FOREWIND

DOGGER BANK
TEESSIDE A & B

October
2013

Draft Environmental Statement
Chapter 6
Assessment of Alternatives

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1 Introduction

1.1 Background

1.1.1 This chapter of the draft Environmental Statement (ES) describes the approach taken to identify the preferred site for Dogger Bank Teesside A & B. The process included consideration of both the offshore and onshore developments, and associated infrastructure.

1.1.2 An important part of the Environmental Impact Assessment (EIA) process is to review the alternatives considered during the evolution of the project, and to set out why they have been discounted in favour of preferred sites for development.

1.1.3 For the offshore development the Dogger Bank Zone has previously been identified as part of The Crown Estate Round 3 Offshore Wind Farm development process. As such, a discussion of the offshore wind farm boundary within this chapter is limited to site selection within that pre-defined Dogger Bank Zone. Where the consideration of alternatives has been possible, for example as part of the onshore cable route selection process, these are discussed within this chapter.

1.1.4 Dogger Bank Teesside A & B will comprise two wind farms, each with a generating capacity of up to 1.2 gigawatts (GW) (2.4GW total). Each wind farm development will include up to 200 wind turbines (i.e. up to 400 in total) with cabling, collector stations, offshore and onshore converter stations and associated infrastructure.

Key components of Dogger Bank Teesside A & B

1.1.5 Dogger Bank Teesside A & B is likely to comprise the following main offshore components:

- Offshore wind farm arrays with a total combined capacity of up to 2.4GW;
- Offshore collector and converter stations;
- Offshore operations and maintenance infrastructure, such as accommodation platforms, permanent moorings, and navigational buoys;
- Offshore meteorological data masts and metocean equipment;
- Associated foundations and scour protection measures;
- High Voltage Alternating Current (HVAC) inter- and intra-array cabling;
- Export cabling, carrying power from the High Voltage Direct Current (HVDC) converter station(s) of the wind farm(s) to the onshore grid infrastructure, or possibly to other wind farm projects within the Dogger Bank Zone;
- Crossing structures at the points where project cables cross existing cables and pipelines; and
- Structures for the protection of cables, where sufficient burial is not achieved.

1.1.6 The main onshore components include:

- Two HVDC cable systems - from the joint transition bay near the coast, to the onshore converter stations;
- Two HVDC converter stations; and
- Two HVAC cable systems - from the onshore converter stations to the National Grid Electricity Transmission (NGET) substation at Lackenby.

1.1.7 For further details on the key components and infrastructure please refer to **Chapter 5 Project Description**.

2 Guidance and Consultation

2.1 Policy

2.1.1 Site selection and the assessment of alternatives have been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to Dogger Bank Teesside A & B are:

- Overarching National Policy Statement (NPS) for Energy (EN-1) (DECC, 2011a);
- NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011c).

2.1.2 The specific assessment requirements for site selection and the assessment of alternatives, as detailed in the NPSs, are summarised in **Table 2.1**, together with an indication of where each is addressed. Where any part of the NPS has not been followed, within the assessment, an explanation as to why the requirement was not deemed relevant, or has been met in another manner, is provided.

Table 2.1 NPS assessment requirements

NPS Requirement	NPS Reference	ES Reference
As in any planning case, the relevance or otherwise to the decision-making process of the existence (or alleged existence) of alternatives to the proposed development is in the first instance a matter of law, detailed guidance on which falls outside the scope of this NPS. From a policy perspective this NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option. However, applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility.	EN-1 paragraph 4.4.1 – 4.4.2	Section 4 outlines the 7 staged approach to the site selection process.
Applicants will need to consult the local community on their proposals to build on open space, sports or recreational buildings and land. Taking account of the consultations, applicants should consider providing new or additional open space including green infrastructure, sport or recreation facilities, to substitute for any losses as a result of their proposal. Applicants should use any up-to-date local authority assessment or, if there is none, provide an independent assessment to show whether the existing open space, sports and recreational buildings and land is surplus to requirements.	EN-1 paragraph 5.10.6	The proposals do not include the loss of any open space or sports or recreational buildings.

NPS Requirement	NPS Reference	ES Reference
The assessment should consider the provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities; and effects on tourism.	EN-1 paragraph 5.12.3	Forewind does not consider that the provision of additional local services and improvements to local infrastructure is proportionate to the proposals described herein. Effects on tourism are considered within **Chapter 23 Tourism and Recreation**.

2.1.3 EN-3 and EN-5 do not specifically include details on the assessment of alternatives.

2.2 Consultation

2.2.1 To inform the draft ES, Forewind has undertaken a thorough pre-application consultation process, which has included the following key stages:

- Scoping Report submitted to the Planning Inspectorate (May 2012);
- Scoping Opinion received from the Planning Inspectorate (June 2013);
- First stage of statutory consultation (in accordance with sections 42 and 47 of the Planning Act 2008) on Preliminary Environmental Information (PEI) 1 (report published May 2012); and
- Second stage of statutory consultation (in accordance with sections 42, 47 and 48 of the Planning Act 2008) on the draft ES (this document) designed to allow for comments before final application to the Planning Inspectorate.

2.2.2 In addition, consultation associated with the Dogger Bank Creyke Beck application (Forewind August 2013), has been taken into account for Dogger Bank Teesside A & B where appropriate.

2.2.3 In between the statutory consultation periods, Forewind consulted specific groups of stakeholders on a non-statutory basis to ensure that they had an opportunity to inform and influence the development proposals. Consultation undertaken throughout the pre-application development phase has informed the decisions and the information presented in this document.

2.2.4 Further information on the consultation process is presented in **Chapter 7 Consultation**. A Consultation Report is also provided as part of the overall planning submission.

2.2.5 A summary of the consultation carried out at key stages throughout the project, of particular relevance to site selection, is presented in **Table 2.2**.

Table 2.2 Summary of consultation responses of particular relevance to site selection and the assessment of alternatives

Date	Consultee	Summary of issue	ES Reference
June 2012 (Scoping, Statutory)	Planning Inspectorate	The Commission notes that the applicant intends to provide an outline of the main alternatives that will be addressed in the ES and reasons for the choice of options taken forward. The applicant should also provide an account of how the alternatives were short listed. The ES must outline the main alternatives and provide an indication of the main reason for the applicant's choice, taking account of the environmental effects (Schedule 4, Part 1, paragraph 18 of the EIA Regs). The reasons for the preferred choice should be made clear and the comparative environmental effects identified.	Section 4
June, July and August 2012 (Non-statutory)	Lazenby Environmental Group	Discussions regarding the design of the converter stations, specifically the height, leading to a change in design by reducing the converter hall heights from 30m to 20m and thus reducing the visual impact.	Section 4 – Stage 5, converter station site selection work
September 2011, November 2011, January 2012, October 2012, November 2012, January 2013 and June 2013 (Non-statutory)	Redcar and Cleveland Borough Council (RCBC)	Multiple meetings and presentations to discuss the site selection work undertaken to date. No key concerns or outstanding comments regarding site section process.	Section 4 – site selection process
On-going (Non-statutory)	National Grid	On-going discussions with National Grid to inform the connection point to the existing Lackenby substation	Section 4 – Stage 3, site selection process
September 2012 (Non-statutory)	Redcar Athletic Football Club/Teesside Athletic Football Club	Discussions regarding onshore cable routing, and avoidance of recreational pitches.	Section 4 – stage 6, onshore cable route selection
August 2012, September 2012, December 2012, and March 2013 (Non-statutory)	Sembcorp Utilities UK Ltd.	Liaison with Sembcorp through the site selection process, Sembcorp provided constraints (such as utilities), and aided site selection through the Wilton Complex area.	Section 4
January 2013 (Non-statutory)	York Potash	Discussions regarding the interactions between the York Potash Pipeline and Dogger Bank Teesside A & B to inform a crossing between the two projects	ES Onshore Chapters (**Chapters 21 to 30**).

Date	Consultee	Summary of issue	ES Reference
On-going (Non-statutory)	Individual landowners	On-going discussions with individual landowner to inform micro-siting of cable route.	Section 4 – site selection process

3 Grid Connection Point

3.1 Grid connection point process

3.1.1 The onshore point of connection to the National Electricity Transmission Systems (NETS) was determined through the Grid Connection Application Process. The process to identify new points of connection (and any new electricity networks infrastructure) accords with a framework of Regulation governed by Ofgem.

3.1.2 Following initial joint development work between National Grid and Forewind, Lackenby substation was initially identified as the onshore connection point for Dogger Bank Teesside A & B.

3.1.3 Following acceptance of the grid connection offers and in parallel with the development phase, National Grid and Forewind have jointly undertaken further detailed option appraisal work to identify the optimum onshore interface point(s) for the projects. This has included environmental considerations, land availability, technical requirements, economic considerations, and programme and timing requirements.

3.1.4 The detailed option appraisal work has confirmed the initial conclusion that Lackenby remains the agreed onshore interface points for Dogger Bank Teesside A & B. **Appendix 6A** provides a Statement of Choice on Onshore Interface points (NGET 2013).

4 Site Selection Process

4.1 Introduction

4.1.1 Forewind recognises the importance of selecting appropriate sites for its project proposals and that the identification of those sites should include consideration of technical and commercial feasibility, environmental impact and stakeholder concerns.

4.1.2 The site selection process summarised here is supported by a series of technical appendices (**Appendices 6A** - **6F**), which have provided the necessary technical information to inform the process, alongside consultation with stakeholders such as the Marine Management Organisation, Natural England, the Environment Agency, the Ministry of Defence, the Local Planning Authority (RCBC) and nearshore fishermen.

4.1.3 Site selection can be applied at many different levels for projects of this scale and nature (i.e. one that has an offshore component (the wind farm) a linear component (both marine and onshore export cabling), a landfall component, and an onshore component (the converter stations)). In recognition of this complexity and the range of stakeholders involved with each component, a site selection process that is reflective of the nature of this scheme has been adopted. This process has been iterative in nature, and key development considerations which have been identified throughout the process have fed into each stage.

4.1.4 **Figure 4.1** shows a flow chart which describes the site selection process which is described in more detail under the relevant sections.

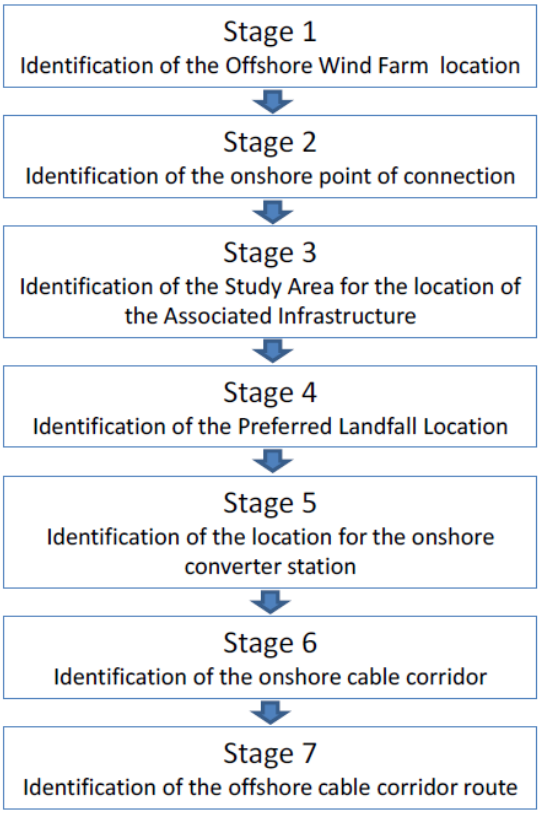


Figure 4.1 The site selection process

4.2 Stage 1 – Identification of the offshore wind farm location

4.2.1 In January 2010 Forewind was awarded a Zone Development Agreement by The Crown Estate for the Dogger Bank Offshore Wind Farm Zone, as part of the Round 3 Offshore Wind Farm development process.

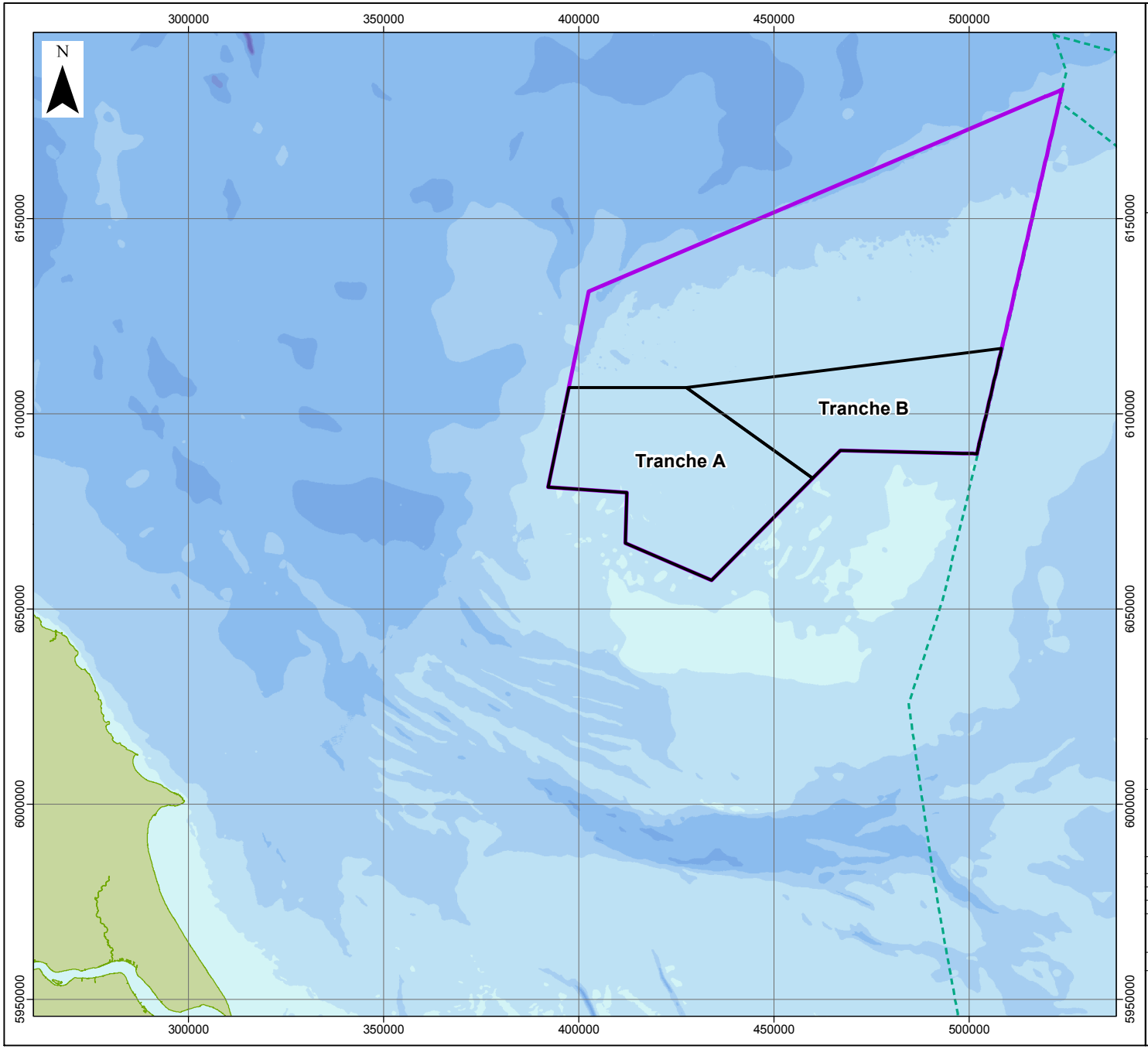
4.2.2 Forewind decided to divide the zone into four development Tranches A, B, C and D. Tranches A and B were selected using data collated during the Zone Appraisal and Planning (ZAP)[1] process and presented in the Zone Characterisation Documents (ZoC) (Forewind, 2010). The boundary selections for Tranches C and D were informed by the second iteration of the ZoC (Forewind, 2011) and The Offshore Tranche, Wind Farm Array Boundary and In-Zone Export Cable Corridor Selection Report (Forewind, 2013). Forewind's approach to spatial planning within the zone is underpinned by the documents detailed above, which collectively detail the environmental baseline, technical and commercial considerations and inputs from stakeholders.

