

Section 5

Site Selection and Consideration of Alternatives



5 **SITE SELECTION AND CONSIDERATION OF ALTERNATIVES**

5.1 **INTRODUCTION**

5.1.1 **BACKGROUND**

This section describes the site selection process and the alternatives considered for the offshore elements of the Humber Gateway Offshore Wind Farm. This includes a description of the following:

- the process leading to the selection of the site;
- the evolution of the site boundary; and
- the selection of the offshore export cable route and cable landfall point.

E.ON recognises the importance of careful site selection and detailed studies have been carried out to assess the environmental, economic and technical feasibility of a range of possible sites.

The findings have informed the EIA process and, as a result, site selection is a key embedded mitigation which ensures that potential environmental impacts are minimised from the start of the development process.

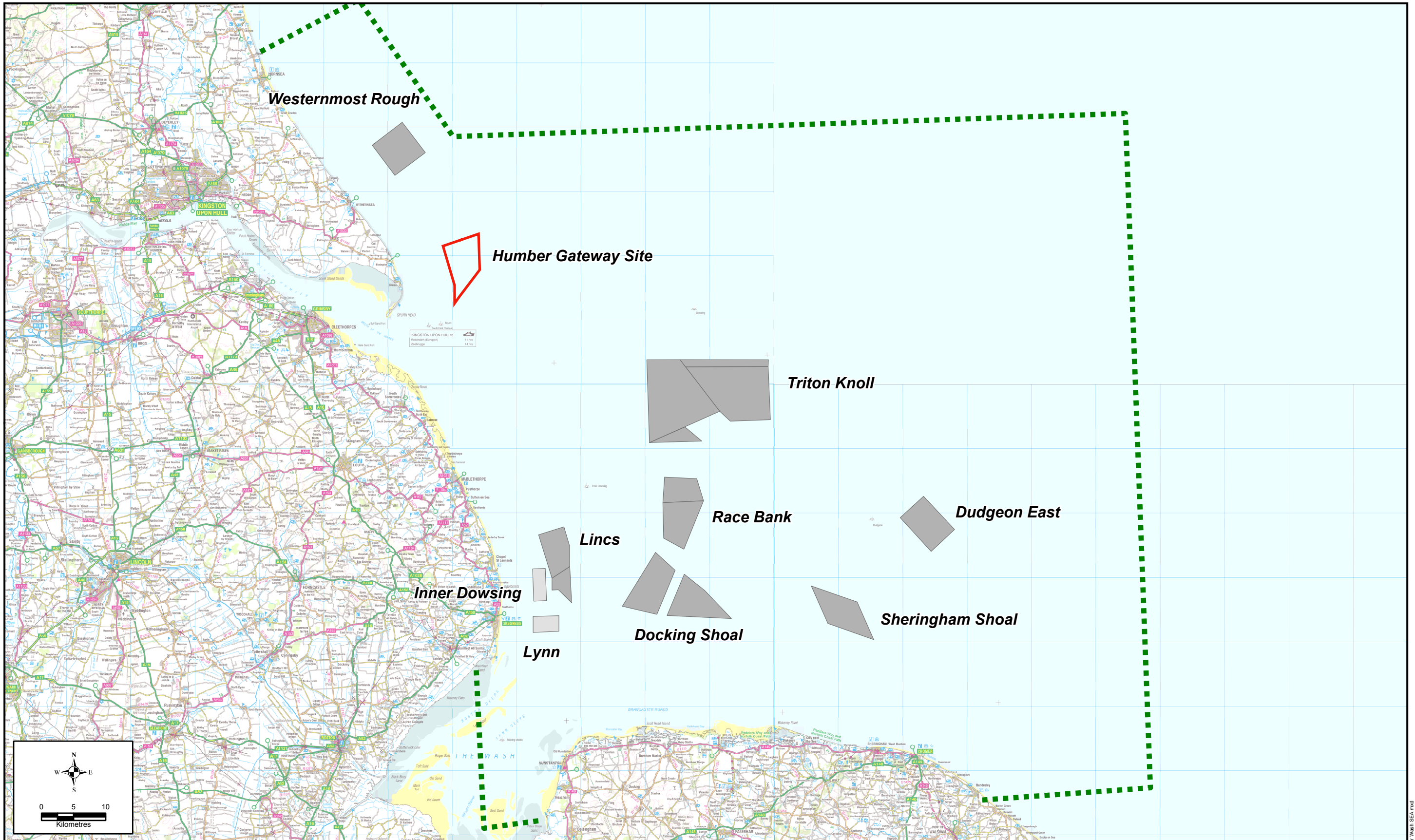
5.1.2 **OFFSHORE SITE SELECTION**

Humber Gateway is located within the Greater Wash Strategic Environmental Assessment (SEA) area, which was identified by the UK Government as being a potentially suitable location for offshore wind farm development. *Figure 5.1* shows those sites ultimately successful in securing an Agreement for Lease from the Crown Estate, within the Greater Wash SEA area.





In order to arrive at the Humber Gateway site shown in *Figure 5.1*, a team of environmental and engineering specialists identified a list of potentially suitable locations. The following factors had an important bearing on the suitability of a potential site:

- potential impacts on the natural environment (including birds, fish, marine mammals and other fauna and flora);

- proximity to regional, national and international environmental designations such as Ramsar Sites, Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Areas of Outstanding Natural Beauty (AONBs);
- the economic feasibility of the site, which includes the suitability of the wind resource, the proximity to the electricity grid connection;
- the engineering suitability of the site, including water depth, bathymetry and geological conditions;
- the availability and proximity of suitable port facilities during construction, operation and maintenance of the proposed offshore wind farm;
- whether the location would adversely affect aviation or military interests;
- proximity to activities such as shipping, aggregates dredging and commercial fishing; and
- the extent of existing cables and pipelines in the vicinity of the Humber Gateway site.



