RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Environmental Statement

Volume 7

Chapter 4 – Site Selection & Assessment of Alternatives (Revision 2) (Clean)

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01	N/A	N/A	Submitted for DCO Application
02	99	4.1.2.5.5 Table 4-21	Chapter 4 Site Selection, Table 4-21, has been updated as requested in the Rule 17 letter [PD-006] to confirm that Option 07A was taken forward. No other changes have been made.

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Glossary

Term	Definition
Accommodation Platform	An offshore platform (situated within either the DBS East or DBS West Array Area) that would provide accommodation and mess facilities for staff when carrying out activities for the Projects.
Array Areas	The DBS East and DBS West offshore Array Areas, where the wind turbines, offshore platforms and array cables would be located. The Array Areas do not include the Offshore Export Cable Corridor or the Inter-Platform Cable Corridor within which no wind turbines are proposed. Each area is referred to separately as an Array Area.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Development Scenario	Description of how the DBS East and / or DBS West Projects would be constructed either in isolation, sequentially or concurrently.
Dogger Bank South (DBS) Offshore Wind Farms	The collective name for the two Projects, DBS East and DBS West.
Electrical Switching Platform (ESP)	The Electrical Switching Platform (ESP), if required would be located either within one of the Array Areas (alongside an Offshore Converter Platform (OCP)) or the Export Cable Platform Search Area.
Environmental Statement (ES)	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.

Term	Definition
Export Cable Platform Search Area	The Export Cable Platform Search Area is located mid-way along the Offshore Export Cable Corridor and is the area of search for the Electrical Switching Platform (ESP).
Haul Road	The track along the Onshore Export Cable Corridor used by traffic to access different sections of the onshore export cable route for construction.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Horizontal Directional Drill (HDD)	HDD is a trenchless technique to bring the offshore cables ashore at the landfall and can be used for crossing other obstacles such as roads, railways and watercourses onshore.
In Isolation Scenario	A potential construction scenario for one Project which includes either the DBS East or DBS West array, associated offshore and onshore cabling and only the eastern Onshore Converter Station within the Onshore Substation Zone and only the northern route of the onward cable route to the proposed Birkhill Wood National Grid Substation.
Inter-Platform Cable Corridor	The area where Inter-Platform Cables would route between platforms within the DBS East and DBS West Array Areas, should both Projects be constructed.
Inter-Platform Cables	Buried offshore cables which link offshore platforms.
Intertidal	Area on a shore that lies between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Jointing Bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.

Term	Definition
Landfall	The point on the coastline at which the Offshore Export Cables are brought onshore, connecting to the onshore cables at the Transition Joint Bay (TJB) above mean high water.
Landfall Zone	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) and the Transition Joint Bays (TJBs) inclusive of all construction works, including the landfall compounds, Onshore Export Cable Corridor and intertidal working area including the Offshore Export Cables.
Local Authority	The Local Authority is a body empowered by law to exercise various statutory functions for a particular area of the United Kingdom. This includes County Councils, District Councils and the Broads Authority, as set out in Section 43 of the Planning Act 2008. East Riding of Yorkshire Council (ERYC) is the Local Authority for the entirety of the onshore project footprint.
Mean High Water Springs (MHWS)	MHWS is the average of the heights of two successive high waters during a 24 hour period when the range of the tide is at its greatest (Spring tides).
Mean Low Water Springs (MLWS)	MLWS is the average of the heights of two successive low waters during a 24 hour period when the range of the tide is at its greatest (Spring tides).
National Policy Statement (NPS)	A document setting out national policy against which proposals for NSIPs will be assessed and decided upon.
Nearshore	The zone which extends from the swash zone to the position marking the start of the offshore zone (~20m).
Offshore Converter Platforms (OCPs)	The OCPs are fixed structures located within the Array Areas that collect the AC power generated by the wind turbines and convert the power to DC, before transmission through the Offshore Export Cables to the Project's Onshore Grid Connection Points.
Offshore Development Area	The Offshore Development Area for ES encompasses both the DBS East and West Array Areas, the Inter-Platform Cable Corridor, the Offshore Export Cable Corridor, plus the associated Construction Buffer Zones.

Term	Definition
Offshore Export Cable Corridor	This is the area which will contain the offshore export cables (and potentially the ESP) between the Offshore Converter Platforms and Transition Joint Bays at the landfall.
Onshore Development Area	The Onshore Development Area for ES is the boundary within which all onshore infrastructure required for the Projects would be located including Landfall Zone, Onshore Export Cable Corridor, accesses, Temporary Construction Compounds and Onshore Converter Stations.
Onshore Export Cable Corridor	This is the area which includes cable trenches, Haul Roads, spoil storage areas, and limits of deviation for micro-siting. For assessment purposes, the cable corridor does not include the Onshore Converter Stations, Transition Joint Bays or temporary access routes; but includes Temporary Construction Compounds (purely for the cable route).
Onshore Export Cables	Onshore Export Cables take the electric from the Transition Joint Bay to the Onshore Converter Stations.
Onshore Converter Stations	A compound containing electrical equipment required to transform and stabilise electricity generated by the Projects so that it can be connected to the electricity transmission network. There will be one Onshore Converter Station for each Project.
Onshore Substations	A compound containing electrical equipment required to transform and stabilise HVAC / HVDC electricity generated by the Projects so that it can be connected to the electricity transmission network. Outdated term used during the site selection process when both HVAC / HVDC technologies were being considered, referred to as Onshore Converter Stations following the removal of HVAC technology from the Projects design envelope.
Onshore Substation Zone	Parcel of land within the Onshore Development Area where the Onshore Converter Station infrastructure (including the Haul Roads, Temporary Construction Compounds and associated cable routeing) would be located.
Temporary Construction Compound	An area set aside to facilitate construction of the Projects. These will be located adjacent to the Onshore Export Cable Corridor and within the Onshore Substation Zone, with access to the highway.