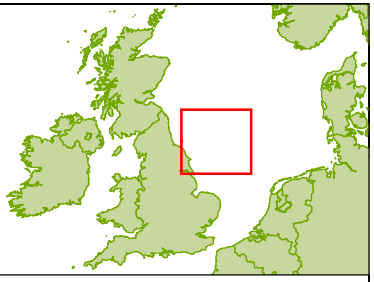
4.2.3 Dogger Bank Teesside A & B, the subject of this draft ES, are the first and second projects of the second stage of the Dogger Bank development undertaken by Forewind, the first stage being Dogger Bank Creyke Beck. Dogger Bank Teesside

[1] A framework intended to rationalise and balance the commercial aim of maximising development capacity aspirations with the practicalities of deliverability

A & B will comprise two wind farms, each with a generating capacity of up to 1.2 gigawatts (GW), and will connect to the existing National Grid substation at Lackenby, in Teesside. Dogger Bank Teesside A & B projects will have a total combined generating capacity of up to 2.4GW.

4.2.4 Dogger Bank Teesside A is located within the eastern portion of the developable area in Tranche B. Dogger Bank Teesside B crosses the border between Tranche A and Tranche B, with the majority of the project being located in Tranche B. Tranche A was identified in 2010 (Tranche A selection report, Forewind, October 2010b) and spans 2000km^2 while Tranche B was identified in 2011 (Tranche B selection report, Forewind, May 2011b) and covers 1500km^2 sharing it's western boundary with Tranche A (see **Figure 4.2**).





LEGEND

- Dogger Bank Zone
- Tranche Boundary
- International Boundary

0 50
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2013
Background bathymetry image derived in part from TCarta data © 2009
UK International Boundary data supplied by UKHO using information published from open sources

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.2: Tranche Boundaries

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
1	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-016**

SCALE	1:1,500,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

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Identification of project boundaries

4.2.5 A project boundary selection process was then undertaken using both desk-based and site specific survey data gathered both for environmental and engineering purposes. Within Tranche A and Tranche B the developable area was assessed on the basis of this information.

4.2.6 The key engineering, commercial, health and safety and environmental considerations that the ZAP process identified as having the potential to influence boundaries of projects located in Tranches A and B were assessed and modelled.

4.2.7 The outputs of the modelling were the project boundaries for Dogger Bank Creyke Beck A & B and Dogger Bank Teesside A & B. Details of this process are included within **Appendix 6B**.

4.2.8 Dogger Bank Teesside A is located within Tranche B and Dogger Bank Teesside B is predominately in Tranche B but overlaps into Tranche A. The final project boundaries are shown on **Figure 4.3**.

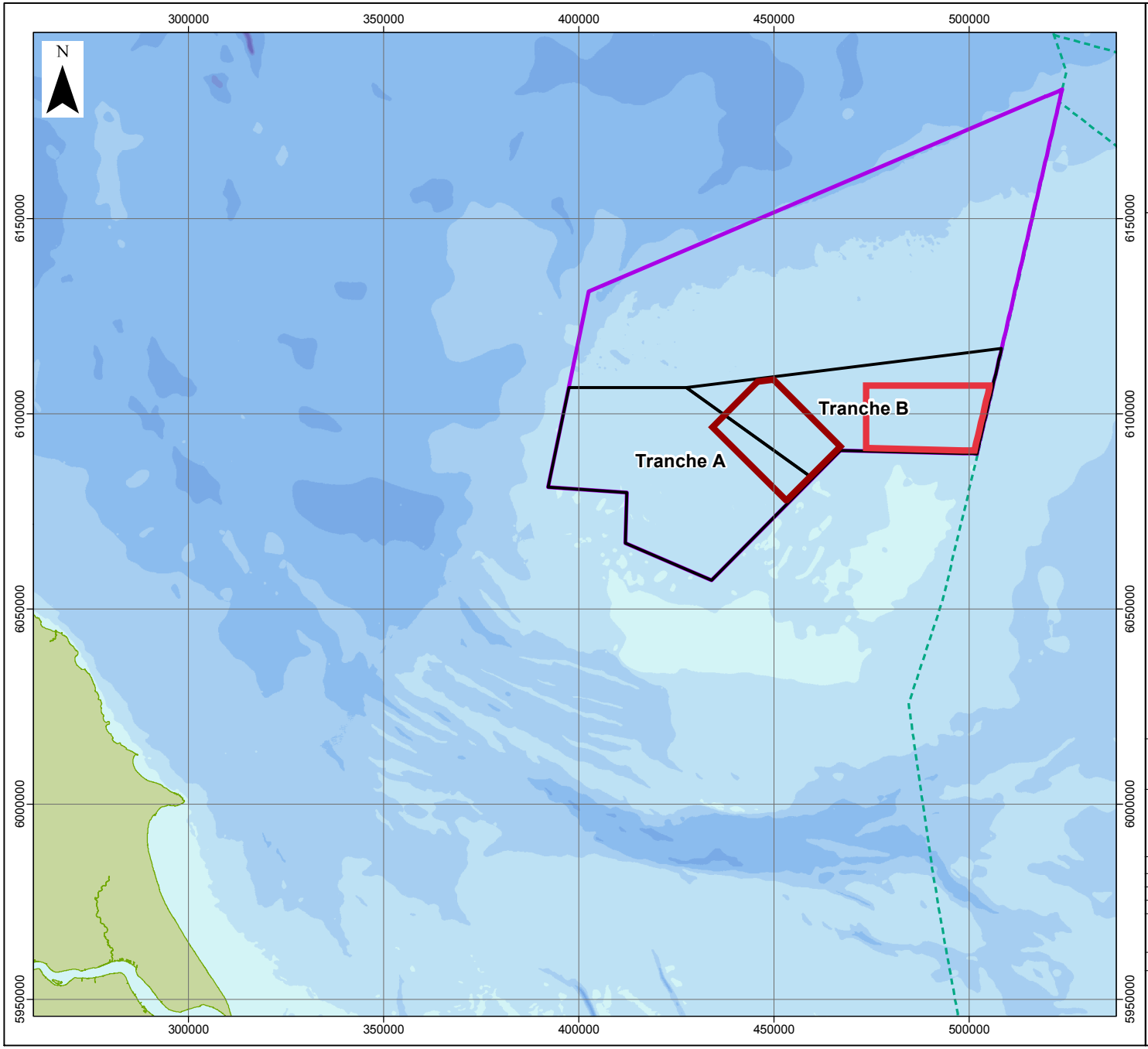
4.3 Stage 2 – Identification of onshore point of connection

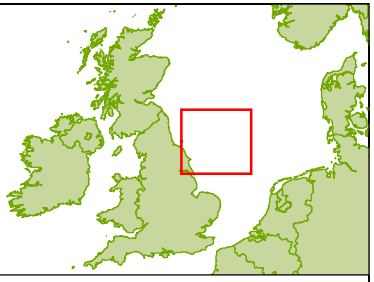
4.3.1 As previously referenced, the onshore point of connection is determined through the Grid Connection Application Process.

4.3.2 The process to identify new points of connection (and any new electricity networks infrastructure) accords with a framework of Regulation governed by Ofgem.

4.3.3 Through the Grid Connection Application Process, Forewind has secured the capacity for two offshore wind farm projects (Dogger Bank Teesside A & B) that are anticipated to be connected at the existing National Grid substation at Lackenby.

4.3.4 The grid connection location is shown in **Figure 4.4**.





LEGEND

- Dogger Bank Zone
- Tranche Boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- International Boundary

0 50
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2013
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PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.3: Final Offshore Project Boundaries

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
1	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-017**

SCALE	PLOT SIZE	DATUM	PROJECTION
1:1,500,000	A4	WGS84	UTM31N

FOREWIND

LEGEND

▲ Lackenby 400KV substation

0 3

Kilometres

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.4: Dogger Bank Teesside A & B Grid Connection Location

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-018**

SCALE	1:75,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

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4.4 Stage 3 – Identification of the Dogger Bank Teesside study area

4.4.1 **Figure 4.5** shows the initial Dogger Bank Teesside study area for the development which was identified following initial studies, research, stakeholder discussions and assessments. It comprises of Tranche A, Tranche B, an export cable corridor and an onshore study area.

4.4.2 This study area was also presented as the "Scoping Envelope" in the Dogger Bank Teesside Scoping Report (May 2012).The description of the proposed development provided for in the Scoping Report comprised up to four projects, each with a generating capacity of up to 1.2GW, by way of the submission of one or a number of DCO applications. In parallel, Forewind consulted on the Preliminary Environmental Information, and issued a Statement of Community Consultation encompassing all four Dogger Bank Teesside projects. In June 2012, the Secretary of State issued the Dogger Bank Teesside Scoping Opinion.

4.4.3 In December 2012 Forewind informed the Planning Inspectorate and all consultees prescribed by the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 that the optimum consenting strategy for Dogger Bank Teesside is to split the development into two separate DCO applications. The first DCO application (this application) seeking consent for Dogger Bank Teesside A & B (as provided for in the Scoping Opinion, Preliminary Environmental Information 1 and Statement of Community Consultation).

4.4.4 Stages 1, 3 and 4 of the site selection process are relevant for all four Teesside projects. Stages 2, 5, 6 and 7 specifically refer to this application, Dogger Bank Teesside A & B.

4.4.5 The offshore wind farms, collector stations, offshore converter stations and associated array cables will be located in both Tranche A and Tranche B (as described in Stage 1).

4.4.6 A broad envelope connecting the west of the zone to the onshore study area was identified as the area within which the export cable corridors were to be located.

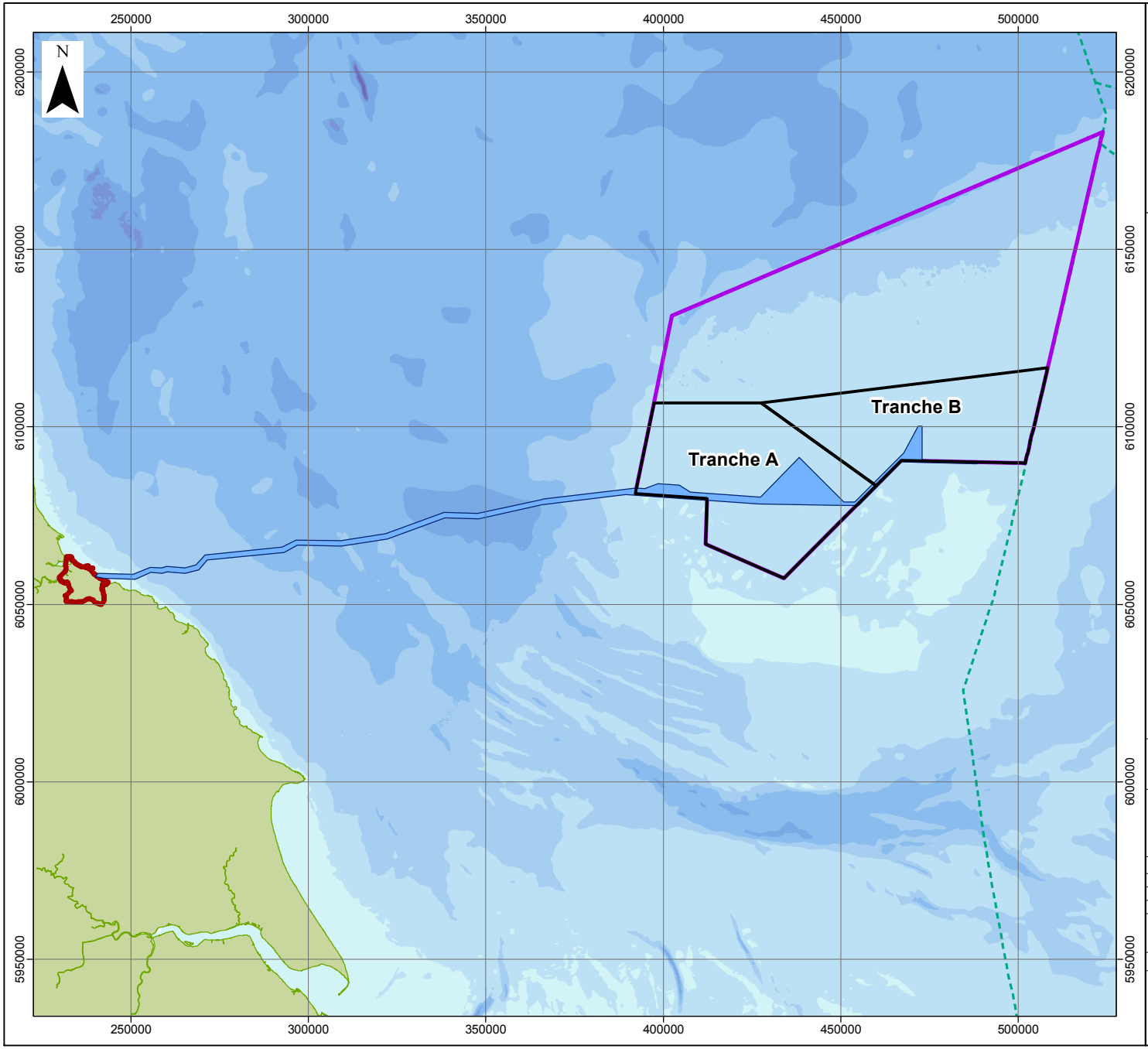
4.4.7 The Onshore Study Area for Dogger Bank Teesside covered the area in which up to four new converter stations would be sited, as well as the associated buried cable systems between the landfall and the converter stations, and between the converter stations and the National Grid substations.

