

DUDGEON OFFSHORE WIND FARM ENVIRONMENTAL STATEMENT

Non Technical Summary

JUNE 2009



Dudgeon Offshore Wind Ltd
Dudgeon Offshore Wind Ltd



INTRODUCTION



WIND TURBINE TOWERS

This document provides a Non Technical Summary of the Environmental Statement produced as part of the consent application process for the offshore elements of the Dudgeon Offshore Wind Farm (Dudgeon). The Environmental Statement is the formal report of an Environmental Impact Assessment undertaken by Dudgeon Offshore Wind Limited into the potential impacts of the construction, operation and eventual decommissioning of Dudgeon.

Dudgeon Offshore Wind Limited

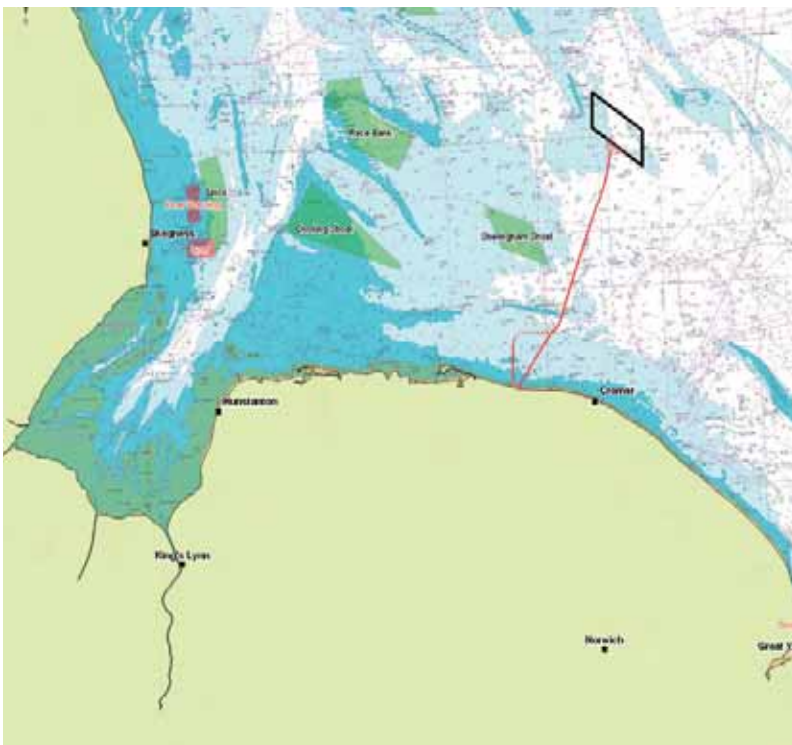
Dudgeon Offshore Wind Limited, a subsidiary of Warwick Energy Limited, has been awarded the rights to develop an offshore wind farm in the Greater Wash Strategic Environmental Assessment area by The Crown Estate under Round Two of the offshore wind licensing arrangements. This is subject to Dudgeon Offshore Wind Limited being successful in gaining the necessary consents for construction and operation of the wind farm.

Dudgeon Offshore Wind Farm - Project Details

The Dudgeon site is located on relatively flat, uniform seabed between the Cromer Knoll and Inner Cromer Knoll sandbanks, over 32km north of the town of Cromer in north Norfolk.

The layout of Dudgeon is dependant upon the final choice of wind turbine, which could range between 3.0 megawatts (MW) and 10.0MW. The maximum output of Dudgeon will be 560MW, which is large enough to provide electricity for almost 400,000 average UK homes.

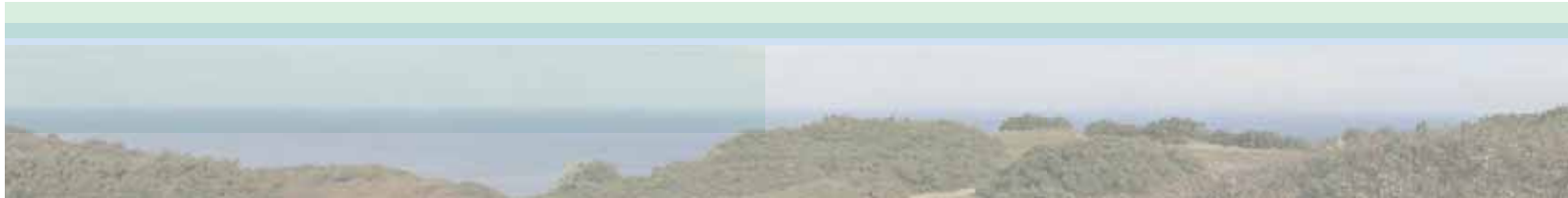
The maximum height of the wind turbines from mean sea level to the blade tip will be 190m in a vertical position and the minimum spacing between wind turbines will be 360m.