Term	Definition
The Applicants	The Applicants for the Projects are RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South Offshore Wind Farms).
Transition Joint Bay (TJB)	The Transition Joint Bay (TJB) is an underground structure at the landfall that houses the joints between the Offshore Export Cables and the Onshore Export Cables.

Acronyms

Term	Definition
AEZ	Archaeological Exclusion Zone
AfL	Agreement for Lease
AoS	Area of Search
BEIS	Department of Business, Energy and Industrial Strategy
BRAG	Black-Red-Amber-Green
CB	Creyke Beck
CION	Connection and Infrastructure Options Note
DBS	Dogger Bank South
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESO	Electricity Systems Operator
ESP	Electrical Switching Platform
ETG	Expert Topic Group
EU	European Union
HDD	Horizontal Directional Drill
HND	Holistic Network Design
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current

Term	Definition
IEMA	Institute of Environmental Management and Assessment
IPC	Infrastructure Planning Commission
MCZ	Marine Conservation Zone
MLWS	Mean Low Water Springs
MOD	Ministry of Defence
NETS	National Electricity Transmission System
NGT	National Gas Transmission
NPPF	National Policy Planning Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OCP	Offshore Converter Platform
OS	Ordinance Survey
OTNR	Offshore Transmission Network Review
PEIR	Preliminary Environmental Information Report
PEXA	Practice and Exercise Area
RCP	Reactive Compensation Platform
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TCC	Temporary Construction Compound
TJB	Transition Joint Bay

Term	Definition
UK	United Kingdom
UXO	Unexploded Ordnance

4 Site Selection & Assessment of Alternatives

4.1 Introduction

1. This chapter of the Environmental Statement (ES) provides a description of the site selection and alternatives assessment process and the approach taken by the Applicants to refine the design of Dogger Bank South (DBS) East and DBS West Offshore Wind Farms (the Projects). The process includes consideration of both the offshore and onshore infrastructure, and the assessment of reasonable alternatives as the proposals for the Projects have developed through the pre-application process to date.

2. This chapter outlines the staged approach to defining the spatial boundaries and constituent parts of the Projects. It also explains and details the main alternatives considered for the Projects, including location and infrastructure options, in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations); the Marine Works (Environmental Impact Assessment) Regulations 2007; the Conservation of Habitats and Species Regulations 2017 (the Habitat Regulations); and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (the Offshore Habitat Regulations).

4.2 Key Components of Dogger Bank South

3. A summary of the key components for the Projects are presented below. Further details of the key components of the offshore and onshore infrastructure can be found in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**.

4. The key offshore components are:

- Offshore wind turbines and their associated foundations;
- Offshore platforms and their associated foundations;
- Scour protection around foundations; and
- Sub-sea cables comprising:
  - Offshore Export Cables (linking the Offshore Converter Platforms (OCPs) to the landfall);
  - Inter-platform cables;
  - Array cables (linking the wind turbines to the OCPs);
  - External cable protection on sub-sea cables as required; and
  - Fibre optic communications cables.

5. The key components at the landfall are:

- Installation of up to six completed ducts which would be installed using a trenchless technique such as Horizontal Directional Drill (HDD). This consists of three ducts per project (two power cable ducts plus a smaller duct for a fibre optic communications cable). In the event of a trenchless crossing failure the equipment would be removed and the void filled and another attempt would be made in another location within the Landfall Zone.
- Up to four Transition Joint Bays (TJBs) to house the connection between the offshore and onshore.

6. The key onshore components are:

- Ducts installed underground to house the electrical cables along the Onshore Export Cable Corridor;
- Onshore cables installed within ducts except under specific circumstances for example where an unknown obstacle is identified which may result in direct lay;
- Joint bays and links boxes installed along the cable corridor;
- Trenchless crossing points at certain locations such as some roads, railways and sensitive habitats (e.g. rivers of conservation importance);
- Temporary construction compounds and vehicular accesses;
- Temporary bridges and culverts;
- Permanent bridges and culverts;
- Onshore Converter Stations and onward High Voltage Alternating Current (HVAC) connections to the proposed Birkhill Wood National Grid Substation; and
- Permanent operational Onshore Converter Station(s) and cable route access.