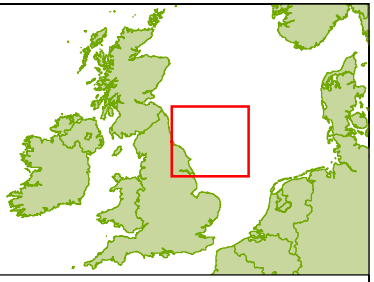
4.4.8 The Onshore Study Area was initially identified for the purposes of characterising the relevant onshore area. The study areas established:

- Onshore and nearshore constraints that informed landfall selection;
- The boundary of the envelope for the converter station locations; and
- Design constraints for the cable route.

4.4.9 The Onshore Study Area was initially identified due to the location of the onshore grid connection point. Initial desk-top environmental characterisation studies were commissioned (informed by environmental, physical, and social constraints) in

combination with a high level assessment of the technical and commercial considerations. For more detail on these assessments see **Appendix 6C**. The initial investigations were then used to inform the Onshore Scoping Area. The Onshore Scoping Area is a refined area in which further surveys were focused and was used to consult with relevant stakeholders. The Onshore Scoping Area is shown in **Figure 4.6**.





LEGEND

- Dogger Bank Zone
- Dogger Bank Teesside A & B export cable corridor
- Tranche Boundary
- Onshore Cable Route Study Area
- International Boundary

0 50
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2013
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Figure 4.5 Dogger Bank Teesside A & B Overall Study Area

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
1	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-019**

SCALE	PLOT SIZE	DATUM	PROJECTION
1:1,650,000	A4	WGS84	UTM31N

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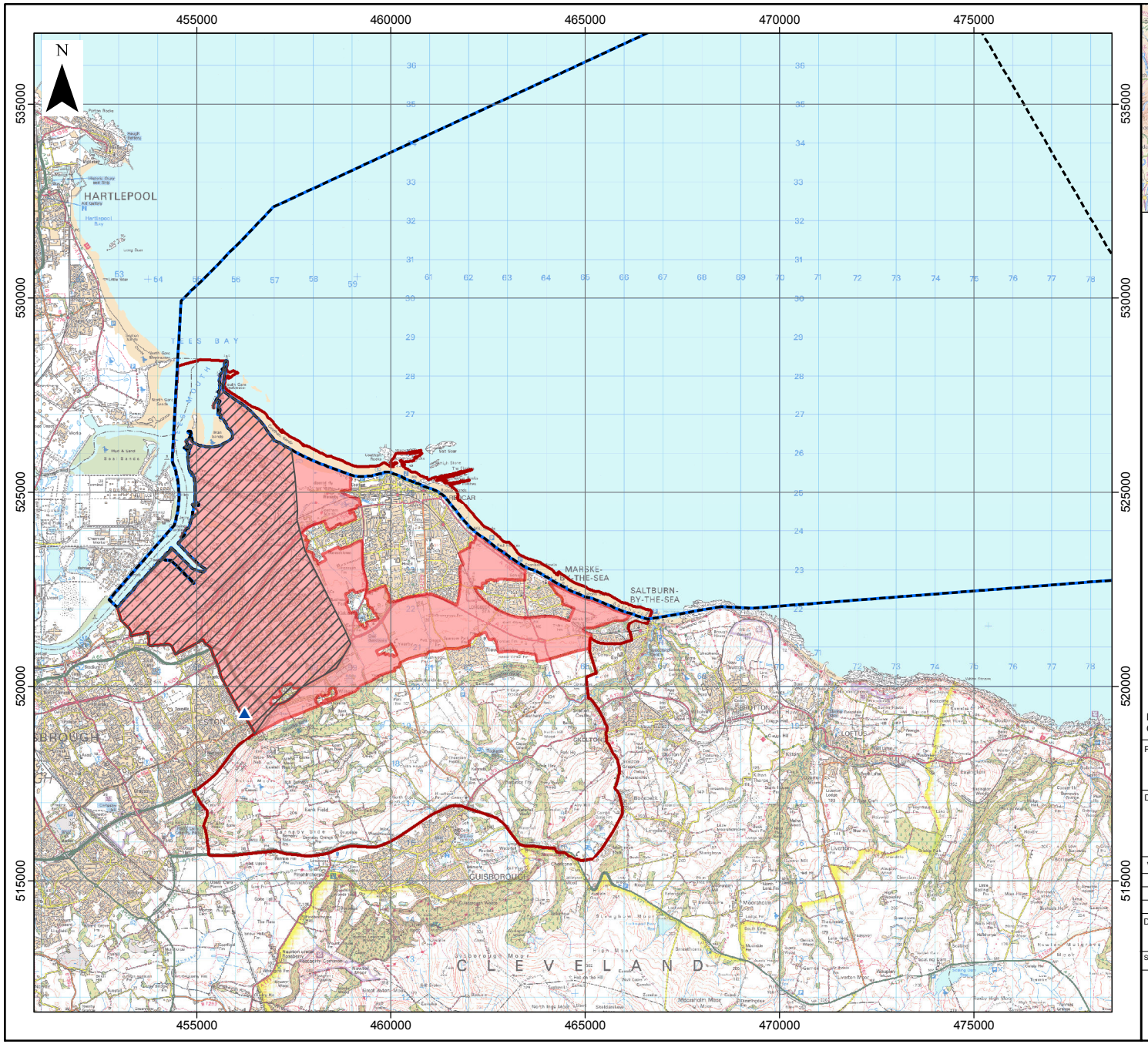

LEGEND

- Onshore Cable Route Study Area
- Onshore Scoping Area
- Teesside Coastal Study Area
- Nearshore study area
- Industrialised Zone
- Lackenby 400KV substation

0 — 6

Kilometres

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Figure 4.6 Onshore Study Area

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER:

F-ONC-MA-020

SCALE	1:150,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

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Onshore Study Area characterisation

4.4.10 This study area includes the Teesside industrial area which comprises steel works to the north, the commercial port of Teesport, the Wilton Complex, which includes some green field areas that are currently in agricultural use, as well as a range of other industrial and commercial areas to the west of Teesport. The settlements of Lazenby, Redcar, Marske-by-the-Sea, Saltburn-by-the-Sea, Wilton, Kirkleatham, Dunsdale, Yearby, Upleatham and New Marske all lie within the Onshore Study Area.

4.4.11 The southern and eastern portion of the study area is characterised by large woodland belts, much designated as Ancient Woodland and also Local Wildlife Sites. There are also a number of other Local Wildlife Sites that are designated for a variety of habitats and species. There are nature conservation sites of national and international importance along the north western coast of the study area and also in the southern portion of the study area. There are a number of listed buildings, Conservation Areas, Scheduled Monuments and Historic Environmental Records within the study area. The Onshore Study Area has been characterised in the Dogger Bank Teesside – Onshore Study Area Characterisation Report (see **Appendix 6C**).

Onshore Scoping Area characterisation

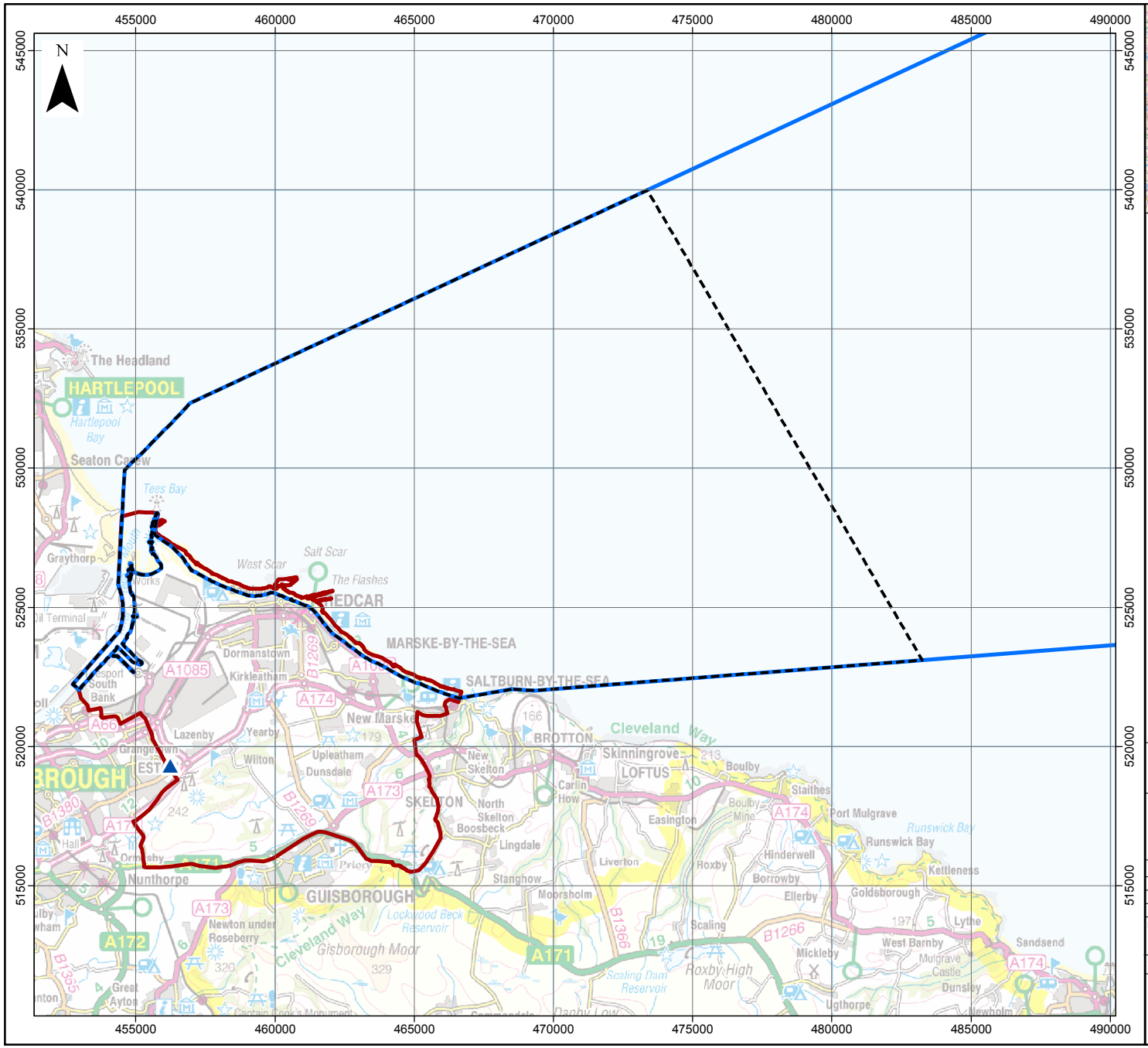
4.4.12 This area was informed by a number of considerations, including:

- Environmental;
- Physical;
- Technical; and
- Social.

4.4.13 The Scoping area is largely characterised as the onshore study area, but without the main built up areas such as Redcar, and including the industrial areas within the Borough.

Near Shore Study Area Characterisation

4.4.14 This area was identified to inform the site selection for the landfall and consequently the onshore cable routes. The nearshore Study Area extends from the coastline to a point out to 21km from the coast (at its further point). This was selected to include all known infrastructure in the nearshore relevant to landfall identification (**Figure 4.7**).



LEGEND

- Onshore Cable Route Study Area
- Teesside Coastal Study Area
- Nearshore study area
- Lackenby 400KV substation

0 8

Kilometres

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.7 Nearshore Study Area

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-021**

SCALE	1:210,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

4.5 Stage 4 – Identification of the landfall location

4.5.1 The electricity from the Offshore Wind Farm needs to be transported to the onshore grid connection using up to four individual export cables systems which operate at High Voltage Direct Current (HVDC). Each of the HVDC cable systems comprises a pair of HVDC cables.

4.5.2 Due to the complex nature and the potential significance of the technical, commercial, environmental and ecological considerations associated with the identification of a proposed landfall location, a thorough and comprehensive assessment was undertaken. The full detail of this assessment is provided in the Coastal Cable Corridor Assessment Report (which is included as **Appendix 6D**).

