Norfolk Boreas Offshore Wind Farm

Environmental Impact Assessment Scoping Report Non-Technical Summary

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Photo: Ormonde Offshore Wind Farm

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1. Introduction

This document provides a high level non-technical summary of the Norfolk Boreas Offshore wind farm Scoping Report. Including a description of the project, an outline of the Environmental impact assessment (EIA) process, the key environmental factors under consideration and a summary of how the consultation process works. The full Norfolk Boreas Scoping Report scoping report is available from the Planning Inspectorates website:

https://infrastructure.planninginspectorate.gov.uk

Norfolk Boreas is large enough to be considered as a Nationally Significant Infrastructure Project under the Planning Act 2008. Consequently an EIA is required as part of a Development Consent Order (DCO) application. The Scoping Report is the first phase of the EIA.

The project is being developed by Vattenfall Wind Power Limited (VWPL) and our key drivers are providing cost effective energy security for the UK, reducing greenhouse gas emissions, and maximising economic opportunities through investment in the UK.

Norfolk Boreas is the sister project to the proposed Norfolk Vanguard offshore wind farm project which is also currently being developed by Vattenfall.

2. The project

Norfolk Boreas wind farm will be located 72 kilometres (at the closest point) offshore from the Norfolk Coast. It will have a generation capacity of 1,800 Mega Watts of energy and will produce enough energy to power 1.3million UK households[1]. The Norfolk Boreas project when constructed will comprise an array of offshore wind turbines and offshore substations which will be connected to the shore by offshore export cables installed within an offshore cable corridor.

The project will also require onshore infrastructure in order to transmit and connect the offshore wind farm to the National Grid (Figure 1), which in summary would comprise:

- Landfall;
- A cable relay station, (only required if an Alternating Current (AC) solution is chosen);
- Underground cables;
- An onshore project substation near Necton; and
- Works at the Necton National Grid Substation (including extension of the existing substation and modification of the overhead powerlines).

[1] The load factor is the actual output of a turbine benchmarked against its theoretical maximum output in a year (http://www.renewableuk.com/page/UKWEDExplained)

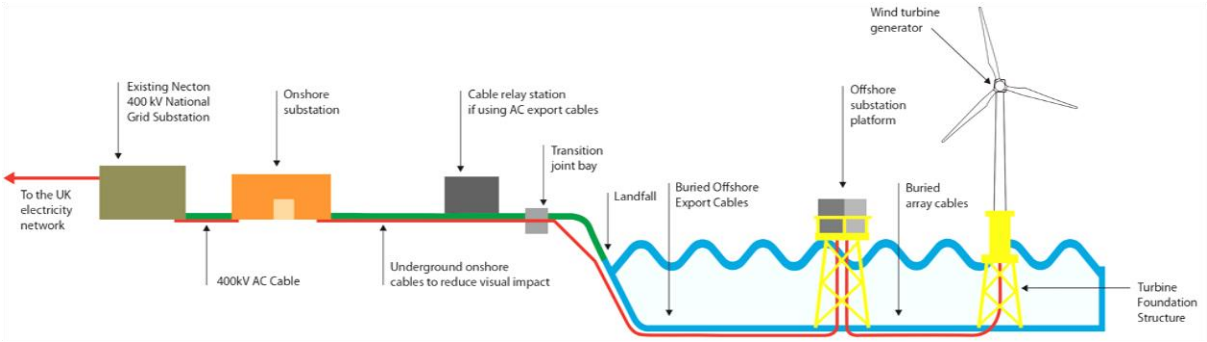


Figure 1 Diagram illustrating the key components of the Norfolk Boreas project

If the project is built, between 90 and 257 wind turbine generators would be installed within the Norfolk Boreas site (**Figure 2**). A range of different turbines sizes and foundations are currently being considered. Turbines could be as tall as 325m (above sea level) and produce up to 20 Mega Watts of power whilst the smallest turbines under consideration would produce 7 Mega Watts of power.

Five different types of foundation design are currently being considered, these are:

- **Monopile** – A large cylinder which is hammered into the seabed;
- **Jackets on pin piles (3 or 4 legs)** – a lattice structure, similar to an electricity pylon which is attached to the seabed by hollow metal poles which are hammered into the seabed;
- **Jackets on suction caisson (3 or 4 legs)** a lattice structure, similar to an electricity pylon which is attached to the seabed by tube which is inserted into the seabed using a negative pressure created by sucking the water from inside the tube;
- **Gravity Base Structures** - Large structure which relies on weight to keep it attached to the seabed; and
- **Floating**- a platform which is anchored to the seabed by mooring lines.

The turbines will be connected to the offshore substations by an array of electrical cables. Array cables will transmit energy from the turbines at 75 kilovolts.

Substations will collect the energy and transmit it along the export cables connecting to the shore. There are two technical options being considered for transmitting the electricity from the wind farm to shore. These are based on either an Alternating Current (AC) or Direct Current (DC). The substation design will depend on which option is selected.

All offshore cables would be buried where possible and when not possible cable protection would be installed to ensure the cables are not damaged.

