



Humber Gateway Offshore Wind Farm

Non-Technical Summary of the Offshore Environmental Statement
and Onshore Cable Route Environmental Statement



Humber Gateway Offshore Wind Farm could generate
enough energy to power up to 195,000 homes a year*

*Based on an average domestic household consumption of 4,725kWh (Source BERR).

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Who we are

Humber Wind Limited, a wholly owned subsidiary of E.ON UK plc, is applying for planning consent to build and operate an offshore wind farm off the Holderness Coast. The wind farm will be known as the Humber Gateway Offshore Wind Farm.

E.ON is one of the UK's leading power and gas companies, generating and distributing electricity, and retailing power and gas. We generate around 10% of the UK's electricity from coal, gas and oil-fired power stations, combined heat and power stations and renewable electricity generating plants.

Our strategy recognises and embraces the importance of renewable energy and we have a growing portfolio of 21 wind farms, covering offshore and onshore. This includes the UK's first offshore wind farm at Blyth, Northumberland, and the UK's second large-scale offshore wind farm at Scroby Sands, Norfolk.

We have recently started constructing our third offshore wind farm, Robin Rigg in the Solway Firth. We are also jointly developing the London Array which, once built, will be one of the world's largest offshore wind farms.



The environmental statement assesses the environmental impacts in relation to the existing biological, physical and human environments

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All about this document

An application for planning permission to build a project such as the Humber Gateway Offshore Wind Farm must be accompanied by information on any effects that the project may have on the environment. In addition, a description of the measures to minimise any negative effects must also be given.

This information is gathered through a process known as Environmental Impact Assessment (EIA), the results of which are written up in an Environmental Statement (ES). This document is the Non-Technical Summary of the ES that has been prepared by ERM, our environmental consultants, for this project.



Three environmental statements

The whole of the Humber Gateway project will be covered by three separate Environmental Statements:

- Offshore Environmental Statement
- Onshore Cable Route Environmental Statement
- Onshore Substation Environmental Statement.

This Non-Technical Summary covers the first two and therefore summarises the impacts associated with:

- the offshore aspects of the proposed scheme (elements which are below the high tide mark), including the turbines and their foundations, the meteorological masts, the offshore electricity substation, the cables connecting the turbines to the offshore substation and the subsea cables from the substation to the shore (see pages 14-28)
- the onshore aspects of the project, including the cable landfall and the proposed underground cable (see pages 30-38).

A new onshore electricity substation is required for the project near Salt End. This will be the subject of a separate planning application and ES and this will be produced later in the year.

More copies

If you would like to see a copy of the:

- Offshore Environmental Statement
- Onshore Cable Route Environmental Statement

please write to the address below or email humberenquiries@eon-uk.com Paper copies cost £250 each or CD-ROM versions are available for £5 each.

Please make cheques payable to Humber Wind Limited.

Humber Wind Limited
Westwood Business Park
Westwood Way
Coventry
CV4 8LG

Additional copies of this Non-Technical Summary document are free of charge. This Non-Technical Summary is also available at eon-uk.com/humbergateway

Description of the Humber Gateway project

The site

The site lies north of the mouth of the River Humber and 8km to the east of Spurn Head. This long sand peninsula shelters the entrance to the Humber Estuary. The northernmost point of the site is 8.2km from Easington. Its southernmost point is 18km from Grimsby, on the south bank of the Humber Estuary. The site is around 15km from the nearest point on the Lincolnshire coast, Donna Nook.

The site is located within the Greater Wash Strategic Environmental Assessment area, which was recognised by the UK Government in 2002 as a suitable location for offshore wind farm development.

There are no local, national or international environmental designations at the Humber Gateway site itself.

Location of the Humber Gateway Offshore Wind Farm site. Reproduced from Ordnance Survey digital map data. © Crown copyright. All rights reserved. 2007 license number 0100031673. Projection: British National Grid.





Photomontage – viewpoint from Spurn Head Visitor Centre

The proposed Humber Gateway Offshore Wind Farm is a 300 MW wind farm which would consist of between 42 and 83 wind turbines, depending on the capacity of the turbines. The wind farm site covers an overall area of 35km² and is located in waters of around 15m depth.

In addition to the turbines and their foundations, the wind farm will include up to three meteorological masts (to measure wind speeds and weather conditions at the site). There will also be an offshore substation and cables to connect the turbines to the offshore substation. Subsea cables will then bring the electricity ashore at a point near Easington. Once the subsea cables come ashore, they will then join an underground cable which will run 30km and connect into the National Grid near Salt End, east of Hull.

Throughout this document, there are computer generated images shown of the wind farm. These are called photomontages.

Offshore

Construction of the foundations and installation of the turbines and offshore cables is anticipated to take place over a period of two years.

Precise details of the foundation design, turbine choice and methods of installation would be determined during the detailed design phase.

Each wind turbine (comprising a nacelle which houses the gearbox and generator and the hub with 3 blades fitted) would be mounted onto a steel tubular tower which in turn is supported by the foundation fixed to the seabed. A transition piece (a steel collar) joins the tower and foundation together and also provides a boat access platform and ladder.

The main foundation options under consideration are:

Monopile: this is a driven pile foundation, which comprises a long steel tube driven vertically into the seabed.

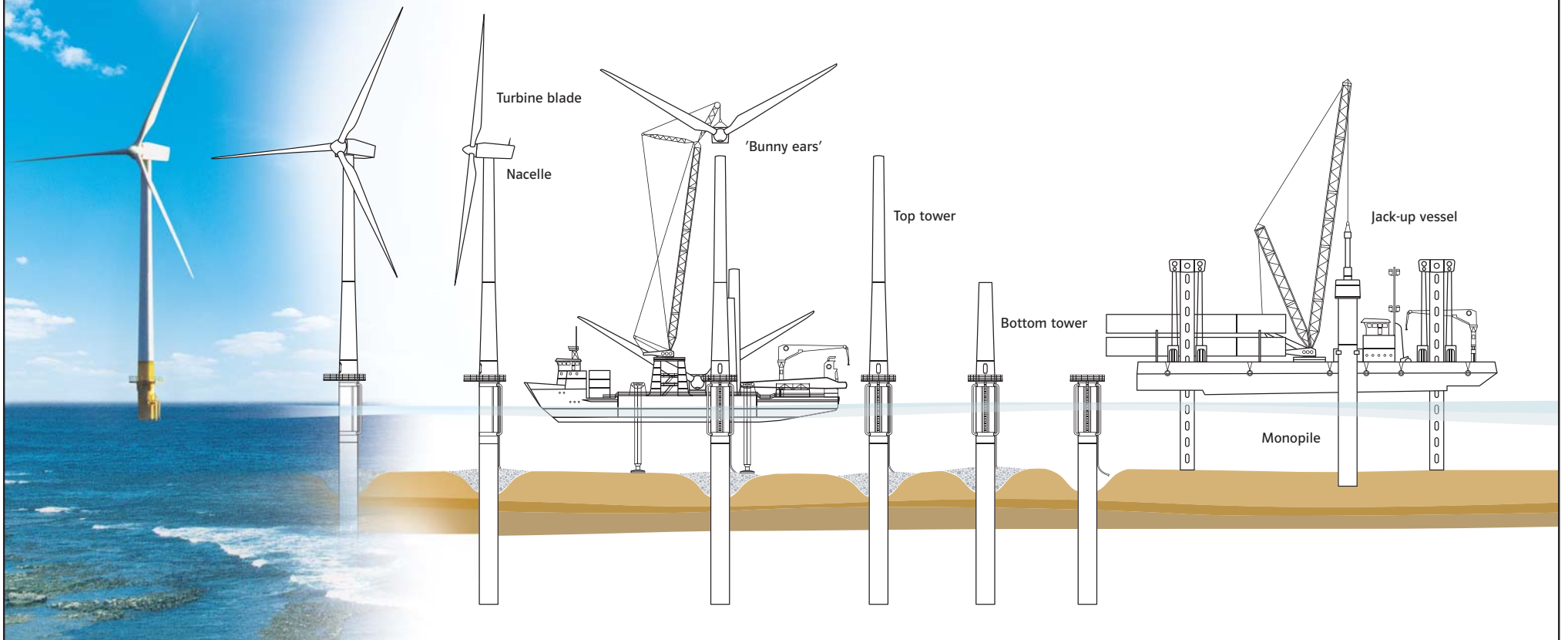
Concrete gravity base foundation: this foundation rests on the seabed and relies on its weight to support the wind turbine.