7. It should be noted that the terms 'Onshore Substation' and 'Onshore Converter Station' are both used throughout this chapter. For the majority of the site selection process for the Projects, due to both HVAC and HVDC technologies being under consideration the compound(s) containing electrical equipment required to transform and stabilise electricity generated by the Projects were referred to as Onshore Substations.

8. Following the removal of HVAC technology from the Projects' design envelope, the terminology used to refer to Onshore Substations was amended to Onshore Converter Stations. In this chapter, references to Onshore Substations have been kept where appropriate to reflect the terminology that was used at the specific point in time in the site selection process, and as the overall term used to refer to the Onshore Substation / Onshore Converter Station site selection process.

4.3 Legislation, Policy and Guidance

9. Site selection for offshore wind farms in the UK is governed by the existing legislative, policy and guidance framework for the development of electrical infrastructure and for environmental assessment in the UK (see **Volume 7, Chapter 3 Policy and Legislative Context (application ref: 7.3)**) for further detail). The key pieces of legislation, policy and guidance which set the framework for site selection and the assessment of alternatives for offshore wind farms in the UK, which informed this methodology, are summarised in **Table 4-1**.

10. The Planning Act 2008 makes provision for National Policy Statements (NPSs). NPSs are designed to set the policy framework for determination of nationally significant infrastructure project (NSIP) applications. The three which are relevant to the Projects are:

- The Overarching NPS for Energy (NPS EN-1) (Department for Energy Security and Net Zero (DESNEZ), 2023a);
- The NPS for Renewable Energy Infrastructure (NPS EN-3) (DESNEZ, 2023b), which covers nationally significant renewable energy infrastructure (including offshore generating stations in excess of 100 MW); and
- The NPS for Electricity Networks Infrastructure (NPS EN-5) (DESNEZ, 2023c), which covers the electrical infrastructure associated with an NSIP.

11. It is noted that the NPSs were revised during the Projects site selection process. These were published in November 2023 and designated in January 2024. The updates contained in these new versions have been considered within this site selection process.

Table 4-1 Legislation, Policy and Guidance Considered During the Site Selection and Assessment of Alternatives Process

Legislation, Policy or Guidance	Details
Legislation	
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017	The consideration of alternatives and major design decisions made during the development of a project has been part of Environmental Impact Assessment (EIA) Legislation since the adoption of the original EIA directive in UK law under the European Union (EU) EIA Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC). The 2017 Regulations, at Schedule 4, paragraph 2, require an ES to include "*a description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*".
The Electricity Act 1989	Schedule 9 of The Electricity Act 1989 sets out the obligations for a generation installation to preserve amenity, including "*shall have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest*", and "*shall do what he reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects".*
The Planning Act 2008	The Planning Act 2008 is the primary legislation that established the legal framework for applying for, examining and determining applications for Nationally Significant Infrastructure Projects (NSIPs) taking into account the guidance in NPSs.
National Policy	
Overarching NPS for Energy (EN-1) (2023)	The NPS for Energy (EN-1) states that, in relation to consideration of alternatives, "*Applicants are obliged to include in their ES, information about the reasonable alternatives they have studied. This should include an indication of the main reasons for the*

Legislation, Policy or Guidance	Details
	applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility." (paragraph 4.2.15).
NPS for Renewable Energy Infrastructure (EN-3) (2023)	The NPS for Renewable Energy Infrastructure (EN-3), which relates to renewable energy generation infrastructure (transmission infrastructure is covered by EN-1 and EN-5) states that, in relation to consideration of alternatives, the "*specific criteria considered by applicants and the weight they give to them will vary from project to project. Where there are requirements on applicants or the Secretary of State to consider specific factors, these are made clear in the text. The choices which applicants make in selecting sites reflect their assessment of the risk that the Secretary of State, following the general points set out in Section 4.1 of EN-1, will not grant consent in any given case. It is for applicants to decide what applications to bring forward. In general, the government does not seek to direct applicants to particular sites for renewable energy infrastructure. In specific circumstances it may be appropriate to provide some direction or guidance, for example to areas of search or areas to avoid through Marine Plans, Strategic Environmental Assessments (SEAs) or The Crown Estate Leasing Rounds, in respect of marine renewable technology. All of the examples given consider marine specific aspects of many of the assessment principles set out in Part 4 of EN-1"* (paragraph 2.3.2 – 2.3.5). NPS EN-3 outlines that for offshore wind farm sites, the Secretary of State should be satisfied that the site selection process has been undertaken in a way that reasonably minimises adverse effects on a variety of environmental parameters.
NPS Electricity Networks Infrastructure (EN-5) (2023)	EN-5 highlights the constraints on site selection imposed by "*the location of new generating stations or other infrastructure requiring connection to the network, and/or system capacity and resilience requirements determined by the Electricity System Operator*" (paragraph 2.2.2), together with the Government's legally-binding Net Zero commitment and directs the Secretary of State to consider these in the decision-making process. NPS EN-5 directs that "*Applicants retain control in managing the identification of routeing and site selection between the identified initiating and terminating points or within the development zone*", and notes that the locational constraints identified in paragraph 2.2.2 of EN-5 do not "*exempt applicants from their duty to consider and balance the site-selection consideration… much less*