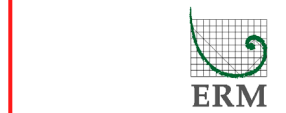
KEY:

	Humber Gateway Site
	Indicative Greater Wash SEA Area
	Round 1 Wind Farm Sites
	Round 2 Wind Farm Sites

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TITLE: **Figure 5.1
The Greater Wash SEA Area**



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5.1.3 CONSIDERATION OF ALTERNATIVES

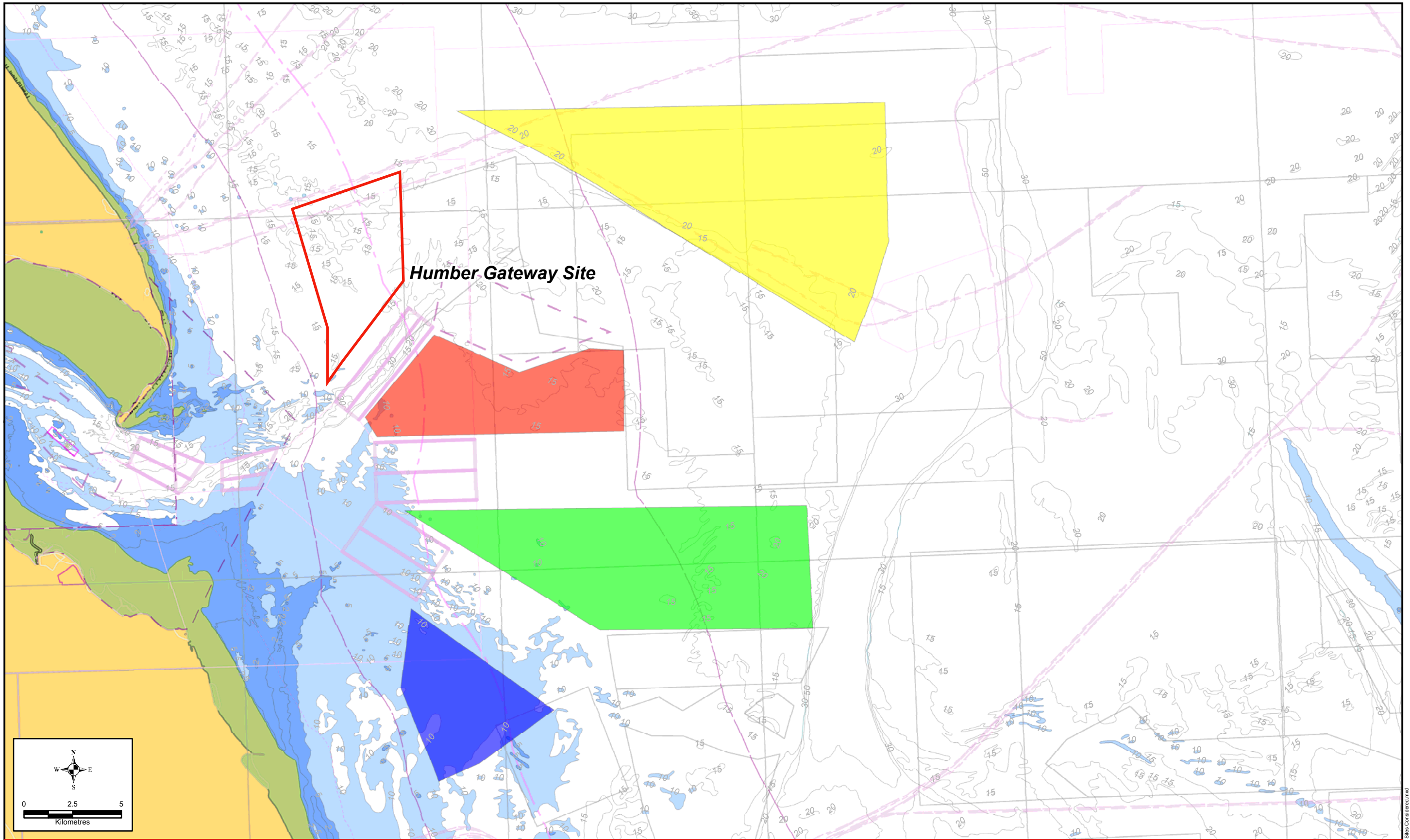
Through the site selection process, five potential development blocks were identified, as shown in *Figure 5.2*. These were investigated in more detail and constraints for each site have been mapped using existing and publicly available data. Initial consultation was also carried out with key stakeholders, for example Natural England, the Maritime and Coastguard Agency (MCA) and ABP Humber Ports.

Table 5.1 summarises the key constraints that were mapped. This demonstrates that some considerations remained applicable to all the sites with equal weighting (e.g. nature conservation, fisheries etc), however some constraints were unique and only applicable to individual blocks e.g. MoD constraints.

Four of the sites shown in *Figure 5.2* were rejected for the reasons set out below.