The installation of wind turbines and their foundations requires large specialist vessels and equipment. Foundations are taken to site carried by a vessel or floated out. The foundation is lifted by a large crane and in the case of a monopile is placed in a clamp before being driven into the seabed. In the case of a concrete gravity base it will be flooded and lowered onto the seabed.

For all designs a large crane lifts the tower, the turbine and blades into place.

Subsea cables are buried for protection and for the safety of sea users. These connect the individual turbines (inter-array cables) to the offshore substation, from where electricity is transmitted through export cables to shore south of Easington. All cables are buried in a trench formed by using ploughing, jetting or trenching techniques.

Construction technique previously used at Scroby Sands Offshore Wind Farm, Great Yarmouth.



Onshore

An underground cable would run, predominantly under agricultural land, from Easington to Salt End on the east side of Hull (a distance of around 30km). This would enable the electricity to be connected into the National Grid at a proposed new substation to be constructed near Salt End. To facilitate the cable installation, there will be two temporary facilities for construction compounds, which will be used for storage of materials and plant.

The underground cables will be laid in two trenches, with the construction works taking place over two seasons, between the months of April and October.

A key element of this project relates to joining the subsea cables with the onshore cable. We have chosen a horizontal directional drilling design at the landfall location to minimise disruption and reduce any impacts on the environment. This involves the use of a drilling rig located near the cliff top, which will drill a small tunnel through the cliffs and under the beach. The cables will be pulled through this tunnel.

It is anticipated that cable installation will commence almost a year before the offshore works, so the overall construction programme will be around three years.

Overall programme

The Humber Gateway project is planned to operate for 40 years, which is the term of the lease of the offshore site from the Crown Estate. After 20 to 25 years, re-powering (ie replacing the wind turbines at the end of their economic life with new turbines) may be necessary, but this would be subject to further environmental studies and further consents.

Maintenance and servicing of the wind farm would take place on a regular basis. This would require an Operations and Maintenance base at a local port where access boats, personnel and spares will be located.



The need for the project

In recent years, there has been growing awareness of the need to reduce carbon emissions to slow down the pace of climate change resulting from human activity. The electricity generating industry is one of the sources of carbon emissions, as traditionally fossil fuels have been burned to generate electricity.

Humber Gateway Offshore Wind Farm could save up to 395,000 tonnes of carbon emissions every year*

The contribution of renewable energy is critical to progressing towards lower carbon emissions. We believe that the Humber Gateway project will provide a clean and efficient means of generation. The scheme will also help to tackle climate change and make a significant contribution to the UK's renewable generation targets.

The Humber Gateway project could save up to 395,000 tonnes of carbon emissions each year, helping us to produce energy in more diverse ways, whilst securing energy supplies for the future.

*The carbon dioxide savings are current estimates of likely emissions savings, since the yield of the wind farm will not be accurately known until it is built.



Obtaining planning approval

Planning approval for the project will be sought through two principal pieces of legislation:

- For the offshore aspects of the project, planning permission will be sought from the Department for Business, Enterprise and Regulatory Reform through Section 36 of the Electricity Act 1989.
- For the onshore aspects of the project, planning permission will be sought from East Riding of Yorkshire Council (the local planning authority) through Section 57 of the Town and Country Planning Act 1990.

There are a number of other approvals that will be required under other regulations, including:

- Land Drainage Act 1991
- Coast Protection Act 1949
- Food and Environment Protection Act 1985
- Energy Act 2004
- Habitats Directive.



Photomontage – viewpoint from Withernsea seafront

The environmental impact assessment process

EIA is a systematic process, whereby the impacts that the project is likely to have on the environment, both positive and negative, are identified and assessed. An early stage of the process, referred to as scoping, is carried out to identify the topics that need to be included in the EIA process. This involves consultation with a wide range of organisations to gather information and views on potential impacts that the project may have. These topics are then assessed in detail.

If any significant impacts are identified, consideration is given to any measures that could be put into place to minimise them – these are known as mitigation measures. Any significant residual impacts that will remain even after the adoption of mitigation measures are then described.

Scoping and consultation

For the offshore components of the project

A scoping exercise was carried out to identify the main environmental issues that needed to be considered. This included the distribution of a scoping report and consultation with over 40 statutory and non-statutory bodies representing key interest and user groups in the area of the Humber Gateway site.

The scoping report included information on:

- details of the development (including its construction, operation and decommissioning)
- the need for the wind farm and the alternative sites considered
- the key potential impacts of the development
- the key issues to be considered in the EIA.