Legislation, Policy or Guidance	Details
	the policies on good design and impact mitigation detailed in Sections 2.4-2.9" (paragraph 2.2.5 and 2.2.6). Paragraph 2.2.7 of EN-5 states that "*The connection between the initiating and terminating points of a proposed new electricity line will often not be via the most direct route. Siting constraints, such as engineering, environmental or community considerations will be important in determining a feasible route*".
Planning Inspectorate Advice Note Seven: EIA	The Planning Inspectorate Advice Note Seven suggests the EIA needs to explain "*the reasonable alternatives considered and the reasons for the chosen option taking into account the effects of the Proposed Development on the environment*" (paragraph 9.3).
Planning Inspectorate Advice Note Nine: Rochdale Envelope	The Rochdale Envelope enables and facilitates a degree of flexibility within the project design at consent. Planning Inspectorate Advice Note Nine: Rochdale Envelope states "*The need for flexibility is identified in a number of National Policy Statements (NPS) which suggest the Rochdale Envelope as an approach to address uncertainties inherent to the Proposed Development e.g. changing market conditions. However, Energy (EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and the NPS for National Networks all stress the need to ensure that the significant effects of a Proposed Development have been properly assessed*" (paragraph 1.3).
BEIS Energy White Paper	The BEIS Energy White Paper sets out how the UK will clean up its energy system and reach net zero emissions by 2050, reiterating the UK Government target of achieving 50GW of offshore wind by 2030, of which the Projects could make a significant contribution (see **Volume 7, Chapter 3 Need for the Project (application ref: 7.3)**). Seeking the appropriate balance between environmental, social and economic costs is a key component of the white paper.
Marine Policy Statement	The Marine Policy Statement adopted by all UK administrations in March 2011 provides the policy framework for the preparation of marine plans, establishing how decisions affecting the marine area should be made in order to enable sustainable development.
East Inshore, East Offshore, North East Inshore and North East Offshore Marine Plans	The approach taken to offshore wind renewable energy infrastructure and subsea cabling outlined in the plans and associated policies. With specific reference to subsea cabling, engagement has been undertaken to understand potential

Legislation, Policy or Guidance	Details
	impacts on navigation lanes and deep water channels, with the Offshore Export Cable Corridor subsequently adapted to minimise impact.
The Crown Estate's Cable Route Protocol	The Cable Route Protocol comprises a set of principles and requirements for offshore wind developers in the planning of offshore export cable routes. Compliance with these principles and requirements is secured within the offshore array Agreement for Lease (AfL). Compliance with these requirements must be demonstrated within the Corridor Identification and Approval for Linear Activities document which will accompany an application to The Crown Estate for a transmission assets AfL.
National Planning Policy Framework (NPPF)	The NPPF does not contain specific policies for NSIPs (for which particular considerations apply, determined in accordance with the decision-making framework set out in the Planning Act 2008 and relevant NPSs) but may be considered as a relevant and important matter.
Guidance	
The Horlock Rules	In order to identify the most appropriate location to site the Onshore Converter Stations, National Grid Electricity Transmission's Guidelines on Substation Siting and Design ('The Horlock Rules') (National Grid Company (NGC), 2009) are considered. These guidelines document National Grid Electricity Transmission's best practice for the consideration of relevant constraints associated with the siting of onshore substations.
The Holford Rules	National Grid Electricity Transmission employs the rules on overhead line routeing. Since the formulation of the Holford rules, formal requirements for environmental assessment have been introduced. Whilst environmental assessment for overhead lines addresses wider topics than the visual amenity issue on which the Rules concentrate, they remain a valuable tool in the selecting and assessing potential route options as part of the environmental assessment process. While there will be no overhead lines in the Projects' design envelope, the Holford Rules provide the context for the National Grid connection point. They also inform the Project decision to select buried rather than overhead cables.
The Pathway to 2030 Holistic Network Design	The Holistic Network Design (HND) sets out National Grid ESO's plan to connect 23GW of planned offshore wind to the grid. The

Legislation, Policy or Guidance	Details
	HND dictates where and how the Projects will be connected to the grid.
EIA Guide to Shaping Quality Development (Institute of Environmental Management and Assessment (IEMA))	IEMA's EIA Guide to Shaping Quality Development (2015) states that considering the key environmental and consenting risks alongside the engineering requirements of a project can influence design in many ways. The earlier the interaction commences, the more likely it is that cost effective, positive outcomes will be achievable. This can be considered in several ways: • The review of site selection of alternative development sites to avoid key sensitive receptors; • Alternating the layout to work within a site's existing natural systems; • Amending the design of a specific aspect of the development to manage impacts; • Specifying construction techniques to avoid effects on receptors; and • Changing materials to reduce volume and/or transport impacts.

