



**DOGGER BANK
TEESSIDE A & B**




**March
2014**


Environmental Statement Non-Technical Summary

Application Reference: 6.36

Cover photograph: Installation of turbine foundations in the North Sea

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 Summary
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Drafted by	Royal HaskoningDHV	
Checked by	Amy Harrower	
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Approved by	Angela Lowe	
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Prepared by: Royal HaskoningDHV		Checked by: Amy Harrower
Approved by: Angela Lowe	Signature / Approval (Forewind)  Gareth Lewis	Approval Date: 17 March 2014

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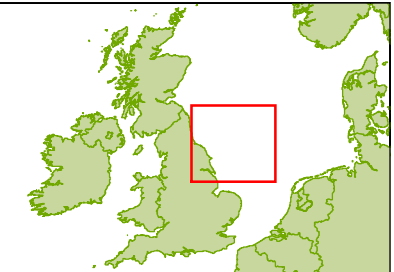
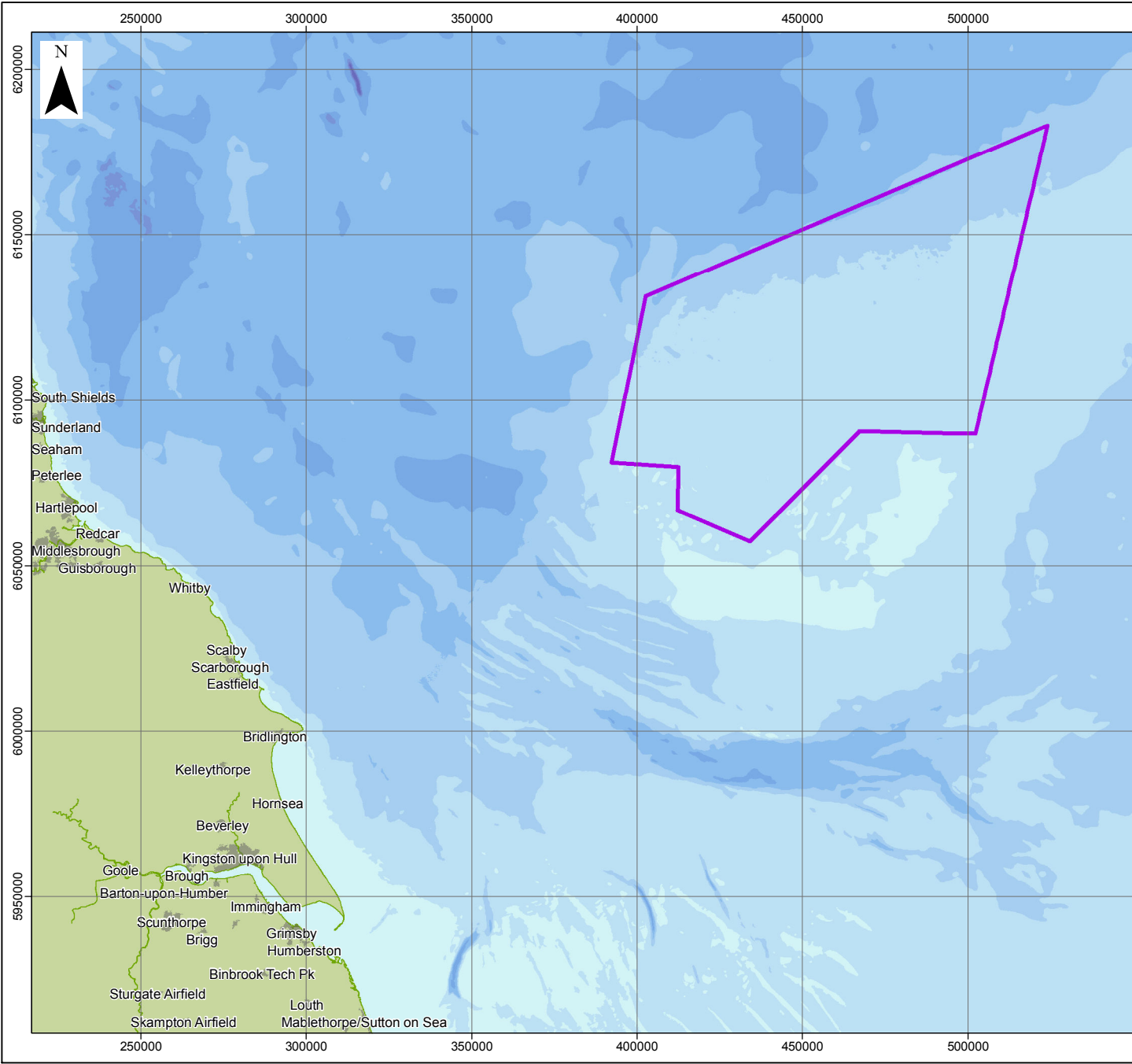
1. Introduction


1.1. Non-Technical Summary

- 1.1.1. This Non-Technical Summary presents the findings of the Environmental Statement, avoiding, where possible, the use of technical language.
- 1.1.2. The Environmental Statement documents the findings of the Environmental Impact Assessment process undertaken by Forewind into the potential impacts of construction, operation and decommissioning phases of both the offshore and onshore parts of Dogger Bank Teesside A & B.
- 1.1.3. Details of how to obtain further information on the development are given at the end of this document.

1.2. Dogger Bank Teesside A & B

- 1.2.1. In January 2010, The Crown Estate awarded Forewind the exclusive development rights for 'Zone 3, Dogger Bank'; the largest of the nine Round 3 offshore wind farm zones. The Dogger Bank Zone comprises an area of 8,639 km², and is located in the North Sea between 123 km and 290 km off the coast of Yorkshire, see **Figure 1.1**.
- 1.2.2. Dogger Bank Teesside A & B, the subject of this Environmental Statement, are the second stage of the Dogger Bank development. Forewind's development of the Dogger Bank Zone began with Dogger Bank Creyke Beck A & B for which the planning application was accepted for examination during September 2013.
- 1.2.3. Dogger Bank Teesside A & B will comprise two wind farms, each with a generating capacity of up to 1.2 GW, and will connect to the existing National Grid substation at Lackenby, in Teesside. Dogger Bank Teesside A & B projects will have a total combined generating capacity of up to 2.4GW
- 1.2.4. Cabling from the wind farms will come ashore north of Marske-by-the-Sea and travel approximately 7km inland to two new converter stations, situated within the Wilton Complex. The converter stations will convert the High Voltage Direct Current to High Voltage Alternating Current, to allow connection to the UK's electricity transmission network. Approximately 2km of High Voltage Alternating Current cabling will connect the converter stations to the existing National Grid substation in Lackenby refer to **Figure 1.2**.



LEGEND
 Dogger Bank Zone



Data Source:
 Round 3 offshore wind farm boundary © Crown Copyright, 2013
 Background bathymetry image derived in part from TCarta data © 2009
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PROJECT TITLE
DOGGER BANK TEESSIDE A & B


DRAWING TITLE
Figure 1.1 Dogger Bank Zone Overview

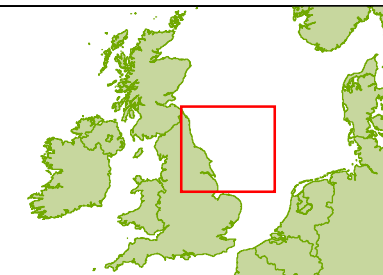
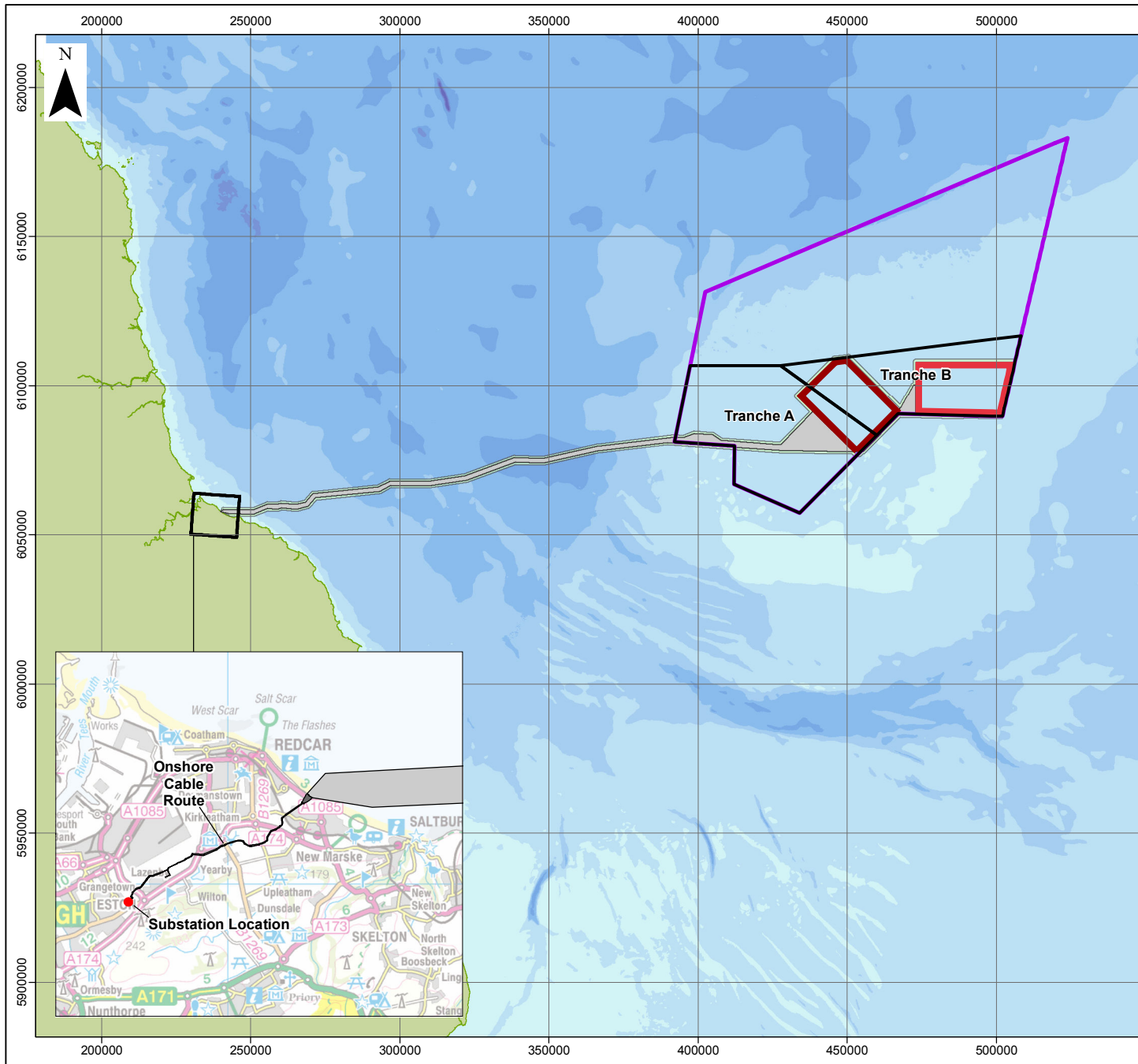
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DRAWING NUMBER:
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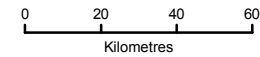
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LEGEND