Consultation with the following bodies has been carried out throughout the course of the EIA:

- Associated British Ports, Humber
- Department for Business, Enterprise and Regulatory Reform (BERR), formerly DTI
- British Marine Aggregate Producers Association
- Bridlington and Flamborough Fishermen's Society

- Bridlington Town Council (Planning, Licensing and Environmental Committee)
- Campaign to Protect Rural England
- Centre for Environment, Fisheries and Aquaculture Science
- CEMEX
- Chamber of Shipping
- The Commercial Fishing Industry
- Cruising Association
- CNS Systems – Navigation, Spectrum and Surveillance
- Countryside Agency
- Department for Culture, Media and Sport
- Department for Transport
- Department for Environment, Food and Rural Affairs
- Directorate of Airspace Policy
- East Riding of Yorkshire Council
- English Heritage
- Environment Agency
- Government Office for Yorkshire and Humber
- Hornsea and Withernsea District Fishermen's Association



Photomontage – viewpoint from car park at Haile Sand Fort

- Hull University
- Humber Archaeological Partnership
- Humberside International Airport
- Joint Nature Conservation Committee
- Marine and Fisheries Agency
- Maritime and Coastguard Agency
- Ministry of Defence (Defence Estates)
- National Air Traffic Services En Route Ltd
- National Federation of Fisherman's Organisations
- Natural England (formerly English Nature)
- North Eastern Sea Fisheries Committee
- North Lincolnshire Council
- Royal Yachting Association
- Royal Yorkshire Yacht Club
- Royal Society for the Protection of Birds
- Sea Watch Foundation
- Statoil ASA
- Trinity House Lighthouse Service
- UK Hydrographic Office
- World Wildlife Fund
- Yorkshire Wildlife Trust.

For the onshore underground cable

A similar scoping exercise has been carried out for the EIA for the onshore underground cable. It was necessary to obtain agreement with the key consenting and statutory bodies over the range of issues which formed the scope of the EIA.

Consultation was carried out with:

- Associated British Ports, Humber
- Botanical Society of the British Isles Recorder
- British Geological Society
- Civil Aviation Authority
- Countryside Agency
- Country Land and Business Association
- Campaign to Protect Rural England
- Department for Environment, Food and Rural Affairs
- Easington Parish Council
- East Riding of Yorkshire Council
- East Yorkshire Bat Group
- English Heritage
- Environment Agency
- Forestry Commission
- Health and Safety Executive, Hazardous Installations Directorate
- Hedon Town Council

- Humber Archaeological Partnership
- Humberside Fire and Rescue Service
- Humber Industry Nature Conservation Association
- Joint Nature Conservation Committee
- Keyingham Parish Council
- Ministry of Defence (Defence Estates)
- National Trust
- Natural England
- North and East Yorkshire Ecological Data Centre
- North Eastern Sea Fisheries Committee
- Ottringham Parish Council
- Ottringham, Preston, Skeffling, Thorngumbald and Keyingham Internal Drainage Boards
- Patrington Parish Council
- Paull Parish Council
- Preston Parish Council
- Ramblers' Association
- Royal Society for the Protection of Birds
- Skeffling Parish Council
- Sunk Island Parish Council
- Thorngumbald Parish Council
- Welwick Parish Council
- Yorkshire Water
- Yorkshire Wildlife Trust.



Introduction to the impacts of the offshore components

The following sections summarise the likely environmental impacts associated with the construction and operation of the offshore aspects of the Humber Gateway Offshore Wind Farm.

The following topics were assessed:

Impacts on the physical environment:

- water quality
- coastal processes.

Impacts on the biological environment:

- intertidal ecology
- subtidal ecology
- fish
- marine mammals
- birds.

Impacts on the human environment:

- landscape, seascape and visual environment
- marine archaeology and wrecks
- noise
- commercial fisheries
- navigation and shipping
- aviation
- television, radio and fixed line-of-sight links
- marine navigation systems
- social and economic impacts
- other infrastructure.

Cumulative impacts from other wind farm developments or other existing or planned projects or activities in the area have also been addressed, as well as the impacts from decommissioning the Humber Gateway Offshore Wind Farm at the end of its operational life.

Impacts on the physical environment

Water quality

There are four designated bathing waters along the coast adjacent to the Humber Gateway Offshore Wind Farm site. Water quality impacts have been assessed in relation to the sensitivity of these sites and in light of the need to maintain the quality of the water as required by the Environmental Quality Standards set out in the relevant legislation.

Construction of the project, particularly the foundations and the cable routes, may disturb the sediments on the seabed. If these areas contain any contaminated material that could be disturbed by this work, this could result in significant impacts on the environment. However, there is no indication that there is any contaminated material present.

Even in the absence of contamination, additional mud and other fine material disturbed by the works could increase the cloudiness of the water, which could affect marine organisms. However, existing levels of water cloudiness are naturally high in the area. Modelling results show that the extent and severity of increases in cloudiness due to construction or decommissioning activities will fall within the range of natural variability. Furthermore, species inhabiting this area are typically well adapted to tolerate conditions such as these.

No significant impacts to water quality are therefore anticipated.

Coastal processes

The Holderness Coast is already subject to significant erosion and deposition as a result of the influence of tides, winds and waves, as well as due to trends associated with long-term climate change.

In order to assess the potential changes to the coastal environment that may occur as a result of the Humber Gateway Offshore Wind Farm, detailed studies were carried out to assess the magnitude and significance of any changes that could result from the presence of the wind turbine structures.

These studies showed that any potential changes to water levels, current speed and direction will be minimal, particularly in the context of likely naturally occurring changes. Particular attention was given to potential changes to wave height, since this could influence rates of erosion at the coast, but the studies showed that wave heights will only be slightly reduced by the Humber Gateway project and that there will be **no significant impacts** to coastal erosion.

Impacts on the biological environment

Intertidal ecology

The construction works have the potential to impact on species and habitats in the intertidal zone (ie the beach area between high and low tide). Surveys indicated that invertebrates living in the seabed were extremely scarce, with only 14 individuals found across the area as a whole. No species living on the seabed were identified within the intertidal zone. As a result, the intertidal area is considered to be extremely impoverished in ecological terms, with low diversity across the whole survey area. This habitat is typical of the area.

The design of the cable landfall installation incorporates mitigation measures to ensure that any impacts are minimised. These measures relate specifically to the way the cable will be moved across the foreshore, the use and management of drilling fluids, and the maintenance of vehicles and equipment. Due to the fast recovery rate of this type of environment and the resilience of the species present in this habitat, **no significant impacts** to intertidal ecology are anticipated.

Subtidal ecology

Surveys were carried out within the Humber Gateway site, subsea cable route areas and surrounding areas to characterise the ecology of the subtidal area (ie the seabed below the low tide level). The survey results indicated that the seabed is typical for the region, although there are some features of interest. These consist of areas that have some characteristics similar to reefs (which are generally very diverse and important habitats). These areas are formed either by accumulations of cobbles, or by a reef-forming worm species known as *Sabellaria*. However, the assessment concluded that the site is not considered to constitute a reef habitat.

Several important crustacean species, including lobster, are also present in the area.

A number of wind farm related activities have the potential to cause impacts to benthic communities (collection of organisms, which live in and on the seabed) during the construction, operation and decommissioning phases of the project. These include habitat and community disturbance during construction vessel positioning and cable installation, changes to water quality during construction, habitat and community loss as a result of the presence of turbine foundations and noise and vibration during operation, among others.

The main impacts to benthic ecology relate to loss and alteration of the seabed habitat as a result of the physical presence of turbine foundations and the increased levels of suspended particles. However, the species that inhabit the area are well adapted to tolerate environmental disturbance and have high recovery rates. Preconstruction surveys will be undertaken to identify key areas of *Sabellaria* so that they can be avoided during construction. As such, only **minor significant impacts** are predicted.