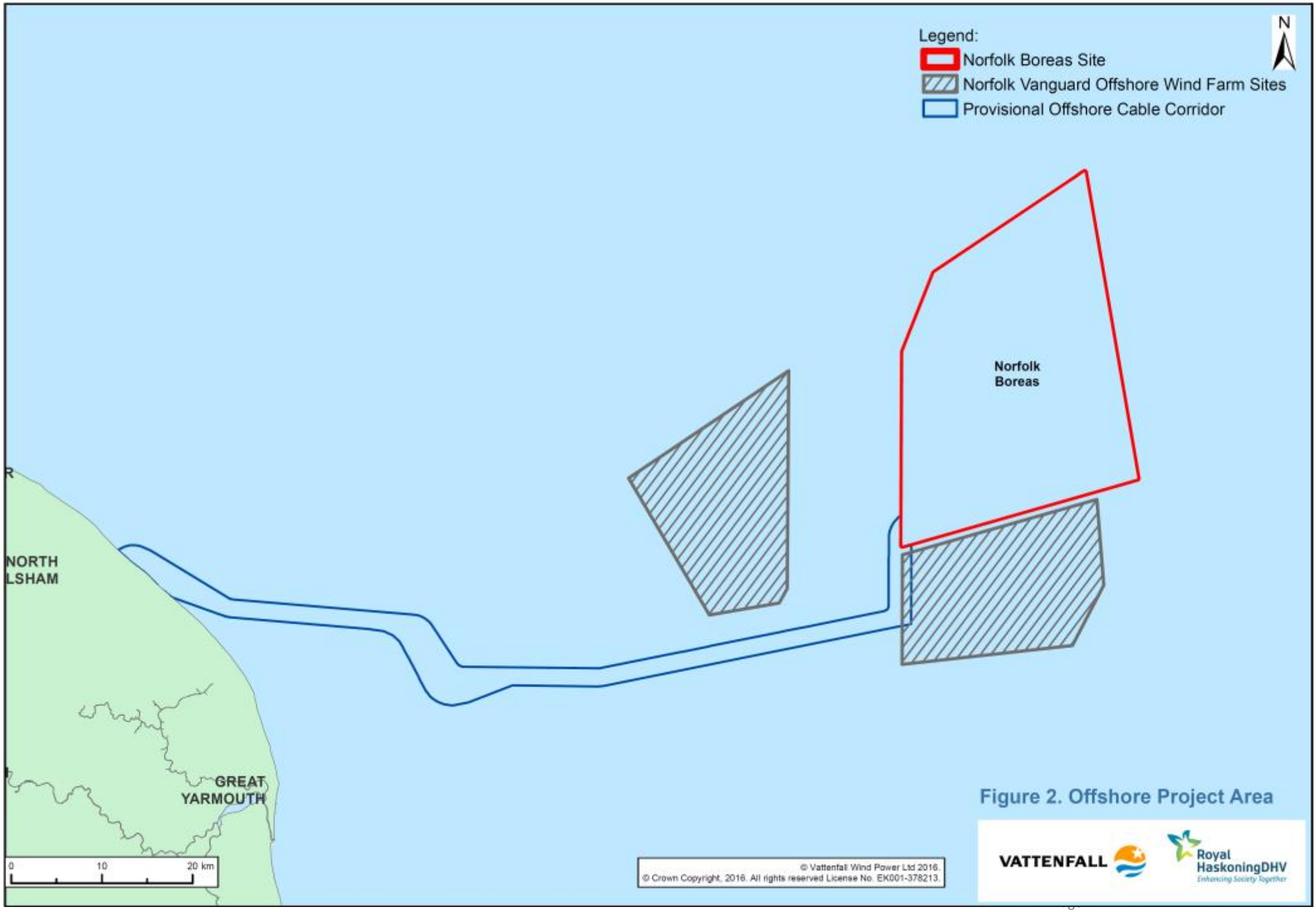


Figure 2. Offshore Project Area

Figure 3. Onshore Project Area

Up to six offshore export cables operating at between 220 and 245 kilovolts will be used to transmit the electricity to shore. Export cables would make landfall at one of the three locations currently being considered. These are:

- Bacton Green;
- Walcott Gap; and
- Happisburgh South.

At the landfall narrow tunnels will be drilled (by a process called Horizontal directional drilling) from the land, under the cliffs and seashore to a break out point which will either be on the beach or the seabed just offshore. From the location at which the drill breaks out, a duct (hollow tube) will be pulled back through each tunnel on to land.

Once the ducts are in place the offshore export cables would be pulled through the cliffs on to the land. At a sufficient distance inland from the exiting shore line to take account of coastal erosion a transition pit will be constructed within which the offshore cables would be joined to onshore cables.

If an AC electrical solution is used a cable relay station would then be required to improve the efficiency of the electrical transmission by providing compensation for electrical losses associated with an AC system. The cable relay station would be located in one of the green hatched areas shown in Figure 3. A provisional three dimensional visualisation of a cable relay station is provided in Figure 4.

Figure 4 visualisation of cable relay station

Box 1. Norfolk Vanguard and Norfolk Boreas Scenarios

The Norfolk Vanguard project (Norfolk Boreas's sister project) will make an application for a Development Consent Order approximately one year prior to Norfolk Boreas making its application. Norfolk Vanguard will apply for permission to, not only construct its own infrastructure, but also to construct some infrastructure for Norfolk Boreas. This approach will minimise disruption and environmental impacts as many areas will only be impacted once. Under this approach Norfolk Vanguard will undertake the following during its construction which will be utilised by Norfolk Boreas:

- Install buried cable ducts along the entire length of the onshore cable route,
- Undertake work to extend the existing national grid substation at Necton (further information provided below);
- Undertake modifications to the overhead powerlines around the Necton National Grid substation (further information provided below); and
- Install landscaping schemes designed to reduce the visual impacts at the onshore project substation and cable relay stations (further information provided below).

