained. These are presented in the following paragraphs and are relevant to not only the construction phase but also the operation and decommissioning phases.

Mitigation of potential impacts upon aeronautical SAR operations

6.1.6. Mitigation measures are highlighted in accordance with those set out in CAP764, CAP437 (offshore helicopter operations) (CAA 2012a,b) and Marine Guidance Note 371 (Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues) as issued by the MCA and comprise of:

- Charting; all structures over 300ft in height must be charted on civil aviation maps. The MOD uses a lower height threshold. A clear numbering system on individual wind turbines would help crews in undertaking a rescue. The

Defence Geographic Centre will be kept informed of specific project details including development location, the location, size and height of each wind turbine generator, and construction schedules;

- Lighting; both the CAA and MOD through consultation have highlighted the requirements for wind turbine generators to be lit to aid visibility in accordance with their individual criterion (see also Section 9 Inter-relationships). MGN 371 highlights the need for lighting to be able to be switched on or off on individual turbines based on pilot discretion. The specific lighting requirements will be the focus of ongoing consultation with appropriate stakeholders as the design phase progresses;
- Marking; it is important that wind turbine generators are individually marked so that any single unit can be identified, from the required distance, by SAR helicopter crews to aid communication and co-ordination during an incident. In addition, specific requirements for blade markings; colours, high visibility banding/marking that may be required will be incorporated as necessary;
- Radar visibility; with SAR operations frequently undertaken at night and in adverse weather, it is imperative that individual wind turbine generators are visible to on-board radar. Given the size of the proposed wind turbine generators for Dogger Bank Teesside A & B, this should automatically be the case although consultation with the appropriate stakeholders will cover this topic and inform design specifications if deemed necessary; and
- Post consultation actions; consultation with SAR providers will take place as the project progresses and may result in additional (to those listed above) mitigation measures being proposed.

Residual impact

6.1.7. Adherence to the mitigation measures set out above, and those which may arise during stakeholder consultation, will minimise adverse impacts should a SAR operation be undertaken in the vicinity of, or within Dogger Bank Teesside A or Dogger Bank Teesside B. Whilst the presence of a wind farm fundamentally changes the operating environment, SAR operations can take place safely as long as revised procedures, taking account of the changes caused by the wind farm, are followed. At the same time, limitations will exist that previously did not; a rescue attempt within a wind farm will be more difficult than in open water, and helicopters will only be able to get within a specified distance of a turbine before the collision risk dictates they can get no closer, possibly delaying a recovery. By the start of construction, the capability of SAR helicopters and on-board technology will be greater than at the time of the North Hoyle trials. Forewind will continue to work closely with the MCA and SAR operators to ensure that the development places the minimum possible constraint on SAR activity.

Dogger Bank Teesside A & B together

6.1.8. As detailed in **Chapter 5**, Dogger Bank Teesside A & B may either be constructed simultaneously or sequentially with up to a two and a half year gap between construction phases.

6.1.9. Building Dogger Bank Teesside A & B simultaneously will result in the maximum spatial extent of interference at any one time and therefore a larger area within which SAR operations could be affected. The likelihood of an incident requiring SAR assistance would be increased, reflecting the peak levels of construction staff, vessels and equipment on site at any given time.

6.1.10. Under a sequential build scenario, the overall construction period would be longer (up to 11 years 6 months), extending the duration that SAR operations could be affected during construction activities.

6.1.11. However, in general, it is anticipated that the construction scenarios under consideration will have little influence on the extent of impacts upon aeronautical SAR operations against what has been assessed for either project in isolation.

7. Assessment of Impacts – During Operation

7.1. Aeronautical Search and Rescue operations

7.1.1. Aeronautical SAR operations could be affected during operation by:

- General interference of operations from the presence of installed infrastructure (wind turbines, meteorological masts, accommodation platforms, cranes, etc.) in an area of formerly open water; and
- Introduction of a collision hazard in the event of a helicopter undertaking SAR activity, especially at night, in poor weather or other low visibility conditions.