The wind turbines are composed of a nacelle and rotor complete with three blades, which are mounted upon a cylindrical steel tower; this in turn is supported by a foundation fixed to the seabed. A number of different foundation types are being considered for Dudgeon and the final choice will be based upon the size of wind turbine selected, in addition to seabed stability, ground conditions, water depth and environmental conditions at the site. The wind farm may also include up to four meteorological masts to collect data on wind speed and direction.

The wind turbines will be interconnected by a buried interarray cable network, typically at 33 kilovolt (kV), and connected to an offshore substation platform (up to three platforms in total may be required), where the voltage is typically stepped up to around 132kV. Electricity will be transferred to shore by up to four export cables, which will come ashore at Weybourne Hope on the north Norfolk coast and terminate at an onshore transition pit. The cables will be buried in the seabed to a target depth of at least 1m.

There are two potential export cable route landfall locations in the Weybourne area under consideration; an eastern and a western landfall.



The onshore cable route will run from the onshore transition pit at the landfall to a connection point to the electrical network, details of which will be subject to a separate Environmental Statement and consent application at a later date.

Dudgeon will have an operational life of 40 years after which time it will be decommissioned. A full Decommissioning Plan will be agreed prior to construction and will include for the complete removal of all offshore structures above seabed level.

Regular servicing of the wind turbines will take place during the operational life of the project, the location of a support base for these activities will be decided by the contractor chosen to do this work but it is currently expected that at least some of these activities might be based in Wells-next-the-Sea.

The Need for Renewable Energy

The central aim of UK Government energy policy is to establish a supply of energy that is diverse, sustainable, secure and is offered at competitive prices. Key to this goal is a 60% reduction of carbon dioxide (CO₂) emissions by 2050. The development of renewable energy plays a primary role in UK Government strategy for carbon reduction. In particular, it has set a target that 20% of the UK's electricity supply should come from renewable sources by 2020.

UK Government targets for renewable energy will help the UK to meet its international obligations, but also obtain greater security of energy supply through the promotion of indigenous electricity generation.

The development of Dudgeon will help the UK move towards its goals by reducing emissions of CO₂ by up to 33 million tonnes over its 40 year lifetime and by providing more than 0.5% of the UK's overall annual electricity needs.



WIND TURBINE COMPONENTS AND INSTALLATION VESSEL



LANDFALL AREA AT WEYBOURNE HOPE



REGULATORY REQUIREMENTS AND THE EIA PROCESS

Regulatory Consents

A number of regulatory consents are required for the construction and operation of Dudgeon. The Energy Development Unit of the Department of Energy and Climate Change (DECC) is leading the consents process.

Dudgeon Offshore Wind Limited has applied for the following key consents:

- Consent under *Section 36 of the Electricity Act 1989* to construct and operate the offshore wind farm, including all ancillary infrastructure;
- Licence under *Section 5 of the Food and Environment Protection Act (FEPA) 1985* to deposit materials such as the wind turbine foundations and the subsea cables on the seabed. The Department for Environment, Food and Rural Affairs (Defra), which takes responsibility for protecting marine ecosystems, is the consenting authority for the FEPA licence;
- Consent under *Section 34 of the Coast Protection Act (CPA) 1949* in order to make provision for the safety of navigation in relation to the export cables. The Marine and Fisheries Agency (MFA), which is a Defra department, is responsible for this consent; and
- Deemed planning permission under *Section 90 of the Town and Country Planning Act 1990*, sought as part of the section 36 application, for the onshore elements of the works, which comprise the cable landfall and onshore transition pit.

In addition, the extinguishment of public rights of navigation has been requested under the Energy Act 2004, for the areas of seabed directly covered by the offshore structures comprising the wind turbines, offshore substation(s), accommodation platform (if required) and meteorological mast(s) (if required).

It is expected that Safety Zones of up to 500m around all offshore structures will also be requested during the construction phase, which will limit the activities of certain vessels within this area. This is to ensure the safety of lives at sea. Safety Zones for the operation and decommissioning phases of the project will also be requested at the appropriate time.



WIND TURBINE NACELLES

Programme

Construction of the offshore works is likely to avoid the winter months (i.e. it will probably take place between March and November) due to potential adverse weather conditions leading to delays in activities and an increase in construction costs.

A two year programme is likely to be adopted. The activities carried out in the first year will probably include the installation of all offshore foundations at the wind farm site, with the remaining construction activities and the full commissioning programme taking place during the following year.

Subject to all consents for the project being received during the first half of 2010, it is currently hoped that Dudgeon will be constructed during 2012 – 2013.