If for any reason Norfolk Vanguard is not built Norfolk Boreas will be required to undertake the work listed above and will make an application to be able to undertake these works. Therefore two scenarios must be considered

- Scenario 1 – Norfolk Vanguard is built and undertakes the above works for Norfolk Boreas
- Scenario 2 – Norfolk Vanguard is not built and therefore Norfolk Boreas will need to undertake all works listed above.

Along the entirety of the onshore export cable corridor cable ducts will be buried between one and two metres below ground level. Under scenario 1 (Box 1), these ducts would have been installed, however, under Scenario 2, trenches would be excavated within which the ducts would be laid. Once the ducts are laid the ground would be reinstated to its original condition.

Jointing pits would be established at approximately 800m intervals along the onshore cable corridor. Once each pit has been established cables will be pulled through the ducts, jointed together and sealed in a concrete box. Once the cables are jointed the ground above would be reinstated. Small above ground access points will be located above some of the jointing pits.

All onshore cable corridor options from the three landfalls reach a convergence point at a location to the north of North Walsham (Figure 3). From North Walsham the onshore cable corridors head south-west across Norfolk passing to the north of Aylsham and Reepham

before crossing the River Wensum. From this point the onshore cable corridors pass to the North of Dereham before crossing the A47 and entering the onshore project substation zone near Necton (Figure 3).

An onshore project substation will be required to convert the electricity produced by the windfarm into a format that can be accepted by the National Grid. Visualisations of what the onshore project substation could look like are presented in **Figure 5.** The project substation is likely to be located in the onshore project substation zone shown in Figure 3.

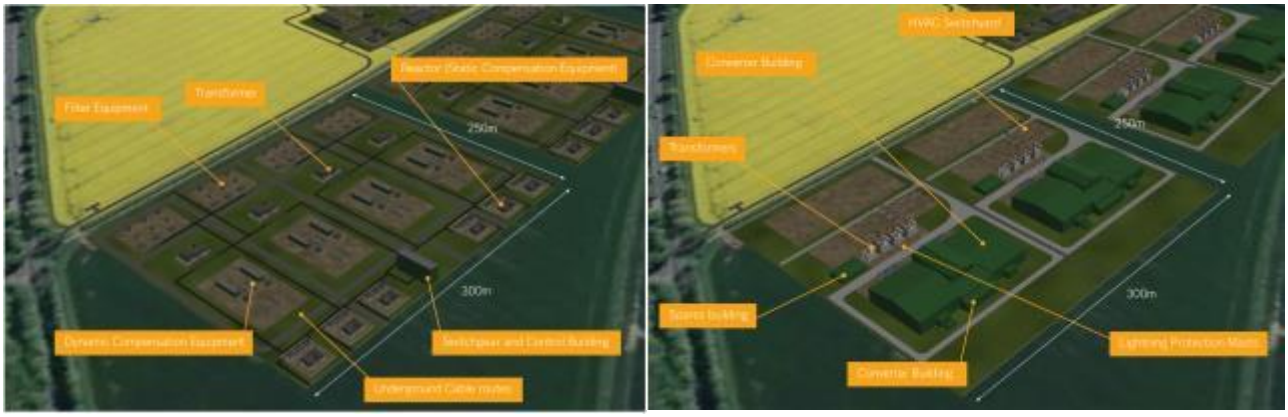


Figure 5 Visualisation of HVAC (right) and HVDC (left) onshore project substations

Once the electricity has been converted it will transmitted through 400 kilovolt underground cables to the Necton National Grid substation Figure 3.

In order accommodate the electricity produced by the Norfolk Boreas project the Necton National Grid substation will need to be extended to create “customer bays” to except the electricity. The extension would be in an east west direction and would be within the Necton National Grid Substation extension zone displayed in Figure 3.

Due to the extension of the Necton National Grid substation the overhead powerline configuration around Necton would require some modification. This would include the removal of one existing pylon and the installation of two new pylons which would be approximately to same dimensions as the existing pylons.

Under Scenario 1 see Box 1 the extension of the Necton National Grid substation and the overhead line modification would be undertaken by Norfolk Vanguard. Under Scenario 2 Norfolk Boreas would be required to undertake this work.

3. Site selection process

The Norfolk Boreas project is in the early stages of development and although extensive site selection work has already been completed there is still a lot of refinement work to be done. For example further iterations of cable relay and substation zones will be developed during 2017 following review of feedback from public drop-in Exhibitions held in March 2017 See Section 6) and with due regard to input from other stakeholders throughout 2017 and 2018.

Key elements of the Norfolk Boreas project have been identified and optimised through a site selection process taking account of environmental, physical, technical, commercial and social considerations and opportunities as well as engineering feasibility with the aim of identifying sites that will, in the long term, provide the lowest cost of energy whilst minimising impacts.

The main considerations when identifying the location of Norfolk Boreas offshore elements were avoiding:

- Shore to sea visual impacts by location the array at a sufficient distance from shore;
- Interaction with inshore fisheries interests;
- International shipping routes and areas of high shipping activity;
- Dredging and aggregate extraction areas;
- Ministry of Defence danger and exercise areas;
- Marine Conservation designations;
- Areas of high ornithological activity;
- Herring spawning areas; and
- Existing cables and pipelines.

The main considerations when identifying the landfall area were:

- It provides a relatively short route from Norfolk Vanguard and Norfolk Boreas;
- There are minimal cable/pipeline crossings;
- It crosses the shipping deep water route using the shortest distance;
- It avoids the areas of known inshore seabed mobility off Gorleston;
- It is around 6km from the aggregate dredging grounds off Lowestoft thereby reducing any interaction;
- The minimum corridor width of 2km could accommodate cables from both the Norfolk Vanguard and Norfolk Boreas project should this be required; and
- It allows for onshore cable routeing options outside the Broads National Park.