Dogger Bank Teesside A or B in isolation

7.1.2. Wind farm developments can have impacts upon helicopter-borne SAR assets as detailed in Section 4.9. The presence of the wind farm and associated routine and unplanned maintenance activities will result in additional people, vessels, helicopters and equipment in the area, although in far less significant numbers than during the construction phase.

7.1.3. Dogger Bank is currently designated as a 'very low risk' area for SAR operational capability as defined by the MCA. The SAR operational environment of the site will change, relatively substantially, once Dogger Bank Teesside A & B are operational. This will be both in terms of the obstructions (to flying operations) created by the wind turbines and other structures, and the fact that the project will generate significant levels of activity (human, vessel, engineering, etc.) in an area where there is currently very little. Should a helicopter be scrambled to undertake SAR, either in proximity to or within an offshore wind farm, the wind turbines will present a hazard compared to a rescue in open water. The need to safely navigate through the wind farm at low level, in poor visibility, at night and in bad weather presents a highly challenging environment within which the crew must operate. Whilst technologies available to the crew (Section 4.8) and mitigation measures (Section 6.1) serve to minimise risks and maximise safety, the fact remains that once operational, there will be more than 200 structures within a relatively small spatial extent within each project area.

7.1.4. Given the distance of the project areas offshore, it is possible that SAR helicopters would seek to utilise any of the platforms that may be associated with Dogger Bank Teesside A & B that have a helicopter landing pad, in the event of an emergency in the area. This could be for the uplift of fuel to prolong the time a helicopter can remain 'on station', or a structure from which individuals could be rescued in the event of a nearby vessel collision or abandonment.

7.1.5. Adherence to the mitigation measures described in Section 6.1 above, and any further necessary mitigation that may arise during stakeholder consultation, will minimise any adverse impacts in the unlikely event that a SAR operation is

undertaken in the vicinity of the Dogger Bank Teesside A or Dogger Bank Teesside B project areas. Whilst the presence of a wind farm fundamentally changes the operating environment, SAR operations can take place safely as long as revised procedures, taking account of the changes caused by the wind farm, are followed. At the same time, limitations will exist that previously did not; a rescue attempt within a wind farm will be more difficult than in open water, and helicopters will only be able to get within a specified distance of a turbine before the collision risk dictates they can get no closer, possibly delaying a recovery. By the start of construction, the capability of SAR helicopters and on-board technology will be greater than at the time of the North Hoyle trials. Forewind will continue to work closely with the MCA and SAR operators to ensure that the development places the minimum possible constraint on SAR activity.

Dogger Bank Teesside A & B together

7.1.6. The operation of both projects together would effectively double the area within which SAR operations could be affected (the area of Dogger Bank Teesside A is 560km^2 and the area of Dogger Bank Teesside B is 593km^2).

7.1.7. However, given the considerations set out above for either project in isolation, it is considered that there will not be any additional impact when both projects are operating together.

8. Assessment of Impacts – During Decommissioning

8.1. Aeronautical Search and Rescue operations

8.1.1. Aeronautical SAR operations could be affected during the decommissioning phase by:

- General interference of operations from the presence of installed infrastructure (wind turbines, meteorological masts, accommodation platforms, cranes, etc.) in an area of formerly open water; and
- Introduction of a collision hazard in the event of a helicopter undertaking SAR activity, especially at night, in poor weather or other low visibility conditions.

8.1.2. This assessment assumes a worst case scenario whereby infrastructure associated with the project (excluding offshore cabling) is removed at the end of the life of the projects. The precise arrangements relating to the decommissioning of the project will be detailed within a Decommissioning Plan which will be drawn up and agreed with DECC prior to construction. All impacts arising from the decommissioning process will be subject to future assessment once the nature of activities is fully understood.

Dogger Bank Teesside A or B in isolation

8.1.3. Any effects during the decommissioning phase are anticipated to be similar in nature to those described for construction.

8.1.4. Following decommissioning, and re-instatement from a SAR perspective to 'pre-wind-farm conditions', there will be no possibility of any ongoing effects on SAR operations.

Dogger Bank Teesside A & B together

8.1.5. Given the considerations set out above for either project in isolation, it is considered that there will not be any additional impact should both projects be decommissioned together.