4.4 Site Selection Process

12. The siting, design and refinement of the Projects' offshore and onshore infrastructure has followed a site selection process, taking account of environmental, physical, technical, commercial and social considerations and opportunities, as well as engineering requirements. The details of the approach taken to select the Array Areas; Offshore Export Cable Corridor; possible landfall locations; Onshore Export Cable Corridor and the location of the Onshore Converter Stations and onward cable routing to the new National Grid substation close to the existing Creyke Beck substation known as Birkhill Wood are provided in sections 4.7 to 4.13. The aim was to identify locations that would be environmentally acceptable, deliverable and consentable, whilst also being economic and efficient.

13. A multi-disciplinary team was formed to undertake the site selection process, which included a team of specialists including engineers, planners, land agents, landscape architects, legal advisors and EIA consultants.

14. The site selection process commenced with the identification of the offshore wind farm Array Areas as part of The Crown Estate's Offshore Wind Leasing Round 4 process (discussed further in section 4.7). Subsequently, National Grid Electricity Systems Operator (ESO) advised that the onshore grid connections for the Projects would be in the vicinity of the existing National Grid Electricity Transmission substation at Creyke Beck, East Riding of Yorkshire (section 4.13), which enabled a selection process to be undertaken to identify possible locations for the Projects Landfall (section 4.9), Onshore Substations (section 4.10), Offshore Export Cable Corridors (section 4.11) and Onshore Export Cable Corridors (section 4.12) and onward cable routing to the National Grid substation (section 4.13).

15. Prior to the selection of the connection point at Creyke Beck, potential grid connection points within the Hawthorn Pit and South of Humber regions were investigated, along with a second potential area of search within Creyke Beck. As a result, the initial site selection work for the Projects Landfall, Onshore Substations, Offshore Export Cable Corridor and Onshore Export Cable Corridor were conducted for the following areas of search:

- Creyke Beck 1 (southwest of Beverley);
- Creyke Beck 2 (northeast of Hull);
- Hawthorn Pit; and
- South of Humber.

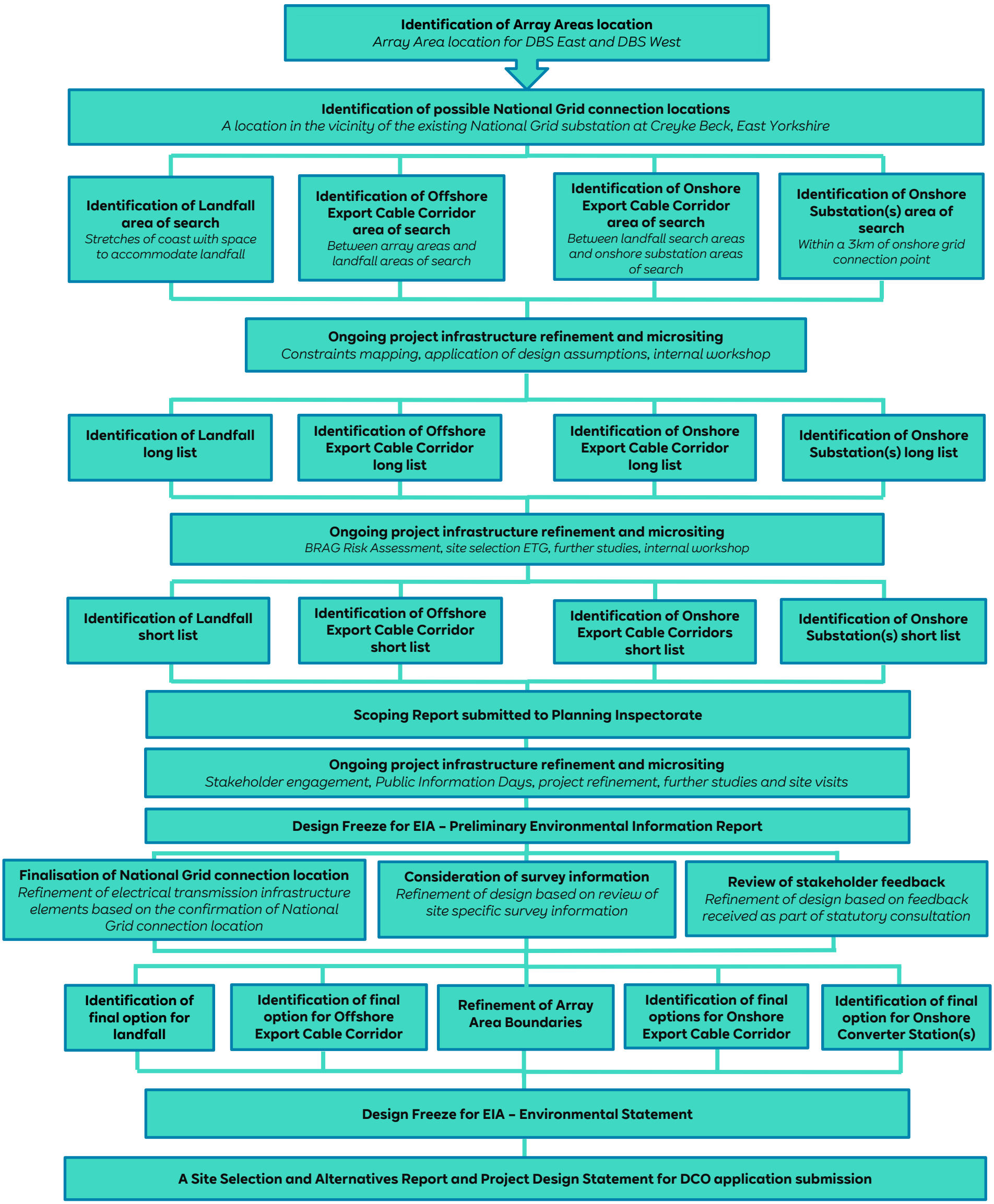
16. Following the Applicants being made aware by NGESO that Creyke Beck 1 was the favoured location for the onshore grid connection investigations into Creyke Beck 2, Hawthorn Pit and South of Humber areas of search ceased as they were no longer relevant. The areas of search for Creyke Beck 1 for the Projects Landfall, Onshore Substations, Onshore Export Cable Corridor and Offshore Export Cable Corridors are shown in **Volume 7, Figures 4-3** to **4-6 (application ref: 7.4.1).** The grid coordinate location for the Creyke Beck 1 substation was used by the Projects during the site selection process. The Projects were informed of an updated location approximately 1km southeast of the original coordinates provided to inform the Areas of Search. This refined location at Birkhill Wood meant that the original assumed location of the Creyke Beck 1 onshore grid connection subsequently became available for consideration for the Projects onshore substations. This is considered in section 4.10.2.1.