- Dogger Bank Zone
- Tranche Boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area



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PROJECT TITLE
DOGGER BANK TEESSIDE A & B


DRAWING TITLE
Figure 1.2: Offshore and Onshore Project Elements

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1.3. The applicant – Forewind

1.3.1. Forewind is a consortium comprising four leading international energy companies - RWE, SSE, Statoil and Statkraft. Together, these companies combine extensive experience of international offshore project delivery and renewable energy development, construction, asset management and operations. Through the combined strength of these four companies, Forewind has the ability to make a significant contribution to the future of wind energy in the UK, and to demonstrate commitment to the continuing development of offshore wind.

1.4. Project need

1.4.1. In a recent quote from the Government in answering the question “why do we need renewable energy?” Ed Davey responded as follows:

“...Combined with much greater energy efficiency, the construction of modern low-carbon energy infrastructure will improve our energy security. It will reduce our dependence on increasingly expensive fossil fuels from risk-ridden regions, in favour of home-grown energy we can rely on, helping to keep energy bills down. And in the process it will provide jobs for our citizens, profits for our businesses and growth for our economy as the global green market place expands” (Edward Davey, Secretary of State for Energy and Climate Change 2013).

1.4.2. Under the Climate Change Act 2008, the UK is legally bound to reduce its greenhouse gas emissions by at least 80% by 2050 through action either at home or abroad. In order to achieve this, there will have to be major changes in how energy is used and generated. It is estimated that approximately 40-70 GW of new low carbon electricity generation will be needed by 2030 and this will be provided, in part, by offshore wind farms such as Dogger Bank Teesside A & B.

1.4.3. Offshore wind energy generation is well placed to play a significant role in meeting government climate change and energy targets. It has shorter lead-in times than nuclear energy and is more advanced, both from a technical and economic perspective, than other forms of low carbon energy technology (such as carbon capture and storage and other renewable technologies including wave and tidal).

1.4.4. Forewind currently intend to secure development consent for six projects, which will have a total target installed capacity of 7.2 GW. Forewind is focusing on the first four projects, which together are Dogger Bank Creyke Beck A & B and Dogger Bank Teesside A & B.

1.4.5. Dogger Bank Teesside A & B and the other potential offshore wind farms within the Dogger Bank Zone all have the potential to contribute to national targets for tackling climate change, reducing reliance on fossil fuels and securing energy supplies. They also have an important role in supporting the local and regional economy by providing new job and business opportunities

1.5. Dogger Bank Teesside A & B offshore project details

1.5.1. Dogger Bank Teesside A & B will comprise the following main offshore components:

- Up to 400 wind turbines and supporting tower structures;
- Two offshore converter platforms, and associated foundation;
- Up to eight offshore collector platforms, and associated foundations;
- Up to four offshore accommodation or helicopter platform(s) for operations and maintenance activities, and associated foundations;
- Subsea inter-array and inter-platform cables between offshore collector platforms and High Voltage Direct Current offshore converter platforms;
- Offshore export cable systems, carrying power from the offshore High Voltage Direct Current converter platforms to the landfall(s);
- Crossing structures at the points where project cables cross existing subsea cables and pipelines or other Dogger Bank project cables;
- Up to ten offshore meteorological monitoring stations. This is in addition to the two meteorological stations which were subject to an earlier and separate consent application and installed in 2013; and
- Ancillary works including: cable and pipeline crossing structures; protection against foundation scour and subsea damage, cable protection measures and vessel-mooring facilities.

Table 1.1 Summary of key project components

Parameters	Maximum per project	Maximum total for Dogger Bank Teesside A & B
Wind turbines	200	400
Offshore collector substation platforms	4	8
Offshore converter substation platforms	1	2
Offshore accommodation or helicopter platforms	2	4
Length of inter-array cabling (km)	950	1,900
Length of inter-platform cabling	320	640
Number of HVDC export cable pairs	1	2
Onshore converter stations	1	2
Number of export HVAC cables	3	6
Meteorological Masts	5	10

1.6. Offshore construction programme

1.6.1. Offshore construction of Dogger Bank Teesside A and Dogger Bank Teesside B may be undertaken separately or at the same time, and either project could be built first. Although exact timings are yet to be determined, the earliest that construction work will start is 2017. This depends on a number of factors including the connection agreement with National Grid, the date that planning consent is awarded, and the availability of key project components, such as the wind turbines.

1.6.2. The minimum construction period per project is three years and the maximum construction period per project is six years. Offshore construction will commence no sooner than 18 months after planning consent, but must start within seven years of consent (it is anticipated that this will be a condition of the Development Consent Order). Taking this into account, the minimum construction period would be three years and the maximum would be 11 years and six months.



1.7. Dogger Bank Teesside A & B onshore project details

1.7.1. The main onshore components include:

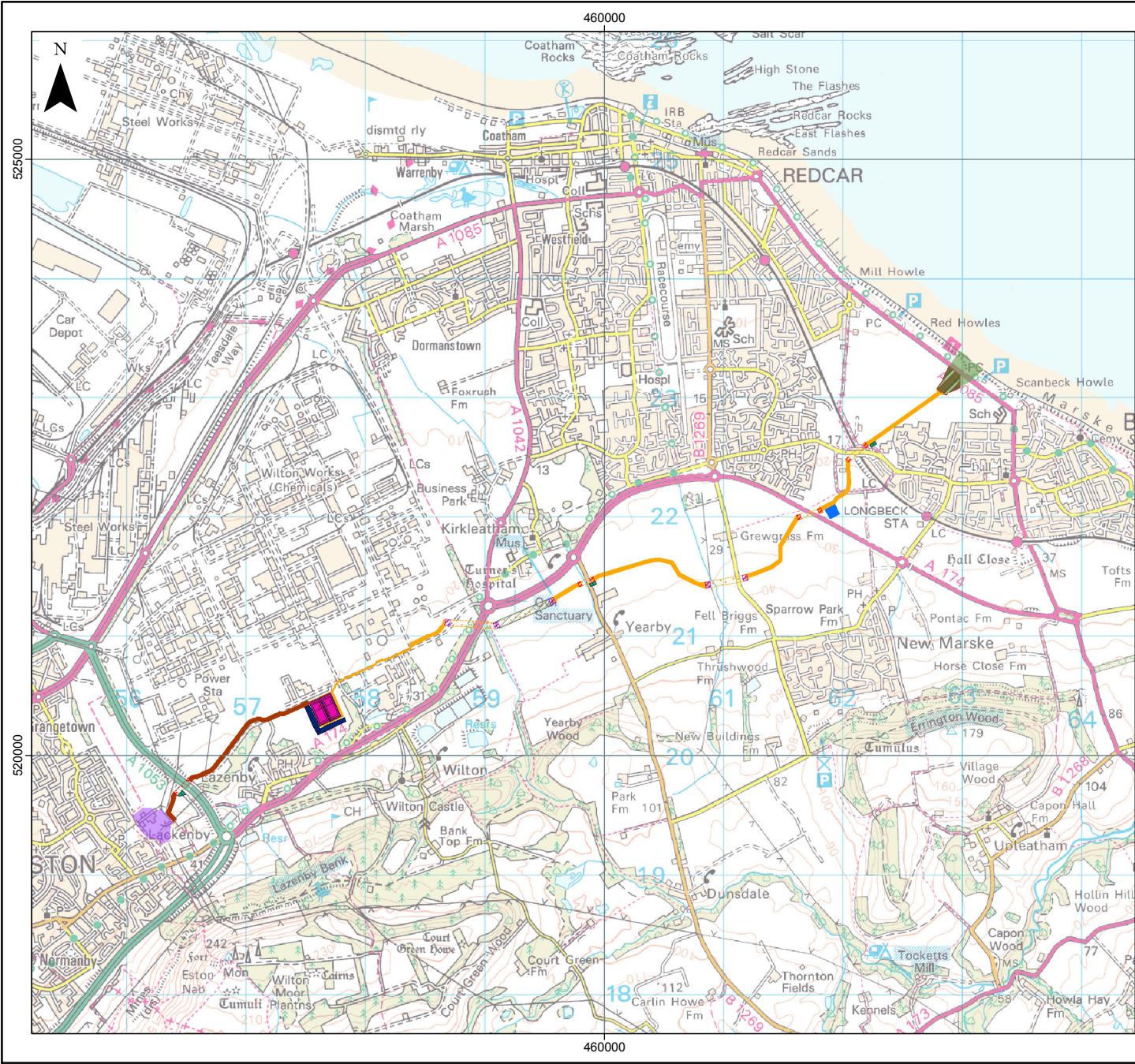
- Underground cable transition joint bays at the landfall, north of Marske-by-the-Sea;
- Underground High Voltage Direct Current cables running approximately 7km from the landfall joint bays to the two converter stations;
- Two converter stations located within the Wilton Complex and with associated access roads, fencing, landscaping and drainage;
- Underground High Voltage Alternating Current cables running approximately 2km from the converter stations to the existing National Grid substation at Lackenby, where connection works will be carried out; and
- Ancillary works including temporary working areas, permanent and temporary access roads, and service corridors.