The Need for Environmental Impact Assessment

Dudgeon is subject to an Environmental Impact Assessment, as required under the Electricity Works (Environmental Impact Assessment) Regulations 2000. The Environmental Statement for Dudgeon has been carried out in accordance with these regulations.

The Environmental Impact Assessment Process

Environmental Impact Assessment is a tool for systematically examining and assessing the impacts and effects of a development on the environment. The resultant Environmental Statement reports on the Environmental Impact Assessment and contains:

- A description of the development, including any alternatives considered;
- A description of the existing environment at the site and surrounding areas;
- A prediction of the potential impacts on the existing human, physical and natural environment at the site and assessment of subsequent effects;
- A description of mitigation measures to avoid or reduce such effects; and
- A Non Technical Summary.

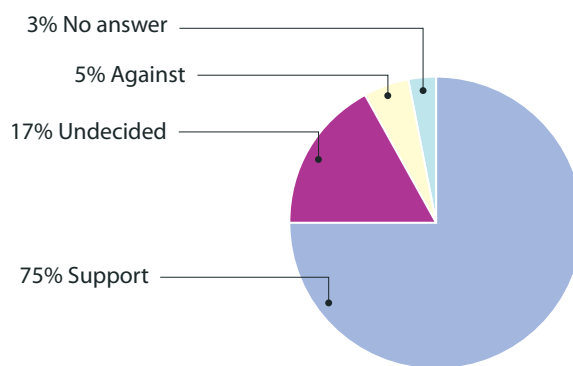
Scoping and Consultation

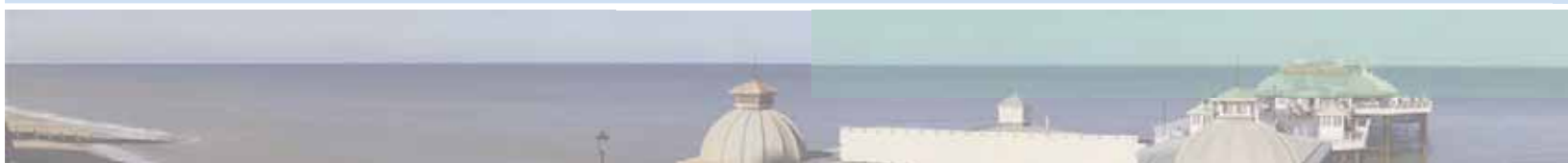
A scoping exercise was carried out to identify the main issues that needed addressing as part of the Environmental Impact Assessment. Consultation was carried out as part of this process with over 100 statutory and non statutory bodies representing key interests and user groups in north Norfolk and wider area. Consultation and liaison continued throughout the Environmental Impact Assessment and will be ongoing throughout the life of the project.

Two public exhibitions were held in February 2009 in Cromer and Sheringham, north Norfolk, and were attended by 248 people in total. Questionnaires were available at the exhibitions and, of the 194 responses received, a total of 75% (147 individuals) of all returns were either supporters or strong supporters of the project and only 5% (9 individuals) considered themselves to be against or strongly against the project.

Public opinion of the proposals

Do you support our proposals for this offshore wind project?





Original Data Collection and Surveys

Further to the findings of the scoping exercise and consultation with the statutory consultees, the following surveys were undertaken as part of the Environmental Impact Assessment:

- Geophysical survey to understand the characteristics and features on the surface and subsurface of the seabed;
- Metocean survey (i.e. measurement of the wind, wave, current and tidal conditions at the site);
- Aerial and boat based bird surveys;
- Marine biological survey including sampling and analysis of organisms living in the sediments of the seabed and on the surface of the seabed;
- Fish surveys and observer trips on local fishing vessels;
- Activity survey of local fishermen;
- Landscape, seascape and visual impact assessment;
- Marine traffic survey;
- Archaeological assessment of geophysical data; and
- Terrestrial ecological survey to identify the main habitats and presence of any protected species.

Impact Identification and Evaluation

Impact identification and evaluation was carried out via a number of standard methods and techniques, as agreed during the scoping exercise. Significance levels have been assigned to each impact in order to provide a consistent framework for considering and evaluating impacts. The assigned definitions are set out in *Table 1*. Where the assessment necessitated a variation in terminology, this is explained in the relevant section of the Environmental Statement.