17. Throughout the site selection process options had been subject to a comparative assessment of engineering and environmental risk, consisting of a Black-Red-Amber-Green (BRAG) test, to identify the risks associated with each option identified. High risk options were given a red rating, whilst those with medium risk were coded amber and those with the least risk were assigned green. Black options were those which are not feasible from an engineering or environmental perspective. The aim of the BRAG tests was to ascertain which options carried the least risk with respect to the assessment criteria applied and based upon the professional judgement of the multi-disciplinary team of experts.

18. With regards to the Array Areas, potential amendments to these boundaries were investigated and implemented following the submission of the Projects Preliminary Environmental Information Report (PEIR) in June 2023 (see section 4.7 for further information).

19. **Plate 4-1** provides an overview of the site selection process undertaken for the Projects. It is important to note that whilst the site selection process is illustrated and described as a linear approach in this chapter for ease of presentation, the reality of any project development is that site selection is a complex, iterative process with decisions made having considered multiple factors. Decisions on site selection are required at various stages to enable the Projects to progress and are based on the best information available at the time.

Plate 4-1 Overview of the DBS Site Selection Process



4.5 Consultation

20. The Applicants have undertaken pre-application engagement with stakeholders, communities and landowners in order to seek input to refine the Projects' design and to communicate key project updates.

21. Consultation on refinements to the Projects' site selection, layout and configuration have been undertaken through the statutory and non-statutory pre-application stages to date:

- Consultation on the Scoping Report;
- Consultation on the Preliminary Environmental Information Report;
- Expert Topic Group (ETG) meetings with statutory and non-statutory technical stakeholders;
- Introductory Public Consultation;
- Parish Council briefings; and
- Direct discussions with landowners.

22. **Table 4-2** details the comment received on the site selection process as part of the consultation on the Scoping Report.

Table 4-2 Key Stakeholder Responses Regarding Site Selection and Assessment of Alternatives

Comment	Project Response
Scoping Opinion (Planning Inspectorate, September 2022)	
The Inspectorate acknowledges the Applicant's description of work undertaken to date regarding site selection as set out in Section 1.6 of the Scoping Report. No reference to alternatives in relation to turbine array layout is made, however it is noted that Paragraph 35 in Section 1.5 discusses factors that will influence the final layout. The ES should explain how these factors have been considered within the discussion of alternatives, where alternative layouts have been assessed. *The Inspectorate would expect to see a discrete section in the ES that provides details of the alternatives studied and the reasoning for the selection of the chosen option(s), including a comparison of the environmental effects, with*	This chapter outlines the options studied for each element of the Projects and the reasons for selecting the preferred options presented in this ES. It is not anticipated that any final decisions will be made in relation to the layout of turbines until after project consent has been achieved. The potential worst-case options for turbine layouts are provided in **Volume 7, Chapter 14 Shipping and Navigation (application ref: 7.14)**, with a minimum spacing between turbines confirmed as 830m.