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 military activities and civil aviation 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. Potential inter-related impacts associated with military activities and civil aviation interests include indirect operational effects on aviation lighting on account of ornithological concerns and marine navigation requirements, in line with Paragraph 2.6.107 of EN-3. The CAA stipulates the requirement for aviation warning lighting to be fitted to 'some or all of the wind turbines'. Whilst article 220 of the Air Navigation Order (ANO) (2009) refers in full, in general offshore wind turbines of 60m or higher are required to be fitted with aviation obstruction lighting as set out below:

- At least one medium intensity steady red light positioned as close as possible to the top of the fixed structure;
- Where four or more wind turbines are located together in the same group, with the permission of the CAA only those on the periphery of the group need to be fitted with obstruction lighting; and
- The downward spread of light should be restricted as far as possible to minimise any potential confusion with maritime lighting whilst at the same time maintaining flight safety.

9.1.3. The CAA also advises that consultation must be undertaken with the MCA when considering the offshore lighting requirements for wind turbines at sea, given the requirements for turbines to be lit for the benefit of both aviators and mariners. It is therefore important that when constructed, the wind farm is lit in a way which satisfies the requirements of the CAA, MOD and marine authorities. Discussions are ongoing and the agreed strategy and specifications will be reflected here and in other chapters once agreed. **Chapter 16** discusses maritime lighting requirements in detail and the outcomes of associated MCA consultation.

9.1.4. MOD lighting requirements are taken from the most recent consultation and state that "*turbines need to be fitted with 2000 candela omni-directional red lighting or 2000 candela red/infrared lighting with an optimised flash pattern of 60 flashes per minute of 200ms to 500ms duration at the highest practicable point*".

9.1.5. There is potential for an inter-related impact between military activities and shipping and navigation due to a possible reduction in navigational routes in the vicinity of MOD training areas. Restrictions on training areas are anticipated to be minimal.

9.1.6. No inter-relationships have been identified where an accumulation of residual impacts upon military activities and civil aviation, and the relationship between those impacts, gives rise to a need for additional mitigation.

Table 9.1 Inter-relationships relevant to the military activities and civil aviation assessment

Inter-relationship	Section where addressed	Linked chapter
All phases		
Influence of marine navigation interests upon military activities and civil aviation related to obstacle lighting requirements.	Lighting requirements are discussed throughout this chapter, see in particular Section 6.1. Exact lighting arrangements will be confirmed through consultation with the appropriate authorities prior to construction.	**Chapter 16 Shipping and Navigation**
Influence of civil and military lighting requirements upon ornithological interests.	Lighting requirements are discussed throughout this chapter of the ES and in particular in Section 6.1 The potential for impacts from aeronautical lighting upon ornithological interests is assessed and discussed in Chapter 11.	**Chapter 11 Ornithology**

10. Cumulative Impacts

10.1. CIA Strategy and screening

10.1.1. This section describes the CIA for military activities and civil aviation, taking into consideration other plans, projects and activities. A summary of the cumulative assessment is presented in **Chapter 33**.

10.1.2. Forewind has developed a strategy (the 'CIA Strategy') for the assessment of cumulative impacts in consultation with a number of statutory stakeholders, including the Marine Management Organisation (MMO). Further details of the approach to CIA that has been adopted for this ES are provided in **Chapter 4**.

10.1.3. 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, projects and plans outwith the Dogger Bank Zone (e.g. other offshore wind farm developments), for which sufficient information regarding location and scale exist.

10.1.4. 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.

10.1.5. There are two key steps to the Forewind CIA strategy, which both involve 'screening' in order to arrive, ultimately, at an informed, defensible and reasonable list of other plans, projects and activities to take forward in the assessment.

10.1.6. The first step in the CIA for military activities and civil aviation involved an appraisal of the key impacts relevant to each of the receptors that have been identified (**Table 10.1**). For each impact, the potential for impacts to occur on a cumulative basis has been identified, both within and beyond the Dogger Bank Zone; the confidence in the data and information available to inform the CIA has been appraised (following the methodology set out in **Chapter 4**); and the other activities that could contribute to these impacts has been identified.