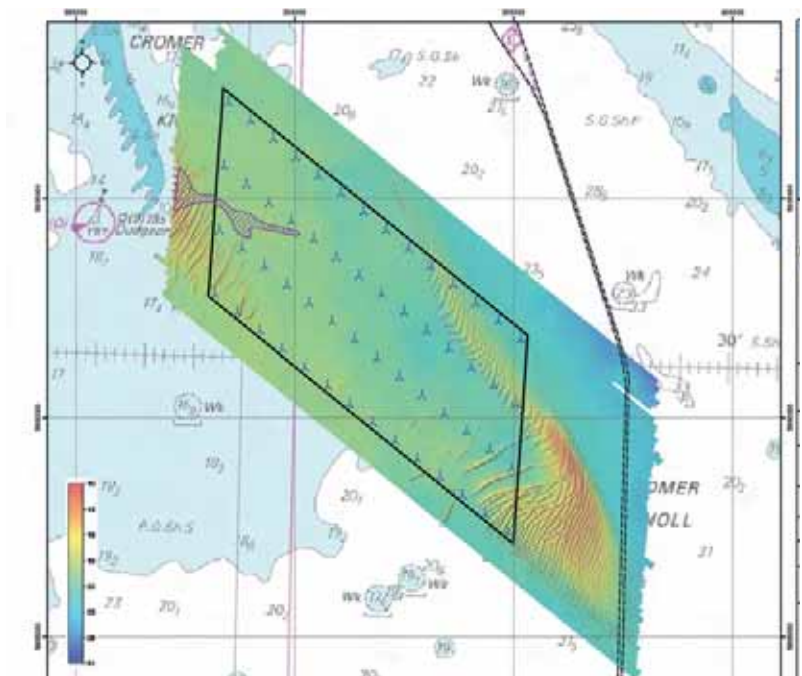
TABLE 1 TERMINOLOGY FOR CLASSIFYING ENVIRONMENTAL IMPACTS	
Impact Significance	Definition
Major adverse	The impact gives rise to serious concern and it should be considered as unacceptable
Moderate adverse	The impact gives rise to some concern but is likely to be tolerable depending on scale and duration
Minor adverse	The impact is undesirable but of limited concern
Negligible	The impact is not of concern
No Impact	There is an absence of one or more of the following: impact source, pathway or receptor
Minor beneficial	The impact is of minor significance but has some environmental benefit
Moderate beneficial	The impact provides some gain to the environment
Major beneficial	The impact provides a significant positive gain

SUMMARY OF ENVIRONMENTAL IMPACTS

Introduction

The following sections summarise the potential environmental impacts associated with Dudgeon, as detailed in the Environmental Statement. Impacts on the following environmental parameters have been assessed, with mitigation requirements included where necessary:

- Physical processes;
- Marine and coastal water quality;
- Ornithology (birds);
- Marine ecology;
- Natural fish resource;
- Marine mammals;
- Commercial fisheries;
- Landscape, seascape and visual impact assessment;
- Shipping and navigation;
- Archaeology and cultural heritage;
- Military and civilian aviation;
- Other human activities;
- Socio-economic assessment;
- Geology, water resource and land quality;
- Terrestrial ecology;
- Coastal tourism and recreation;
- Traffic and access;
- Air quality; and
- Noise and vibration.



BATHYMETRY

Physical Processes

An assessment was undertaken to look at the changes that the wind farm and export cable route would have on the local waves, currents, sediment distribution, sediment transport regime and features of the seabed. Dudgeon will have some localised impact in the immediate vicinity of the wind farm site, but will not have any significant impact further away from the site. There is potential for localised scour around the base of each foundation structure, although the detailed design will take this into account.

Changes due to the presence of the offshore structures are considered to be less than those experienced due to the natural variation in both the seabed and shoreline and as such the potential impacts are considered *negligible*.



DUDGEON OFFSHORE WIND FARM



Marine and Coastal Water Quality

Changes in water quality associated with the re-suspension of sediment (including the re-suspension of potential contaminants and bacteria embedded in the sediments) during construction, was assessed to be of *negligible* impact against background levels. Similarly, *no impact* is predicted during the operation and decommissioning phases.

Increased levels of suspended sediment resulting from the cable installation process have the potential to impact upon shellfish. However, the short term nature of the construction activity and the localised nature of sediment deposition are predicted to have a *negligible* impact on the species.