1.7.2. An overview of the onshore works is shown in **Figure 1.3**.

1.7.3. The offshore cables will come ashore at the landfall to connect to the onshore cable systems. The cable landfall works, including the methods of installation,

will depend on the ground conditions, the height of the cliffs and any local environmental considerations.

- 1.7.4. Installation of the cable at the landfall is likely to be via Horizontal Directional Drilling, which removes the needs for trenches. This is the preferred installation technique at the landfall and is used wherever feasible to reduce disruption to the shoreline.
- 1.7.5. To connect the onshore and offshore cables, Horizontal Directional Drilling would start from an onshore transition bay and ideally end at the seabed. However, it may be the case that the Horizontal Directional Drilling does not reach this far and the exit point falls in the inter-tidal zone (this is the zone between the low water mark and the high water mark). Under these circumstances, cofferdams may be required. A cofferdam is a temporary enclosure dug into the sand, water is then pumped out of the enclosure to create a dry work environment. Cable jointing can then take place to connect the onshore and offshore cables.
- 1.7.6. The onshore cables will be buried underground for the entire length of their route and will be laid across agricultural land by open trenching. This method involves trenches being excavated and cables placed inside, before the trenches are filled in. However, the cables will need to cross a number of obstacles such as minor and major roads, a railway line, and watercourses, where alternative installation methods, such as Horizontal Directional Drilling, will be considered.
- 1.7.7. A visualisation of the Horizontal Directional Drilling technique is provided in **Figure 1.4**.



LEGEND

- Teesside A&B cable landfall envelope
- Teesside A&B landfall construction envelope
- Teesside A&B HVDC, Open trench
- Teesside A&B HVDC, HDD
- Teesside A&B HVAC, Open trench
- Teesside A&B HVAC, HDD
- Teesside A&B major horizontal directional drill entry or exit locations (2,000m²)
- Teesside A&B minor horizontal directional drill entry or exit locations (1,200m²)
- HDD or open trench to be confirmed
- Teesside A&B cable route primary construction compound (10,000m²)
- Teesside A&B intermediate construction compound (784m²)
- Teesside A&B converter stations
- Teesside A&B converter stations construction compounds (10,000m² per project)
- Lackenby 400kV substation

0 2
Kilometres

Data Source:
Ordnance Survey data © Crown copyright and database right, 2012

PROJECT TITLE
DOGGER BANK TEESIDE A & B

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Figure 1.3 Onshore Overview

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1	06/09/2013	Submit for PEI3	SW	AH
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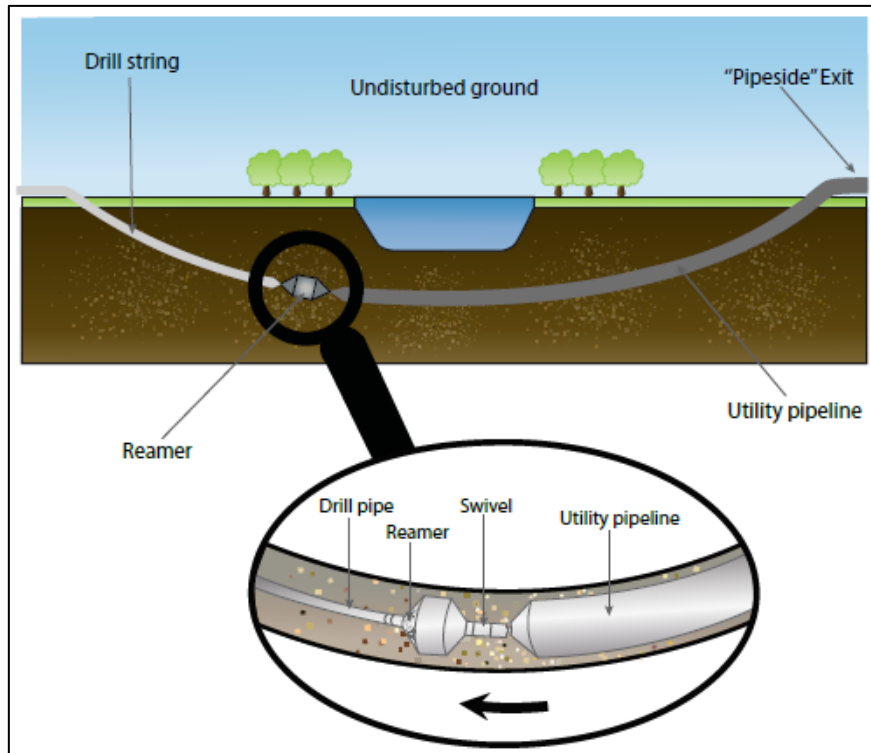


Figure 1.4 Illustrative visualisation of Horizontal Directional Drilling technique

- 1.7.8. Two converter stations will be built, one for Dogger Bank Teesside A and another for Dogger Bank Teesside B. They will be located within the Wilton Complex, approximately 2km east of the existing National Grid substation at Lackenby.
- 1.7.9. Each converter station will include a valve hall, control building, outdoor equipment, car parking and internal roads. An example of a typical converter station similar to those proposed for Dogger Bank Teesside A & B is shown in **Figure 1.5**.

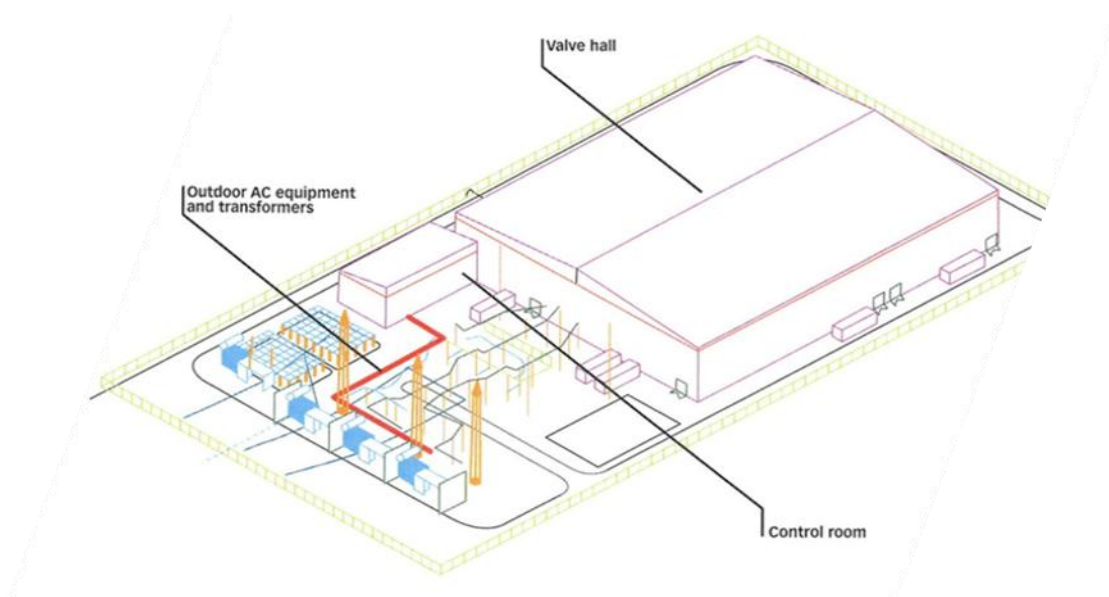


Figure 1.5 Typical converter station layout

1.8. Onshore construction programme

- 1.8.1. The onshore elements of Dogger Bank Teesside A & B may be constructed separately or at the same time, although exact timings are yet to be determined. If the projects are constructed separately, either may occur first. The first of the projects to be constructed may carry out enabling works for the second project, in order to reduce the overall construction effort. If the two projects were to be built separately, each may take up to three years, resulting in a total of six years construction activity. However, should the two projects be constructed together the total duration of construction activities would be three years. An Onshore Construction Programme will be developed by the future developers and operators of the development post consent.
- 1.8.2. As with the offshore programme construction must start within seven years of consent. If the projects were constructed separately the maximum period over which the construction of both projects could take place is 10 years (which could include up to a five year gap between the end of construction of the first project and the start of the second project).

2. Consenting Process

2.1. Regulatory consents and environmental impact assessment process

- 2.1.1. As Dogger Bank Teesside A & B exceeds 100 megawatts of generating capacity, it is classified as a Nationally Significant Infrastructure Project and requires a Development Consent Order to allow it to be constructed and operated.
- 2.1.2. Under the Planning Act 2008 in England, it is possible to include development that is associated with a Nationally Significant Infrastructure Project within the Development Consent Order. The inclusion of the onshore works for Dogger Bank Teesside A & B (onshore underground cables, cable landfall, onshore converter stations and connection into the existing National Grid Lackenby substation) means that separate onshore planning permission is not required.
- 2.1.3. The Environmental Impact Assessment Regulations on Nationally Significant Infrastructure Projects came into force in October 2009. Offshore wind farm developments require an Environmental Impact Assessment where they are likely to have significant effects on the environment due to their nature, size or location.
- 2.1.4. In submitting the information included in the request for a Scoping Opinion (Forewind 2012), Forewind notified the Infrastructure Planning Commission (now the Planning Inspectorate) of its proposal to provide an Environmental Statement alongside a Development Consent Order application.
- 2.1.5. In addition to the Development Consent Order, it is expected that a number of other consents and permissions will be required prior to construction. These could include traffic regulation orders and land drainage consents. Deemed marine licences will also be included and will be drafted in discussion with the Marine Management Organisation.

3. Approach to the Assessment

3.1. Environmental impact assessment

- 3.1.1. Environmental Impact Assessment is an iterative tool to examine and assess the impacts and effects of the construction, operation and decommissioning phases of a development on the environment. They are described in a resulting Environmental Statement. This Non-Technical Summary is a summary of the findings reported in that document.
- 3.1.2. The impact assessment has used standard methods (supplemented with additional bespoke work where required) and has been informed by a number of other studies, such as geophysical survey and flood risk assessment. In accordance with the Environmental Impact Assessment Regulations, information included within the Dogger Bank Teesside A & B Environmental Statement includes:
- A description of the development;
 - An outline of the main alternatives;
 - A description of the aspects of the environment likely to be significantly affected by the development;
 - A description of the likely significant effects of the development on the environment;
 - A description of mitigation measures proposed to prevent, reduce and where possible, offset any significant adverse effects on the environment; and
 - An indication of any difficulties encountered when compiling the required information.
- 3.1.3. The Planning Act 2008 introduced additional requirements for the environmental impact assessment process including:
- Submission of Preliminary Environmental Information to the relevant prescribed stakeholders (this was done earlier in the process);
 - Liaison with stakeholders to resolve matters arising from their responses on the Preliminary Environmental Information and responses received on the Environmental Statement during the examination period; and
 - A final decision by the Secretary of State on whether consent should be granted in the light of all environmental information.
- 3.1.4. Potential impacts identified as being major or moderate in the Environmental Statement, can be regarded as significant in terms of the Environmental Impact Assessment Regulations. The potential for mitigation has been considered in relation to such impacts in order to reduce them.