10.1.7. This also identifies where cumulative impacts are not anticipated, thereby screening them out from further assessment.

10.1.8. The distance of the development offshore means that impacts upon shore-based radar (both PSR and SSR), CNS infrastructure, defence radar stations and aerodrome operations will be unaffected, regardless of the size of the development.

10.1.9. The potential for cumulative impacts has been identified in relation to aeronautical SAR operations (**Table 10.1**), but only with others plans, projects and activities within approximately 1km of the Dogger Bank Zone and export cable corridor. Data confidence is assessed as medium. Whilst it is recognised that the proliferation of offshore wind developments in this part of the North Sea could affect the 'SAR environment' (i.e. the general ability of SAR assets to respond to incidents) (see also **Chapter 16**), there will be no overlap of activities between Dogger Bank Teesside A & B and other plans, projects and activities outwith approximately 1km of the Dogger Bank Zone and all associated export cable corridors. On this basis, the potential for any other cumulative impacts is screened out from further consideration in the process.

Table 10.1 Potential cumulative impacts (impact screening)

Impact	Dogger Bank Zone and export cable corridor (within 1km)		Beyond 1km from the Dogger Bank Zone and export cable corridor		Rationale for where no cumulative impact is expected
	Potential for cumulative impact	Data confidence	Potential for cumulative impact	Data confidence	
Impact on aeronautical SAR operations (all phases)	Yes	Medium	No	N/A	No cumulative impact is anticipated outside the Dogger Bank Zone due to the scale and nature of the impacts assessed for Dogger Bank Teesside in its own right (i.e. all impacts are associated with SAR activities taking place within the project areas).

10.1.10. Where the first step has indicated the potential for cumulative impacts, the second step in the CIA for military activities and civil aviation involved the identification of the actual individual plans, projects and activities within those broad industry levels for inclusion in the CIA. In order to inform this, Forewind has produced an exhaustive list of plans, projects and activities occurring within a very large study area encompassing the greater North Sea and beyond (referred to as the 'CIA Project List', see **Chapter 4**). The list has been appraised, based on the confidence Forewind has in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

10.1.11. The plans, projects and activities relevant to military activities and civil aviation are presented in **Table 10.2** and **Figure 10.1**, along with the results of the screening exercise that identifies whether there is sufficient confidence to take these forward in a detailed cumulative assessment, or whether they can be screened out on account of distance to the receptor in question.

10.1.12. It should be noted that:

- Where Forewind is aware that a plan, project or activity could take place in the future, but has no information on how the plan, project or activity will be executed, it is screened out of the assessment; and
- Existing projects, activities and plans are already having an impact and so are part of the existing environment as it has been assessed throughout the ES. Therefore these projects have not been included in the cumulative assessment.

10.1.13. As set out above, potential impacts that have been identified during the construction, operation and decommissioning phases of Dogger Bank Teesside A & B (Sections 6 to 8) that could result in a cumulative impact, is a potential impact on aeronautical SAR operations.

10.2. Potential impacts on aeronautical SAR operations

10.2.1. Dogger Bank Teesside A & B are the first and second projects of the second stage of the Dogger Bank development. The projects are located within Tranche A and B of the Dogger Bank Zone. To the north of the Tranche A and B developments will be Teesside projects C & D. Dogger Bank Creyke Beck is the first stage of the Dogger Bank development and also comprises of two wind farms sited 5km to the west of Dogger Bank Teesside Project B (**Figure 10.1**). The proposed project timescales for Dogger Bank Creyke Beck and Dogger Bank Teesside A & B indicate that the four wind farms may be built and be operational at similar times (**Table 10.2**).

10.2.2. The proliferation of offshore wind developments may give rise to cumulative impacts for SAR assets when it comes to transiting from a base to the site of an incident. If a wind farm lies between a SAR base and an incident, transiting the wind farm during inclement weather could result in a helicopter having to make a costly (in terms of time) diversion around the wind farm. Poor weather comprising of low cloud, poor visibility and the freezing level occurring close to the surface would mean that a helicopter may not be able to climb above the wind farm and may instead have to route around it. Depending upon the size of the wind farm, this could place a significant, and potentially unacceptable, penalty upon incident response times.