In October 2016 an offer was made by National Grid to connect to the 400 kilovolt network at the Existing Necton National Grid substation. This followed a detailed review by National Grid and Vattenfall to look at the range of connection options and identify the most efficient and economic point to connect. The main considerations when identifying the onshore cable route and project sub stations were:

- The National Grid offer to connect at the Necton National Grid substation;
- Avoid proximity to residential dwellings;
- Avoid proximity to historic buildings;
- Avoid designated sites;

- Minimise impacts to local residents in relation to access to services and road usage, including footpath closures;
- Wherever possible, the onshore cable corridor would seek to use open agricultural land;
- Minimise requirement for road, river and rail crossings;
- Avoid areas of important habitat, trees, ponds and agricultural ditches;
- Install cables in flat terrain maintaining a straight route where possible for ease of pulling cables through ducts;
- Avoid other services (e.g. gas pipelines);
- Minimise the number of hedgerow crossings, using existing gaps in field boundaries if possible; and
- Minimise impacts on agricultural practices and access, avoid rendering parcels of agricultural land inaccessible during construction.

The main considerations when identifying the cable relay station and project substation locations were the same as those for the cable route with the additional considerations of:

- The cable relay station needs to be as close to the landfall as possible;
- The Norfolk Boreas onshore project substation needs to be within 3km of the Necton National Grid connection point;
- Ease of road access for large loads;
- Use of existing woodland, and landform to mask substations and cable relay stations, minimising visual impact wherever possible; and
- Avoiding noise sensitive receptors such as houses

4. The EIA process

The EIA will consider all relevant topics covered under the three general areas of physical environment, biological environment and human environment.

As part of the process, a detailed description of the current baseline will be identified, through a combination of desk based studies, consultation and on site surveys.

All potential impacts of the construction, operation or decommissioning of Norfolk Boreas will be identified, and an assessment will be made on the severity of each potential impact using a standardised approach by EIA specialists.

Where impact assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, mitigation measures will be proposed and discussed with the relevant authorities to avoid impacts or reduce them to acceptable levels and, if possible, to enhance the environment.

The process will also consider:

- Inter-relationships, where impacts to one receptor can have a knock on impact on another (for example an impact on a fish population may lead to reduced prey for birds and marine mammals);
- Cumulative impacts, where the project will be considered alongside the predicted impacts of other sizable construction projects in the nearby area (for example another offshore wind farm or a road development); and
- Trans-boundary impacts, where activities in other countries may be impacted (for example shipping routes and fishing activities).

5. The Environmental Scoping Report

The topics below have been identified through a Scoping Report, submitted to the Planning Inspectorate on 9th May 2017 by Vattenfall Wind Power Limited.

The Scoping Report outlines the receptors that will be considered during the EIA and the planned approach to data gathering and characterising the existing environment, assessing potential impacts associated with Norfolk Boreas and developing mitigation measures. A programme of consultation will be ongoing with stakeholders and communities throughout the process (See Section 6). VWPL is committed to engaging with the community and stakeholders. Responses to the Scoping Request, as well as feedback during public drop-in exhibitions and the consultation process as a whole, will inform the development of Norfolk Boreas.

The EIA for Norfolk Boreas will be undertaken by experienced and well qualified technical specialists using best practice and following appropriate and relevant guidance. Further information can be found in the Norfolk Boreas Scoping Report.

In response to the Scoping Request the Planning Inspectorate will provide a "Scoping Opinion" (due at the end of June 2017). Once published, this can be found on the Planning Inspectorate website, details of which are listed in Section 7 at the end of this document.

Offshore topics for environmental impact assessment

The following topics will be assessed in the Norfolk Boreas EIA, and will be reviewed and updated in accordance with the Planning Inspectorate's *Scoping Opinion for Norfolk Boreas Offshore Wind Farm* once published.

Marine Geology, Oceanography and Physical Processes

Water depths across the Norfolk Boreas site vary between approximately 22 and 41m at the lowest possible tide. The average spring tide cycle varies between 0.1m – 1.5m.

The waves are swell waves generated offshore and wind-waves generated locally. Since wind-waves are determined by the weather, the wave patterns are highly irregular with strong seasonal variation. The dominant wind direction is from the south-southwest.

The Norfolk Boreas site is dominated by sand and slightly gravelly sand but also contains gravelly sand, gravelly muddy sand and slightly gravelly muddy sand.

The coast of north-east Norfolk is an almost continuous line of soft glacial till cliffs. Rapid cliff erosion is currently occurring in places throughout this frontage. Severe storm events can rapidly change beach levels and the degree of exposure of the natural or defended coastline. Net sediment transport is to the south-east and the potential for transport increases with distance south as the coastline curves clockwise.

The potential impacts which will be considered for marine geology, oceanography and physical processes include:

- Effects on waves and tidal currents;
- Effects on seabed sediments; and
- Effects on suspend sediments.

Marine Water and Sediment Quality

Marine water and sediment quality will be considered within the EIA as if reduced could negatively impact fish or seabed plants and animals and by extension, commercial fisheries.

The sediments across the Norfolk Boreas site are coarse and are not considered likely to contain contaminants. The Norfolk Boreas site does not overlap any disposal sites but there are active gas wells within the site which could be potential sources of contamination.

Potential impacts which will be considered for marine water and sediment quality include:

- Deterioration in water quality due to increased suspended sediments;
- Release of contaminated sediments; and
- Accidental release of contaminants from vessels and offshore substations.