- The Red Block overlapped with an MoD air defence and safety area, which was a highly significant constraint. In addition, the proximity to the deep water anchorage would add additional risk which was considered difficult to mitigate against through the EIA process. The site was therefore rejected.
- The Green Block also overlapped with the MoD air defence and safety area. In addition, a shipping analysis revealed a very high density of shipping movement across the site. These issues were considered highly significant constraints and so the site was rejected.
- The MCA indicated that the Blue Block would not be considered favourable due to the proximity to the shipping lanes. The Blue Block was also in close proximity to the MoD Donna Nook Firing and Bombing Range. Together, these issues are considered highly significant constraints and the Blue Block was therefore rejected.
- Although initially favourable, the Yellow Block was found to have four gas pipelines, a cable, five seabed wells and one surface well within the site boundary. The yellow block was also deemed to be a considerable distance offshore, which would add to the cost and complexities of construction and maintenance. These issues are considered highly significant constraints. The Yellow Block was therefore rejected.

The most favoured site was ultimately Humber Gateway, given its lower incidence of constraints compared to the alternative sites. The principal determining factor was its closer proximity to the shore and thus onshore grid connection. It was also positively selected by ABP Humber as the site least likely to interfere with marine navigation and safety and was outside all MoD constraints.



- KEY:**
- Humber Gateway Site
 - Blue Block
 - Green Block
 - Red Block
 - Yellow Block

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TITLE: **Figure 5.2
Alternative Sites Considered**



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Table 5.1 Comparative Appraisal of Alternative Sites

Issue	Red Block Site	Green Block Site	Blue Block Site	Yellow Block Site	Humber Gateway Site
Summary of Shipping Intensity	This site borders the traffic separation scheme at its western extent and also lies adjacent to the deep water anchorage. Shipping density is therefore very high. Given the proximity of the deep water anchorage and possibility that ships may drag anchors, this presents an additional element of risk and therefore a high constraint .	This site lies between the eastern and south eastern traffic separation scheme. The shipping intensity study indicated a very high density of shipping movements crossing the site, resulting in a high constraint .	This site lies between the south east traffic separation scheme and the north of the Aggregate Dredging Area 197. Discussions with MCA and ABP Humber indicated that it would not be considered favourably due to the proximity of high density of shipping approaching from the south.	This site is the furthest away from the most concentrated shipping movements and, given the distance offshore, presented low levels of shipping. The MCA were most favourable about this site and therefore this site presents a low constraint .	Humber Gateway does not affect the main route north to Flamborough and is outside all shipping lanes. The site also avoids the Aggregate Dredging Area 102. Discussions with MCA and ABP Humber indicated this site to be the preferred site from a shipping perspective and so is a low constraint .
Closest Distance to Conservation Designations	The Humber region has national and international conservation designations along much of the coastline, and whilst none of the proposed blocks are situated on a designated site, the proximity of the designations remained an important consideration . For example, regardless of the site progressed, ornithology would require detailed discussion with Natural England, the RSPB and the Yorkshire Wildlife Trust. The data below shows the closest distance of each site to a designated area in kilometres.				
RAMSAR – Humber Flats Marshes and Coast Phase 1	11.0	11.5	7.2	18.1	8.2
SPA – Humber Flats Marshes and Coast Phase 1	11.0	12.2	7.2	18.1	8.2
SAC – Saltfleetby	14.6	14.7	6.8	34.2	19.3
SSSI – Humber Flats & Marshes	13.4	13.4	6.8	17.6	8.2
National Nature Reserve	13.4 (Spurn Point)	14.0 (Donna Nook)	6.8 (Saltfleetby)	19.4 (Spurn)	8.2 (Spurn)
Local Nature Reserve	None	None	None	None	None
Heritage Coast – Spurn	13.4	14.0	17.3	19.4	8.2
AONB – Lincolnshire Wolds	28.1	27.9	23.6	43.0	28.7
Visual Impacts	All the development blocks are further offshore than the restricted visual seascape contour indicating a low constraint for all sites.				
Closest Distance from the coast (km)	10.2	12.4	7.2	17.3	8.2
MOD Interests (e.g. D306 Cowden Ordnance Demolition, D307 Donna Nook Firing and Bombing Range)	This site has a significant percentage of its area within the MoD Weapons Airspace Safety Area. This is considered a highly significant constraint .	This site has a significant percentage of its area within the MoD Weapons Airspace Safety Area. This is considered a highly significant constraint .	This site has a significant percentage of its area within the MoD Weapons Airspace Safety Area. This is considered a highly significant constraint .	This site is not affected by the MoD interests in the area and there is therefore a low constraint .	This site does not overlap with the MoD Weapons Airspace Safety Area and is therefore considered a low constraint .

Issue	Red Block Site	Green Block Site	Blue Block Site	Yellow Block Site	Humber Gateway Site
Cables and Pipelines	One cable runs through the site and there are no known pipelines, seabed wells or surface installations.	There are no known cables, pipelines, seabed wells or surface installations.	This site has one cable running through the site.	This site has four gas pipelines, a cable and five seabed wells within the site.	Two pipelines run through the site operated by Britoil and they are active. There are no seabed wells or surface installations.
Marine Mammals	The Humber region has important numbers of Grey and Common Seals and the closest regular haul out area in proximity to the development blocks is Donna Nook (the closest is 11.6 km from the Blue Block). Regardless of the site progressed, it was an important consideration and would require detailed discussion with Natural England and JNCC to characterise the use of the selected site by marine mammals.				
Fisheries	A fisheries spawning map was produced from publicly available data. This indicated that herring, sprat, sole, lemon sole and sandeel are all species that could be potentially affected by any of the development blocks. Regardless of the site progresses, fisheries and commercial fisheries was an important consideration and would require detailed discussion with the MFA, the fishing industry and local statutory bodies.				

5.1.4 EVOLUTION OF THE SITE BOUNDARY

Once the site was identified, an application for Humber Gateway was made to the Crown Estate in 2003. This followed the announcement of a competitive bid process for Round 2 offshore wind farms.