3.2. Habitats regulations assessment

- 3.2.1. Certain habitats and species of European importance are protected under the Habitats Directive, creating a network of protected areas referred to as Natura 2000 sites. The Habitats Regulations require consideration as to whether a plan or project has the potential to have an adverse effect on the integrity of a Natura 2000 site. This process is known as Habitats Regulations Assessment.
- 3.2.2. Information to inform an appropriate assessment under the Regulations has been submitted alongside the Environmental Statement.

4. Site Selection and Assessment of Alternatives

4.1. Site selection process

4.1.1. Forewind recognised the importance of selecting appropriate sites for its proposals and that the identification of those sites needed to give consideration to the technical and commercial feasibility, environmental impact and stakeholder concerns. This has been undertaken in seven stages, as shown in the flow diagram (**Figure 4.1**) below.

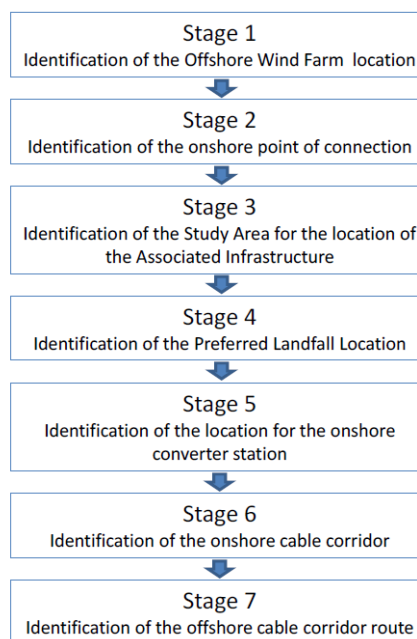


Figure 4.1 The site selection process

4.1.2. An iterative process of surveys, consultation, technical investigations professional judgement and constraints mapping drove the site selection process. It allowed Forewind to identify the preferred sites of both the offshore wind farm and the chosen route for bringing the power onshore and connecting to the national grid. These seven stages comprised:

- **Stage 1 – Identification of the offshore wind farm location** – The starting point for the offshore wind farm location, following a government-led Strategic Environmental Assessment, was the award of the Dogger Bank Zone by The Crown Estate in January 2010. A Zone Appraisal and Planning process followed to identify the location of the wind farm projects within the zone, taking into account all relevant technical, environmental and commercial considerations. This resulted in the identification of the Dogger Bank Teesside A & B project boundaries in 2012.
- **Stage 2 – Identification of onshore point of connection** - The onshore connection point was determined between Forewind and National Grid through the Grid Connection Application Process.

- **Stage 3 – Identification of the Dogger Bank Teesside A & B study area** – A broad envelope connecting the Dogger Bank Zone to the onshore study area was identified as the area within which the export cable corridor was to be located. The onshore study area was initially identified due to the location of the onshore grid connection point. It was a broad area of land within which the onshore works for Dogger Bank Teesside A & B could be most feasibly located.
- **Stage 4 – Identification of the landfall location** - Due to the complex nature and the potential significance of the technical, commercial, environmental and ecological considerations associated with the identification of a proposed landfall location, a thorough and comprehensive assessment was undertaken. The proposed location for the landfall was identified through this process to be north of Marske-by-the-Sea.
- **Stage 5 – Identification of the onshore converter stations location** - Forewind determined that the onshore converter stations site would ideally be located as close as possible to the existing National Grid substation at Lackenby. The aim being to minimise the impact associated with introducing new electricity structures to the surrounding area. The site selection process therefore included consideration of people that live in and use the area, cultural and scientific value of the site, the local context, planning policy, industry guidance and existing land use.
- **Stage 6 – Identification of onshore cable corridor (Landfall to Lackenby)** - A cable route construction corridor, 50m wide, was identified connecting the proposed landfall location to the onshore converter stations site in the Wilton Complex. The route was determined based on a review of the known onshore constraints, such as locations of residential areas, protected plants and animals, important landscape features and buried archaeology. This 50m wide route was refined to a 36m wide route for the High Voltage Direct Current cables (and extends back to 50m for HDD crossing) based on engineering considerations and 39m for High Voltage Alternating Current cables.
- **Stage 7 – Offshore cable corridor selection** – The 2km wide proposed offshore cable corridor was identified following analysis of known constraints and reconnaissance survey data for the area. The design decision considerations included; physical and biological seabed features, cables, pipelines, wrecks and draft Marine Conservation Zones.

4.2. Scoping and consultation

- 4.2.1. Effective and meaningful consultation is integral to Forewind’s development activities and Forewind is committed to ensuring a transparent approach to its consultation and engagement activities. Forewind carried out a multi-stage consultation process in relation to the Environmental Impact Assessment process with a wide range of interested parties. The consultation process went above and beyond the requirements of the Planning Act and Environmental Impact Assessment Regulations and took into account relevant advice and

guidance published by the Planning Inspectorate (previously the Infrastructure Planning Commission).

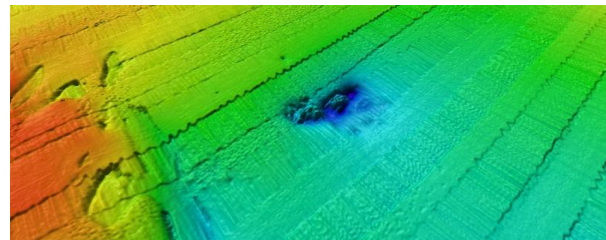
- 4.2.2. At the start of the development process, in March 2012, Forewind notified the Secretary of State of its intention to undertake an Environmental Impact Assessment and provide an Environmental Statement in respect of Dogger Bank Teesside.
- 4.2.3. In May 2012, Forewind submitted a Scoping Report to the Secretary of State. The description of the proposed development provided for in the Scoping Report comprised up to four projects, each with a generating capacity of up to 1.2GW, by way of the submission of one or a number of Development Consent Order applications. In parallel, Forewind consulted on the Preliminary Environmental Information, and issued a Statement of Community Consultation encompassing all four Dogger Bank Teesside projects. In June 2012, the Secretary of State issued the Dogger Bank Teesside Scoping Opinion.
- 4.2.4. In December 2012, Forewind informed the Planning Inspectorate and all consultees prescribed by the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 that the optimum consenting strategy for Dogger Bank Teesside is to split the development into two separate Development Consent Order applications. The first Development Consent Order application (this application) seeking consent for Dogger Bank Teesside A & B (as provided for in the Scoping Opinion, Preliminary Environmental Information 1 and Statement of Community Consultation). The second Development Consent Order would be for Dogger Bank Teesside C & D.
- 4.2.5. The comments received through the scoping process informed the selection of survey methodologies for the Environmental Impact Assessment and are detailed and considered throughout the Environmental Statement. A copy of the full Scoping Report and resultant Scoping Opinion is available on the project website (www.forewind.co.uk)
- 4.2.6. In November 2013, Forewind undertook the second stage of statutory consultation, s42 consultation on the draft ES. This stage provided stakeholders with the opportunity to comment on the latest proposals and assessments prior to the final application being submitted to the Planning Inspectorate.

5. Data Collection and Surveys

5.1.1. To understand the implications of the Dogger Bank Teesside A & B development on the site and surrounding area, a number of baseline surveys and technical studies were undertaken. The scope and methodology of these surveys and assessments were agreed with the relevant stakeholders and have incorporated all relevant existing data, where available. These surveys have covered the following areas:

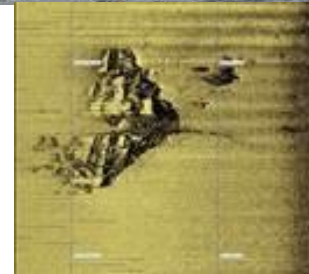
5.1.2. Offshore Surveys

- Geophysical;
- Geotechnical;
- Metocean data collection;
- Vessel movements (recorded and surveyed);
- Marine and intertidal ecology;
- Fish and shellfish;
- Birds (data collected by boat based, coastal and aerial survey work); and
- Marine mammals.



5.1.3. Onshore Surveys

- Viewpoint photography and landscape walkover;
- Archaeology (onshore cable route and converter station sites);
- Contaminated land walkover;
- Flood risk assessment topographical surveys and watercourses walkover;
- Background noise monitoring;
- Onshore ecological work to identify the main habitats onshore and the presence of any protected species; and
- Traffic counts.



6. Assessment Outcomes

6.1. Designated sites

- 6.1.1. A wide range of marine and terrestrial designated sites and protected species are present within the study area, which are considered and assessed, notably:
- Six OSPAR¹ threatened species (including cod, spotted ray, spurdog, thornback skate / ray, harbour porpoise and black-legged kittiwake);
 - 64 Sites of Special Scientific Interest of which 46 are designated for breeding bird populations (17 are component sites of six Special Protection Areas and have been combined with the Special Protection Area for the assessment), and 18 are included in the assessment in relation to grey seal (and these are component Sites of Special Scientific Interest of four Special Areas of Conservation and have been combined in their assessment) and one is a terrestrial site along the onshore cable corridor;
 - Two Marine Conservation Zones;
 - One Local Wildlife Site;
 - One area of Ancient Woodland;
 - One Biodiversity Action Plan habitat (hedgerow); and
 - 30 Biodiversity Action Plan species ranging from fish, sharks, grey seals, harbour porpoise, to otter and terrestrial bird species.
- 6.1.2. All European and internationally designated sites (Special Areas of Conservation, Special Protection Areas, and Ramsar sites) are assessed within the Habitats Regulations Assessment under a separate process and separate method to environmental impact assessment, so are not considered here.
- 6.1.3. The construction, operation, and decommissioning phases of Dogger Bank Teesside A & B are predicted to result in no moderate adverse impacts on any UK designated sites and species.
- 6.1.4. If Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B, and Dogger Bank Teesside C & D were built and operated at the same time, it is predicted that impacts would be negligible or minor for the majority of UK designated sites and species, with the exception of a long-term moderate adverse impact on the Flamborough Head Site of Special Scientific Interest due to collisions affecting the black-legged kittiwake population. .
- 6.1.5. If Dogger Bank Teesside A & B and all other projects that are currently in the planning process were to commence at the same time, impacts would be negligible or minor for the majority of UK designated sites and species, with exception of the following:

¹ OSPAR is the mechanism by which 15 Governments of the western coasts and catchments of Europe, together with the European Community, cooperate to protect the marine environment of the North-East Atlantic.