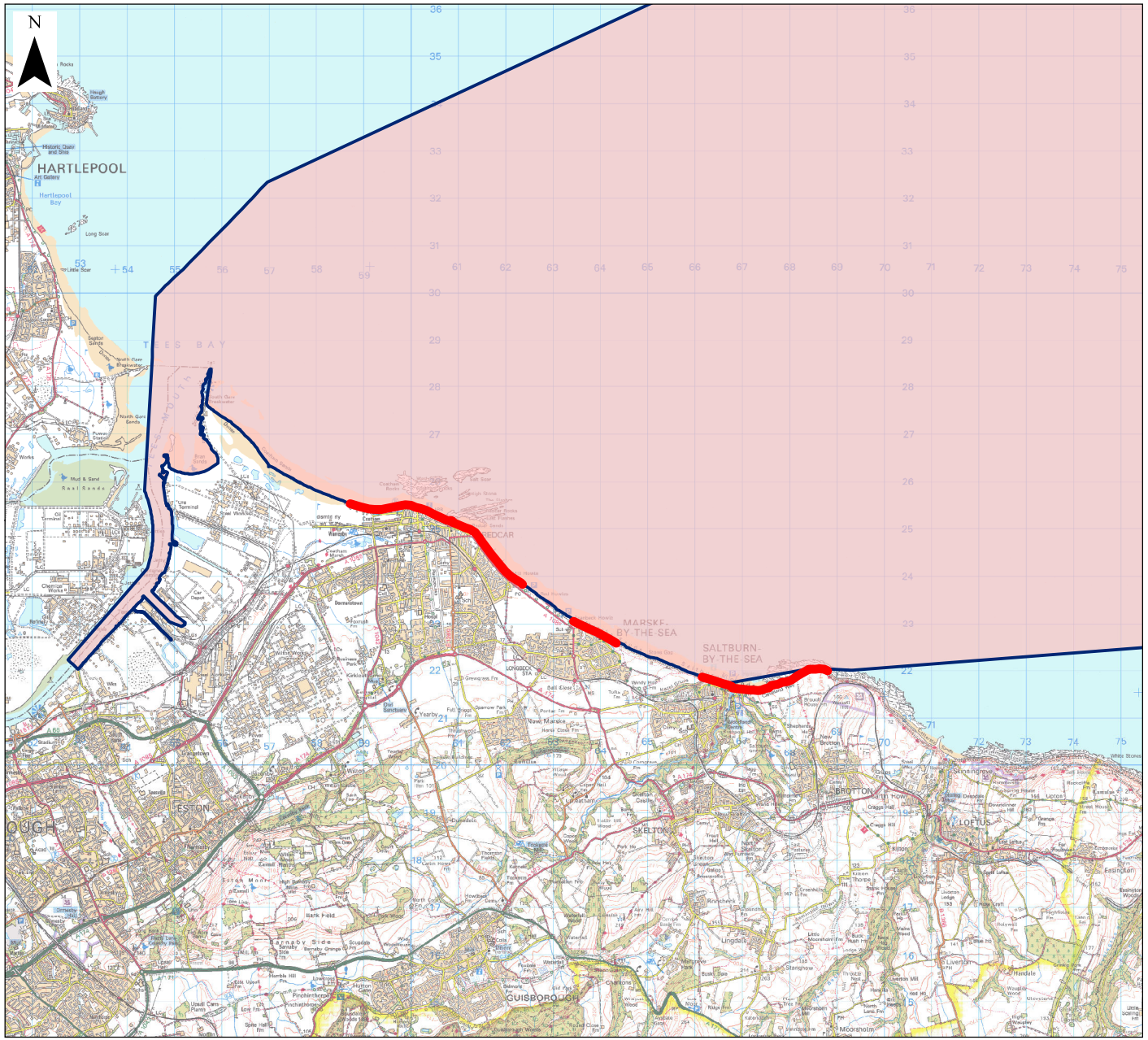
4.5.3 An appropriate section of coastline was identified taking into account a number of technical considerations. This was on the design assumption that up to four cable systems would need to be accommodated. This included:

- Cable installation techniques;
  - Two Horizontal Directional Drills (HDD) are required to lay each pair of cables (two cables in each system are laid in two separate trenches).
- Rate of coastal erosion; and
  - The predicted rate of coastal erosion over the lifetime of a wind farm is considered during detailed design as the cable must remain buried during operation.
- Burial depth and cable specification.
  - There were substantial technical considerations associated with the suitability of much of the Teesside area including cliff height.

Identification of landfall search envelope

4.5.4 The landfall search envelope was initially drawn to include much of the south eastern bank of the Tees Estuary and a continuous stretch covering Coatham Sands, the Redcar and Marske-by-the-Sea frontages up to the edge of Saltburn-by-the-Sea.

4.5.5 A key consideration in the development of the landfall search envelope was to avoid where possible the developed areas along the coast, where more suitable alternative locations were available. On this basis, a number of areas were recommended to be scoped out from further assessment (Areas A, B and C, shown on **Figure 4.8**). In removing these specific areas from further consideration, Forewind avoided where possible a number of potential impacts on residential areas.



LEGEND

- Scoped Out Areas
- Teesside Offshore Study Area
- Teesside Coastal Study Area

0 5

Kilometres

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.8: Identification of Landfall Search Envelope and Scoped Out Areas

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-022**

SCALE	1:130,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

Identification of landfall options

4.5.6 A number of landfall options were identified and further information can be found in the Coastal Cable Corridor Assessment in **Appendix 6D**. The options were assessed against technical, environmental and commercial considerations. A short summary of the short list of landfall options is provided below.

Short list of landfall options

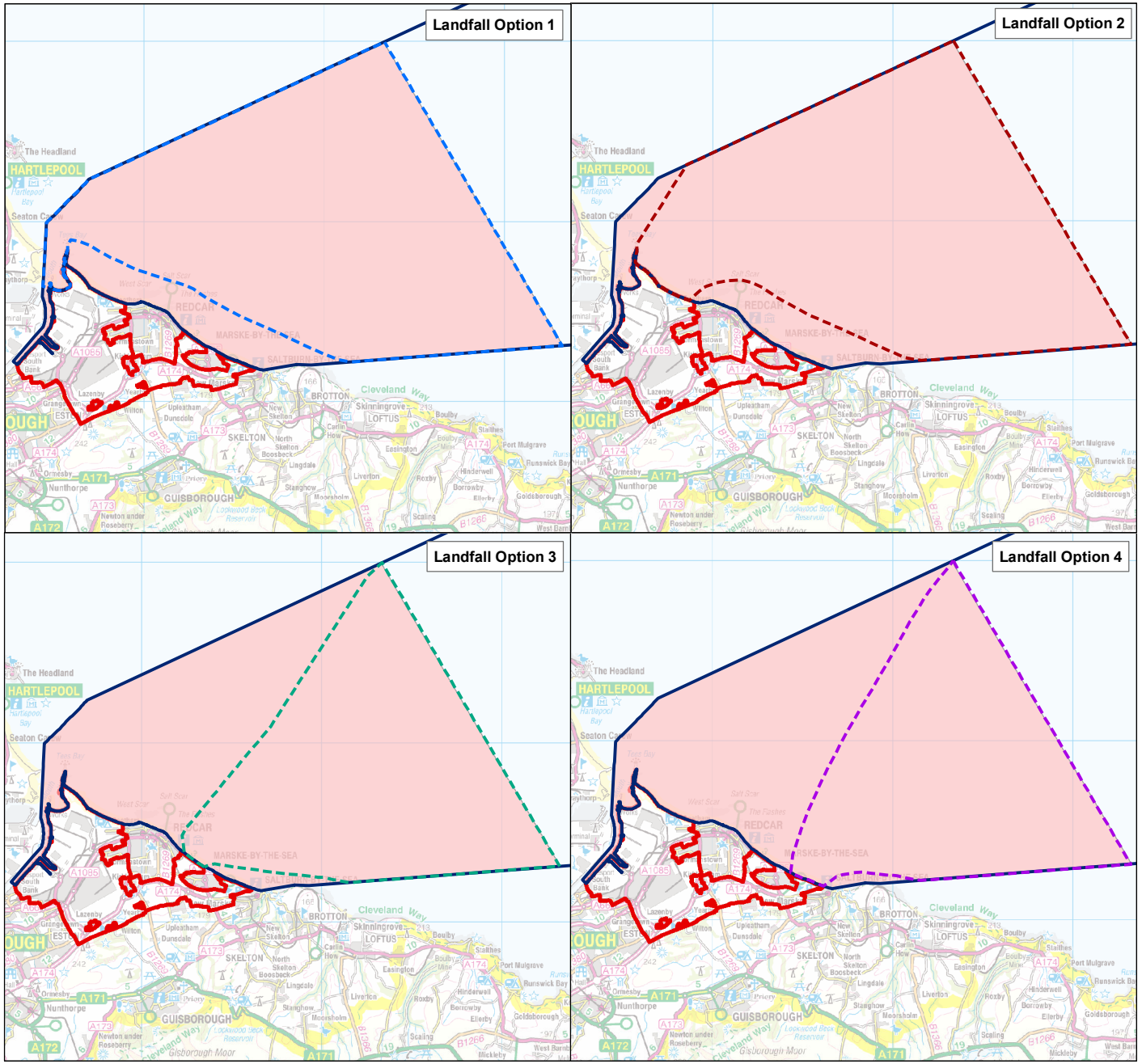
4.5.7 Four broad potential landfall areas along the coast were identified within the study area (**Figure 4.9**), these areas were determined through desk study and mapping exercises. The boundaries of the landfall areas were as wide as possible to enable the maximum opportunity for cable routing.

4.5.8 Each of the four potential landfall areas contains certain environmental (biological, human, and physical) constraints. **Appendix 6D** provides an overview of the development considerations that fall within each of the areas identified.

4.5.9 During initial consultations between Forewind and The Harbour Authority, Landfall Option 1, was discounted due to their objections regarding potential impact to port operations. This option was therefore removed from the shortlisted options, and three potential landfall areas were identified within the landfall search envelope. These are shown on **Figure 4.10**.

- Landfall area 1 – South Gare to the Cotham rocks;
- Landfall area 2 – Redcar to Marske-by-the-Sea; and
- Landfall area 3 – Marske-by-the-Sea to Saltburn-by-the-Sea.

4.5.10 Each of these three options is discussed in turn below, outlining the key considerations taken into account during the site selection process.



LEGEND

- Teesside Offshore Study Area
- Onshore Scoping Area
- Teesside Coastal Study Area
- Nearshore Landfall Option 1
- Nearshore Landfall Option 2
- Nearshore Landfall Option 3
- Nearshore Landfall Option 4

0 10

Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2013
Background bathymetry image derived in part from TCarta data © 2009
UK International Boundary data supplied by UKHO using information published from open sources

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

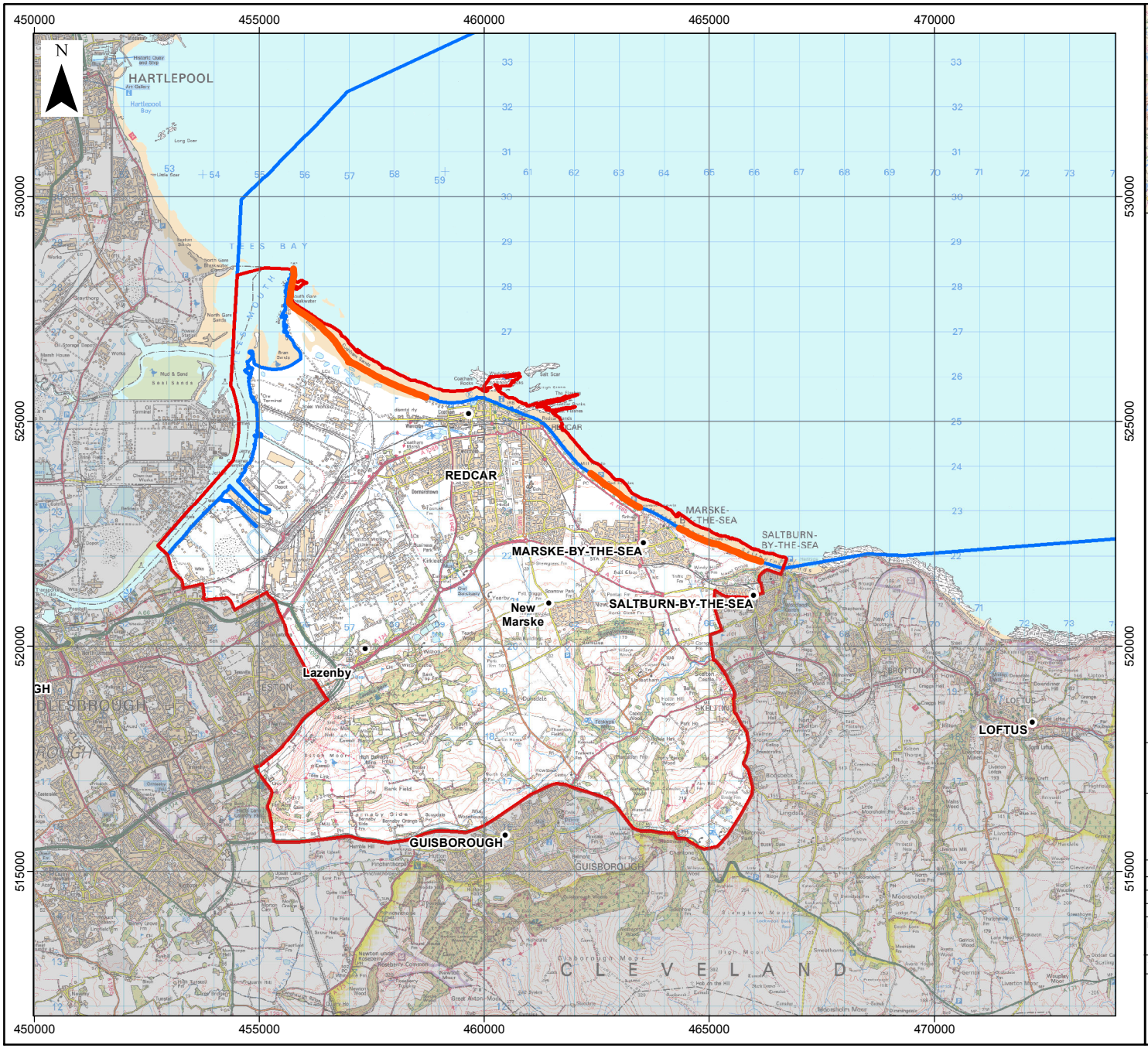
Figure 4.9 Shortlist of Landfall Options

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-023**

SCALE	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND



LEGEND

- Onshore study area
- Offshore cable route study area
- Area outside onshore study area
- Potential Teesside landfall areas
- Settlement

0 5

Kilometres

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.10: Shortlist of Potential Landfall Areas

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-014**

SCALE	1:130,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

Landfall Option 1

4.5.11 This option for landfall covers the coastline bounded by the South Gare breakwater to the north west, and the Cleveland Golf Club to the south east. It consists of a medium gradient beach backed by sand dunes along its entire length. The sand dunes front an area of marsh and industrial wasteland that is a well-established wildlife habitat. To the south west, there are steel works and further sites of nature conservation importance.

Landfall Option 2

4.5.12 This area is a beach front that is approximately 1.5km in length, situated between towns of Redcar and Marske-by-the-Sea. The beach is backed by soft eroding cliffs and beyond the cliffs is the A1085, leading to an expanse of farmland extending up to 1km inland.

Landfall Option 3

4.5.13 The third option is a 2.5km stretch of coastline that is characterised by cliffs that increase in height from around 20m adjacent to Marske-by-the-Sea up to 40m at the eastern extent next to Saltburn-by-the-Sea. On the landward side, this area is open farmland with few features.

Preferred landfall selection

4.5.14 All landfall area options have different technical, environmental and commercial risks associated with their development. Due to consultation with the Tees Harbour Master, the proximity of the Anchoring Prohibited Area, operation and planned infrastructure (CATS, Breagh Pipeline, potential CCS pipeline, EDF Teesside Offshore Wind Farm export cables), and proximity to National and European environmental designations, Forewind ruled out the siting of any export cables at Landfall Option 1.