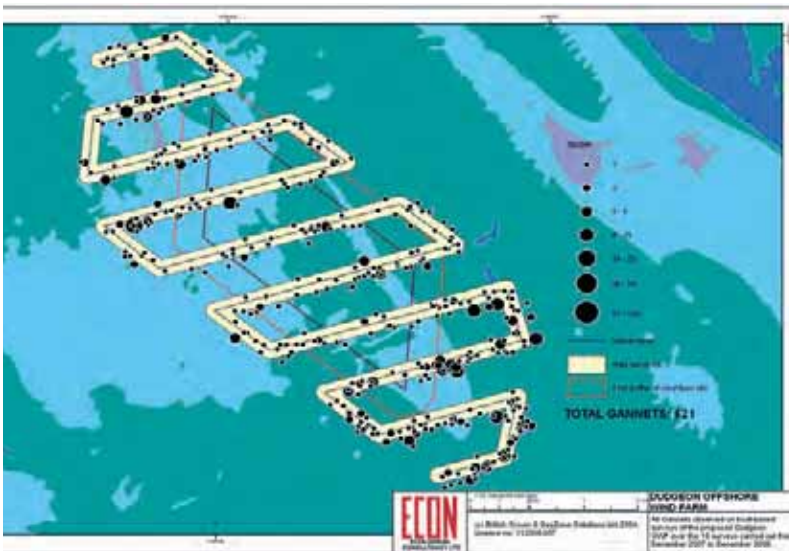


SANDWICH TERN

There are nine designated bathing areas and four designated shellfish areas located along the western and central Norfolk coast. Due to the localised extent of impacts, the exposed location of the wind farm site and the distance of any disturbance effects from designated sites (40km to the nearest site) no *impact* is predicted.

Ornithology

An intensive programme of 15 boat based surveys from December 2007 to December 2008 inclusive, supplemented by previous aerial surveys has been used to describe the bird use and activity at the Dudgeon site and the surrounding area.



BIRD SURVEY DATA

The relatively low number of species recorded on site was in line with expectations, given the location of the site at some distance offshore. The density of birds recorded was also low at less than 15 individuals/km².

Impacts covering a range of potentially sensitive species were assessed and only the predicted collision risk for Sandwich tern was determined to potentially be of *major adverse* significance. This is considered to be a highly precautionary assessment, based on the worst case scenario, and it is fully anticipated that the second year of surveys will result in a lowering of the significance levels assessed to date.

Although a number of *moderate adverse* impacts were also identified, usually related to very highly sensitive species, these were all considered to be tolerable and therefore not significant.

The second year of boat based surveys is currently underway and will provide further detail on the potential impact on Sandwich tern and other bird species. Dudgeon Offshore Wind Limited will continue to liaise with the nature conservation agencies on this issue and it is anticipated that the full assessment will be available in late 2009.



Marine Ecology

A number of surveys were carried out to characterise the environment of the site with regard to the marine plants and animals within and around Dudgeon. The site was typical of the region and characterised by patchy communities of worms and shellfish. No species of conservation significance were present and those species present are considered to be well adapted to living in a dynamic and periodically disturbed environment. The intertidal area within the vicinity of the cable landfall location is restricted to a highly mobile shingle beach backed by a shingle ridge. This habitat is not suitable for colonisation by marine species and is considered barren.

The direct impact on habitats and species through the installation of foundation structures, subsea cables and associated infrastructure are considered to be of short term duration and of *negligible* significance. Indirect impacts from sediment disturbance and deposition resulting from construction activities is considered to be of *negligible* significance due to the tolerance of the bottom living community to such disturbances and impacts.

Following construction there is the potential for scour to occur around the foundation structures. The scoured areas and foundations are expected to be readily colonised by species from adjacent areas and may cause a localised increase in biodiversity providing feeding opportunities and refuge habitats for a range of species.

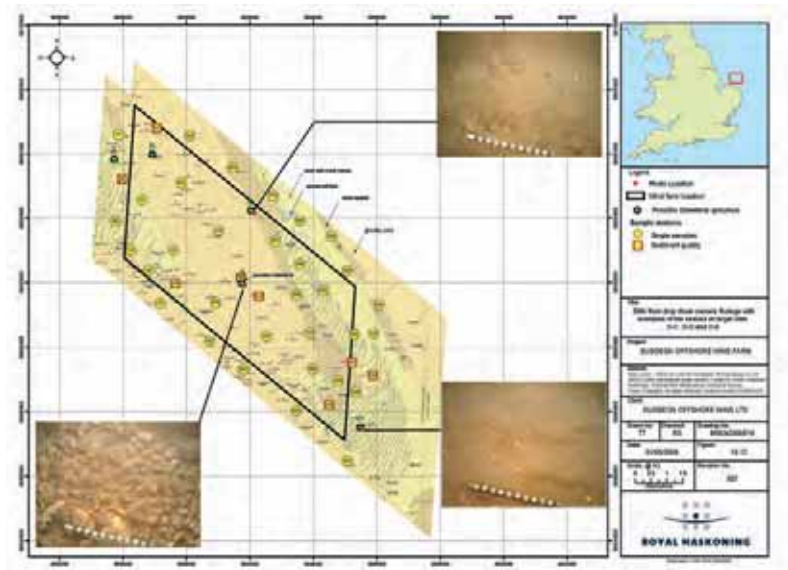
Natural Fish Resource

Site specific surveys targeting fish and shellfish species were carried out at Dudgeon during the spring and autumn of 2008. 77 species were caught during the two survey periods, with the lesser weever fish and velvet crab being the most numerous species encountered during the spring survey, and whiting, dab, gobies, pink shrimp and slipper limpet the most numerous during the autumn survey. The fish communities were considered typical for the area.