- There is a potential for a long term moderate adverse impact on two Special Protection Areas and three Special Protection Areas (and their suite of SSSI sites) and three Sites of Special Scientific Interest with regard to common guillemot, razorbill, great-black-backed gull, black-legged kittiwake and northern gannet populations.
- There is also potential for medium term moderate adverse impacts on harbour porpoise (OSPAR and Biodiversity Action Plan population), grey seal (Local Biodiversity Action Plan population and legally protected species) and harbour (common) seal (Biodiversity Action Plan population and legally protected species).

6.1.6. It should be noted that the predicted moderate adverse impacts on the bird populations within the designated sites are (when considered against population viability or over-precautionary assessment for other projects) not predicted to result in a decline in the populations at the designated sites, and hence would be expected to reduce to acceptable levels.

6.2. Marine physical processes

6.2.1. The existing marine physical processes, including waves, tidal currents and sediment transport have been investigated using data collected by offshore instruments, geophysical and geotechnical surveys, and seabed sediment sampling, followed by desk-based modelling.

6.2.2. The wind farm site is crossed by low velocity tidal currents and therefore movement of sediment is mainly controlled by waves. The wind farm site is mostly covered by sand with smaller patches of gravel and areas where the underlying geology is exposed. Sediment concentrations within the water across Dogger Bank and along most of the export cable corridor are very low. At the landfall, waves drive sediment movement alongshore to the south.

6.2.3. The magnitude of the physical process effects caused by Dogger Bank Teesside A & B has been assessed by modelling the behaviour of waves, tidal currents and sediments. These models have identified a number of potential effects during installation and operation of the wind farm and cables.

6.2.4. Suspended sediment concentrations will temporarily increase during the construction and operation phases and additional sediment will be deposited on the seabed. Sediment deposited on the seabed from suspension will be continuously re-suspended until its thickness is spread to effectively zero. Operation of the wind farm will cause small but permanent changes to wave heights and tidal current velocities, but the magnitude of change will be within what would be expected through existing levels of natural variation. Coarser sediment that is not dispersed as part of the construction plume will be deposited on the seabed at its source position. This deposited sediment is assumed to be sculpted into a sand wave through reworking by tidal currents and waves.

6.2.5. The greatest potential for changes to sediment transport at the coast will be by interruption from nearshore subtidal linear cable protection (if it is required). The worst case scenario is for remedial protection across the whole of the nearshore

subtidal zone to an unspecified distance offshore. Active sediment transport takes place up to 2km offshore from mean low water spring along the cable route. However, longshore sediment transport rates are low and although some sediment would be trapped on the 'updrift' side of the remedial protection, it is anticipated to be a small volume. Therefore, the magnitude of changes 'downdrift' of the cable corridor due to the remedial protection is likely to be small.

6.3. Marine water and sediment quality

- 6.3.1. The existing marine water and sediment quality was established through site specific sediment surveys and a review of available literature. The assessment of marine sediment contamination, and the potential implications for water quality, was based on accepted sediment guidelines and action levels.
- 6.3.2. The majority of the area surveyed did not record concentrations of contaminants at significant levels of concern and therefore no impacts on water quality are anticipated. Potential impacts such as deterioration of water quality due to re-suspension of sediments are also not anticipated to be significant. The risk of deterioration in water quality as a result of accidental spillage of material or discharges of waste water is assessed as low due to environmental protection and control measures which will be implemented. The impact on Designated Bathing Waters is also deemed not to be significant.

6.4. Marine and coastal ornithology

- 6.4.1. Baseline surveys and data collection were carried out to provide a robust understanding of the numbers of the marine and coastal bird species using the area in and around Dogger Bank Teesside A & B and the Dogger Bank Teesside A & B Export Cable Corridor, and their abundance and behaviour. This data was also used to understand how the birds located within the Dogger Bank Zone compared to the national and international populations of these species, particularly at designated sites (such as Sites of Special Scientific Interest) important for their bird interests. European designated sites are considered in detail in the Habitats Regulations Assessment Report, consideration was also given to Transboundary European sites.



- 6.4.2. The surveys and baseline data collection identified that there were 12 seabird species (Arctic skua, Atlantic puffin, black-legged kittiwake, common guillemot, great black-backed gull, great skua, lesser black-backed gull, little auk, northern fulmar, northern gannet, razorbill and white-billed diver) which use the offshore areas in significant numbers. A total of 73 species of waterbird and 62 terrestrial bird species were recorded in the Dogger Bank zone, though only 45 of these are migratory bird (terrestrial and waterfowl) species which are considered to migrate in notable numbers (either in total or at the population scale).
- 6.4.3. The following potential impacts were examined in the assessment on the marine and coastal bird species:
- Disturbance and displacement due to construction of the export cable landfall;
 - Disturbance and displacement during construction, operation and decommissioning of the wind farm and all associated structures and cabling;
 - Collision risk during operation;
 - Barrier effect during operation; and
 - Habitat loss and/or alteration during construction, operation, and decommissioning.
- 6.4.4. Mitigation has been undertaken and included in the project design in order to reduce and minimise the potential impacts, including:
- The wind farm boundaries were moved away from the high intensity sandeel habitat, and associated concentrations of birds, in the north-western and western regions of the Dogger Bank Zone; and
 - Specifically with respect to collision risk, by considering a maximum of 200 turbines per project with a minimum lower rotor tip height raised from the industry standard of 22m, to 26m above highest astronomical tide.
- 6.4.5. The impacts during construction (and decommissioning) of Dogger Bank Teesside A & B are predominantly short-term and reversible disturbance and displacement impacts. These are not considered to be significant with respect to:
- The national and biogeographic populations of seabirds (offshore);
 - Seabirds and waterfowl (landfall);
 - Any Biodiversity Action Plan species;
 - OSPAR threatened species; and
 - Sites of Special Scientific Interest (either individually or as component suites of European designated sites) which are designated for breeding, wintering or passage seabirds or waterfowl.
- 6.4.6. During operation of Dogger Bank Teesside A & B there is likely to be: disturbance and displacement effects due to habitat loss or alteration; a barrier effect on many of the breeding seabird and migratory wintering or passage bird

populations; and collision effects could arise on seabird and migratory birds' national populations. However, none of these effects are predicted to be significant with respect to the national and biogeographic populations of seabirds (offshore) or seabirds and waterfowl (landfall), BAP species, OSPAR species or designated sites (SSSIs) which are designated for breeding, wintering or passage seabirds or waterfowl.

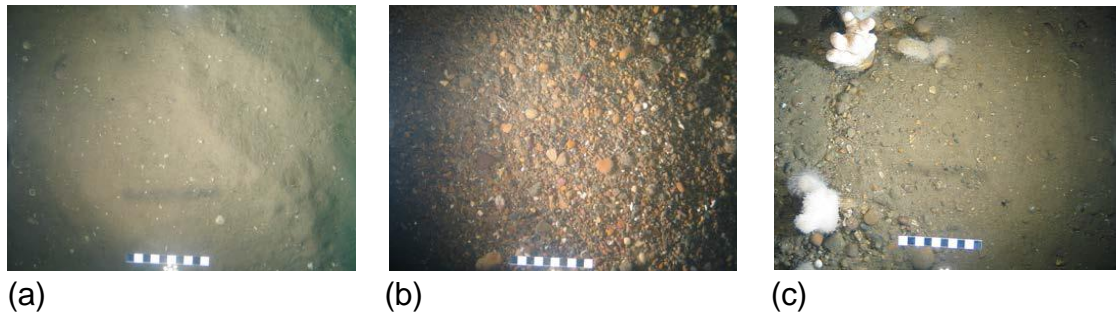
- 6.4.7. If Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D were constructed and operated at the same time, the majority of impacts are not considered to be significant. The one exception is the impact on the black-legged kittiwake populations of Flamborough Head Site of Special Scientific Interest (also designated as Flamborough Head and Bempton Cliffs Special Protection Area), due to potential collisions in the operational phase. The black-legged kittiwake population at Flamborough Head could experience an increase in background mortality, however, given the population at the site is stable and potentially increasing and using modelling from other projects, the numbers are considered to be below the threshold whereby the population at the site would decline.
- 6.4.8. If Dogger Bank Teesside A & B and all other wind farm projects identified in the assessment were built and operated at the same time, the majority of impacts are not considered to be significant. In particular, populations of migratory birds (terrestrial and waterfowl) at national, biogeographic or designated site level are, for the most, not predicted to be significantly affected. However, there are several exceptions, notably:
- A potentially significant impact is predicted on the national populations of great black-backed gull, lesser black-backed gull and northern gannet. However, the initial assessment has used the lowest population of these species (whereas the populations comprise a number of sub-populations) to indicate the magnitude of the impact, consequently it is considered that the significant impact would not arise, further supported by the indication that the population estimates are significant under-estimates.
 - Potentially significant impacts are predicted on: the common guillemot population of the Buchan Ness to Collieston Coast Special Protection Area (component Sites of Special Scientific Interest); the great black-backed gull population of the East Caithness Cliffs Special Protection Area (component Sites of Special Scientific Interest) the black-legged kittiwake and northern gannet populations of the Flamborough Head Site of Special Scientific Interest; the black-legged kittiwake, common guillemot and razorbill populations of the Forth Islands Special Protection Area (component Sites of Special Scientific Interest); the common guillemot and razorbill populations of the Fowlsheugh Site of Special Scientific Interest; and the common guillemot and razorbill populations of the St Abb's Head to Fast Castle Site of Special Scientific Interest. The impact on common guillemot, razorbill and great black-backed gull populations at five of the designated sites are considered to arise from over-precautionary predicted population impacts from other projects. Dogger Bank Teesside A & B contribute a negligible number to this overall total, and as such further analysis is

expected to reduce the significance of the impact to a level that would not affect the viability of the populations. The black-legged kittiwake population at Flamborough Head Site of Special Scientific Interest is expected to remain viable. With respect to the northern gannet population at Flamborough Head Site of Special Scientific Interest, modelling along with the consideration that collisions from other projects were based on more precautionary avoidance rates (recent studies suggest that higher avoidance rates are more appropriate) indicates that the numbers are considered to be below the threshold whereby the population at the site would decline.