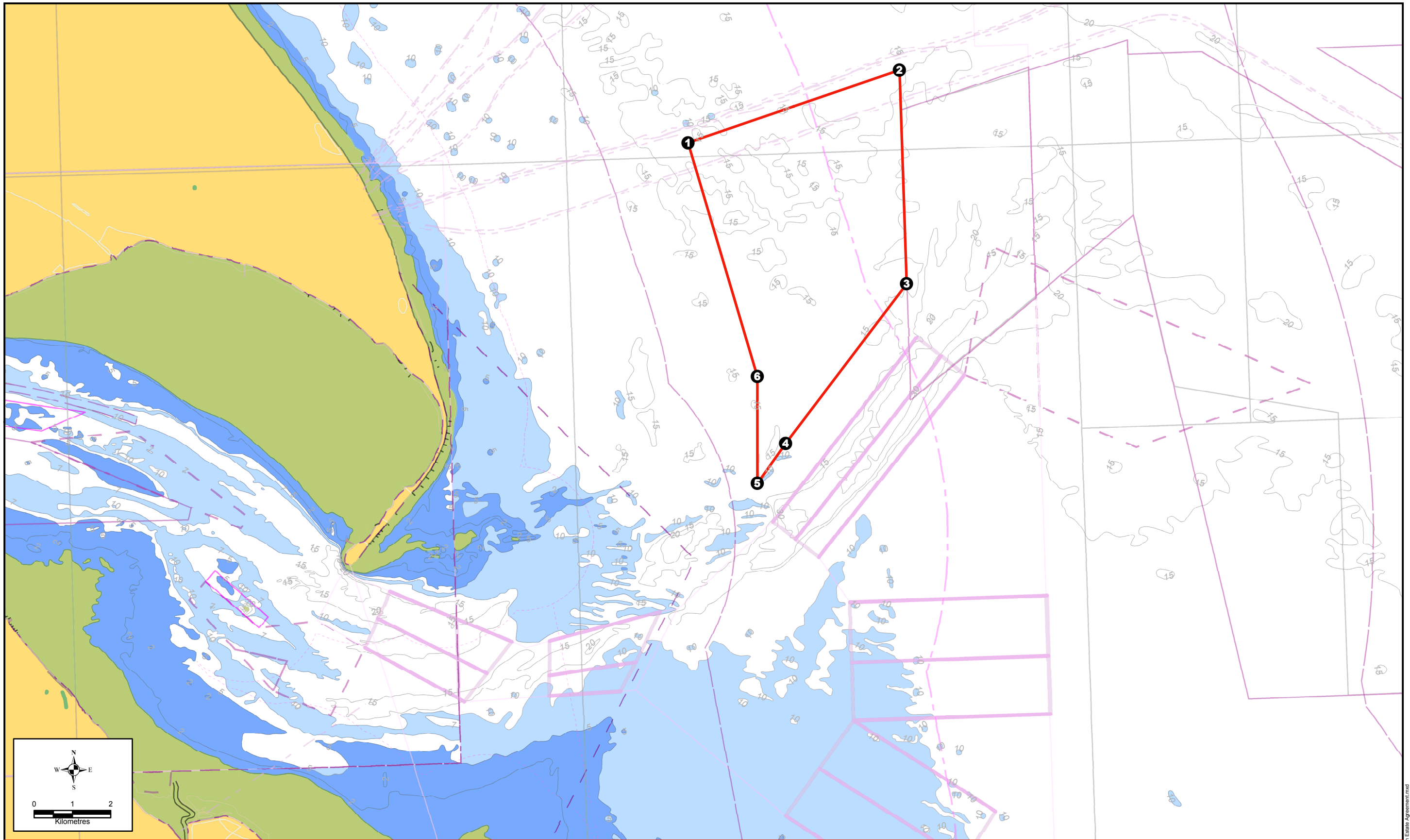
The bid for Humber Gateway was successful and the Crown Estate awarded an *Agreement for Lease for Humber Gateway* in December 2003. The coordinates awarded by the Crown Estate are shown in *Figure 5.3*.

The site boundary has since evolved through the EIA process and ongoing consultation with statutory bodies and key stakeholders. *Figure 5.4* shows the evolution of the boundary and two key constraints that have reduced the size of the site:








- A no-build zone of 1 nm from the ship Traffic Separation Scheme (TSS) has been discussed and agreed with both the MCA and ABP Humber. This is discussed in more detail in *Section 12.6*.
- E.ON is committed to a 250 m no build zone either side of the BP Exploration Amethyst gas pipeline, due to construction and operational risks.

The location of Humber Gateway is therefore constrained on all sides for the following reasons:

- the site must be located more than 8 km from the coast in accordance with the conditions of Government recommendations in the SEA report. This constraint defines the western boundary;
- the southern and eastern boundaries are defined by known navigational and regulatory constraints;
- there are a number of pipelines to the north of the site, which present construction and operational risks (thereby defining the northern boundary);
- the site can only have a maximum of 35 km² as per the Crown Estate agreement for lease; and
- a maximum generating capacity of 300 MW is a condition of the Crown Estate agreement for lease.