4.5.15 Landfall Option 3 was ruled out due to technical development considerations associated with the cliff height, average rate of erosion and proximity to Marske-by-the-Sea and residential dwellings.

4.5.16 Forewind consider the risks associated with landfall areas 1 and 3 to pose a risk to development and although there are technical and environmental considerations associated with Landfall Option 2 (for example cliff height and proximity to other development), Forewind consider these risks to be acceptable and therefore through the assessment process, the preferred landfall location.

4.6 Stage 5 – Identification of the onshore converter station location

4.6.1 Onshore converter stations are required in order to convert the electricity carried by the underground HVDC cables to 400kV High Voltage Alternative Current (HVAC) so that it can be connected to the National Grid. The project description outlining the key components of each converter station can be found in **Chapter 5**.

4.6.2 Dogger Bank Teesside A & B will require the construction of two converter stations, which will be co-located in order to minimise the overall footprint. This, along with other key design assumptions, used at the time of site selection can be found in the following sections. An iterative assessment process has been undertaken to determine the most suitable locations for the converter stations, this has included the following steps:

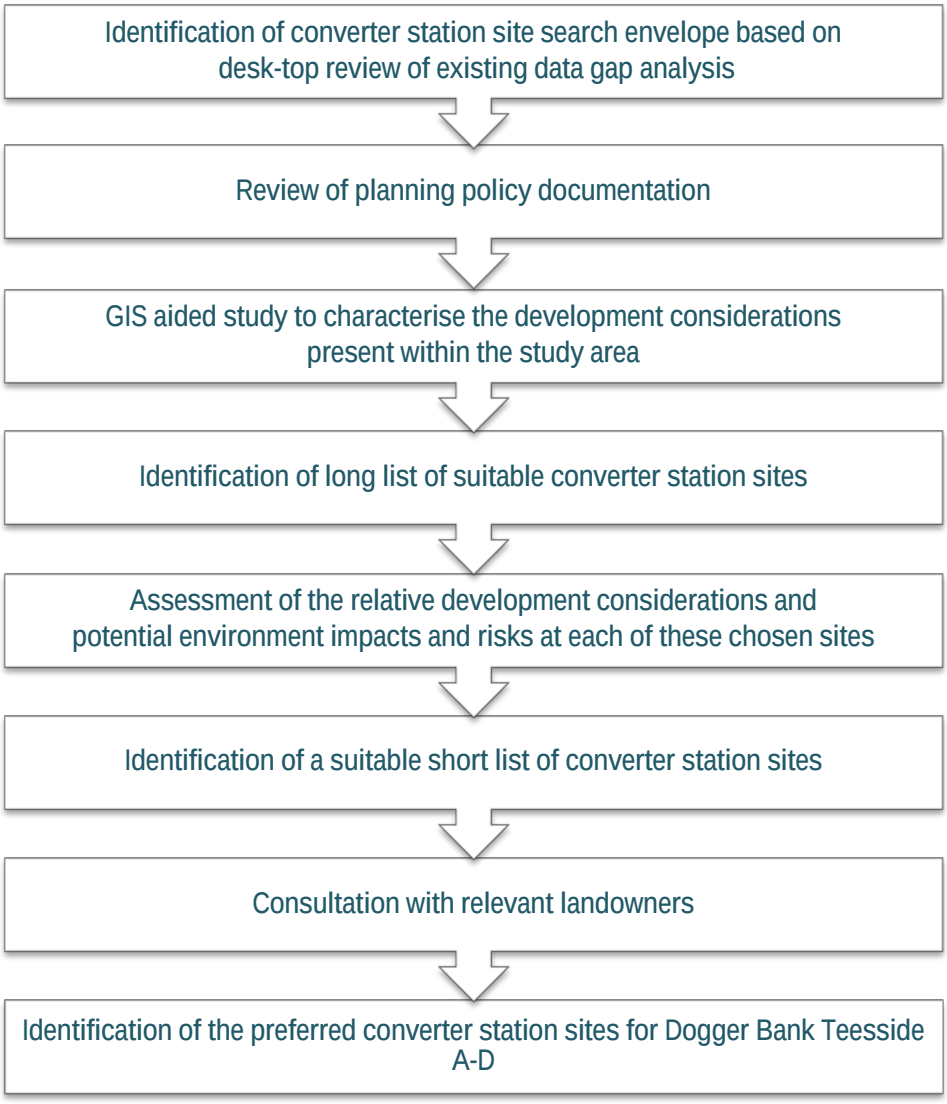
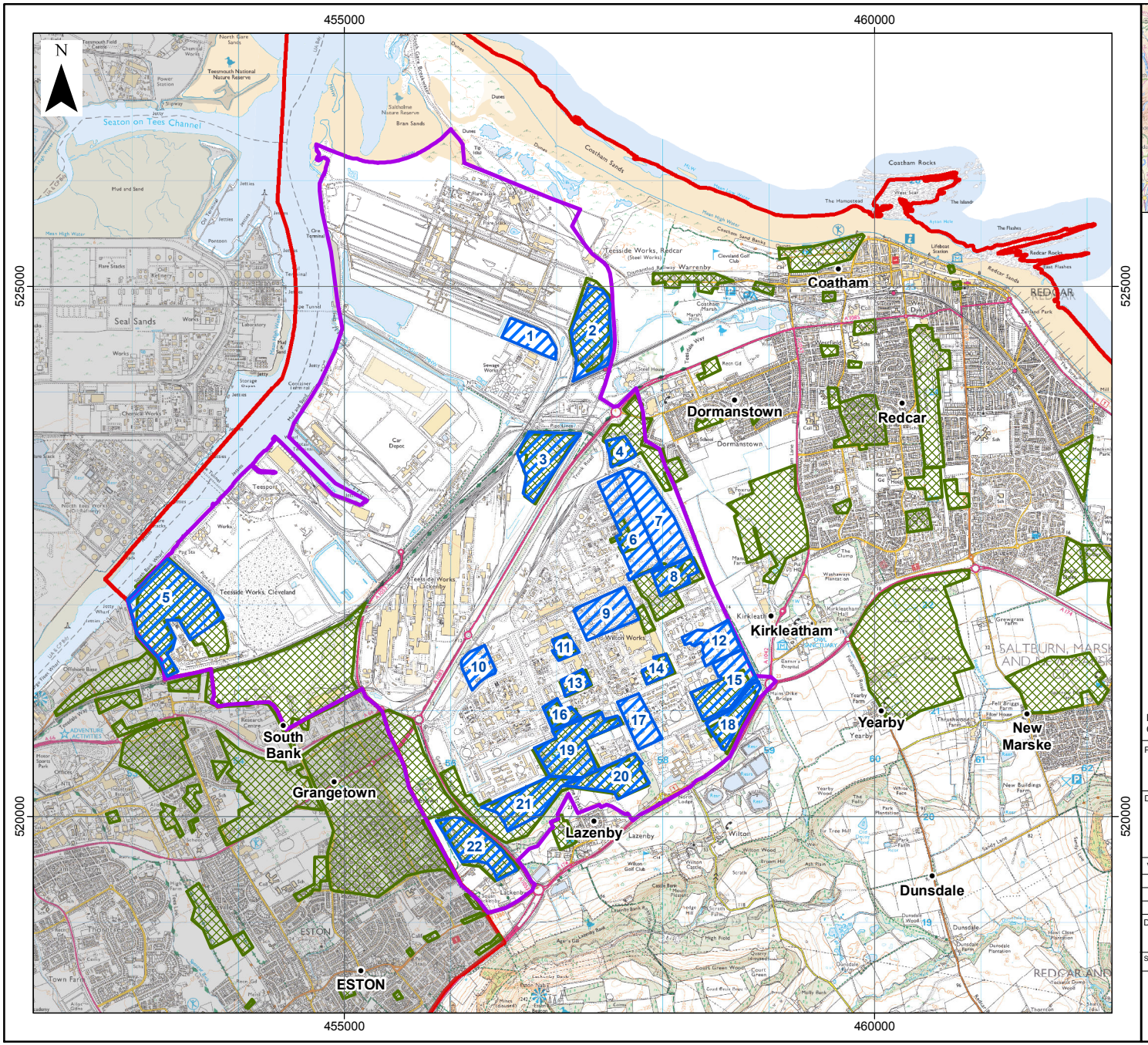


Figure 4.11 Converter station site selection process

Identification of converter station site search envelope

4.6.3 The process to identify a proposed onshore converter stations site required the identification of a converter station study area (**Figure 4.12**). Forewind established a converter station site study area for the initial identification of potential converter station sites within the existing Teesside industrial area to the south of the Tees Estuary.



LEGEND

- Onshore study area
- Long List of Converter Station Sites
- Strategic Flood Risk Assessment (SFRA) Development
- Converter Station Site Search Envelope
- Area outside onshore study area
- Settlement

0 2

Kilometres

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.12: Converter Station Sites (long list)

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-015**

SCALE	1:55,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

4.6.4 This area comprises steel works to the north, the commercial port of Teesport, the Wilton complex which includes some green field areas currently in agricultural use and other industrial and commercial areas to the west of Teesport. The village of Lazenby to the south of the Wilton Complex was excluded from the search envelope as it is a residential area, and because there is a preference for utilising a site within or adjacent to the industrial landscape.

Design and technical assumptions

4.6.5 To allow for the initial stages of the converter station site selection work, (for a footprint of a 1GW converter station), a footprint of 4.5ha was used. This was based upon technical drawings, for the electrical infrastructure only, and more land would be required to contain associated buildings, landscaping or construction compounds.

4.6.6 Initially, the selection process considered sites of 3.5ha or greater given that this is the minimum requirement for one 500MW converter station (however in the later stages of the converter station site selection process it was identified that two 500MW converter stations would be located side by side on the same site a minimum space of 4.5ha will be required, this will be discussed later in this section).

4.6.7 Forewind determined that the onshore converter stations would ideally be located as close as possible to the existing National Grid substation at Lackenby in order to minimise effects associated with introducing new electricity infrastructure to the area. Following this decision the site selection process has included consideration of sensitive receptors.

4.6.8 Reference has been made to the National Grid's Guidelines on Substation Siting and Design (The Horlock Rules) when designing the process to identify an appropriate site for its converter stations. These guidelines document National Grid best practice for the consideration of relevant constraints associated with the siting of electricity network infrastructure. Forewind consider these guidelines to be applicable to its own site selection process and supports the overriding principle of The Horlock Rules which state that:

"*consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments* against *the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum*."

Identification of long list of converter station sites

4.6.9 Based on the initial converter station site selection work undertaken to identify technical and environmental constraints, a large proportion of the search envelope was considered constrained based upon the following issues:

- Valuable Biodiversity Action Plan (BAP) habitats;
- Land use;
- Archaeological sensitivities;
- Flood risk;

- Active and Historic areas of contaminated land; and
- Existing infrastructure (roads and railways).

4.6.10 Through the iterative process of site selection, and environmental and technical assessment and evaluation, design assumptions were identified to be included in the identification of potential converter station sites including:

- Sites must have a minimum of 3.5ha with no upper limit;
- There must be no known current operational or proposed industrial development within the site boundary;
- There must be no designated or non-designated nature conservation, landscape or heritage sites within the boundary;
- The sites must be in compliance with local spatial planning policies;
- The sites must where possible avoid known land contamination; and
- The site must not be within Flood Risk Zone 2 or 3a.

4.6.11 Following these criteria, a long list of 22 potential converter station sites was identified (**Figure 4.12**) and characterised in more detail in **Appendix 6E**.

Identification of short list of converter station sites

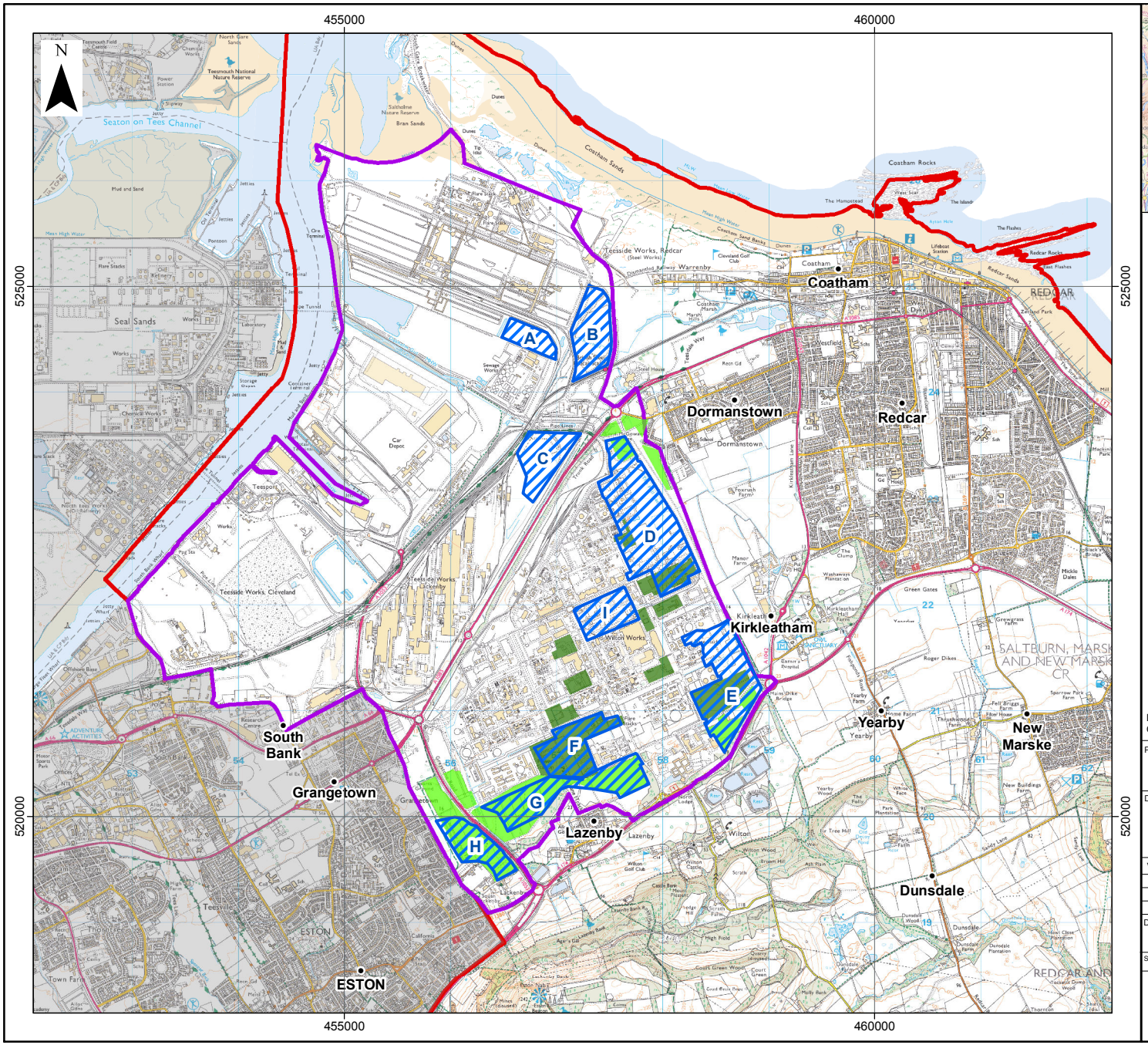
4.6.12 Forewind established that in order to minimise the overall footprint of the development, the converter stations could be co-located if possible. Through additional converter station design assumptions and principles, Forewind also determined that a single converter station for each individual project would require a footprint of 5.5ha. This was based on the following dimensions:

- 2ha per converter station;
- 1ha of temporary infrastructure;
- 2ha of landscaping/screening; and
- 0.5ha for drainage.