Minor significant impacts are also predicted to crustaceans as a result of increases in suspended sediments during construction whilst **no significant impacts** are predicted to other species. **No significant impacts** are anticipated as a result of all other activities.

There may be a net environmental benefit to the local ecosystem because the turbine structures will attract species and increase diversity.



Fish

Fish surveys carried out within the Humber Gateway site and surrounding areas confirmed that the fish species present are typical of the Holderness Coast and southern North Sea area. Studies were carried out which identified the presence of a number of important species. The Twaite Shad (which migrates through the inshore cable corridor area) is of particular nature conservation interest.

Construction, operation and decommissioning activities have the potential to cause increased water cloudiness. Any increase in suspended sediments could result in impacts to fish. In addition, impacts may result from underwater noise during construction (hammer piling and vessel noise) and decommissioning activities (vessel noise) and to a lesser extent during operation (operating turbine noise). In order to minimise impacts from hammer piling during construction, the hammer energy is built up gradually over time (known as 'soft start') so that the fish can move away from the noise source before it reaches full power.

The electromagnetic field caused by electricity flowing through the subsea cables also has the potential to cause impacts to sensitive species, however the cables are buried in order to minimise this impact.

The principal impacts to fish relate to disruption of migration routes during construction as a result of increased suspended sediment concentrations.

The majority of fish species are highly mobile and move over large areas and will move away from any significant disturbance and return once the area has either returned to its original state or the disturbance has ceased. Given the conservation importance of the Twaite Shad, **moderate significant impacts** are predicted, whilst **minor to moderate significant impacts** are predicted for sprat.

No significant impacts to minor significant impacts are predicted for sea trout, salmon, spawning sea bass and other gadoid and flatfish species.

Some migrating fish may also experience disturbance during the operational phase. Because of the sensitivity of Twaite Shad, **minor significant impacts** are predicted, whereas **no significant impacts to minor significant impacts** are predicted for the other species.

Given that the subsea cables will be buried at an approximate depth of between 1m and 3m, **no significant impacts to minor significant impacts** are predicted as a result of electromagnetic fields.

No significant impacts to minor significant impacts are also predicted as a result of physical disturbance to the seabed associated with construction vessel positioning and subsea cable installation.

Once the turbine structures are in place, colonising species will provide an additional food source for some fish species. As such, **a minor positive significant impact** is predicted.



Grey seal



Guillemot



Herring Gull

Images courtesy of Andy Coates, ERM

Marine mammals

A marine mammal survey confirmed the presence of three key species (harbour porpoise, grey seal and common seal) in the vicinity of the Humber Gateway site. These species are believed to be present in low to moderate numbers. A seal breeding site is located on the Lincolnshire coast approximately 15km to the south of the site.

Construction, operation and decommissioning activities have the potential to cause impacts to marine mammals. A number of activities have been identified including hammer piling during construction, electromagnetic fields during operation, vessel activity during construction and operation. These impacts have been considered in relation to their effect on marine mammal behaviour including displacement and impacts to the way marine mammals navigate and locate their prey.

The principal impact to marine mammals will be from hammer piling during construction. Whilst the noise created by piling will be built up over time to allow marine mammals to move away from the noise source, physical impacts to grey seals are likely to occur and as a result **moderate significant impacts** are predicted. Both harbour porpoise and grey seal are likely to display changes in behaviour eg avoidance and **minor significant impacts** are therefore predicted.

During the operational phase, it is likely that grey seals may suffer acoustic disturbance from turbine noise and maintenance vessels and **minor significant impacts** are therefore predicted.

Birds

Bird surveys, by air and boat, were carried out to establish both the species and numbers present in the vicinity of the Humber Gateway site. The birds recorded were mostly seabirds, however occasionally some migratory waterfowl and passerines (perching birds) were noted. Also of note were rafts of flightless Auks that occur in late summer and early autumn during their post-breeding feather moult.

The site is used all year round although bird numbers vary with season. The nearest breeding colonies are located at Flamborough Head approximately 53km north of the site along the Holderness Coast.

Construction, operation and decommissioning activities have the potential to cause impacts to birds using the Humber Gateway site. A number of types of impacts have been considered including displacement due to habitat loss, impacts to flight lines and collision risk. Potential impacts on environmentally designated sites, the nearest of which is 8km away, have also been assessed.

However, any habitat loss will be temporary and bird populations are not expected to be affected. Careful routing of construction vessels will be used to minimise disturbance, particularly in relation to moulting seabirds which can form floating rafts. In addition, the EIA studies have indicated that there will be no significant displacement effects and that the number of collisions between birds and the turbines will be very low. On the basis of these findings, and taking into account these mitigation measures, the assessment concluded that there will be **no significant impacts** to birds.

Impacts on the human environment

Landscape, seascape and visual environment

The proposed wind farm is located several kilometres offshore (some 8km east of Spurn Head) and the wind farm will be visible from the shore. The impact on the visual environment has therefore been considered as part of the EIA.

In doing so, the assessment considered both impacts on landscape/seascape character and visual impacts, as follows:

- Landscape or seascape impacts relate to the effects on the landscape or seascape and its resulting character and quality. Landscape and seascape resources and character are considered to be important in their own right and are valued for their intrinsic qualities regardless of whether they are seen by people.
- Visual impacts relate to the effects on the visual amenity and views experienced by people, eg residents, workers, tourists etc on land and at sea, from key viewpoints.

The Humber Gateway Offshore Wind Farm project is expected to give rise to impacts to both the landscape and seascape character. The site is at a minimum distance of 8km from the Holderness Coast and a minimum distance of 15km from the Lincolnshire coast. **Minor to major significant impacts** are predicted depending on the location and impacts will diminish at greater distances.

The project will also give rise to changes to visual amenity and to views from key viewpoints near the coast by day and night (due to safety lighting), when weather conditions are clear. **Minor to major significant impacts** are predicted, depending on the location and impacts will diminish at greater distances.

However, it is important to note that the attitude to and perception of wind farms varies from person to person. Public perception studies have been carried out, which indicate that offshore wind turbines may be considered dramatic sculptural features by some, whereas others may dislike the effects on the skyline and the presence of new man-made objects within the seascape.



Marine archaeology and wrecks

The North Sea basin has, at times, been under ice or exposed as dry land, and human settlements have existed periodically. In addition, the Humber Estuary has been an important harbour and communication route since prehistoric times.

As a result, the site contains a number of archaeological sites, including a number of wrecks and the remains of an F3 Tornado aircraft that is known to have crashed in the area in 1995.

To ensure that any impacts on these archaeological remains are minimised in particular during construction, a number of exclusion zones within the Humber Gateway area will be set up around sites of known archaeological interest. The project will also incorporate a number of other measures which will ensure that careful attention will be paid to impacts on archaeology during construction works, and that any information on archaeology in the area discovered during the works is properly recorded.