KEY:

 Humber Gateway Site	 WGS84 (00 19.88453,53 38.01906)
Site Boundary Coordinates	 WGS84 (00 16.89551,53 35.82725)
 WGS84 (00 14.81194,53 40.10458)	 WGS84 (00 16.24035,53 35.27662)
 WGS84 (00 19.88188,53 41.03345)	 WGS84 (00 16.28001,53 36.78196)

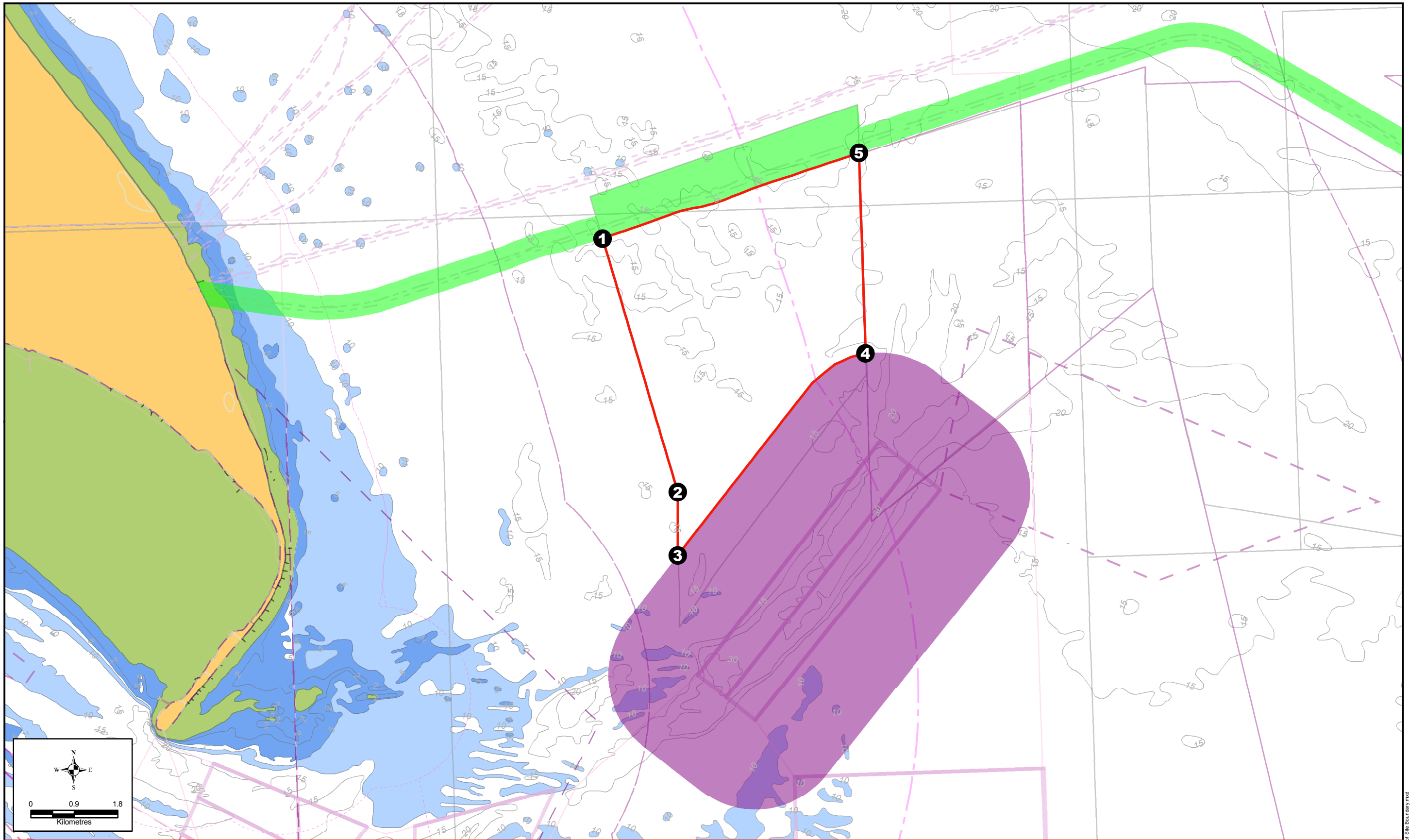
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TITLE: **Figure 5.3
The Crown Estate Lease Agreement**



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KEY:

- Revised Boundary Following the EIA Process
- BP Pipeline No Build Zone
- TSS 1nm Buffer Zone

Revised Site Boundary Coordinates

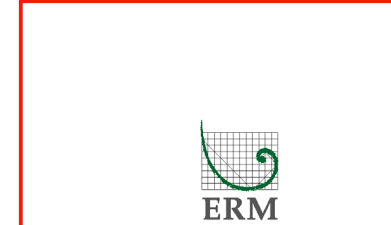
- 1** WGS84 (00 15.0194, 53 39.6316)
- 2** WGS84 (00 16.2777, 53 36.7827)

- 3** WGS84 (00 16.2398, 53 36.0767)
- 4** WGS84 (00 19.8828, 53 38.2574)
- 5** WGS84 (00 19.8802, 53 40.4935)

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TITLE: **Figure 5.4 Evolution of the Site Boundary**



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5.1.5 GRID CONNECTION POINT

Introduction

The availability of a suitable onshore grid connection point is one of the critical elements in the development of an offshore wind farm. The selection of the grid connection point and onshore cable routes for Humber Gateway was an iterative process and involved planning policy, environmental, financial and technical considerations. The key three stages are outlined below.

Stage 1: Assessment of Possible Connection Options

A number of connections points, both north and south of the Humber, were considered. These include connection points at Creyke Beck, Salt End and Killingholme. All these locations have been assessed for likely capacity and technical and commercial viability.

Stage 2: High Level Environmental Appraisal to Identify a Viable Onshore Cable Route

Route corridors were then sought between a number of landfall points on the Holderness Coast and the potential connection points on the National Grid network. The area of search was primarily influenced by the location of the Humber Gateway site awarded by the Crown Estate. A high level planning and environmental constraints appraisal was undertaken.