Comment	Project Response
reference to the Black-Red-Amber-Green ranking referenced in Paragraph 78.	
"Paragraph 92 of the Scoping Report indicates that the onshore cable corridor scoping boundary comprises five route variations. These routes are not provided, either within a figure or accompanying text, and as such it is not clear where the routes would be. *Paragraph 97 indicates that there are three onshore substation location zones, which are also not represented on a figure.* *The ES should clearly describe any alternative cable routes and substation locations assessed, including the use of appropriate figures, and provide a justification for the chosen options."*	Section 4.10 and section 4.12 outline the options considered for the onshore substations and onshore export cable route respectively.
"The Scoping Report describes the potential use of alternatives in the place of a 'conventional' connection (Section 1.1 Paragraph 5). The Inspectorate expects the ES supporting the application for the Proposed Development to describe the preferred option for connection and an assessment of the alternatives considered."	The Applicants can confirm that a conventional connection is being sought and no alternative to conventional connection solutions are included in the application.
"The ES should provide specific information on where any restricted working widths or seasonal restrictions are to apply during construction. The choice of construction methodology e.g., through open-cut trench or Horizontal Directional Drilling (HDD) or other trenchless methods, should be justified and explained in the ES. The Inspectorate advises that effort is made to commit to a construction method particularly in sensitive locations, and for the ES assessment to be based on the chosen method rather than introduce unnecessary uncertainty by retaining multiple options. *The Inspectorate would expect the ES to explain how the outcomes of consultation with stakeholders has been used to refine the site selection options. This is likely to be particularly important where options for micro-siting*	**Volume 7, Chapter 5 Project Description (application ref: 7.5)** provides details of the current assumptions around construction methods. In addition, **Volume 7, Appendix 5-2 Obstacle Crossing Register (application ref: 7.5.5.2)** details which potential onshore crossings would be crossed using a trenchless crossing method (e.g. HDD). Details of consultation with stakeholders and how this has influenced the site selection process are included throughout this chapter.

Comment	Project Response
infrastructure are limited by the presence of other existing or planned infrastructure proposals."	
Environment Agency Scoping Response (September 2022)	
"When narrowing site selection, we would ask the applicant to consider whether any locations could interact with any planned coastal flood or erosion schemes. This should include the Humber Strategy for any location(s) in the locality of Spurn Point. An example would be Tunstall Drain. It should also be ensured that, as part of data collection, the most recent scheme information is obtained, for example the Withernsea South coastal defence extension. We recommend both East Riding of Yorkshire Council and the Environment Agency are contacted again as the landfall options are refined."	East Riding of Yorkshire Council and the Environment Agency have been consulted throughout the site selection process and planned schemes have been considered where relevant.
"There are a number of 'main rivers' that outfall directly to the North Sea or have catchments that are near the existing coastline, as per para. 628 and Figure 3-16. We would expect to see the landfall options to avoid any main river channels or flood infrastructure (e.g., outfalls and flood defences) by at least 20 metres. As per para. 632, some of these 'main rivers' also have statutory designations."	The preferred landfall option selected for ES avoids statutory main rivers and flood infrastructure. Further details are available in **Volume 7, Chapter 20 Flood Risk and Hydrology (application ref: 7.20)**.
"As there are three potential landfall areas identified at this stage, there is a vast amount of data and information to be considered in the time allowed for this consultation. We therefore encourage the applicant to continue to engage with us as the site selection process progresses, to ensure we can provide specific and relevant advice."	The Environment Agency has been consulted throughout the site selection process. Details of feedback on how this has been addressed in the site selection process is included throughout this chapter.
Ministry of Defence Scoping Response (September 2022)	
"Through paragraph 443 of the Scoping Report, it is acknowledged that the offshore array may fall wholly or partially within Southern Managed	PEXA have been considered a constraint as part of the site selection process.

Comment	Project Response
Danger Area (MDA) Practice and Exercise Areas (PEXA) D323B, D323C, and D323D. The lower vertical limits of blocks of danger area airspace are also noted. In addition, the cable route indicated in the Scoping Report passes through Practice and Exercise Areas (PEXA) D323K, D323D, and D323C. The applicant should be advised to take account of the current published MOD Practice and Exercise Areas (PEXA) in preparation of their development proposal. The MOD has highly surveyed routes which may be relevant to the installation of the export cables & associated infrastructure. MOD should be consulted at the next stage of any application."	Further details on the potential impacts upon PEXA are detailed in **Volume 7, Chapter 15 Aviation and Radar (application ref: 7.15)** and **Volume 7, Chapter 16 Infrastructure and Other Users (application ref: 7.16)**.

23. In addition to the response received as part of the Scoping Opinion, the technical stakeholders were invited to attend ETG meetings on the 4th and 22nd May 2022 to discuss the short-listed options and provide further feedback. The ETG meetings were attended by:

- Eastern Inshore Fisheries and Conservation Authority
- East Riding of Yorkshire Council;
- Environment Agency;
- Historic England;
- Highways England;
- Marine Management Organisation;
- Natural England;
- North Eastern Inshore Fisheries and Conservation Authority;
- Royal Society for the Protection of Birds (RSPB);
- The Wildlife Trusts;
- Yorkshire Wildlife Trust; and
- York Consortium of Drainage Boards.

24. Details of the feedback received and how this has been incorporated into the site selection process are reported throughout each section of this chapter.