As a result of these measures, there will be **no significant impacts** on archaeological heritage.

Noise

Noise from construction and operation of offshore wind farms could affect residential properties and other noise sensitive locations onshore. Given the separation distance between the site and the nearest residential properties during construction, operation and decommissioning, the effects of vibration are unlikely to be significant and have not been considered.

The assessment has shown that construction noise is likely to result in **significant impacts** when piling works to install the turbine foundations are carried out at night. This will affect properties close to the coast and will be temporary in nature.

It has also been concluded that, due to the distance of the wind farm from the coast, there will be **no significant impacts** from the wind turbines when in operation.



Commercial fisheries

The area of the southern North Sea, within which the Humber Gateway Offshore Wind Farm is situated is important for fishing activity and contains populations of a number of commercial fish species, providing spawning grounds and nursery and feeding areas.

Bridlington, Kingston upon Hull and Grimsby are three major fishing ports near the site, and there are also other smaller ports, nearer to the Humber Gateway site, that land fish. The most important crustacean shellfish species caught by local fishermen are lobster and edible crab, while the most important fish are cod, Dover sole and sea bass.

The EIA also assessed concerns relating to issues such as the safety, welfare or profitability of fishing operations at the local level, including the possible loss of fishable area available to the potting sector and increased competition between potting and netting vessels during construction and decommissioning. The principal impacts relate to the crab and lobster potting sector, which is the primary fishery active within the Humber Gateway Offshore Wind Farm site and proposed cable route. Impacts may also occur to vessels using static gill nets, but these impacts are generally anticipated to be less important due to the smaller scale of this fishery.

It is acknowledged that the Humber Gateway project during construction and operation has the potential to cause significant impacts to a small number of local fishermen who fish (potting and netting) the site on a regular basis. Ongoing consultation with local fishermen and the development of appropriate mitigation measures will be required prior to construction in order to minimise impacts to the fishing community.

A fisheries liaison and consultation programme will be implemented which will minimise and mitigate these impacts. Through this programme, we will ensure that the profitability and welfare of those fishermen who are known to operate within the Humber Gateway Offshore Wind Farm site are not compromised, and as such there will be **no significant impacts**.

Navigation and shipping

The sea in and around the Humber Estuary is heavily used by shipping and other vessels. The Humber Gateway site is outside all shipping lanes, however, the possibility of increased risk of accidents resulting from the construction works or the presence of the turbines was considered during the EIA. Extensive consultation was undertaken to ensure that all of the issues were well understood.

Recognising that it is not possible to reduce any risk to zero, the approach has been to minimise the degree of risk so that it is as low as reasonably practicable. To achieve this, the project design includes a number of mitigation measures. These include a buffer zone, between the Transport Separation Scheme and the nearest turbines, an air draft clearance of at least 22m to ensure that the blades are high enough above the surface of the sea so that they will not impact on fishing boats or yachts that might stray too close, and appropriate navigational lighting.

The assessment concluded that the objective of minimising risks so that they are as low as reasonably practicable had been achieved and that there were no unacceptable risks. The additional degree of risk presented by the project was found to be low compared with the existing levels of risk in the area. **No significant impacts** are therefore predicted.

Aviation

There is evidence that wind turbines can affect the efficiency of radar systems, causing 'clutter' on radar screens which can make it hard to detect aircraft. For this reason, the EIA considered all such systems in the area, primarily Claxby Radar and Humberside International Airport Radar, together with any possible impacts on helicopter routes.

A range of technical mitigation measures (such as improved radar techniques and fill-in data sources) and operational mitigation measures were identified which will be implemented to minimise any effects on these systems. This includes agreement in principle to changes in helicopter routes following consultation with the helicopter operator.

In all cases, the mitigation is expected to be effective and there will therefore be **no significant impacts**.

The Ministry of Defence (MOD) was consulted during the site selection process to ensure that the selected site did not compromise the safeguarding activities of the MOD. The MOD responded and stated that it has no objection to the Humber Gateway Offshore Wind Farm. Further information on the project has been provided to the MOD and at the time of the assessment, a further response was awaited.



Television, radio and fixed microwave links

Wind turbines can also affect systems whose operation is based on the transmission of electromagnetic signals. These include VHF communications (widely used by ships), mobile telephones, television and fixed line-of-sight (microwave) links.

This assessment concluded that there would be **no significant impact** on VHF communications, mobile telephones or television reception as a result of the Humber Gateway Offshore Wind Farm.

The assessment identified any fixed line-of-sight links or microwave links in the vicinity of the wind farm and quantified the impact, if any, on the operation of the links.

A line-of-sight link passes through the Humber Gateway Offshore Wind Farm site to serve the BP Exploration Amethyst platform. The number of turbines that may cause interference with this link ranges from two to five, depending on the layout of turbines selected. The impact of any of the possible wind farm layouts could potentially give rise to **significant impacts**. However, altering the location of turbines slightly may be sufficient to avoid impacts on this line-of-sight link.

Marine navigation systems

Possible effects on a number of marine navigation systems were considered in the assessment, as follows:

- large ship and small ship radar systems
- Port of Hull Vessel Traffic Service
- racons (radio beacons used for shipping navigation)
- Global Positioning System
- Automatic Identification System (a system where vessels transmit a signal containing information such as their location and direction of travel).

Of these, there are only two impacts on marine navigation aids which have been judged to be potentially significant. These are the impact of shadowing on the Port of Hull Vessel Traffic Service radar and the false triggering of racons.

With regard to the Port of Hull Vessel Traffic Service, shadowing can occur when signal strength is reduced behind a turbine, hence reducing the likelihood of the radar detecting small objects. To mitigate the impact of shadowing, an additional sensor will be

positioned to fill in the gap in coverage due to turbine shadowing. This will successfully avoid the impact and result in there being **no significant impact**.

In order to avoid a racon from being triggered by a reflection from a wind turbine, a separation of 2km is required between the turbine and the racon. The detailed layout of the turbines will ensure that this separation is always maintained, and there will therefore be **no significant impact**.





Social and economic impacts

Consideration has been given to any effects that the project may have on the socio-economic conditions in the area. It has been concluded that the overall effect on the local economy will primarily be positive, and will enhance the region's profile and its environmental industries. New employment will also be generated during the operation of the wind farm, primarily in the areas of maintenance and security, resulting in a positive residual impact. Overall therefore the Humber Gateway Offshore Wind Farm project will have **minor significant impacts** of a positive nature.

Communication with key community stakeholders will take place throughout the project to ensure that stakeholders are fully informed and aware of future construction activities and opportunities.

Other infrastructure

Impacts on a number of other infrastructures in and around the Humber Gateway Offshore Wind Farm have been considered. Adjacent activities include marine aggregate extraction and marine disposal. There are pipelines that cross the northern part of the site and discussions with the operators will continue throughout the lifetime of the project.