The following sources were consulted to inform the appraisal:

- Local Development Plans for the area of search;
- Countryside Agency (now part of Natural England) Landscape Character Assessments;
- local landscape character assessments and management guidelines;
- Humber Archaeology Partnership;
- previous Environmental Statements produced for projects in the region; and
- field assessments to determine suitable route corridors from an engineering perspective.

This process is described in detail in the Humber Gateway Offshore Wind Farm: Onshore Cable Route Environmental Statement.

Stage 3: Selection of Preferred Grid Connection Point

Salt End was progressed as the preferred grid connection point and a Grid Connection Agreement has been entered into with National Grid for 300 MW. This provides for 220 MW secured through existing capacity on the network at the 275 kV substation at Salt End, with a further 80 MW supplied by National Grid following grid reinforcement works.

In order to reach Salt End, a number of scenarios have been considered and the optimum route was ultimately determined to be a 30 km underground cable, from a landfall point at Easington on the Holderness Coast to the grid connection point at the existing substation at Salt End, on the east side of Hull. This was the most direct route with least environmental issues and the least disturbance to local communities. The onshore cable route and site selection process for this element of the project is described in full in the Onshore Environmental Statement.

5.1.6 SELECTION OF CABLE LANDFALL POINT

Having identified Easington as the preferred landfall location, work was undertaken to select a precise landfall point. Meetings were held between 2004 and 2007 with Natural England, Cefas, the Environment Agency and the East Riding of Yorkshire Council to draw on their local knowledge and explore how potential environmental effects could be managed. Throughout the process, a number of assessments, surveys and engineering modelling exercises have been carried out, including the following.

- A desk top review of the environmental designations and local policy documents relating to local shoreline management (*Section 2*).
- An assessment of the coastal erosion rates. This is important given the high erosion rates experienced by the Holderness coastline (both cliff erosion and seabed erosion). The dynamic nature of the coastline is a key concern and is described in the Physical Baseline (*Section 7*). Studies indicate that the coastline is likely to erode over the 40 year life of the wind farm by between 95 m and 200 m from its current position. This issue requires that the bore length for the cable landfall must be a sufficiently far back from the eroding face of the cliff.

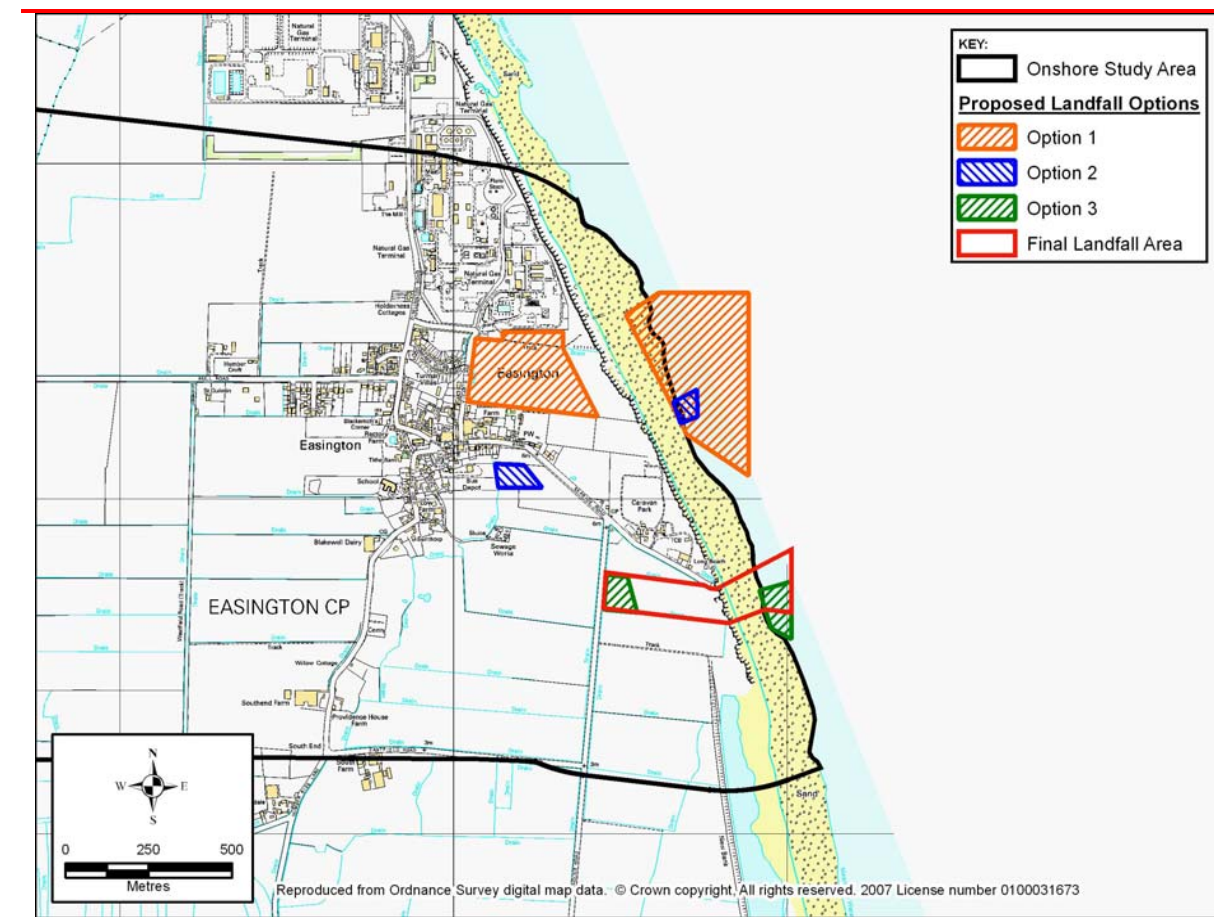
- An assessment of the proximity of The Lagoons which are designated a Site of Special Scientific Interest (SSSI) and are host to a colony of protected little terns.
- An assessment of possible construction methodologies (to ensure that the offshore cables do not become exposed over time).
- Landowner consent is also a key requirement.
- An assessment of existing infrastructure was necessary given the existing gas pipelines near Easington and Dimlington gas terminals.