The main potential impact on fish is considered to be the noise generated from construction activities, in particular from pile driving. This will be effectively reduced by adopting working practices such as soft start piling. Analysis of seabed sediments within and around Dudgeon does not indicate the presence of sediments favoured as a spawning habitat by herring, a species of fish particularly sensitive to noise. In addition, no herring in spawning condition were caught during the targeted herring spawning surveys carried out in autumn 2008.

From a highly precautionary perspective, an impact of *minor* to *moderate adverse* significance might be anticipated should herring be spawning within the vicinity of Dudgeon. However, this is considered to be unlikely and Dudgeon Offshore Wind Limited will continue to liaise with Cefas and the JNCC on the effects of underwater noise to ensure that appropriate mitigation is used to minimise any effect that may arise.

Potential impacts during operation of the wind farm include underwater noise and vibration, the fish aggregating effect of the offshore structures and the influence of electromagnetic fields on sensitive species; however, the impact of all these issues is expected to be of *negligible* significance



DROP DOWN CAMERA FOOTAGE



CRABBING POTS



Marine Mammals

The Greater Wash area is known to support a range of marine mammals including harbour porpoise, species of whale and common and grey seal. Whilst not considered common in the study area in comparison to other areas of the UK, there have been infrequent recordings of marine mammals in the vicinity of Dudgeon. The very low numbers recorded suggest that Dudgeon is not of any significance to important populations of marine mammals. However, Dudgeon Offshore Wind Limited will work in conjunction with the JNCC and Natural England to develop mitigation measures to ensure that potential impacts upon marine mammals are minimised.



GREY SEAL AND PUP

Commercial Fisheries

The commercial fisheries data obtained suggests that the fishing effort and value of fishing in the area of the wind farm site and over the export cable route are significantly lower than most of the other east coast inshore areas. Up to seven local potting vessels are understood to fish sporadically within the boundaries of the wind farm. Inshore areas along the export cable route are fished by a larger number of vessels. The potential impact is temporary and restricted to the construction and decommissioning phases only.

Impacts during construction may include increased steaming time to other fishing grounds and temporary loss or restriction of access to traditional fishing grounds. The potential impacts are considered to be *minor adverse* at worst, due to the limited number of vessels involved and distance offshore.

All impacts identified during the operation of the wind farm are considered *negligible*. Evidence from other offshore wind farms indicates that fishing can still continue during the operational life of the wind farm and that Dudgeon could produce potential beneficial effects for the principal targeted species.



FISHING BOATS AT WELLS-NEXT-THE-SEA



Landscape, Seascape and Visual Impact Assessment

The seascape is defined as the views from the land out to sea. Despite the sensitivity of the north Norfolk coastline, the visual effects are predicted to be minimal due to the distance of Dudgeon from the shore. The closest wind turbine is over 32km offshore from the nearest town of Cromer.

Both the 3.0MW and 10.0MW wind turbines will be visible to varying degrees from a section of the North Norfolk Area of Outstanding Natural Beauty (AONB) between Weybourne and Trimmingham. However, it is considered that there will be *no significant* effect on the AONB. Impacts on visual receptors such as residential areas, coastal paths, roads, railways, commercial vessels and tourist attractions are considered to be *minor* for the 3.0MW wind turbines and *moderate to minor* for the 10MW wind turbines. However, neither is considered significant in terms of the Environmental Impact Assessment Regulations.

While the development of several offshore wind farms off the north Norfolk coast will mean that wind turbines will be visible from a number of locations, Dudgeon itself will potentially be obscured by developments closer to the shore, on the small number of occasions when weather conditions will make it visible (i.e. less than 33 days per year based on Met Office data).



PHOTOMONTAGES BASED ON THE 10MW WIND TURBINE



Other Human Activities

Other human activities include oil and gas exploration and production, marine aggregate extraction, marine disposal sites, military exercise areas, telecommunications and electricity cables, pipelines and unexploded ordnance.

Dudgeon sits within an area of existing gas exploration and production. Two active pipelines and two suspended wells have been identified close to the site boundary. Dudgeon Offshore Wind Limited will avoid the placement of wind turbines, cabling and other infrastructure in the immediate vicinity of these facilities.