4.6.13 Therefore, at this stage of the site selection process either two sites of approximately 5.5ha or a single site of 11ha would be required for siting the converter stations within.

4.6.14 The smaller sites which could only accommodate individual converter stations were largely within the centre of the converter station search envelope which presented cabling technical constraints and therefore sites of less than 10ha (which was further refined to 9ha) were removed from the long list of potential sites.

4.6.15 Other potential converter station sites were removed from the site selection process based on technical and environmental reasoning, and has been outlined in more detail within **Appendix 6F**. Some of the remaining sites were grouped into a single larger site which resulted in an initial shortlist of nine potential converter station sites as shown in **Figure 4.13**.



LEGEND

- Onshore study area
- First Shortlist of Converter Station Sites
- Converter Station Site Search Envelope
- Area outside onshore study area
- Settlement

Sites Available from Wilton International

(owned by Sembcorp Utilities)

- Industrial Development Land
- Light Industrial Development Land

0 2

Kilometres

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.13 Converter Station Locations (short list)

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-024**

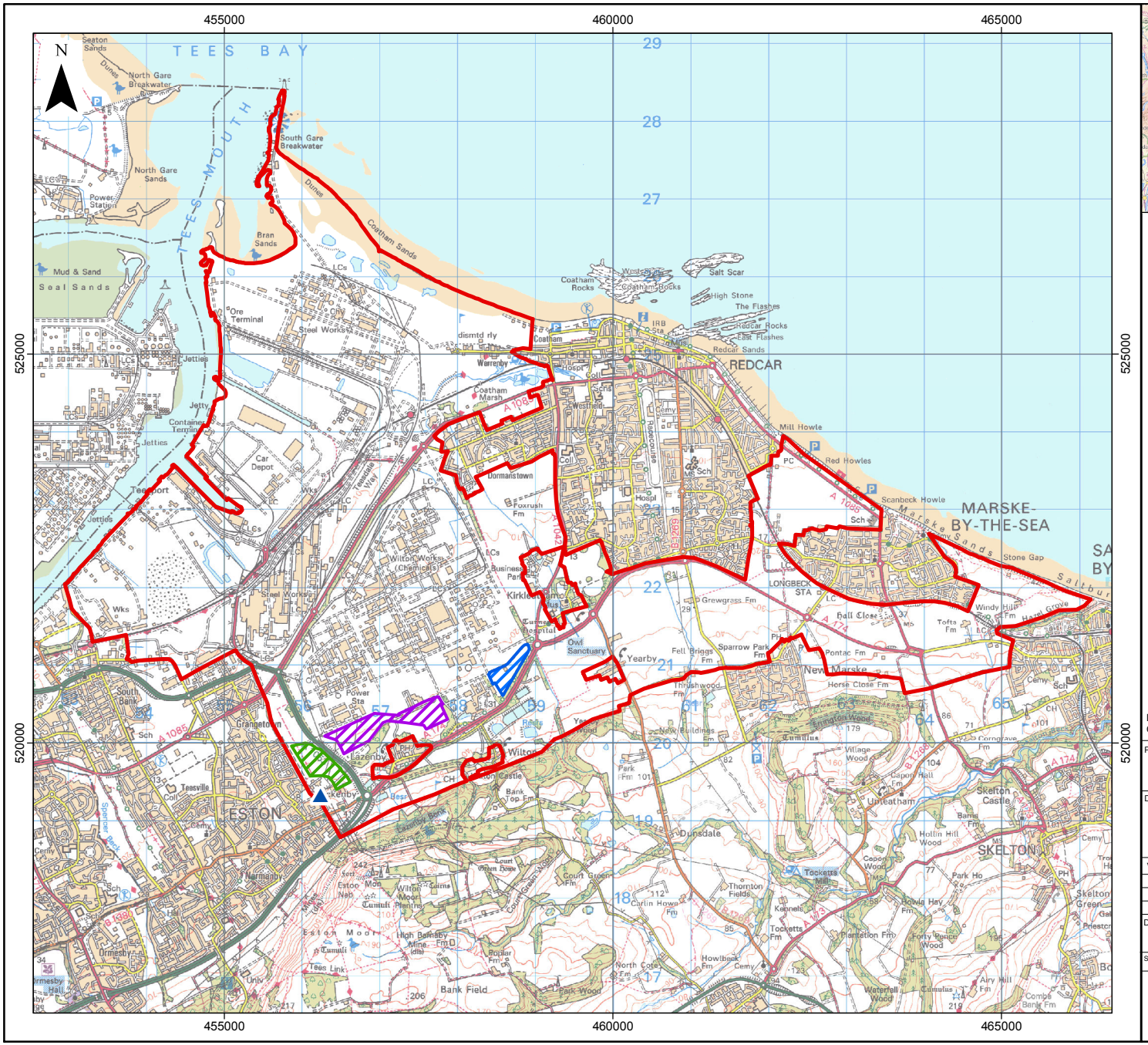
SCALE	1:55,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

Refined short list of potential converter station sites

4.6.16 Consultation throughout the site selection process with landowners, and more specifically in the converter station search area with Sembcorp Utilities, has been undertaken by Forewind. Inputs into the process identified areas of land which would be suitable for a converter station, and were presented to Forewind as potential converter station sites.

4.6.17 Initial landscape and visual, noise, traffic, land quality, ecological and capability assessments were conducted to identify potential risks, constraints and opportunities for siting of the converter station sites. The three shortlisted converter station sites (Site E, G and H) have been assessed based on known constraints and are shown in **Figure 4.14**.



LEGEND

- Onshore Scoping Area
- Lackenby 400KV substation

Converter Station Sites

- E
- G
- H

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.14 Converter Station Sites (preferred)

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-025**

SCALE	1:75,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

Preferred Converter Stations Site for Dogger Bank Teesside A & B

4.6.18 Site G is the largest of the three shortlisted sites, and has the potential to easily accommodate the required converter stations for Dogger Bank Teesside A & B (further details can be found within **Appendix 6F**).

4.6.19 The opportunities with this site are that the site size provides flexibility of design to avoid localised constraints and allows for optimisation and future site expansion. The eastern half of Site G was preferred due to the electricity lines that cross the western half of the site.

4.6.20 The risks associated with the site are that it has a small amount of contaminated land on the northern edge, but this could be avoided through micro-siting and by amending the site footprint. The initial ecology assessment highlighted some potential habitat for water voles, and there is potential for a noise impact on the nearby village of Lazenby, which could however be mitigated given the opportunities for design optimisation within the site.

4.6.21 The combination of low consenting risks, a receptive landowner, and site design optimisation afforded by such a large site combine to identify Site G as the preferred converter stations site for Dogger Bank Teesside A & B.

4.7 Stage 6 – Identification of onshore cable corridor (Lackenby Substation to the landfall)

4.7.1 This site selection stage identified the preferred route of the HVDC cable from the identified landfall to the preferred converter station site within the Wilton Complex. Subsequently, the HVAC cable route from the converter station to the grid connection point at Lackenby was identified.

Design and technical assumptions

4.7.2 A number of technical and design assumptions were identified during this stage of the process, to enable the cable route selection. These were:

- The preferred 'Landfall Two' option between Redcar and Marske-by-the-Sea, as the preferred landfall location;
- The minimum capacity of a single cable route will be 1GW;
- Cable routes accommodating a cable system of 2GW will be required to each of the converter station sites within the Wilton Complex;
- Each 1GW project will require a cable route construction width of up to 18m within agricultural land (i.e. an 18m wide 1GW cable route, a 36m wide 2GW (2x18m wide) route (this is subject to refinement through the on-going site selection process);
- The construction width may be reduced within road surfaces to 7.5m wide for 1GW, 18m wide for 2GW (to be agreed in consultation with Sembcorp utilities); and
- Onshore transition pits at the landfall point to connect the offshore export cables to the onshore cables.

Approach to cable route selection

4.7.3 The cable routing selection was an iterative assessment process based on the following approach:

- A review of data collected as part of the Zonal Characterisation (Zoc) document;
- Analysis of data in GIS to identify development considerations;
- Options based on the three initial landfall points identified by Forewind;
- A comparison between each of the options identified; and
- Further assessment and consultation to define the route.

Cable route characterisation

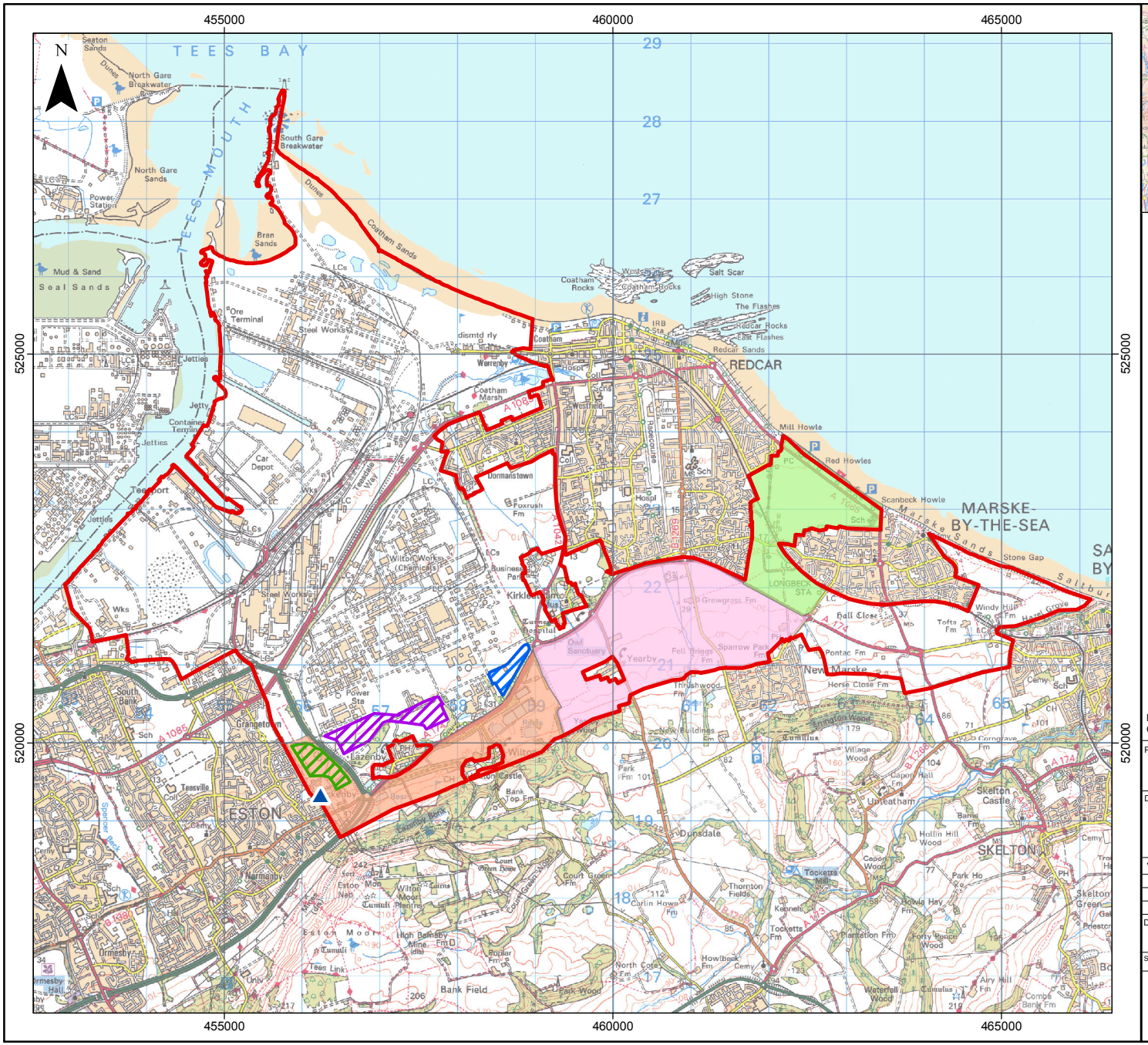
4.7.4 To aid in characterising the cable route, the land between the landfall and the Wilton Complex was divided into sections. A brief description of the three sections is provided below and the areas are shown on **Figure 4.15**.

4.7.5 **Section A**: This section includes the landfall area, the corridor between the towns of Redcar and Marske-by-the-Sea, the sewage works, main railway line, and the agricultural land and woodland up to the A174.

4.7.6 **Section B**: This section includes the agricultural land south of the A174 to the village of New Marske and Longbeck Lane. This section also includes the settlement of Yearby and continues to the A174 roundabout with the A1042 at the south east corner of the Wilton Complex.

4.7.7 **Section C**: This section includes the land directly south of the Wilton Complex adjacent to the A174. This area includes reservoirs, Wilton Golf Club and several areas of woodland and individual mature trees. Along the southern border are Neptune Wood and Wilton Wood. It also includes the land surrounding the existing Lackenby substation.

4.7.8 The assessment of each section is detailed within **Appendix 6G** which also summarises the key consenting risks associated with each option.