Given the engineering and environmental challenges, the following three landfall options (Figure 5.5) have been analysed comparatively.

- *Option 1* - This option presents significant engineering constraints given the existing underground utilities which are present around Easington. Benefits of this option include the existence of coastal protection and the fact that, of all the options, this is the greatest distance away from the SSSI. However, the location was ultimately rejected due to the congestion in the area from existing engineering infrastructure.
- *Option 2* - This option would require a southern approach from an underground cable route (therefore by-passing the village of Easington). However, the route would need to be horizontal directionally drilled (HDD) under a road (Humber Side Lane) and Easington Caravan Park. This site is also located close to residential receptors in the village of Easington which would experience impacts associated with noise and traffic. This site was therefore rejected due to the potential disturbance to the village of Easington.
- *Option 3* - This option is located away from all existing utilities. The site is also located a significant distance away from the village of Easington and is therefore distant from the majority of residential receptors. This option required a southern approach from an underground cable route (therefore by-passing the village of Easington). However, the site is located 206 m from The Lagoons SSSI.

Following further discussion, Option 3 was considered the best option from an engineering and residential perspective. The environmental issues associated with this site are considered to be manageable and East Riding of Yorkshire Council expressed their preference for an option which requires a southern approach from the underground cable route (by-passing the village of Easington). Option 3 satisfies this preference and was therefore taken forward.