Seabed Ecology

A broad scale survey of the seabed ecology of the East Anglia Zone (within which the Norfolk Boreas site is located) was conducted in 2010 and 2011. These studies included a combination of samples taken from the seabed using a grabbing device, fishing gear which was trawled across the seabed and underwater video imagery.

Across the site, the main species were found to be marine worms, followed by brittle stars, sea urchins and starfish. Crabs were also present. Two protected habitats; sandbanks and reefs formed by marine worms may be present in the area. The provisional offshore cable

corridor runs through the Haisborough, Hammond and Winterton Site of Community Importance (SCI) and the Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ).

Potential impacts which will be considered for seabed ecology include:

- Physical disturbance;
- Smothering;
- Disturbance and distribution of contaminated sediments;
- Underwater noise and vibration;
- Loss of habitat;
- Potential impacts on designated sites of marine conservation interest; and
- Colonisation of foundations.

Fish and Shellfish Ecology

Records of fish landed at UK and foreign ports provide a good understanding of what species occur in the region. Another key source of information is the International Bottom Trawl Survey (IBTS). This survey is carried out annually twice a year by eight countries and covers the entire North Sea and Skagerrak/Kattegat with the principle objectives of looking at patterns in fish populations.

The landings data show that the most common species landed from the East Anglia Zone are (in order): plaice, sprat, cod and sole, with flounder, horse mackerel, dab, and herring also often landed.

Shellfish landings within the East Anglia Zone include edible crab, whelk, mussel and lobster.

Potential impacts which will be considered for fish and shellfish ecology include:

- Physical disturbance;
- Increased suspended sediments and smothering;
- Disturbance and distribution of contaminated sediments;
- Underwater noise and vibration;
- Loss of habitat; and
- Fish aggregation.

Marine Mammal Ecology

All whales and dolphins within UK waters are protected by international laws. Surveys for marine mammals (whales, dolphins and seals) were conducted across the East Anglia Zone in conjunction with the bird surveys by observers placed on boats (boat based) and in planes (aerial).

Grey seal, Jen McMillan

Low numbers of whales and dolphins were recorded across the East Anglia Zone, with only 108 individuals identified from the 17 months of data. The majority of these were positively identified as harbour porpoise, which accounted for 38% of sightings. Surveys will continue to obtain up to 2 years of data.

Two species of seal (grey and harbour) may potentially use the Norfolk Boreas site and cable corridor. No seals have been identified in the Boreas site surveys to date.

The Southern North Sea candidate Special Area of Conservation (cSAC) is proposed for designation for harbour porpoise. The Wash SAC is designated for harbour seal.

Potential impacts which will be considered for marine mammals include:

- Underwater noise;
- Impacts upon prey species;
- Vessel interaction;
- Disturbance at seal haul out sites;
- Changes to water quality;
- Potential impacts on sites of marine Conservation Interest;
- Entanglement; and
- Floating barrier effects.

Offshore ornithology

Bird surveys were undertaken across the East Anglia Zone from 2009 to 2011. Aerial surveys started in the Norfolk Boreas site in August 2016 and will continue for up to two years. These will provide an understanding of the species and numbers of birds using the site. Information gathered to date indicates key species and populations of concern for the Norfolk Boreas assessment are likely to be migrant and non-breeding seabirds.


Fulmar, David Tarrant

The Greater Wash Potential Special Protection Area (pSPA) overlaps with the offshore cable corridor. A number of fully designated SPAs will also be considered for potential connectivity between their colonies and the Norfolk Boreas site.

Potential impacts which will be considered for offshore ornithology include:

- Disturbance and displacement;
- Impacts upon prey species;
- Collision risk; and
- Barrier effects.

Commercial Fisheries

The majority of fishing that occurs within the Norfolk Boreas site is conducted by Dutch registered fishing vessels with a few Belgian and UK registered vessels. These vessels are mainly beam trawlers aiming to catch sole and plaice in autumn and winter. Cod is caught by longlines (baited hooks attached to a fishing line) in the winter and spring. The longliners also catch rays, spurdog and bass throughout the year.

The inshore fishery along the export cable route is dominated by longliners, gillnets and potting.

Potential impacts which will be considered for commercial fisheries include:

- Impacts on commercial exploited species;
- Loss or restricted access to traditional fishing grounds;
- Displacement of fishing activities;
- Increased collision risks;
- Increased steaming times; and
- Loss or damage to fishing gear.

Shipping and Navigation

The region of the southern North Sea in which the Norfolk Boreas site is located is considered busy in terms of passing vessel traffic. The majority of this traffic is comprised of cargo vessels and tankers. Vessels associated with the oil and gas industry are also frequently present in the area. Other traffic transiting the region includes passenger (both commercial ferries and cruise liners), fishing, and recreational vessels.

The potential impacts which will be considered for commercial fisheries include:

- Vessel routing;
- Displacement of third party marine activities;
- Increased collision (vessel to vessel) risk;
- Allision (collision to structure) risk;
- Interaction with subsea cables;
- Impacts on emergency response resources; and
- Interference with marine navigational equipment.

Offshore Archaeology and Cultural Heritage

Archaeological features include maritime sites (wrecks and wreckage from prehistory to the present), aviation sites and submerged prehistoric archaeological sites. Archaeological features were identified through a combination of interpretation of different seabed survey types, records held by national inventories and other sources.

To determine the archaeological features, the results of the marine surveys will be reviewed alongside previously collected data sets.