The impacts predicted for other human activities are expected to range from *minor adverse* to *no impact*.

Socio-economic Assessment

Dudgeon is expected to generate positive economic effects and, given the likely total project investment of more than one billion pounds, the effect on the local and national economy is considered to be *beneficial*. Positive effects will also arise from employment via the construction supply chain and the maintenance activities throughout the wind farm's 40 year lifetime.

Geology, Water Resource and Land Quality at the Cable Landfall

Due to the predominantly agricultural use of the study area from the 1800s to the present day, there are relatively few potential contaminated land issues identified. The main hydrological impacts of the landfall are associated with the presence of local water courses and increased sedimentation / soil erosion associated with earthworks and excavation.

Based on good construction practice and specific mitigation measures the impacts with respect to geology, hydrogeology, hydrology and land quality have been identified as *negligible*. The potential impact of horizontal directional drilling, if required at the cable landfall, in the event of encountering any contamination is *minor adverse*.

Terrestrial Ecology

Surveys show that habitats within the immediate construction footprint of the cable landfall and onshore transition pit are of low ecological significance. There are patches of scrub in the study area, along with arable land, reedbed and a number of water bodies. All have the potential to provide habitat for a range of plants and animals including rare flowers, nesting and breeding birds, reptiles and badger. However, no species of conservation interest that will be unavoidably affected by the development have been identified. Mitigation measures will be developed where necessary to ensure that disturbance to protected species is avoided and that any affected habitats are restored following completion of construction.

Most of the water bodies identified on the cable landfall site have the potential to support great crested newt. The location of the cable landfall and onshore transition pit will avoid these water bodies, however, suitable mitigation will be put in place should a population of great crested newt be found. Overall, the impact on great crested newt is considered to be of minor adverse significance.





BOATS AT BLAKENEY

Coastal Tourism and Recreation

It is considered that there will be *minor adverse* impacts on coastal tourism and recreation during the construction phase. These impacts relate to disruption to recreational sailing and associated activities, although, these impacts will be minimal due to the distance of the project offshore.

There is potential for minor impacts relating to visual impacts on the AONB during operation. However, it is considered that these impacts will be *negligible* due to the distance offshore. The wind farm may increase the tourism potential of the area.

Traffic and Access

Impacts on the local traffic network are anticipated to be minimal during the onshore construction period, which is expected to last for approximately 90 – 100 days. Heavy Goods Vehicle movements will be co-ordinated to ensure that they arrive and depart outside of peak traffic times. A short term *minor adverse* impact upon the surrounding road network is predicted during the onshore works, while there is predicted to be *no impact* upon the local road network once the site is operational. Discussions with Norfolk County Council Highways Development Control will take place to agree traffic management requirements and to minimise disruption wherever possible. There will be no significant onshore movements associated with the offshore works and *no impact* upon the local road network is anticipated.



WEYBOURNE HOPE

Air Quality

Air quality impacts are only likely to arise during construction of the onshore works, based on impact to sensitive receptors (i.e. points where the public are likely to be regularly present and exposed for a period of time). It is anticipated that the increase in traffic on the local road network and dust emissions during construction will have a *negligible* impact. Machinery used in the onshore construction phase, such as excavators, bulldozers and front loaders may have a minor adverse impact on air quality in the immediate vicinity of the works, however, the impacts will be local and short term lasting for the duration of construction only.

Noise and Vibration

Impacts through elevated noise levels during installation of the onshore works were assessed to be temporary in nature and short term. Noise impacts are likely to only affect local receptors (i.e. residential properties and recreational users of the area) around the landfall site during construction.

Noise may arise from machinery involved in the excavation of the cable landfall, onshore transition pit and the potential use of horizontal directional drilling. Delivery of materials for the onshore construction works by Heavy Goods Vehicles may pass close to residential properties, however, mitigation measures will be put in place to reduce noise impacts as far as possible and an overall impact of *negligible* significance is predicted. Due to the distance offshore, no noise impact is expected for local receptors from the offshore construction activity or during the operation phase.

CONCLUSION

Overall, given the successful implementation of the stated mitigation measures committed to by Dudgeon Offshore Wind Limited, combined with ongoing dialogue with interested stakeholders and the Regulatory Authorities, it is predicted that Dudgeon will not have any long term impacts that are unacceptable. The project will, however, make a significant contribution to national targets for renewable energy.