- 6.4.9. Overall, taking in to consideration the over-estimates of populations, use of lowest populations in assessment of magnitude, and use of modelling, it is considered that no significant impacts would arise on marine and coastal ornithology receptors and their populations as a result of Dogger Bank Teesside A & B alone and cumulatively.
- 6.4.10. The impacts assessed for Dogger Bank Teesside A & B alone and cumulatively with other wind farm projects are the worst case impacts and, as identified above, are based on built in mitigation measures that go beyond the industry standard.

6.5. Marine and intertidal ecology

- 6.5.1. The type and distribution of marine plants, animals and related seabed habitats within Dogger Bank Teesside A & B and the Dogger Bank Teesside A & B Export Cable Corridor (including at the landfall) have been described using data collected from site-specific surveys and review of existing data.
- 6.5.2. The seabed habitats recorded in these areas are among the most common habitats found around the coast of the UK. The wind farm site is dominated by slightly gravelly sand which supports relatively low diversity plant and animal communities. There are also smaller areas of mixed sediments (sand, gravel and cobble) within the wind farm site that support more diverse animal and plant communities. The majority of the offshore cable corridor comprises relatively uniform sandy sediments, with some mixing with gravels and muds near the landfall and where the Dogger Bank Teesside A & B Export Cable Corridor joins the wind farm site.



(a) Slightly gravelly sand – dominant habitat in Dogger Bank Teesside A & B main wind farm sites

(b) Mixed sediments – found within small parts of Dogger Bank Teesside A & B main wind farm sites

(c) Sandy gravel – found within Dogger Bank Teesside A & B offshore cable corridor

6.5.3. The seabed habitats within the boundary of the wind farm site and the offshore part of the export cable corridor form part of the Dogger Bank candidate Special Area of Conservation. The proposed landfall location between Redcar and Marske-by-the-Sea is 1km south of the Teesmouth and Cleveland Special Protection Area and Ramsar site and approximately 0.5km south of the boundary of the Redcar Rocks Site of Special Scientific Interest.

6.5.4. Key potential impacts on marine plants and animals have been assessed for all stages of the development. Temporary disturbance of existing habitats and increases in suspended sediment levels and subsequent deposition of sediment will occur during the construction phase, with some permanent loss of habitat where infrastructure is fixed in place during operation.

6.5.5. The impact assessment has established that these impacts will not be significant. This is based on the fact that the areas of existing seabed habitats that will be subject to temporary disturbance and/or permanent loss represent only a small proportion of similar seabed habitats in the wider region. In addition the habitats affected are generally considered to exhibit low sensitivity and high recoverability to the majority of effects predicted to arise.

6.6. Fish and shellfish ecology

6.6.1. Information on existing fish and shellfish populations was collected by site-specific surveys and a desk study to describe the species present and their abundance and distribution. Principal fish and shellfish species found on the Dogger Bank and in the Dogger Bank Teesside A & B Export Cable Corridor include several species of commercial value, such as sandeel, herring, haddock, whiting, cod, plaice, lobster and edible crab.

6.6.2. Of particular note, the baseline characterisation surveys undertaken in the Dogger Bank former herring spawning grounds (south of the Dogger Bank Zone), found no evidence of spawning herring in the area. The inshore section of the Dogger Bank Teesside A & B Export Cable Corridor falls within the northern edge of the coastal spawning grounds where there may be relatively high densities of herring larvae, however survey data suggests that suitable habitat for spawning is widespread within the spawning grounds. Therefore there are alternative spawning areas available to herring. Important areas for

sandeel were also confirmed by survey, but these are primarily found to the west of Dogger Bank Teesside A & B. Fish and shellfish species may be impacted by the development in a number of ways, including: habitat disturbance or loss; increased suspended sediment concentrations and sediment deposition; underwater noise; and electric and magnetic field emissions from subsea cables.

- 6.6.3. The impact assessment has established that none of the identified effects will result in a significant impact. This conclusion is based on a number of factors, namely: the available habitats for breeding species are large relative to the development footprint; noise mitigation measures (soft start methodology) will be used during piling operations enabling fish to swim away from the noise source (pile driver) thus reducing their exposure; the effects of increased suspended sediment concentration and deposition will be temporary, localised and with minimal deposition due to tidal movements; and electromagnetic field emissions from cables are limited to the immediate vicinity of the cable.

6.7. Marine mammals

- 6.7.1. Site specific boat based and aerial survey data were combined with existing reports and publications to describe the occurrence of marine mammals in the Dogger Bank Zone and the wider region. Harbour porpoise are the most frequently occurring species of marine mammal in the wind farm area, with minke whale, white-beaked dolphin and grey seal also being common. Harbour seal are less common in the offshore area. Based on the data collected, all other species of cetacean are considered rare or only occasional visitors, and were therefore not taken forward in the assessment.



- 6.7.2. All cetaceans (whales, dolphins and porpoises) are listed as European Protected Species under Annex IV of the Habitats Directive, as they are classified as being endangered, vulnerable or rare. Both grey seal and harbour seal are protected under Annex II of the Habitats Directive which requires Member States of the European Union to designate areas essential to their life and reproduction as Special Areas of Conservation.



- 6.7.3. Potential impacts include:
- Underwater noise (from pile driving, vessels, operational turbines and cutting);
 - Collision risk with vessel hulls and propellers;
 - Indirect effects from changes in food sources;

- Electromagnetic fields; and
- Project infrastructure acting as a physical barrier to movements.

- 6.7.4. The key impacts for marine mammals relate to the potential for auditory injury and/or behavioural disturbance (such as displacement from a feeding area) during construction. The risk of causing auditory injury to marine mammals will be minimised through the use of a Marine Mammal Mitigation Protocol. The protocol will aim to reduce the exposure of marine mammals to levels of noise below that which could cause auditory injury.
- 6.7.5. During construction there is the potential for behavioural disturbance, as a result of underwater noise from pile driving, to occur for up to six years per project. However, due to the relatively small proportion of the population of each species that may be temporarily displaced, the impacts are not considered to be significant. No impacts are considered to be significant in the assessment of Dogger Bank Teesside A or Dogger Bank Teesside B, or cumulatively between Dogger Bank Teesside A & B. The cumulative assessment of projects within the Dogger Bank Zone (including Dogger Bank Teesside A & B, Dogger Bank Teesside C & D and Dogger Bank Creyke Beck A & B) also concludes no potential significant impacts. However, there is limited data linking the effects of disturbance to significant fitness effects in individuals or populations, resulting in a high amount of uncertainty in the conclusions of the assessment. .
- 6.7.6. The cumulative impact assessment beyond the Dogger Bank Zone considers the impacts on marine mammals occurring as a result of Dogger Bank Teesside A & B and other developments within the geographical extent of the population in question. The cumulative impact assessment concludes that there is the potential for significant residual impacts on harbour porpoise, due to pile driving noise. There is also the potential for a moderate adverse and significant impact from pile driving noise on grey seal. Forewind will continue to keep informed of research in this field, and follow new industry guidelines or mitigation measures should they be introduced, in order to refine the impact levels down. Significant impacts are not anticipated upon other species of marine mammal as a result of underwater noise
- 6.7.7. The impact of collision risk in harbour seal due to propellers is considered significant when taking into account cumulative impacts from projects outside of the Dogger Bank Zone. However, the actual contribution of the Dogger Bank projects to this cumulative impact is only small. It is anticipated that industry wide initiatives will be developed in due course to mitigate this impact, and Forewind will also continue to keep informed of research in this field.

6.8. Commercial fisheries

- 6.8.1. The commercial fisheries impact assessment has used a variety of sources of information, including fisheries datasets from national fisheries agencies in the UK and other EU countries. The data confirms that in the Dogger Bank Zone and the export cable corridor, fishing vessels from the UK, the Netherlands, Denmark, Germany, Belgium, Norway, France and Sweden target several commercial species of fish and shellfish, with a variety of fishing gears.

6.8.2. Potential impacts on fishing activities as a result of construction, operation and decommissioning of Dogger Bank Teesside A & B include: the effects of the temporary or complete loss of, or restricted access to, traditional fishing grounds; displacement or interference with fishing activity; safety issues for fishing vessels; increased steaming times to fishing grounds; and impacts on commercially exploited species of fish and shellfish.

6.8.3. The assessment also considered:

- Accidentally dropped or discarded objects associated with construction and maintenance works; and
- The ecological impact of the development on commercially exploited species.



6.8.4. The significant impacts on commercial fishing interests included the potential loss of fishing grounds for the seine net fishery during construction, operation and decommissioning. Potential mitigation to reduce impacts on seine netting vessels will be explored.

6.8.5. The cumulative impact assessment considers any impacts on commercial fishing activities as a result of the development of Dogger Bank Teesside A & B as well as other developments within known fishing ranges. The majority of potential cumulative impacts are identified as being not significant, during all phases. An exception to this is a potential significant impact on the seine net fishery during construction and operation, due to the extensive nature of the nets. However, the actual contribution resulting from the construction of Dogger Bank Teesside A & B to the wider cumulative impact is expected to be relatively small.

6.9. Shipping and navigation

6.9.1. A Navigation Risk Assessment was undertaken, which describes the existing hazards within the development area and the navigation routes commonly used by vessels. Common vessel types include commercial fishermen, recreational boats and commercial operators. Very few vessels transit through the site and given its location, relatively small changes in a vessel's course are necessary to avoid the development.

6.9.2. Although the number of potential hazards increases as a result of the project, significant impacts are not expected. Due to the potential development of other large offshore renewable projects in the North Sea, cumulative and transboundary impacts, although not significant at this stage, will continue to be assessed as part of the ongoing development of wind farms on Dogger Bank.