Potential impacts which will be considered for offshore archaeology and cultural heritage include:

- Direct physical disturbance;
- Indirect physical disturbance; and
- Indirect disturbance of setting

Aviation and Radar


Aeroplane, Vattenfall

The airspace within, above and surrounding the Norfolk Boreas site is used both by civil and military aircraft. The nearest UK airport to the Norfolk Boreas site is Norwich Airport, approximately 90km away. Amsterdam Schiphol Airport is approximately 115km from the eastern boundary of Norfolk Boreas. A number of Helicopter Main Routes are located in the vicinity of the Norfolk Boreas site. One offshore platform is present within the site boundary, with a further eight located nearby.

There are four Royal Air Force (RAF) stations located in the East Anglian region and a single Army Air Corp base at Wattisham. Although all of these military bases are located more than 130km away from the Norfolk Boreas site, aircraft operating from any of these bases may transit through or within the airspace above the Norfolk Boreas site.

The nearest Air Defence Radar (ADR) to Norfolk Boreas is located at RAF Trimingham in North Norfolk. The majority of the Norfolk Boreas site would be within radar coverage and theoretically detectable by this radar.

Potential impacts which will be considered for aviation and radar include:

- Effects on aviation radar systems;
- Risk of aviation collision; and
- Effects on helicopter main routes and offshore platforms.

Infrastructure and Other Users

A number of other wind farm developments are in various stages of the planning process within the former East Anglia Zone, including Norfolk Vanguard, East Anglia THREE, East Anglia ONE, East Anglia ONE North and East Anglia TWO. The nearest operational windfarm is Scroby Sands Offshore Wind Farm, located 68km away.

There is one gas platform and five wells currently active within the Norfolk Boreas site. There are currently no aggregate dredging areas within offshore project area. A number of subsea cables are present. There is one disused marine disposal site that runs through the Norfolk Boreas site and the provisional offshore cable corridor.

There are currently two Ministry of Defence (MoD) identified explosives dumping grounds to the west and south west of the former East Anglia Zone and no Military practice and exercise areas (PEXAs) overlap with Norfolk Boreas or the offshore cable corridor.

Potential impacts which will be considered for infrastructure and other users include:

- Potential interference with other wind farms;
- Potential interference with oil and gas operations;
- Physical impacts to subsea cables and pipelines; and
- Impacts on aggregate dredging activities.

Topics removed from the assessment

Having considered the following topics, it is proposed that they are scoped out of the assessment and not assessed within the Norfolk Boreas Environmental Impact Assessment:

- Air Quality (offshore); and
- Airborne noise (offshore)

Further detail on these topics, and the reasons for removing them from the assessment, can be found in the Norfolk Boreas Scoping Report.

Onshore

Ground Conditions and Contamination

The solid geology of the Norfolk area is principally chalk, which is covered by marine sands and gravels in the east. A number of Mineral Safeguarding Zones[2] and groundwater Source Protection Zones[3] are present.

The Happisburgh Cliffs Site of Special Scientific Interest (SSSI) is designated specifically for its geological interest.

The majority of the cable route is located across arable fields and there is potential for both diffuse and point source pollution to be present in relation to current and past agricultural activities.

[2] minerals safeguarding is the process of ensuring that non-minerals development does not needlessly prevent the future extraction of mineral resources

[3] Groundwater provides much of our drinking water and it also maintains the flow in many of our rivers. Source Protection Zones (SPZs) are defined for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area.

Potential impacts that will be considered for ground conditions and contamination include:

- Contamination;
- Alteration to the coastline; and
- Sterilisation of mineral resources and waste generation.

Air Quality

Due to the largely rural setting, local air quality conditions are likely to be favourable and unlikely to exceed Government National Air Quality Objectives.

Potential impacts which will be considered for air quality include:

- Generation of dust and particulates (e.g. from earth moving or transport of dry materials) potentially having an adverse impact on sensitive receptors; and
- Exhaust emissions from construction traffic.

Water Resources and Flood Risk

The chalk bedrock is designated as a Principal Aquifer and a number of groundwater Source Protection Zones (SPZs) are identified within the area.

The onshore cable routes cross a number of river systems. The principal watercourses of interest are the River Bure, the River Wensum and the River Wissey and their tributaries, in addition to a number of smaller watercourses and drainage channels.

The River Wensum is designated as a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) on account of the water-dependent features and habitats that it supports.

Environment Agency flood zone maps indicate that the majority of the onshore scoping area is located within an area of low flood risk. An area of high flood risk is located close the landfall area.

Potential impacts which will be considered for water resource and flood risk include:

- Direct disturbance of surface water bodies;
- Increased surface water runoff and altered groundwater flows;
- Increased sediment supply;
- Accidental release of fuels, oils, lubricants and construction materials;
- Increased surface water run-off; and
- Changes to water quality.

Land Use

The land use within the onshore cable route is predominantly agricultural. There are a number of villages and urban areas close by. The land within the cable route is classed as

being agricultural grades 1 (excellent quality), 2 (very good quality) and 3 (good to moderate quality).

A number of Public Rights of Way (PRoW) cross the onshore cable route, including The Weavers Way and Paston Way. The Marriott's Way and The Bure-Valley Way also run close by. A number of local footpaths are also crossed. National Cycle Routes 1 and 13, and Regional Cycle Route 33 also cross the onshore cable route.

Potential impacts which will be considered for land use include:

- Change in agricultural productivity;
- Impacts to drainage;
- Disruption to farming practices;
- Temporary closure/re-direction of PRoW / cycle paths;
- Impacts to existing utilities;
- Loss of land;
- Public health and safety; and
- Soil heating.