LEGEND

- Onshore Scoping Area
- Lackenby 400KV substation
- Section A
- Section B
- Section C

Converter Station Sites

- E
- G
- H

0 3

Kilometres

Data Source:
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PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.15 Cable Route Characterisation (Sections A-C)

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-026**

SCALE	1:75,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

HVDC/HVAC long list of cable route options

4.7.9 The following approach to developing a list of cable route options was adopted where practical, in order to further minimise environmental impact to the area:

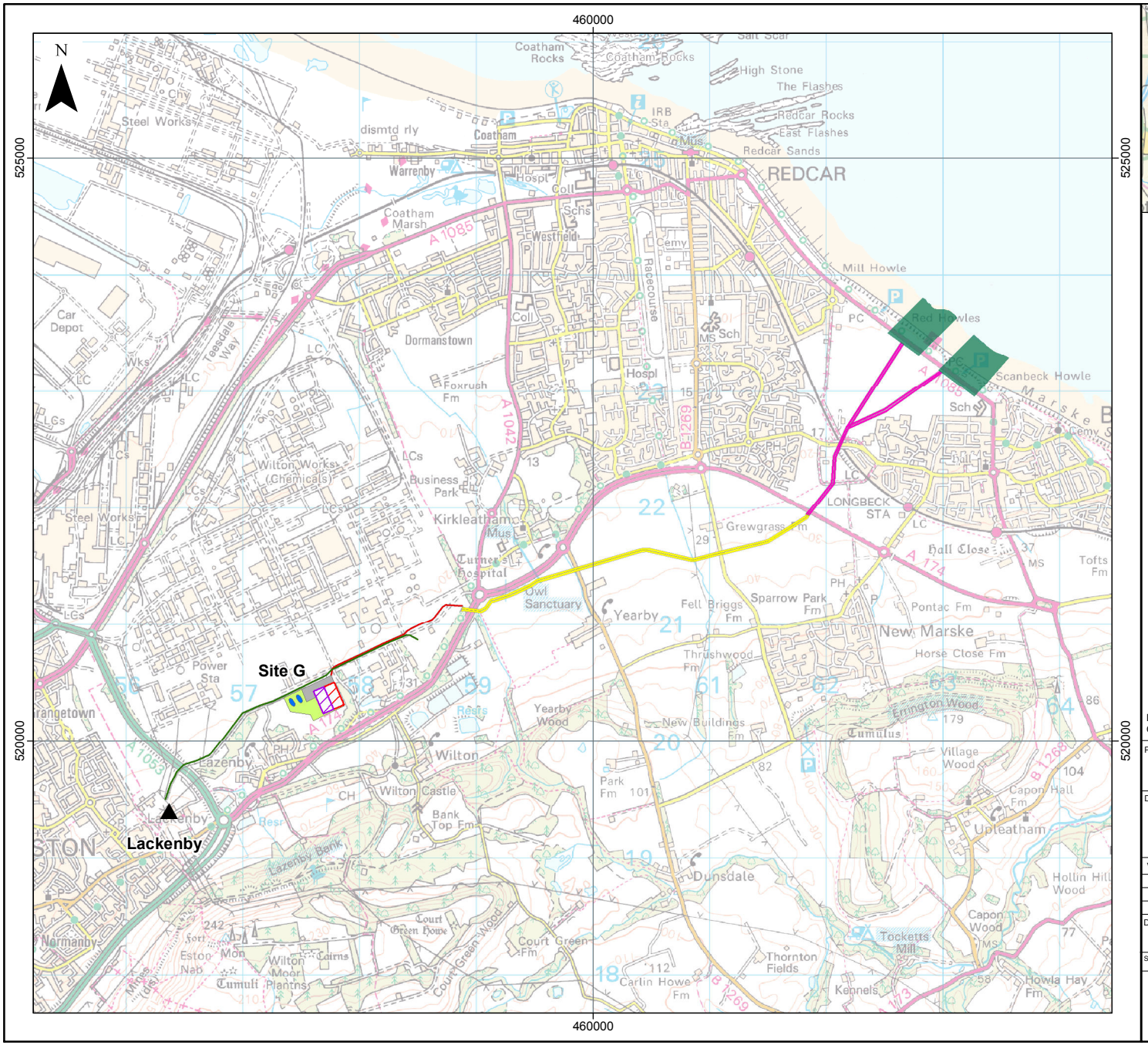
- Reduce proximity to residential dwellings;
- Minimise impacts on agricultural practices;
- The shortest, technically and environmentally acceptable route is preferred;
- Avoid designated sites and areas (i.e. Heritage and biodiversity sites);
- Follow existing field boundaries;
- Minimise the number of hedgerow crossings;
- Utilise existing gaps in field boundaries;
- Avoid isolating parcels of land during construction; and
- Avoid areas of important habitat, trees, ponds and agricultural ditches.

Dogger Bank Teesside A & B HVDC cable routes

4.7.10 The cable route assessment focused on local communities, other infrastructure and populated areas that have the potential to influence cable route selection. Full details on the cable route assessment and the potential cable routes identified can be found in the Teesside Identification of Onshore Cable Corridors in **Appendix 6G**. Using the technical and design assumptions outlined in this chapter, and assessing these against the identified development considerations, enabled the identification by Forewind of 49 potential cable routes to the eight shortlisted converter station sites. This stage was undertaken prior to the preferred converter station sites being chosen.

Dogger Bank Teesside A & B HVAC cable routes

4.7.11 Site G is the preferred site for Dogger Bank Teesside A & B. Due to the proximity of the site to the Lackenby substation, there was only a single route option proposed and is shown in **Figure 4.16**. This route travels west from the converter station towards the current Lackenby substation. The major constraint is a pinchpoint between wooded landscaping bunds and the new grain storage facility. Further constraints include the overhead powerlines and the Greystone road. Consultation with Sembcorp (as outlined in **Table 2.2**) has aided the cable route selection within the Wilton Complex and allowed identification of constraints such as utilities and operational working requirements, which has in turn allowed the route to be further developed.



LEGEND

- Lackenby 400KV
- Cable Landfall Envelope
- Laydown
- Teesside A and B HVAC Cable
- A2 - 2 x 1GW 18m HVDC Cable Route
- B3 - 2 x 1GW 18m HVDC Cable Route
- G1 - 2 x 1GW 13m HVDC Cable Route

0 1
Kilometres

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PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.16: Preferred cables routes

VER	DATE	REMARKS	Drawn	Checked
1	10/07/2013	Draft	SW	RH
2	25/07/2013	Draft	SW	RH
3	27/08/2013	Submit for PEI3	SW	RH

DRAWING NUMBER: **F-ONL-MA-009**

SCALE	1:50,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

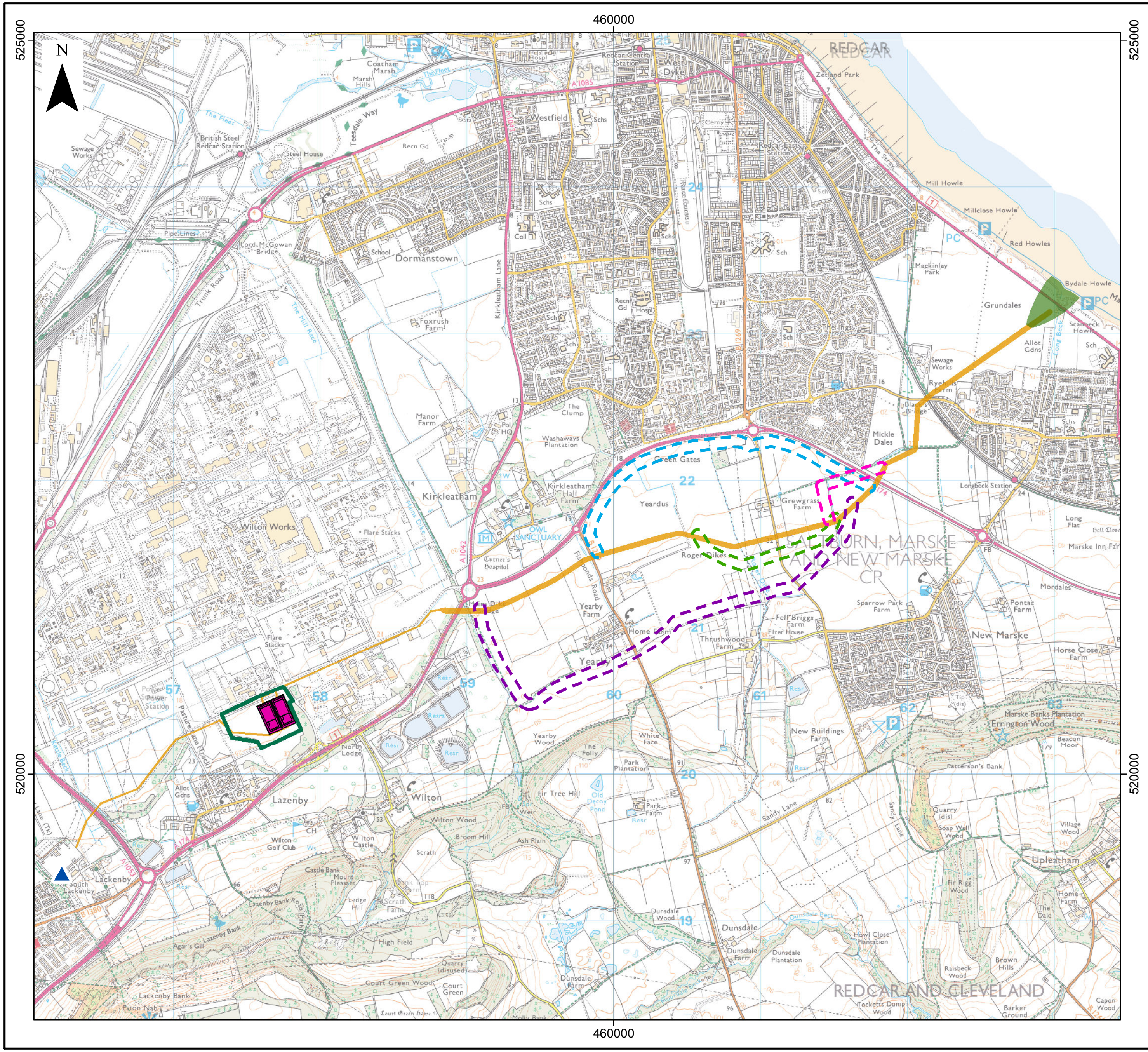
Dogger Bank Teesside A & B HVDC and HVAC micrositing work

4.7.12 Site selection is an iterative process and will continue to be informed by the findings of the on-going impact assessment and stakeholder (including landowners) engagement work.

4.7.13 There were a number of options for micro-siting the cables which came from consultation with landowners and Forewind as shown in **Figure 4.17**. These options were each assessed by the EIA team, taking into account the considerations and data collected through the EIA process to date. Some of the options were ruled out due to their potential environmental impact or physical constraints (such as utilities), and other options were taken forward.

4.7.14 The cable route was amended as shown in **Figure 4.18** as a result of consultations with landowners.

4.7.15 Due to the iterative nature of the site selection process, the cable route was then further refined to reflect changes in number and size of the primary and intermediate compounds, and refinement of the cable landfall envelope. This scheme layout and design is currently being used to inform the EIA assessments and is shown in **Figure 4.19**.



LEGEND

- ▲ Lackenby 400KV substation
- HVDC cable route
- Potential Landfall Area
- Dogger Bank Teesside A + B
- Converter Stations

Proposed route deviations

- Deviation 1
- Deviation 2
- Deviation 3
- Deviation 4

0 — 1.5

Kilometres

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

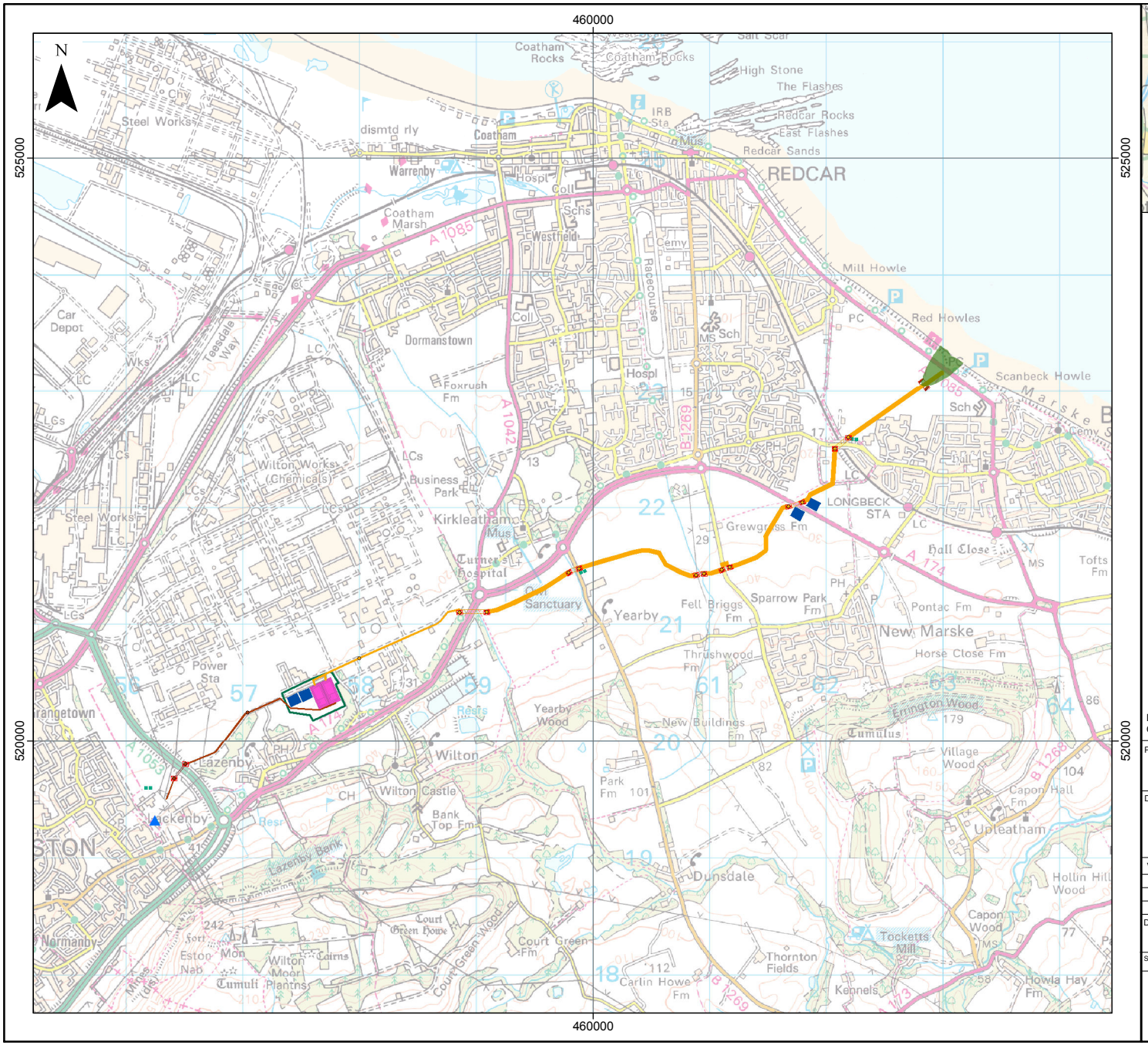
Figure 4.17 Teesside Cable Route Micrositing