FURTHER INFORMATION

The Environmental Statement can be viewed during the statutory consultation period at the following locations:

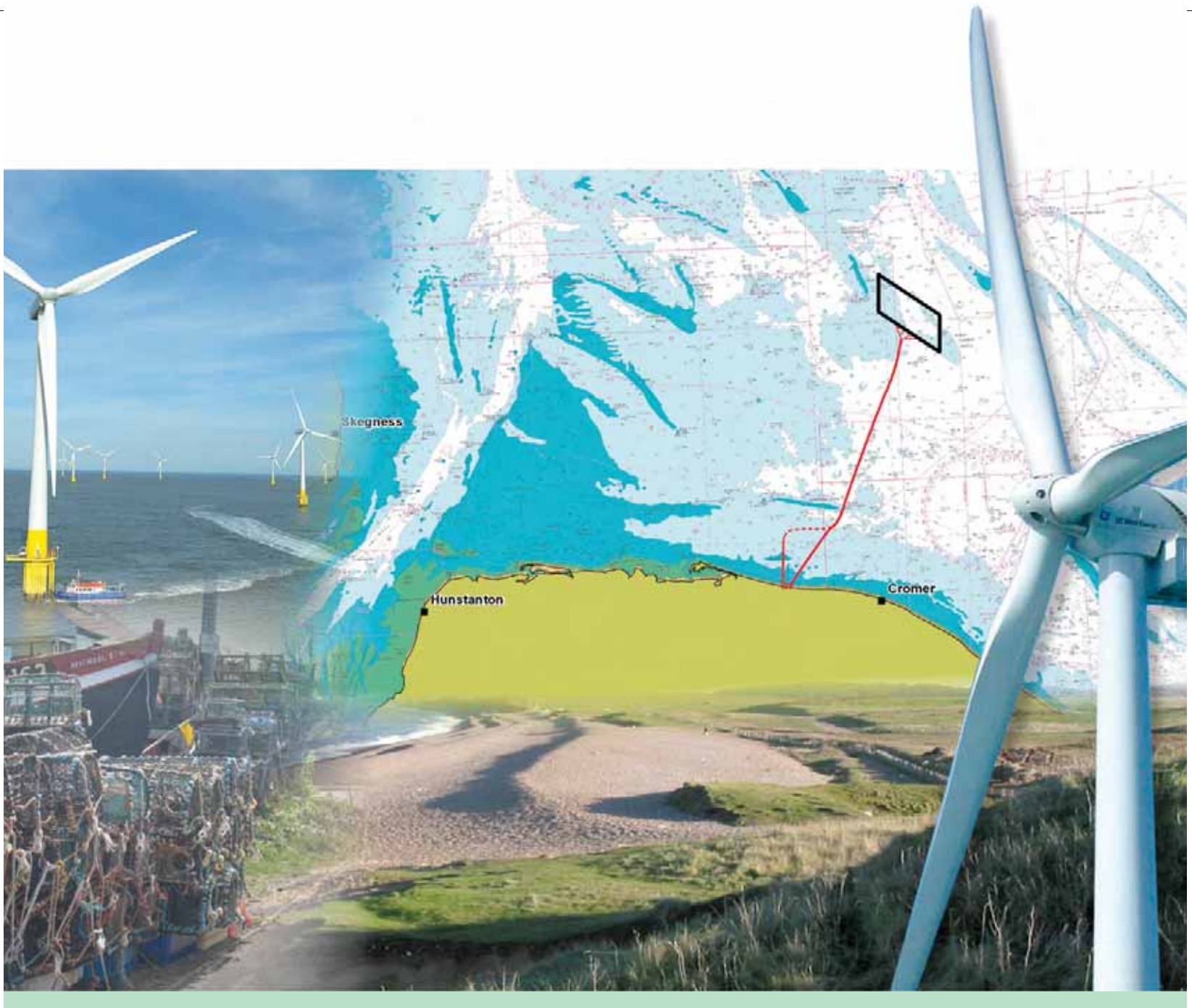
- North Norfolk District Council, Holt Road, Cromer NR27 9EN;
- Norfolk County Council, County Hall, Martineau Lane, Norwich NR1 2DH;
- Cromer Library, Prince of Wales Road, Cromer NR27 9HS;
- Sheringham Library, New Road, Sheringham NR26 8EB;
- Sheringham Tourist Information Centre, Station Approach, Sheringham NR26 8RA; and
- Cromer Tourist Information Centre, Bus Station, Prince of Wales Rd, Cromer NR27 9HS.

Copies of the Environmental Statement are priced at £25 on CD-ROM and at £250 for paper copies. Requests for copies can be made to:

Dudgeon Offshore Wind Limited
c/o Warwick Energy Limited
Wellesbourne House
Wellesbourne
Warwickshire
CV35 9JB

Requests for additional copies of this Non Technical Summary can also be made to the above address. Alternatively a downloadable version is available on the Warwick Energy Limited website www.warwickenergy.com





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