Onshore Ecology


Great crested newt. RHDHV

40 statutory designated sites and 29 non-statutory designated sites have been identified within 2km of the onshore works. Due to careful selection of the cable route, all statutory designated sites will be avoided through micro-siting or through using particular engineering methodology.

Species of conservation interest along the cable route include bats, badger, otter, water vole, great crested newt and reptiles. Several non-native invasive species are also known to be present.

Ecology surveys are ongoing to characterise the habitats and species present within the footprint of onshore works.

Potential impacts which will be considered for onshore ecology include:

- Impacts to statutory and non-statutory designated sites;
- Impacts to habitats;
- Impacts to legally protected and notable species;
- Spread of non-native invasive species; and
- Impacts to fauna due to lighting.

Onshore Ornithology

Three designated sites which fall within 5km of the onshore works contain features relating to passage and/or wintering birds, and six contain features relating to breeding birds. A number of important habitats and bird species have potential to be present in the footprint of the onshore works.


Surveying, Vattenfall

Onshore wintering bird surveys were conducted from October 2016 to March 2017 and will inform the EIA process.

Potential impacts which will be considered for onshore ornithology include:

- Impacts to legally protected and notable species;
- Temporary loss of habitat;
- Noise and visual disturbance; and
- Lighting.

Onshore Archaeology and Cultural Heritage

Norfolk is rich in archaeological features from all periods, from pre-historic through to the Post-Medieval and Modern Period. There are a number of Conservation Areas, Scheduled Monuments, listed buildings, registered parks and gardens, as well as a large number of undesignated heritage assets recorded by the Norfolk Historic Environment Record.

At Happisburgh, excavations have uncovered evidence for the earliest human occupation site in north-western Europe. The internationally important Cromer Forest Bed Deposits are also recorded at Happisburgh.

In addition to these known assets there is also potential for undiscovered buried archaeology to exist within the study area. It will also be necessary to assess potential visual effects upon heritage assets that could result from the presence of the converter station.

Potential impacts which will be considered for onshore archaeology and cultural heritage include:

- Direct impact on buried archaeological remains;
- Direct impact on above ground archaeological remains (e.g. historic earthworks (including the historic landscape character);
- Indirect impact on the setting of heritage assets (designated, non-designated, including historic landscape character); and
- Impact on remains, potentially indicative of former land surfaces.

Onshore Noise and Vibration

The area of onshore works is predominantly rural in nature. Potential noise sensitive receptors include local residents and visitors, recreational users of the area and tourists, users of educational establishments and other buildings such as hospitals.

Existing noise sources within the area are likely to be the road and railway network, industrial area at North Walsham, Aylsham and Dereham, The Robertson Barracks and Swanton Morley Airfield.

Potential impacts which will be considered for onshore noise and vibration include:

- Changes at noise levels at human receptors;
- Construction phase road traffic;
- Construction vibration;
- Noise and vibration impacts to ecological receptors;
- Noise and vibration from fixed and mobile plant during operation; and
- Operational Phase low frequency noise.

Traffic and Transport

The main roads in the road network of relevance to Norfolk Boreas are the A149, A140, A1067 and A47. Highways England has identified a number of schemes along the A47 to address congestion hotspots; these works are programmed to commence construction in 2020 and include the proposed widening of the A47 to dual carriageway between North Tuddenham and Easton.

In addition, the local road network will be used during the construction of the onshore works.

Potential impacts which will be considered for traffic and transport include:

- Increasing traffic congestion impacting upon commuters and seasonal tourist traffic with associated effects, including driver delay, severance, impacts on pedestrians and cycle amenity (i.e. PRoW and cycle networks), and impacts on air quality, noise and vibration; and
- Road safety.

Health

Receptors that are sensitive to potential health impacts will be identified within the topic specific chapters, and a review of these will be presented within the Health Impact Review (HIR). The review will consider settlements/residents; key sensitive receptors include demographic groups such as the young, elderly, and those with underlying health issues. The HIR review will also identify specific sensitive receptors such as schools, nurseries, care homes and hospitals.

Potential impacts relevant to health are expected to include:

- Accidental / incidental chemical leaks/ spills/ releases during transport;
- Emissions to air;
- Waste disposal and transport;
- Transport related accidents;
- Severance of access to public open space;
- Community anxiety and stress; and
- Electromagnetic fields.

Part 4 Wider Scheme Aspects

Seascape, Landscape and Visual

Seascape is defined as the coastal landscape and adjoining areas of open water, including views from land to sea, from sea to land and along the coastline. Landscape starts at the coastline and includes all areas inland. Receptors considered for seascape assessment include recreational boats, passenger ferries and merchant vessels.

A number of published descriptions of landscape character are used to assess the baseline conditions, together with a description of the local area itself. At a national and broad regional level, landscape character descriptions are provided by Natural England each defined by a unique combination of landscape, biodiversity, geodiversity and economic and cultural activity. Landscape considerations include works at the landfall, along the cable route and at the converter station.

Potential impacts which will be considered for seascape, landscape and visual amenity include landscape, visual and cumulative impacts of:

- Offshore components of Norfolk Boreas;
- Landfall;
- Cable relay station;
- Onshore cable route; and
- Substation.

Socio-economics

Norfolk Boreas will require large-scale investment and will need to be supported by a substantial supply chain; a proportion of the expenditure will add to local, regional and UK-wide income during the lifetime of the project.

The offshore project area is primarily used for commercial fisheries and shipping. Significant natural gas infrastructure exists to the north of the site and much of it feeds into the Bacton Gas Terminal. Aggregate dredging is also undertaken or in planning to the north and south of the development area.