6.10. Other marine users

6.10.1. The assessment of impacts on other marine users has been informed by a desk study. The wider offshore areas are subject to a variety of other uses that may be affected by the development, as well as being occupied by existing

infrastructure. These include: other renewable energy projects; carbon capture and storage; oil and gas activity; underground coal gasification; aggregate extraction; Potash mining; and subsea cables and pipelines.

- 6.10.2. Other marine users may be disrupted if activities overlap (primarily carbon capture and storage, oil and gas and aggregates activity). However it is anticipated that, through engagement with the potentially affected parties, significant residual impacts will be avoided.
- 6.10.3. The project area is not crossed by any telecommunications cables or pipelines. However the Dogger Bank Teesside A & B Export Cable Corridor will cross two active subsea pipelines. In the area of the export cable landfall several planned, active or out of use cables and pipelines are, or will be, located. Mitigation measures include, ongoing consultation with operators, minimum separation distances between underwater structures to allow for maintenance and operation activities, comprehensive maps of all structures and the development of crossings and proximity agreements. For these reason, significant residual impacts are not anticipated. Overall the project is not anticipated to significantly affect any other marine activity assessed.

6.11. Marine and coastal archaeology

- 6.11.1. The marine and coastal archaeological resource has been described through a desk-based assessment and the analysis of both geophysical and geotechnical data sets gathered for the current development proposals.
- 6.11.2. The offshore area of Dogger Bank is a well-researched and archaeologically important prehistoric submerged landscape that joined the UK coastline to north-west Europe during periods of glaciation when sea-levels were at their lowest. Additionally, the North Sea between Dogger Bank and the north east coast has records of numerous wreck sites and aviation casualties from the First and Second World Wars. No designated (legally protected) archaeological sites were found to lie within or around the development footprint.
- 6.11.3. The assessment has identified a number of potential impacts, both direct (from the physical footprint of the development) and indirect (arising from changes to marine physical processes such as scour effects).
- 6.11.4. Mitigation proposals recommend the avoidance of any known and identified archaeological remains, and therefore a series of Archaeological Exclusion Zones around identified archaeological features is recommended, as well as provision for micrositing in order to avoid certain positions in design layout. Where features have been identified through geophysical and geotechnical survey, but it is not clear what their origin is, mitigation measures focus on the need for further assessment in line with a Written Scheme of Investigation, and in discussion with English Heritage. Measures to deal with unexpected discoveries are outlined in an Overarching (high level) Written Scheme of Investigation, and are addressed through the application of the Offshore Renewables Protocol for Archaeological Discoveries. As a result, no significant residual impacts on marine and coastal archaeology are anticipated.

6.12. Military activity and civil aviation

- 6.12.1. Potential military receptors include: the exercise, training and operation areas utilised by the Royal Navy, Royal Air Force, British Army and other defence interests; military radar systems; and military airfields. Civil aviation considers impacts upon search and rescue helicopters, helicopters servicing offshore oil and gas platforms, shore-based communication, navigation and surveillance infrastructure, weather radars, airports and civilian aircraft. Given the distance offshore, there is no mechanism for impacts upon military and civilian communication, navigation and surveillance infrastructure, the military low flying system, civilian and military aerodromes and weather radar.
- 6.12.2. The development will not significantly alter baseline conditions in ways that would adversely impact Ministry of Defence practice and exercise areas. To ensure the safety of military vessels and aircraft, turbines will be lit to an agreed standard which will be finalised as the project progresses. The Ministry of Defence will be notified of the construction period and specific wind farm details so that they can be incorporated into the appropriate naval and aeronautical charts.
- 6.12.3. Detailed consideration was given to impacts upon airborne search and rescue and offshore helicopter operations (such as those serving oil and gas platforms). The need for minimum spacing regulations around offshore platforms, and the landing and take-off procedures that helicopter operators must comply with, mean that no impacts on offshore helicopter operations are anticipated.
- 6.12.4. Search and rescue helicopters may be affected by growing numbers of obstructions (such as wind turbines, meteorological masts, accommodation platforms and cranes) in areas of formerly open water, especially at night and in low visibility. Proposed mitigation measures relate to inclusion of the wind farm on aeronautical charts, lighting, marking, maximising turbine visibility on radar and on-going consultation with search and rescue operators.
- 6.12.5. Adherence to these measures will minimise the potential for adverse impacts if a search and rescue operation is undertaken near, or within Dogger Bank Teesside A & B. Whilst the presence of a wind farm fundamentally changes the operating environment, search and rescue operations can take place safely as long as revised procedures, which take account of the changes caused by the wind farm, are followed. Consequently, significant impacts on search and rescue operations are not expected.



6.13. Seascape

- 6.13.1. Given its distance offshore, there are limited seascape effects predicted.
- 6.13.2. The assessment identified no significant impacts on the seascape character at the landfall, and across inshore waters and the export cable corridor. There will

be no significant impacts on the coastal character of the study area as a result of the construction of the landfall and installation of the offshore export cables. There will also be no significant impacts on these areas as a result of the construction and operation of the offshore development due to the distance of the wind turbines offshore.

6.13.3. Impacts on the seascape character of the development area are predicted, although within the context of the North Sea, these are expected to be negligible.

6.13.4. In clear weather conditions the magnitude of visual change will be high, due to the presence of wind turbines within areas up to 15-20 km from Dogger Bank Teesside A & B; however the overall experience of receptors travelling across the North Sea will not be significantly affected.

6.14. Landscape and visual impact

6.14.1. The proposed converter stations are the main potentially visible elements of the development and the Zone of Theoretical Visibility (the extent to which any part of the development can be seen) was determined. Sensitive viewpoints were agreed with Redcar and Cleveland Borough Council.

6.14.2. Measures to reduce landscape and visual impacts are embedded into the design of the cable route and the restoration proposals. Embedded mitigation measures include:

- An early design decision by Forewind to bury the cables rather than overhead lines;
- Single cable route containing two cable systems to minimise the construction footprint and environmental impact;
- Horizontal Directional Drilling method of crossing is proposed at a number of locations along the cable route for example roads e.g. A174 and railways to avoid affecting surface features;
- Reducing the height of the converter stations as much as practicably possible in order to reduce the potential for visual impacts;
- Early cable routing to provide an increased buffer between the cable route and sensitive landscape features such as groups of trees; and
- Avoidance of sensitive designated landscapes.

6.14.3. Proposed additional mitigation includes details of post-construction restoration measures and those which aim to reduce long term landscape and visual impact during operation. These include the extension of two existing landscaped bunds to the north east of Lazenby in order to screen the views towards the development site, and native woodland vegetation will be planted on the top of the new bunding with the aim of providing extra screening from the settlement edge in the long term, and to reduce visual impacts on the wider area.

6.14.4. During construction there will be disturbance to the local landscape arising from construction activity at the landfall, along the High Voltage Direct Current and High Voltage Alternating Current cable route resulting in a limited number of

temporary significant effects but there will be no significant impacts remaining after restoration works have been completed and vegetation has regenerated. The construction of the converter stations and additional bunding will give rise to significant visual impacts on residential receptors at the north-eastern extent of Lazenby.

- 6.14.5. During operation, significant landscape and visual impacts are likely to be restricted to the site of the converter stations, the agricultural farmland to the south and southwest, and the edge of the settlement of Lazenby. This is largely as a result of the introduction of extended areas of bunding and partial close range views of the converter stations. The extension of areas of woodland planting in order to screen views more effectively from the upper storeys of properties within Lazenby will reduce these visual impacts over time, at year 10 it is anticipated that there will be no significant residual visual impacts.
- 6.14.6. No significant impacts are predicted during decommissioning.
- 6.14.7. The York Potash Project could result in localised, direct cumulative effects should the construction phasing of the two projects overlap. There will be additional short term visual change in views experienced by travelling receptors along the A174 in relation to the housing development south of Marske-by-the-Sea, giving rise to minor short term impacts. In the longer term both cumulative landscape and visual impacts will reduce to negligible as the High Voltage Direct Current cable route will be restored to agricultural fields.
- 6.14.8. Overall, the proposed development will have significant residual effects on landscape and visual receptors, but these will be very localised, and set in the context of a landscape where built development is already characteristic.

6.15. Socio-economics

- 6.15.1. A qualitative assessment of the socio-economic impacts and benefits has been undertaken including considering employment figures and the anticipated project expenditure.
- 6.15.2. The North East England Region was identified as the most relevant local economy to assess for socio-economic impacts. Data for the Borough of Redcar and Cleveland have been given to provide context to the regional and UK numbers. The existing workforce numbers and economic baseline for the region was determined using websites such as the Office for National Statistics.
- 6.15.3. Potential socio-economic benefits within the North-East region have been identified for the construction and operation phases relating to project expenditure and job creation.
- 6.15.4. In addition, a number of other proposed offshore wind farms may be based in the North East region. These have been identified as there is potential for cumulative beneficial impacts on the regional economy as well as job creation opportunities within the region
- 6.15.5. Whilst the North East region was analysed as the relevant local economy for assessment purposes, Forewind notes that development of offshore wind has

the potential to have additional beneficial impacts on the national economy and create jobs in the broader economy.

- 6.15.6. Forewind will continue to proactively engage with the UK supply chain and regional suppliers, to ensure that a high quality, sustainable supply base for the industry can be developed. Forewind has already supported initiatives in North East England to ensure businesses are well positioned to tender for the greatest possible share of future work.

6.16. Tourism and recreation

- 6.16.1. The onshore and offshore tourism and recreation existing environment was characterised through a desk study. The features were identified through consultation and information held on tourism websites, such as those managed by Visit England.
- 6.16.2. Some minor, short-term impacts have been identified on onshore tourism and recreation features; associated with disruption and reduced amenity to the Kirkleatham Museum and the Kirkleatham Owl Centre, the local towns and villages, the National Cycle Trail, Public Rights of Ways and other footpaths (including beaches at the landfall location). These impacts will be managed through good communication with the local community and representatives from the tourist attractions, minimising the duration of any closures (if required) and agreement of a strategy with the Public Rights of Way Officer at Redcar and Cleveland Borough Council.
- 6.16.3. In the offshore environment, localised minimal construction impacts include reduced visibility to divers and some localised disruption to anglers.
- 6.16.4. No significant impacts were identified during operation or decommissioning on tourism and recreation features.
- 6.16.5. When considering the impacts of other projects in the locality, the construction of the York Potash Project and Dogger Bank Teesside C & D were identified as potentially causing cumulative impacts on onshore features. Other offshore wind farms in the locality were identified as potentially cumulatively impacting on the offshore environment but overall not to a greater extent than just Dogger Bank Teesside A & B.