10.2.3. However, a review of trials undertaken previously (see Section 4.4) and the mitigation measures that are available, show that it is possible for helicopter SAR activity to take place within or in proximity to a wind farm. Whilst the physical barriers presented by a wind farm do change the dynamic of undertaking at-sea SAR duties, adherence to procedures means it can be undertaken safely. Therefore, a helicopter able to undertake a rescue within a wind farm should be able to safely transit through one, as long as the required operational standards are followed. These could/would include:

- On-board radar capable of accurately detecting all obstacles within a wind farm;
- Global Positioning System (GPS) data which pinpoints the location of each wind turbine generator and other obstacle; and

- Improved autopilot technologies to aid the crew in navigating amongst obstacles in poor visibility conditions.

10.2.4. It can also reasonably be assumed that the rapid progression of technology will, by the time construction commences, have provided crews with enhanced capabilities enabling operations within wind farms to be undertaken with minimal or no increase in crew workload.

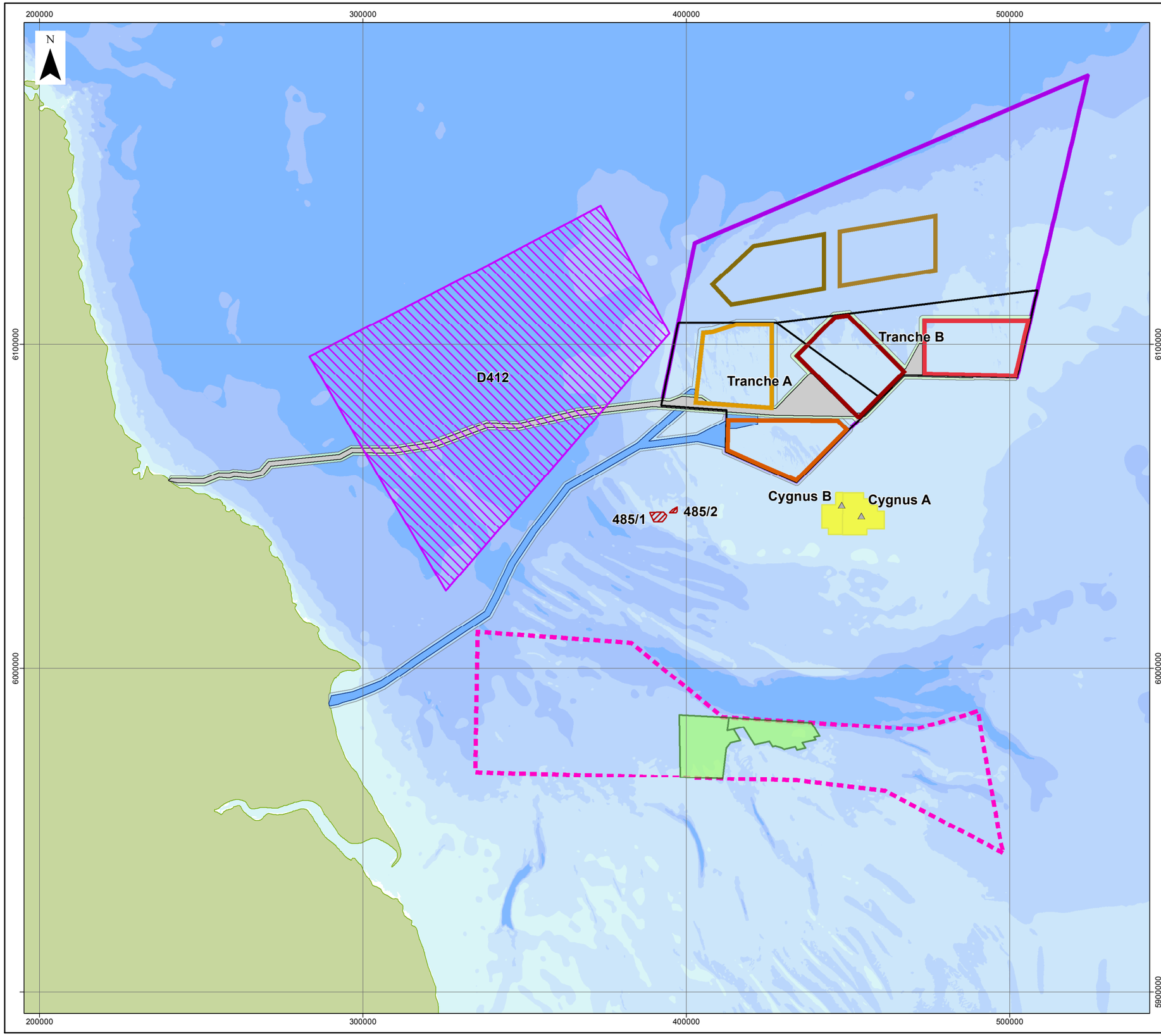
10.2.5. As a result, the residual cumulative impact of Dogger Bank Creyke Beck A & B and Dogger Bank Teesside projects A & B and C & D on aeronautical SAR operations during all phases is anticipated to be no greater than that assessed for Dogger Bank Teesside A & B on its own.