The Norfolk Boreas project is expected to result in a range of direct and indirect economic impacts (e.g. training and education, day-to-day indirect spend from project employees). VWPL will seek to work with UK suppliers and local East Anglian suppliers in particular to maximise the local benefit of the project where possible.

The supply chain and skills strategy for Norfolk Vanguard and Norfolk Boreas will consider the interests and needs of the existing local workforce and seek to prepare new workers adequately for the roles that would become available.

Potential impacts that will be considered for socio-economics include:

- Employment opportunities and supply chain;
- Impact on the demand for housing, accommodation and local services,
- Impact on offshore industries;
- Impact on offshore and coastal tourism and associated economic value;
- Impacts on local tourism and recreation resources, including PRoWs

Tourism and Recreation

Tourism is very important to the economy of Norfolk. The attractiveness of the natural landscape of Norfolk, which includes sandy beaches, lakes and rivers, is a key tourism asset, and the area offers a wide range of opportunities for recreational activities such as fishing, walking, cycling, sailing, golf, wildlife watching and camping.

Potential impacts that will be considered for tourism and recreation include:

- Visual impacts;
- Disruption to marine and coastal recreation activities;
- Restricted beach access;
- Noise, dust and visual disturbance;
- Disturbance to local recreation and tourism provisions and businesses;
- Reduction in available accommodation due to construction personnel; and
- Alternate routes / closures of PRoWs.

Cumulative Impacts Summary

Cumulative impacts will be considered as part of the EIA process. Any other project with the potential to result in impacts that may act cumulatively with Norfolk Boreas will be identified during consultation as part of the Scoping process and following a review of available information

The list of cumulative developments to be considered, which have a potential to act together with the construction, operation or decommissioning phases of Norfolk Boreas in a cumulative way, will be consulted upon and agreed with statutory consultees

Offshore, potential projects may include other offshore windfarms, aggregate dredging, shipping, existing and planned construction of subsea cables and pipelines, potential port and harbour developments and oil and gas installations.

Onshore, potential projects may include offshore wind farms (cable routes), coastal defence projects (such as the Bacton sandscaping scheme) road or large infrastructure projects (including the dualling of the A47, Sizewell Nuclear Power Station and the Norwich Northern Distributor Road).

6. Consultation

As part of the application for consent, a consultation report will be produced, which describes and details all correspondence undertaken with:

- Statutory organisations (including Governmental bodies); and
- Local communities.

Statutory and Prescribed Bodies Consultation

A series of meetings with experts from statutory organisations are being held throughout the planning process of Norfolk Boreas, to discuss and agree all areas where environmental issues may occur. As part of this process, planned research and surveys will be agreed with all parties to ensure the correct and relevant information is being collected.

Community Consultation

VWPL is committed to talking with the communities that are local to the project, and will use a range of methods to engage with communities.

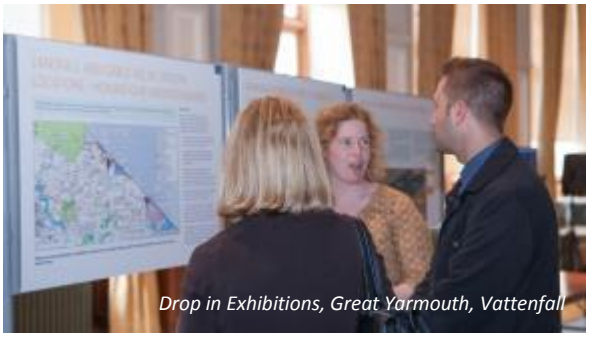
Key stakeholders will be the first point of contact locally, and will have early notice ahead of any planned engagement, and will be consulted on the Applicant's approach to engagement:

- Parish Councils;
- District and County Council;
- Elected Representatives;
- Key network organisations (if relevant);
- Key community groups e.g. Resident's Associations, development trusts / community development organisations; and
- Local Authority Neighbourhood Officer(s)/consultation officers (or equivalent function).

In addition, within the agreed core consultation area, the following will be invited and encouraged to participate in the process:

- Local residents;
- Local groups (i.e. those with environmental, social or economic interests,); and
- Business groups.

VWPL will also engage with the 'hard to reach' audience and interested parties in the wider area, raising awareness of the project, and creating relevant opportunities to encourage participation in consultation events and activities.



Drop in Exhibitions, Great Yarmouth, Vattenfall

Drop-in exhibitions were held in October 2016 and March/ April 2017, and will continue to be held at specific intervals during the EIA process to allow ongoing engagement with local communities. Drop in exhibitions will be held at multiple locations throughout the onshore scoping area, enabling members of the public to learn about Norfolk Boreas and to share their knowledge of the area to help inform the project design.

The display boards presented at the March 2017 drop-in exhibitions are available from the Norfolk Boreas project website.

http://norfolkboreas.vattenfall.co.uk

Further to the drop-in exhibitions, members of the public have been given the opportunity to join a mailing list to receive updates on the project. In addition, information will be circulated through media advertising, posters, social media and regular updates to the project website:

Consultation will also be ongoing with Norfolk County Council and relevant District Councils and Parish Councils throughout the EIA process.

7. Contact us

This document provides a brief summary of the kinds of issues we will be looking at as part of our Environmental Impact Assessment for Norfolk Boreas. If you wish to see more detailed information, the Norfolk Boreas Scoping Report is available online at the following link:

https://infrastructure.planninginspectorate.gov.uk

If you have any further questions on the Environmental Impact Assessment process and areas we will be considering please feel free to get in touch:

Visit our project website:	**http://norfolkboreas.vattenfall.co.uk** and register your interest in the project to receive updates.
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