6.17. Onshore geology, water resources and land quality

- 6.17.1. A series of desk studies and site walkovers provided details of all geology, rivers, streams, ditches, areas of contamination, flood sensitivity and any important water resources along the route.
- 6.17.2. The potential construction impacts that have been identified include:
- The potential for discharge of contaminants into surface geology, soils and shallow groundwater;
 - Surface water run-off and sediment or contaminant discharge into watercourses; and
 - Removal of groundwater to surface water and the generation of construction waste.

- 6.17.3. However, Forewind will ensure that appropriate construction practices are adopted at all times to manage all potential risks and therefore the only impact that will remain after management is the generation of waste sent for disposal. This will be minimised through a Site Waste Management Plan.
- 6.17.4. The construction of the York Potash Project and Dogger Bank Teesside A & B at the same time would generate large quantities of excavated material and both projects would require suitable off-site waste management options (including landfill).
- 6.17.5. During operation, no significant impacts have been identified and during decommissioning, will be similar to those during construction and will be subject to a decommissioning plan and associated environmental studies at the relevant time.

6.18. Terrestrial ecology

- 6.18.1. A combination of desk studies and field surveys were undertaken to inform the baseline environment. These included habitat, bird, bat, otter, water vole, reptile and great crested newt surveys.
- 6.18.2. The cable route and converter stations are mainly located within agricultural land of low ecological value. However the Redcar to Saltburn Coast Local Wildlife Site, with its more valued coastal grassland, will be crossed by the cable route, impacting 15 hedgerows. A diverse mix of bird species were found to be breeding along the cable corridor and wintering bird species, (including golden plover and lapwing) were found to be using the coastal fields close to the landfill during the winter months. Common bat species were also recorded foraging and commuting along the hedgerow network.
- 6.18.3. Mitigation measures proposed to reduce any construction impacts include minimising the working area, habitat reinstatement, consultation, sensitive vegetation clearance and working practices.
- 6.18.4. No significant operation or decommissioning impacts were considered likely but impacts on wintering birds were identified if Dogger Bank Teesside C & D was constructed at the same time. A construction coordination plan for the projects will be required, to include detailed consideration of how best to minimise impacts on wintering birds.

6.19. Land use and agriculture

- 6.19.1. Existing land use was determined through a desk study of available data, information obtained during consultation and a site walkover survey. Principle data sources used included the Agricultural Land Classification mapping held by Natural England and the National Soil Maps held by Cranfield University. The majority of the onshore elements are located within farm land and the cable route avoids residential and built up areas, where possible.
- 6.19.2. Onshore construction activities will disrupt existing land use and agricultural activities along the length of the cable route and at the site of the converter stations. The key impacts included the quantity of land taken out of existing use; degradation and loss of soils; and disturbance and nuisance to landowners.

These are considered acceptable given the temporary nature of the impacts, encountered during construction only. They will also be minimised through reinstatement of land, appropriate soil management and soil surveys, compensation to landowners and occupiers for any resultant losses and ongoing liaison.

- 6.19.3. During operation, the majority of the land will revert back to its existing use with only the agricultural land at the converter stations site permanently lost. This area will be minimised wherever possible to ensure only minimal impacts remain. The impacts during decommissioning will be similar to those during construction and will be subject to a decommissioning plan and associated studies at the relevant time.
- 6.19.4. When the cumulative construction impacts of the scheme are considered, the overall residual impacts remain the same, with the exception of soil degradation, which could result in a localised significant impact. In particular, this is from the risk of soil compaction and deterioration of the soil structure which could result in reduced fertility and crop yields.

6.20. Onshore cultural heritage

- 6.20.1. Known sites of cultural heritage importance were avoided when identifying the preferred location of the converter stations site and the cable route. Geophysical surveys of the construction areas were undertaken between February and April 2013, in order to detect buried archaeological features below the current ground surface. Trial trenches will be excavated via a planning condition to investigate the features detected and to ensure they are preserved to an appropriate level before or during construction. With these measures in place, there will be no significant impacts on buried archaeological features during construction.
- 6.20.2. The operational converter stations will be visible from the scheduled hillfort at Eston Nab, however the buildings will be no taller than the existing structures within The Wilton Complex and will not be a prominent feature in the landscape. There will be no significant impact to the setting of Eston Nab or any other site of cultural heritage importance.

6.21. Traffic and access

- 6.21.1. An assessment of the roads (and communities that adjoin them) expected to be used by construction traffic was undertaken to identify any routes that are considered to be sensitive to changes in traffic flows. This assessment used traffic count data collected from the Department for Transport and was supplemented with new data collected by Forewind.
- 6.21.2. The construction phase will involve significant numbers of vehicles using the main roads through the area. To reduce the impact upon local communities and sensitive receptors associated with the construction work the two main construction compounds have been positioned to avoid routing traffic through sensitive locations, for example avoiding schools and residential areas. This is supplemented by a Traffic and Access Strategy that seeks to manage the traffic impact through 'embedded mitigation' measures outlined:

- Access to the development primarily from A or B roads, thereby minimising the impacts upon local communities and utilising the most suitable roads;
- Access routes located close to the main A and B roads to reduce the impact upon local communities;
- The use of a remote haul road to reduce trips upon the highway network to distribute materials as well as reducing the number of points of access on to the highway network;
- The use of an internal road from the Wilton Complex under the A1053 (via an underpass) to the existing NGET substation at Lackenby to reduce traffic movements upon the B1380 where possible;
- Primary compounds and the converter stations are located away from sensitive receptors to reduce the traffic impact upon local communities;
- The use of Horizontal Directional Drilling for all (public highway) road and rail crossings to reduce the disruption to traffic from more conventional cut and cover techniques;
- The linear nature of the project will allow for the even distribution of activities and associated daily Heavy Goods Vehicle demand; and
- The implementation of car-sharing amongst construction staff at a minimum ratio of 2.5 employees to a vehicle to reduce light commercial vehicle traffic.

6.21.3. The construction phase will involve the movement of a number of large abnormal loads associated with the converter stations. To ensure the impact of these manoeuvres can be accommodated an Abnormal Load Routing study has been commissioned to identify the best route from Teesport and any temporary remedial mitigation measures would be required.

6.21.4. A Construction Traffic Management Plan and Construction Travel Plan will be developed in consultation with highways authorities (Redcar & Cleveland Borough Council and the Highways Agency) to ensure that construction traffic is managed throughout the construction period. In addition to the embedded mitigation outlined the plans will include measures to reduce the risk of accidents, including temporary speed restrictions and advanced warning signs close to the proposed site accesses.

6.21.5. With the measures outlined in place the impact of construction traffic is not considered significant and no further mitigation is proposed.

6.22. Noise and vibration

6.22.1. A baseline noise survey was conducted at residential properties within 1km of the converter stations site, along the onshore cable route and landfall area. The survey demonstrated that noise levels at the converter stations site were typical of a mixed industrial and residential area. The main noise sources include road traffic from nearby roads, noise from the Wilton Complex and the existing NGET substation at Lackenby.

- 6.22.2. During construction, a number of properties in the Old Lackenby and Marske-by-the-Sea areas have been assessed as close enough to the proposed construction works to potentially experience noise levels in excess of the predetermined 65dB noise limit. Construction noise in any one location will be relatively short-lived and the installation of fencing, to screen these properties from the construction works, will reduce the noise level at this small number of properties where an exceedance is predicted.
- 6.22.3. An assessment of operational noise for the converter stations was conducted using computer-modelling software. Noise predictions were made at the closest receptor locations on The Grange Estate, Lazenby Grange Farmhouse, Wilton Complex office accommodation, Wilton Primary School and Wilton Golf Club and some form of noise reduction will be required to ensure operational noise levels are acceptable at these receptors.
- 6.22.4. There is a range of industry standard methods that can be employed to reduce operational noise including: use of quieter equipment, noise barriers and noise enclosures. With these in place it was possible to determine the level of noise reduction for each piece of equipment so that an acceptable low noise level is maintained at these properties. Impacts from the operation of the converter stations are therefore not considered to be significant.

6.23. Air quality

- 6.23.1. The potential for dust to be generated during the onshore construction activities has been assessed. In addition, vehicle exhaust emissions from construction, operational and decommissioning activities associated with both onshore (cars, heavy good vehicles, excavators, etc.) and offshore activities (boats) were also assessed.
- 6.23.2. There is the potential for air quality impacts where construction is close to housing and public areas. However, Forewind will implement a range of measures within a Dust Management Plan to ensure that dust generated during construction does not cause a nuisance to people. Such measures are routinely and successfully applied to construction projects throughout the UK.

7. Programme

7.1. Outline programme

7.1.1. The indicative outline programme for the delivery of Dogger Bank Teesside A&B is as follows:

- Second quarter of 2012 – Request for Scoping Opinion and Statutory consultation on Preliminary Environmental Information 1;
- 2012 to third quarter of 2013 – Environmental impact assessment reporting and preparation of the draft Environmental Statement;
- Fourth quarter of 2013 – Statutory consultation on the draft Environmental Statement;
- First quarter of 2014 – Application submitted to the Planning Inspectorate (including submission of the draft Development Consent Order and final Environmental Statement);
- Second quarter of 2014 – Start of examination of application by Planning Inspectorate;
- Third quarter of 2015 – Determination of application by the Secretary of State;
- 2015 – Pre-construction phase and earliest start of onshore construction works;
- 2016 – Earliest start of offshore construction; and
- 2018 – Earliest start of operation.

7.1.2. The construction programme for Dogger Bank Teesside A & B will be dependent on a number of factors that include, but are not limited to:

- The date that development consent is awarded;
- The future developers and operators of the development;
- The grid connection date agreed with National Grid (which may be subject to change); and

7.1.3. The availability and lead times associated with the key project components, such as wind turbines and foundations.