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
2	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-027**

SCALE	1:40,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND



LEGEND

- Cable landfall envelope
- Landfall joint transition bay (2500m²)
- Onshore cable route HVDC, Open trench
- Onshore cable route HVDC, HDD
- Onshore cable route HVAC, Open trench
- Onshore cable route HVAC, HDD
- HDD entry or exit locations (2000m²)
- Large site construction compound (9000m²)
- Small site construction compound (784m²)
- Converter station site
- Converter stations
- Lackenby 400KV substation (Teesside A+B connection)
- Cable jointing bays HVDC (36m²)
- Cable jointing bays HVAC (56m²)

0 1
Kilometres

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

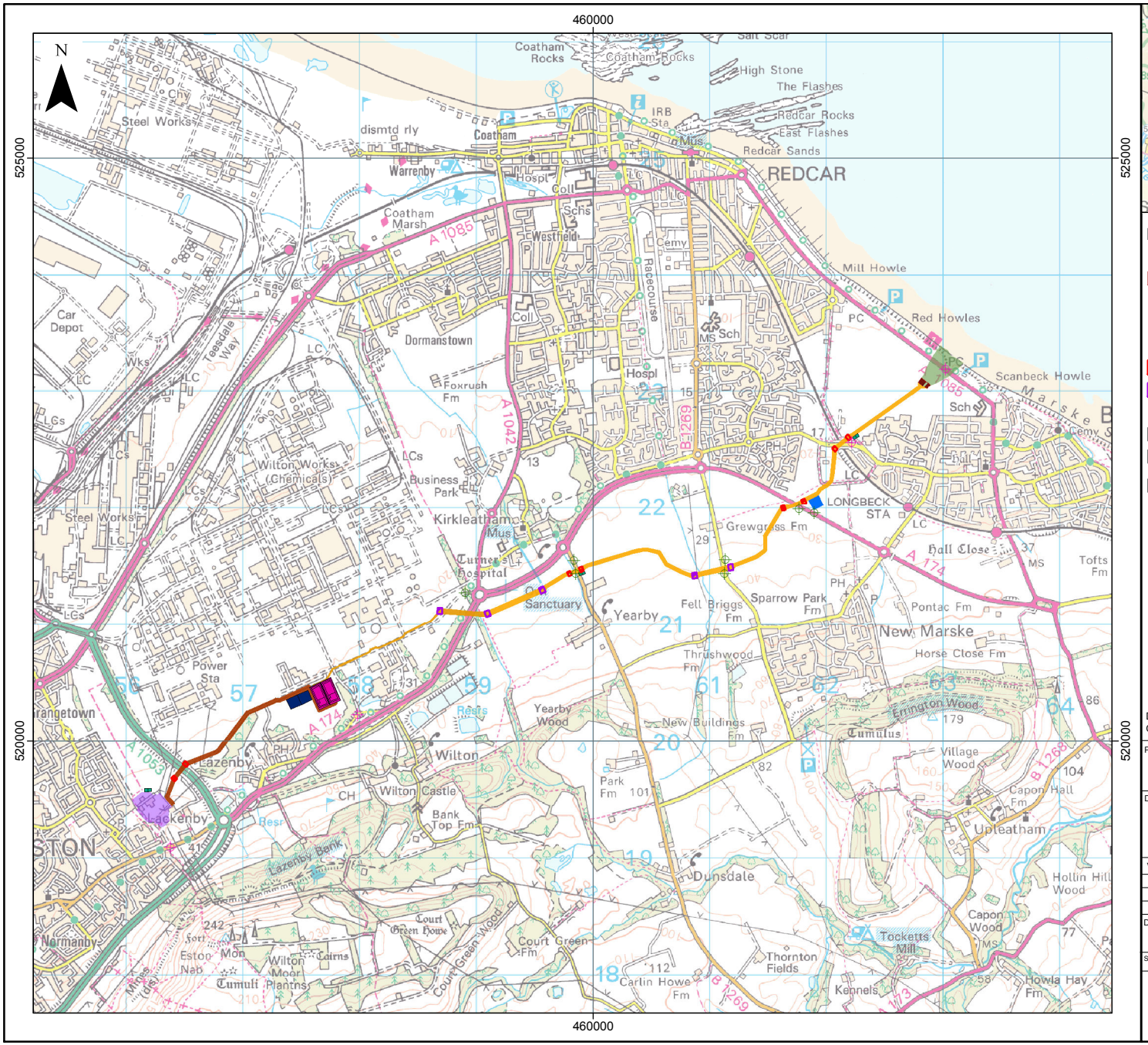
Figure 4.18: Dogger Bank Teesside A & B revised route with landowner changes

VER	DATE	REMARKS	Drawn	Checked
1	10/07/2013	Draft	SW	RH
2	25/07/2013	Draft	SW	RH
3	27/08/2013	Submit for PEI3	SW	RH

DRAWING NUMBER: **F-ONL-MA-010**

SCALE	1:50,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND



LEGEND

- Cable landfall envelope
- Landfall horizontal directional drill compound and joint transition bay
- Direct current cable route (agricultural setting, 36m working width)
- Direct current cable route (industrial setting, 18m working width)
- Alternating current cable route (39m working width)
- Minor horizontal directional drill entry or exit locations (1,200m²)
- Major horizontal directional drill entry or exit locations (2,000m²)
- Primary construction compound (10,000m², 5,000m² per project)
- Intermediate construction compound (784m²)
- Converter stations (one per project)
- Converter stations construction compounds (9,000m², one per project)
- Lackenby 400kV substation
- Indicative access points for construction for Projects A+B
- Indicative access points for construction for all Projects

0 1

Kilometres

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

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.19:
Teesside A - B scheme design for EIA

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	SW	RH
2	23/07/2013	Draft	SW	RH
3	27/08/2013	Submit for PEI3	SW	RH

DRAWING NUMBER: **F-ONL-MA-011**

SCALE	1:50,000	PLOT SIZE	A4	DATUM	OSGB36	PROJECTION	BNG

FOREWIND

4.8 Stage 7 – Offshore cable corridor selection

4.8.1 The selection of a wide export cable corridor in the offshore environment is relatively more straightforward compared to the onshore, largely on account of the absence of potentially complex land use and ownership issues typically encountered on land.

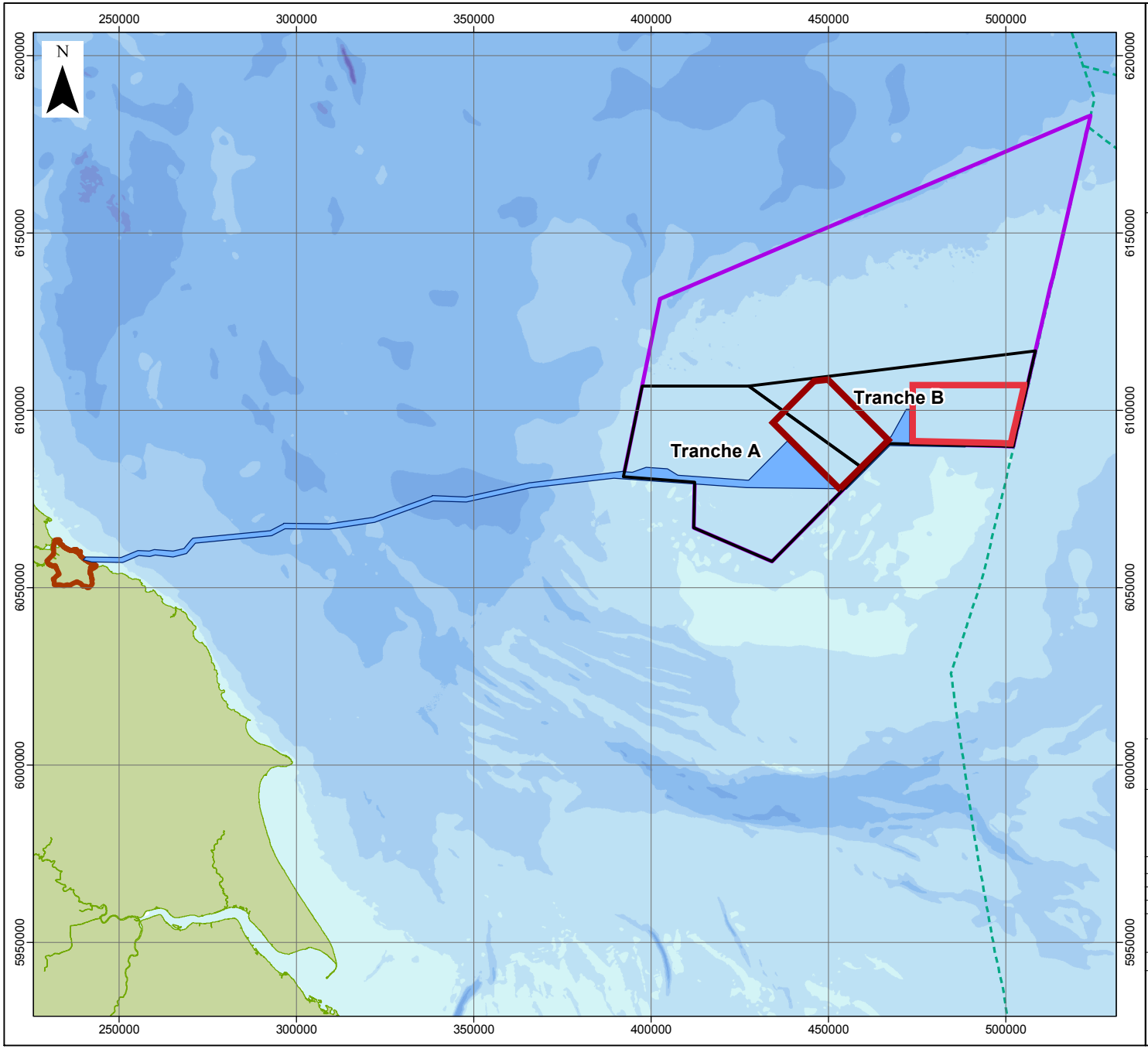
4.8.2 The proposed offshore cable corridor is shown in **Figure 4.20** and was identified by Forewind following a further review of the known offshore constraints and analysis of reconnaissance survey data that Forewind collected within the offshore cable portion of the study area. While Forewind has identified the locations of the first two Dogger Bank Teesside projects (Dogger Bank Teesside A & B) the locations of the further two Dogger Bank Teesside projects (C & D) have yet to be determined, but it is known that they will be located to the north of Tranches A and B in Tranches C and/or D. As Creyke Beck A & B are located between Dogger Bank Teesside A & B and the landfall, the most direct route for the export cable corridor is between the two Creyke Beck projects. To date Forewind has identified the exit point from the zone and the offshore cable corridor for Dogger Bank Teesside A & B and proposes to identify a separate corridor for Dogger Bank Teesside C & D in future.

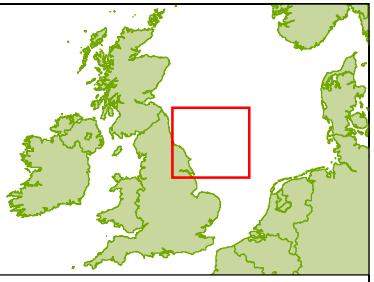
4.8.3 Dogger Bank Teesside A & B export cable landfall is proposed at Marske-by-the-Sea in Redcar and Cleveland from which it will connect into the existing National Grid Lackenby substation near Eston.

4.8.4 The corridor is approximately 1.5km wide and connects the proposed landfall to Tranche A. The design decisions used to inform the corridor included (but were not limited to) consideration of:

- Known areas of active sandwaves and exposed bedrock within the cable envelope established during the reconnaissance survey;
- The position of known obstructions or archaeological features such as wrecks;
- The locations of the draft Marine Conservation Zones (pMCZs); and
- The locations of telecommunications cables and pipelines.

4.8.5 These are presented in further detail in **Appendix 6H**.





LEGEND

- Dogger Bank Zone
- Dogger Bank Teesside A & B export cable corridor
- Tranche Boundary
- Dogger Bank Teesside
- Dogger Bank Teesside B
- Onshore Cable Route Study
- International Boundary

0 50
Kilometres

Data Source:
Round 3 offshore wind farm boundary © Crown Copyright, 2013
Background bathymetry image derived in part from TCarta data © 2009
UK International Boundary data supplied by UKHO using information published from open sources

PROJECT TITLE

DOGGER BANK TEESSIDE A & B

DRAWING TITLE

Figure 4.20 Proposed Offshore Cable Corridor

VER	DATE	REMARKS	Drawn	Checked
1	09/07/2013	Draft	GC	DB
1	30/08/2013	Submit for PEI3	SW	DB

DRAWING NUMBER: **F-ONC-MA-028**

SCALE	1:1,650,000	PLOT SIZE	A4	DATUM	WGS84	PROJECTION	UTM31N

FOREWIND

4.9 Site selection of Dogger Bank Teesside A & B

4.9.1 The site selection process has identified:

- The two offshore wind farms and associated array cables, collector stations and converter stations will be located within both Tranche A (Dogger Bank Teesside B) and Tranche B (Dogger Bank Teesside A & B);
- The preferred wind farm project boundaries;
- An offshore export cable corridor that is 1.5km wide from Tranche A to a preferred landfall location Marske-by-the-Sea;
- A proposed 36m wide onshore HVDC cable route from the onshore converter stations site to the preferred landfall location;
- A converter stations site within the Wilton Complex, that can accommodate the co-location of two converter stations; and
- A proposed 39m wide HVAC onshore cable route to connect the converter stations to the existing Lackenby substation.

4.10 Ongoing site selection activities

4.10.1 Site selection is an iterative process and will continue to be informed by the findings of the ongoing impact assessment work. For example the exact timings of construction activities and the precise routing of the onshore cable alignment, through individual landownership parcels, will ultimately inform the final design. However, this element of work is considered to be micrositing within the preferred site.

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