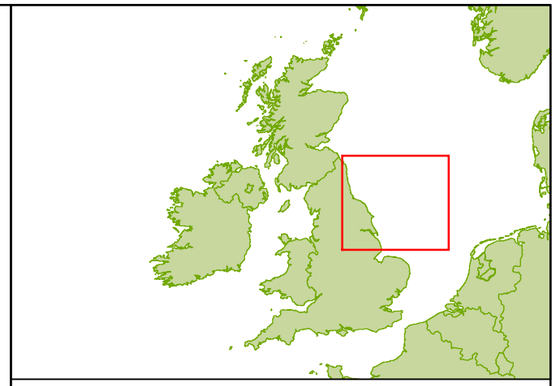
10.2.6. This assessment acknowledges that consultation with the MCA with regard to airborne SAR is ongoing. The outcomes of any further consultation will continue to inform the CIA. At this stage, however, it is not anticipated that there will be any cumulative impacts on aeronautical SAR operations.

Table 10.2 Cumulative Impact Assessment screening for military activities and civil aviation (project screening)

Type of project	Project title	Project status	Predicted construction/development period	Distance from Dogger Bank Teesside A & B (km)	Confidence in project details	Confidence in project data	Carried forward to CIA?	Rationale for not carrying into CIA
Offshore Wind Farm	Dogger Bank Creyke Beck A and B	Pre-Application	Construction may start from 2016	Creyke Beck A approximately 35km Creyke Beck B approximately 5km	High	Medium	Yes	N/A
Offshore Wind Farm	Dogger Bank Teesside C & D	Pre-Application	Construction may start from 2018	Teesside C approximately 7km Teesside D approximately 6km	High	Medium	Yes	N/A
Offshore Wind Farm	Dogger Bank Zone – other future developments	Potential further development - not confirmed	Not confirmed	Not confirmed	Low	Low	No	Low data confidence
Offshore Wind Farm	Hornsea Project One	Pre-Application	Project One may start construction 2015	100km	High	Medium	No	Distance from Dogger Bank Teesside A & B
Offshore Wind Farm	Hornsea Project Two	Pre-Application	Project Two may start construction 2015	98km	High	Medium	No	Distance from Dogger Bank Teesside A & B
Offshore Wind Farm	Hornsea Zone – other future developments	Potential	Not confirmed	Not confirmed	Low	Low	No	Distance from Dogger Bank Teesside A & B
Oil and Gas	Cygnus gas field development (Alpha and Bravo)	Development (pre-production)	Ongoing – production to start in 2015	Greater than 20km	High	Medium	No	Distance from Dogger Bank Teesside A & B