An assessment of the impacts arising from the construction, operation and decommissioning of the Humber Gateway Offshore Wind Farm demonstrated that **no significant impacts** are predicted on infrastructure in the vicinity of the site.



During public exhibitions **90%** were
supportive of the Humber Gateway project*

*Views expressed by 243 people during public exhibitions in 2007.



Cumulative impacts

An assessment was carried out to consider whether or not there could be any impacts that would not be significant with Humber Gateway alone, but which could be significant when the effects of other projects in the vicinity (such as aggregate extraction, marine disposal, dredging operations, pipeline construction, natural processes and also other users of the sea) are taken into consideration.

The assessment considered in detail all other developments (both north and south of the Humber onshore and offshore) that are likely to be constructed within the same time frame as any part of the Humber Gateway project.

These comprise:

- Conisholme Fen Onshore Wind Farm
- Inner Dowsing Offshore Wind Farm
- Lincs Offshore Wind Farm
- Lynn Offshore Wind Farm
- Docking Shoal Offshore Wind Farm
- Race Bank Offshore Wind Farm
- Sheringham Shoal Offshore Wind Farm

- Bangers Farm Onshore Wind Farms
- Out Newton Onshore Wind Farm
- spoil disposal sites
- licensed and proposed dredging areas.

The assessment also considered other developments for which there is less certainty relating to the project itself or the time frame within which the project will occur. Since detailed information was generally not available for these projects, they were considered in outline only.

These projects comprise:

- Mablethorpe Onshore Wind Farm
- Dudgeon East Offshore Wind Farm
- Triton Knoll Offshore Wind Farm
- Westernmost Rough Offshore Wind Farm
- the expanding sea bass fishery
- Ministry of Defence activities
- subsea pipelines and cables.

The cumulative assessment concluded that there will be **no significant cumulative** impacts other than in respect of marine mammals and crustaceans.

With regard to marine mammals there may be loss of benthic habitat from Humber Gateway and nearby dredging operations, which could, if carried out at the same time, act together with noise impacts from piling to displace fish from a larger area than would be observed through piling noise alone. This would serve to increase foraging distances for marine mammals in the vicinity of the Humber Gateway site, resulting in a **minor significant cumulative impact**.

There may also be **cumulative impacts** to female crustaceans due to increased levels of sedimentation from a combination of dredging activities and the Humber Gateway construction works. This could result in a **minor significant cumulative impact** if these activities happened at the same time.



Offshore summary

A comprehensive EIA has been carried out, assessing the impacts on the physical, biological and human environment. Where significant adverse impacts are predicted, mitigation measures have been identified wherever possible to reduce these impacts.

Following mitigation, the only significant impacts that are predicted are as follows:

- subtidal ecology (minor significant impacts, temporary)
- fish (minor to moderate significant impacts, temporary during construction and decommissioning)
- marine mammals (minor to moderate significant impacts, temporary)
- landscape, seascape and visual impact (minor to major significant impacts)
- fixed microwave communication (significant impacts)
- noise (significant impacts, temporary)
- socio-economic (minor positive significant impacts).

In addition, there may be minor significant cumulative impacts to marine mammals and to female crustaceans as a result of the combined effects of any nearby, concurrent dredging activities together with the Humber Gateway Offshore Wind Farm construction activities.



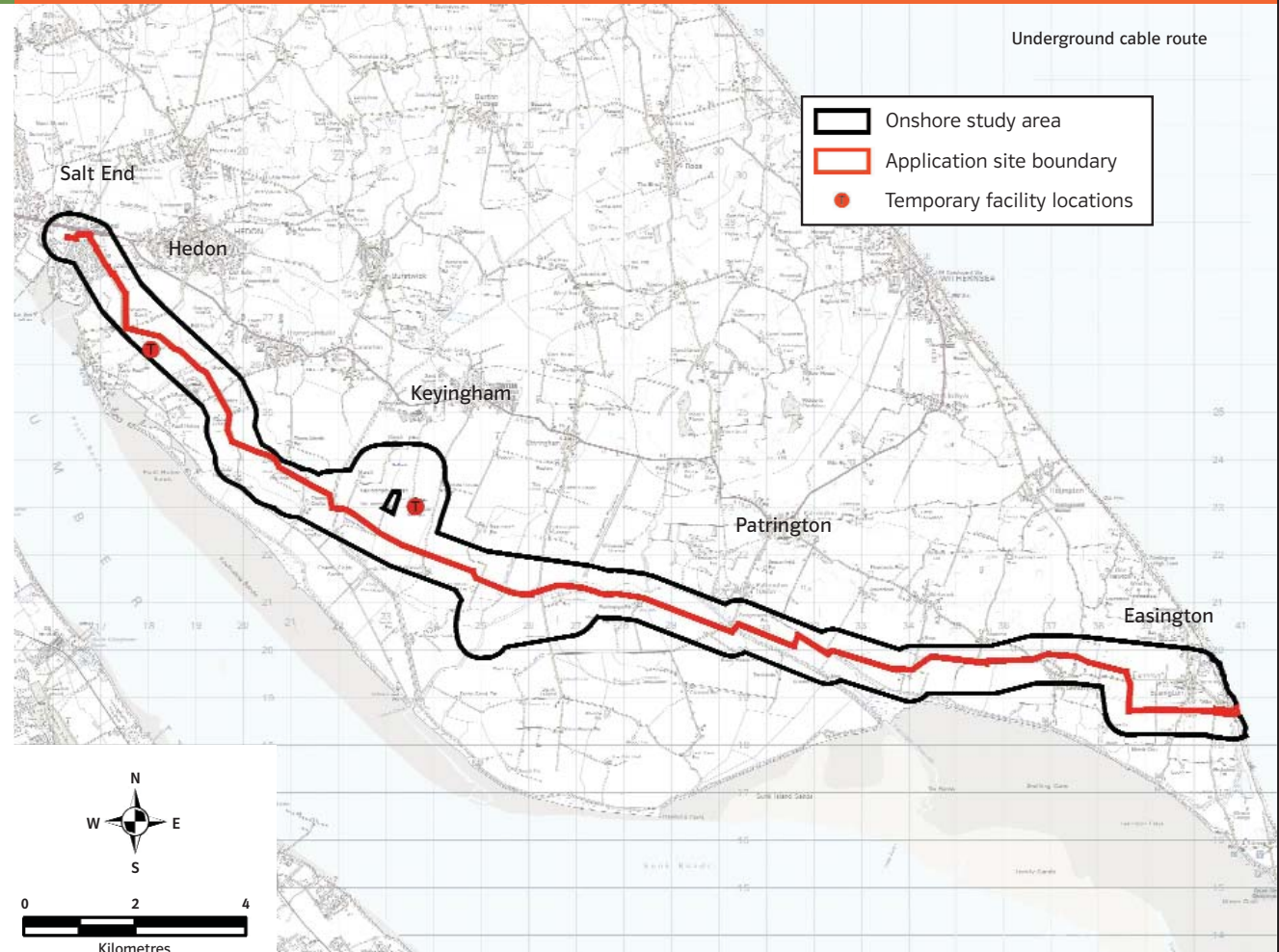
Introduction to the impacts of the onshore underground cable

The following sections summarise the likely environmental impacts associated with the construction and operation of the onshore underground cable that will connect the Humber Gateway Offshore Wind Farm into the National Grid at a substation to be proposed near Salt End.