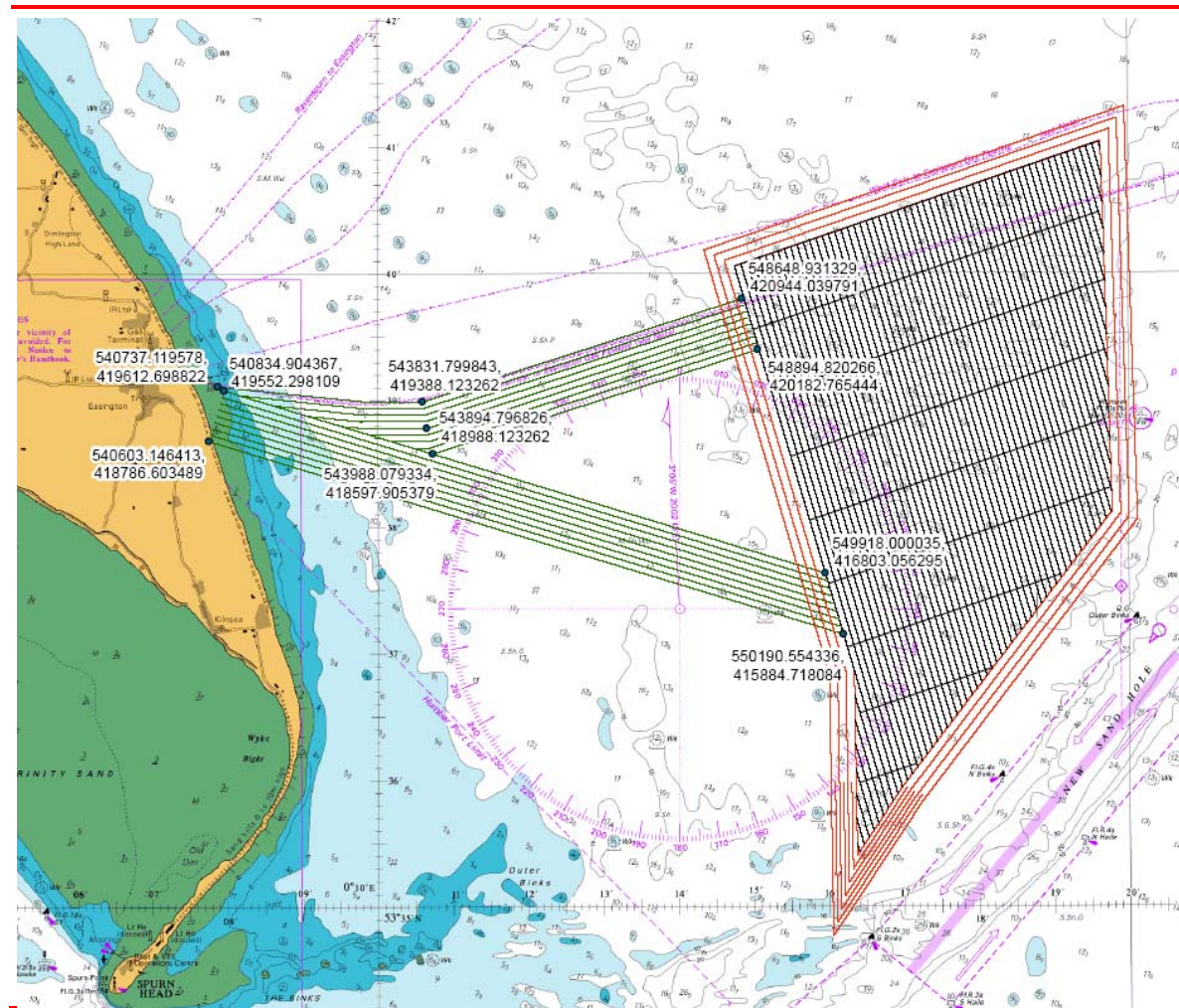
Figure 5.5 Landfall Options

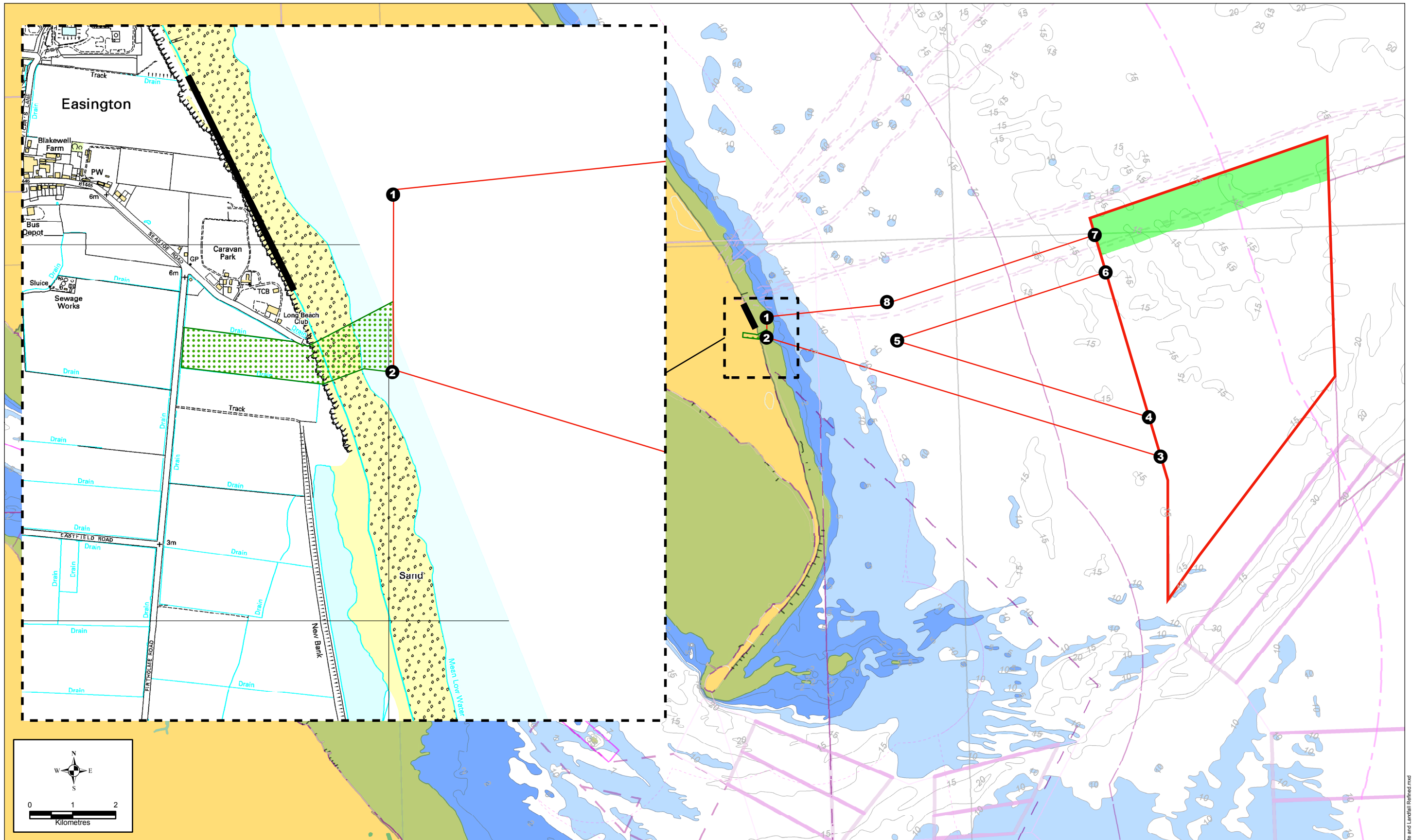


5.1.7 SELECTION OF EXPORT CABLE ROUTE

The offshore export cable corridor comprises two options, leading to one landfall location. The full study area is shown in Figure 5.6. In order to ensure a robust approach, the whole of the export cable study area has been assessed across all environmental disciplines within the ES. The corridor has since been refined to meet the landfall location described in Section 5.1.6, however the precise micro-siting and cable route will be subject to further consultation with statutory bodies and site investigation work. Figure 5.7 shows the combination of the cable landfall and export cable route.

Figure 5.6 Export Cable Survey Corridor





KEY: Landfall Window Humber Gateway Site Final Landfall Area Cable Route Corridor Options BP Pipeline No Build Zone	Coordinates 1 WGS84 (00 7.91355,53 38.98810) 2 WGS84 (00 7.90206,53 38.72780) 3 WGS84 (00 16.14510,53 37.08070) 4 WGS84 (00 15.92420,53 37.58070)	5 WGS84 (00 10.66000,53 38.64180) 6 WGS84 (00 15.20770,53 39.40150) 7 WGS84 (00 14.90426,53 39.89193) 8 WGS84 (00 10.46830 39.12724)	CLIENT: 	SIZE: A3	TITLE: Figure 5.7 The Cable Route and Landfall Point Refined by Environmental Impact Assessment
	DATE: 27-02-2008 DRAWN: FS DRAWING: Fig 5.7Cable Route and Landfall Refined.mxd	CHECKED: HB APPROVED: CW	PROJECT: 0022303 SCALE: as per scale bar	ERM 	REV: 0