Type of project	Project title	Project status	Predicted construction/development period	Distance from Dogger Bank Teesside A & B (km)	Confidence in project details	Confidence in project data	Carried forward to CIA?	Rationale for not carrying into CIA
Aggregate extraction	Area 485/1	Application area	Not confirmed	Greater than 40km	High	Medium	No	Distance from Dogger Bank Teesside A & B
Aggregate extraction	Area 485/2	Application area	Not confirmed	As above	High	Medium	No	Distance from Dogger Bank Teesside A & B Distance to Flamborough Head PEXA (42.3km)





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
- Dogger Bank Creyke Beck Export Cable Corridor
- Dogger Bank Teesside A & B temporary works area
- Dogger Bank Creyke Beck temporary works area
- UKHO Military Firing Practice & Exercise Area (PEXA)
- Hornsea zone
- Hornsea Project Two
- Aggregate application area
- Cygnus gas field development
- Cygnus proposed subsurface infrastructure

0 10 20 40

Kilometres

Data Source:
Aggregate dredging areas © The Crown Estate, 2013,
Cygnus platform locations supplied by GDF Suez, 2012,
Military practice and exercise areas © British Crown Copyright, 2013. All rights reserved.
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Background bathymetry image derived in part from TCarta data © 2009
Offshore wind farm boundaries © Crown Copyright, 2013, Oil and Gas licence blocks from DECC, 2012,

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 10.1 Military activities and civil aviation - Other plans, projects & activities for cumulative impact assessment

VER	DATE	REMARKS	Drawn	Checked
1	13/06/2013	Draft	FK	DB
2	04/10/2013	PEI3	JE	DB
3	05/02/2013	DCO Submission	GC	DB

DRAWING NUMBER:

F-OFL-MA-303

SCALE	PLOT SIZE	DATUM	PROJECTION
1:1,200,000	A3	WGS84	UTM31N

FOREWIND

11. Transboundary Effects

11.1.1. This chapter has considered the potential for transboundary effects to occur upon military activities and civil aviation activity as a result of the construction, operation or decommissioning of the proposed project. CAA guidance provided in CAP764 (January 2012) states "*cross-boundary consultation may be required for later rounds of offshore development. Wind turbine developers should contact the CAA for specific guidance in all instances where developments are likely to approach the limits of the UK Flight Information Region*". The Dogger Bank Zone is not in proximity to the boundary of the UK FIR which sits well to the east (approximately 200km) of the eastern boundary (see Section 4.1). No 'cross-boundary' issues have been raised in consultation conducted with the CAA (or any other stakeholder) to date (see Section 2).

11.1.2. In all cases, it is concluded that the potential impacts arising, by virtue of the predicted spatial and temporal magnitude of the effects, would not give rise to significant transboundary effects on the environment of another European Economic Area member state.

11.1.3. A summary of the likely transboundary effects of the proposed project is provided in **Chapter 32 Transboundary Effects.**

12. Summary

12.1.1. This chapter of the ES has provided a characterisation of the existing environment for military activities and civil aviation. All but one of the receptors considered were scoped out of the impact assessment as no mechanism was identified through which impacts could arise. It was established that the change in the operating environment created by the wind farm may constrain certain elements of SAR activity. However, ongoing discussions with the SAR agencies and the adoption of appropriate mitigation measures will ensure that impacts upon SAR activities are reduced to the lowest level possible.

12.1.2. The anticipated impacts of Dogger Bank Teesside A & B upon SAR assets are summarised in **Table 12.1** below.

Table 12.1 Summary of predicted impacts of Dogger Bank Teesside A & B on military activities and civil aviation

Description of impact	Mitigation measures
All phases	
Impact upon aeronautical SAR operations	As arising from consultation with SAR stakeholders (MCA and MOD); • Inclusion of wind farm on aeronautical charts, position of individual wind turbines plotted for use in GPS/radar datasets; • Lighting of wind farm/wind turbines in accordance with requirements of CAA, MOD and marine regulators; • Marking of wind turbines and blades in accordance with requirements to ensure maximum conspicuity; • Ensuring that the wind turbines have a radar 'signature' sufficient to satisfy needs of stakeholders whose helicopters may need to traverse the site in poor visibility; and • Other measures arising from ongoing consultation with the MCA and relevant SAR agencies as the project progresses.

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