The following environmental topics were assessed:

- soils and agriculture
- air quality and dust
- archaeology and cultural heritage
- landscape and visual
- noise and vibration
- socio-economics
- traffic and transport
- ecology and nature conservation
- water resources and flood risk.

Cumulative impacts from other wind farm developments or other existing or planned projects or activities in the area have also been addressed, as well as the impacts from decommissioning.





Soils and agriculture

The majority (98%) of the cable route will go under agricultural land. In farmland, cables are normally buried at a depth of at least 900mm. However, the proposed burial depth has been revised, at the request of landowners, to a depth of 1,200mm to the top of the cable.

Two trenches are required, as shown in the diagram below, each carrying three cables. Soils excavated from the trenches will be temporarily stored alongside, prior to backfilling.

To avoid damage to the structure of the soil, construction works will only be carried during the drier months of April to October. Topsoil will be stripped on a field by field basis and stored in a mound running along one side of the trench (soil from different fields and hedgerow areas will be separated). Subsoil will be excavated from the trench line and stored separately. Soil will be stored for a maximum of 20 days so no significant deterioration in soil fertility will occur. Stockpiles will be a maximum of 2m in height to avoid compaction from the weight of the overlying soil.

It is possible that pollutants that may be present in the soil from current or historical sources may be encountered and disturbed during excavation. However, given the agricultural nature of the area, no significant contamination is likely.

No significant impacts are therefore anticipated in relation to soils.

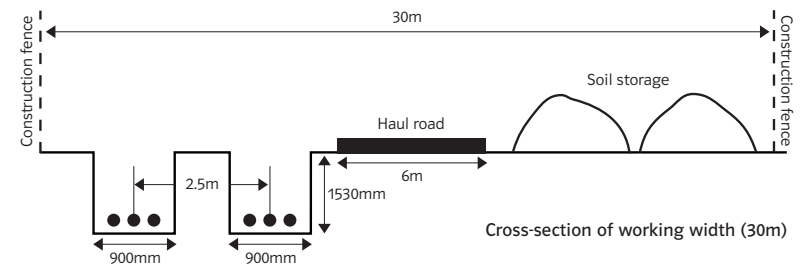
Approximately 95 hectares of agricultural land will be temporarily required during the construction, most of which is considered to be of very good quality.

The construction works could affect agriculture as a result of the temporary loss of productive land, reduced bank stability and restricted flow of field drains, fracturing of field drains, removal of field boundaries to allow continual construction, the temporary restriction of access and the severance of fields.

Prior to construction, a condition survey will be carried out to assess the condition of fences, field drains and hedgerows along the cable route. This will enable an assessment to be made of any damage during construction and will allow for reinstatement.

Following construction, the area will be reinstated according to a specification to be agreed with the landowners and statutory bodies. Any replacement planting that is required will be carried out during the first appropriate season following reinstatement. Any drainage works will be agreed with the relevant Internal Drainage Board, the Environment Agency and the landowner.

Consequently, there will be **no significant impacts** during the construction phase or in the long term.





Air quality and dust

The potential impacts on air quality that may arise are related to emissions of dust from disturbance of soils and from construction vehicles.

Each 1km section of the route will be completed in 50 days. Three properties are located within 100m of the cable route. It is anticipated that one of these properties could experience potentially significant impacts from dust. **No significant impacts** are anticipated for all properties along the cable route.

Construction will be undertaken in accordance with best practice, including measures to minimise dust impacts from construction activities. For example, vehicles will be washed to remove dust from the wheels before leaving the construction site.

Archaeology and cultural heritage

In digging the cable trench, it is possible that any archaeological remains in the area might be disturbed or damaged.

However, there are no known remains within the cable trench working area or the landfall area. There is potential for sites related to the maritime history of the area to be present along sections of the cable route. This is particularly the case where the cable crosses the formerly low lying coastline of the Humber and the number of creeks and channels that were navigable in the past.

To avoid any impacts on unknown archaeological remains, we will implement a range of mitigation measures including the use of an 'archaeological watching brief' which will ensure that all discoveries will be preserved where they are found, if possible, and that any discoveries are fully recorded.

There will therefore be **no significant impacts**.

**Landscape and visual impact**

We decided to bury the cable underground, even though this is considerably more expensive than overhead lines supported by pylons. This ensures that there are no major impacts on the landscape and on the visual environment.

During construction, vegetation will be removed and, where unavoidable, this will include walls and fences. There will also be construction plant and storage compounds and these will be temporary. Therefore minor to moderate significant impacts are predicted.



Noise and vibration

Noise impacts could occur at properties near to the construction works associated with digging the trench and laying the cable, and also from the works required at the landfall site.

There will be **significant impacts**, albeit short term and temporary, at two properties along the underground cable route. This will occur during the topsoil stripping, trenching, backfill and reinstatement phases of the operation and open cut crossings. These impacts are expected to last for approximately seven days.

At the landfall site, large stakes will need to be driven into the ground to anchor the drilling rig that will drill under the cliff and the beach to form a small tunnel through which the cable will be brought ashore. Noise from this activity will result in a **significant impact** on the caravan park in Easington during the daytime, although this level of noise impact is likely to last for only two days.

Decommissioning would result in noise if the underground cable is recovered. However, the noise levels would be no higher than the quieter activities that have been considered in detail in this assessment, and therefore **no significant impacts** are likely.

Socio-economics

The construction phase of the project will potentially give rise to positive benefits to the local economy over the two year construction period, primarily as a result of additional employment.

In total, around 72 personnel will be required for construction. The duration of employment will vary but will generally be seven months per year for a period of two years. The workforce will be sourced from within both the local and wider economy and from both existing contracted or employed personnel and new employees. This will benefit the local economy to some degree and is considered to be a **minor positive significant impact**.





Traffic and transport

Construction of the underground cable route could result in impacts from additional construction traffic, including transport of workers to and from the site, and from temporary closure of roads.

There will be two temporary construction facilities located along the cable route. These temporary bases will contain items of plant and office facilities, and are situated to provide convenient access to the working areas.

A haul road will be constructed along the cable route, which will provide access for vehicles up and down the working width.

The predicted peak daily movements of traffic associated with the development is expected to be 2.3% over current levels. As a result, **no significant impacts** are predicted as a result of increases in traffic levels.

Construction of the cable route will take place over a two year period between April to October, and therefore construction will last for approximately 14 months. Construction hours would be from Monday to Saturday, 7.00am to 7.00pm. Construction works at the landfall are expected to last 36 days.

Temporary parking restrictions may be required in Easington to enable drilling equipment to access the site.

There will be relatively few additional vehicle movements as a result of the landfall works, and **no significant impacts** are anticipated.

Other potential impacts associated with traffic have been assessed, including disruption resulting from temporary road closures, closures of other public rights of way and road safety. A number of standard mitigation measures will be implemented in close liaison with East Riding of Yorkshire Council. There will therefore be **no significant impacts** associated with these issues.

Ecology and nature conservation

The selection of the onshore cable route and the landfall location has taken into account ecological sensitivities identified during the field surveys to avoid impacts to sensitive habitats or species along the route. Nevertheless a detailed assessment was carried out as part of the EIA.

The assessment found that no European or nationally designated sites for nature conservation will be directly affected by the cable route. At its closest point, the cable route lies within 24m of the Humber Estuary Coastal Flats and Marshes Special Protection Area and the Humber Estuary Site of Special Scientific Interest (SSSI).

A colony of Little Tern, a protected species, exists at The Lagoons SSSI. Little Terns are known to be susceptible to disturbance if construction works occur during the breeding season. However, the landfall site is approximately 200m north of The Lagoons and disturbance will not occur at such distances.

There are three sites designated for their local nature conservation importance that could be affected by the works. However, one of these was found to be predominantly bare ground and of no particular ecological interest, and at the other any minor disturbance will be made good after the works. The third site is at Dimlington Cliffs, where the cable will come ashore. The works have been designed at this location to avoid any impacts. The cable will be raised so that it will not be in contact with the cliffs. It will also be laid on rollers to prevent dragging of the cable across the field or the beach.

The route will cross a number of hedgerows, although none of these are in good condition. All hedgerows affected will be reinstated and enhanced in consultation with Natural England and landowners or occupiers. At hedgerow crossings, the working width will be significantly narrowed and therefore **no significant impacts** are predicted to hedgerows.

The proposed route will also cross a number of watercourses. The majority of watercourses affected are narrow field drains, although several larger watercourses will also be crossed. None of these drains are of special botanical importance, although some support water vole and protected bird species. A number of mitigation measures will be implemented.

One area of woodland will be directly affected by the cable route: a small semi-natural broadleaved woodland east of Paull Road at the western end of the cable route. The cable route will result in the permanent loss of trees within an area of 0.15ha. Some of the mature trees could support bat roosts, and there could therefore be a **significant impact** in relation to the loss of any bat roosts at this location.



Water resources and flood risk

There are several aspects of the works that could result in impacts to surface water and groundwater quality, the physical characteristics of watercourses and groundwater bodies and flooding and flood storage capacity.

The key aspects of the works that could give rise to these impacts include construction of temporary construction compounds and haulage roads, construction of the cable trench, dewatering of the trench, directional drilling at the landfall and watercourse crossings.

With regard to impacts on flows in surface water courses, crossing points will be selected to avoid the most sensitive areas and, where possible, crossings will be carried out at times of low flow. Some **minor significant impacts** may occur.

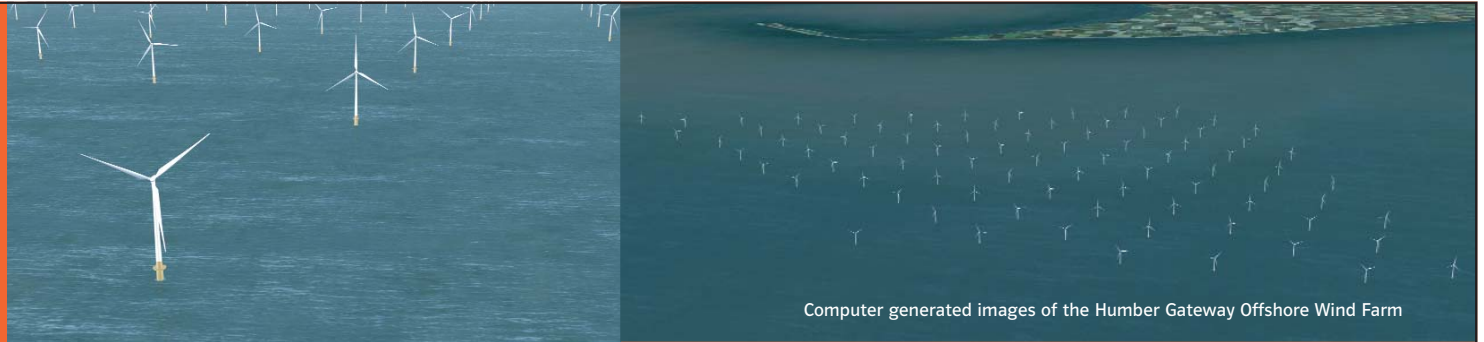
There is potential for impacts to water quality due to additional sediment being generated during excavation. One of the ways in which this will be minimised will be to limit the length of the trench that is open at any one time to a maximum of around 4km, together with other standard mitigation measures. Consequently, **no significant impacts** are predicted.

Minor, short term impacts to water users could occur during the crossings of smaller watercourses. Crossings will be timed, where possible, to coincide with periods of low flow. A **minor significant impact** is predicted. Any watercourses that are particularly sensitive will be crossed by trenchless methods, and therefore **no significant impacts** on water availability or users will occur.

Impacts to land drainage will be minimised through pre-works condition surveys and agreements to restore drainage systems to their current existing status. However, **minor significant impacts** are anticipated, but these will be short term in nature.

Impacts to surface water and groundwater quality are possible in the event of serious flooding in the area. This could result in a substantial amount of soil being washed from the stockpiles into surface watercourses. However, although this could result in **significant impacts**, the magnitude of such impacts is difficult to predict.





Computer generated images of the Humber Gateway Offshore Wind Farm

Cumulative impacts

A number of other projects are planned in the area of the underground cable route. However, none of these are likely to be built at the same time as the onshore cable route and there will therefore be no significant cumulative impacts.

Onshore summary

A comprehensive EIA has been carried out, assessing the impacts on the physical, biological and human environment. Where significant adverse impacts are predicted, mitigation measures have been identified wherever possible to reduce these impacts.

Following mitigation, significant impacts are predicted in the following areas:

- landscape and visual impacts (minor to moderate significant impacts, temporary)
- noise (significant impacts, temporary, at three locations)
- socio-economics (minor positive significant impact, temporary)
- ecology (significant impact to bat roosts)
- surface watercourses (minor significant impacts, temporary)
- water users (minor significant impacts, temporary)
- land drainage (minor significant impacts, temporary)
- consequences of flooding (significant impacts, temporary).

There will be no significant cumulative impacts as a result of the combined effects of any nearby, concurrent construction works together with the Humber Gateway Offshore Wind Farm onshore construction activities.



Scroby Sands Offshore Wind Farm, Great Yarmouth.

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