25. An introductory public consultation was held between 9th September and 14th October 2022 and a statutory consultation was held between 6th June 2023 to 17th July 2023. A supplementary PEIR consultation period was held from 4th August to the 15th September 2023 to allow for stakeholders that had accidentally been omitted from the initial consultation period to provide their feedback. A further targeted statutory consultation period between the 13th November to the 10th December 2023 was undertaken involving all parties with an interest in the areas of land within the onshore development area where adjustments had been made since the Projects' PEIR consultation. Consultation responses and how these were addressed are included in **Volume 5, Consultation Report (application ref: 5.1)** with s42 responses included in **Volume 5, Consultation Report Appendix G1 (application ref 5.8)**.

26. Feedback from members of the local community has been addressed separately by the Applicants and is presented in **Volume 5, Consultation Report (application ref: 5.1)** and **Volume 5, Consultation Report Appendix G2 (application ref: 5.8)**. Consideration of local community comments has been undertaken throughout the site selection process.

27. A technical note was issued to select offshore technical stakeholders on the 8th September 2023 seeking feedback and agreement on the Applicants preferred options for landfall and the Offshore Export Cable Corridor. The details of this note and how feedback was taken into account is detailed in section 4.11.6. In addition, a summary of the rationale that underpinned the refinement of the Array Areas post-PEIR was shared with the Offshore Ornithology ETG pre-submission.

4.6 Project Alternatives

28. A number of strategic-level project design alternatives have been considered as part of the site selection and project design decision-making process. This strategic consideration of alternatives, which fed directly into the Projects' site selection process, are detailed in **Table 4-3**.

Table 4-3 Strategic-Level Project Design Alternatives Considered

Alternatives Considered	Decision	Environmental Benefits
• A single application for development consent for DBS East and DBS West; or • Separate consent applications.	A single development consent application to address both projects.	Consistency in the approach to the environmental assessment, consultation and examination; reduced burdens on stakeholders as only one application will be consulted on and subject to examination; and increased transparency for potential compulsory acquisition process.
• Coordinating the design for DBS East and DBS West where possible; or • Developing separate designs for each Project.	Pursuing a coordinated design for the Projects where possible (for example shared accesses). However, as they are still two separate Projects some flexibility has been built into the design for certain elements to remain individual e.g., onshore converter stations.	By co-locating the infrastructure for both Projects (where possible) the number of receptors impacted by the Projects can be reduced.

Alternatives Considered	Decision	Environmental Benefits
• Overhead lines along the onshore export cable route between landfall and the grid connection location; or • Buried cables within ducts along the onshore export cable route between landfall and the grid connection location.	Buried Onshore Export Cables within ducts	The environmental benefit of burying cables as opposed to overhead lines and pylons is a significant reduction of permanent visual impacts.
• Keeping HVAC technology and High Voltage Direct Current (HVDC) technology options for the electrical system in the application project design • Committing to HVDC technology for the electrical system in the application project design	Commitment to HVDC technology with two HVDC onshore converter stations	Reduced overall footprint of development area as HVDC onshore converter stations have a smaller area than a HVAC substation. Additional benefit of co-locating the two onshore converter stations within the same Onshore Substation Zone to reduce the overall number of receptors.

4.7 Identification of the Array Areas

29. In November 2017, The Crown Estate announced a new round of offshore wind leasing. In September 2019, the final bidding areas were announced, and the Offshore Wind Leasing Round 4 was launched. As part of the Round 4 process, developers were able to identify preferred sites within bidding areas defined by The Crown Estate. Applications were submitted by developers under a competitive bidding process, culminating in an auction held in February 2021. The Applicants undertook their own analyses of environmental and technical constraints to identify preferred project locations. Economic assessments were then undertaken to understand the Applicants' competitive advantage associated with the shortlist of project options that the Applicants had identified, leading to the preference to co-locate two 1500MW projects. The Applicants were successful in the commercially driven auction process, securing preferred bidder status for the DBS East and DBS West projects.

30. The original Array Area boundaries defined for the Projects are shown in **Volume 7, Figure 4-1 (application ref: 7.4.1)**.

4.7.1 Refinement of the Array Areas

31. The Crown Estate Leases for the DBS East and DBS West Projects require a minimum power density of 5MW/km^2. As the initial Array Area boundaries for each Project defined in the Applicants Agreement for Lease would have resulted in minimum power density of less than 5MW/km^2, it was decided to refine the Array Area footprints in advance of application for a Development Consent Order (DCO).

32. A cross-discipline exercise was undertaken following the submission of the Projects' PEIR to consider the potential constraints of the Array Areas, and whether there were specific geographical constraints that could be avoided if possible.

33. Specialists for receptor topics and the Projects engineering teams were requested to review the data available for their given topics and indicate the relative strength of any potential constraints within the original Array Areas, and any potential impact that could result. This exercise was then followed with discussions to score topic specific constraints under the following criteria:

- 0 - Not considered to be a constraint in the scope of the assessment.
- 1 - Low probability of impact occurring, low impact constraint, slight influence on business case and deliverability for the Projects.

- 2 – Low-medium probability of impact occurring, low-medium impact constraint, slight influence on business case and deliverability for the Projects.
- 3 - Medium probability of impact occurring, medium impact constraint, moderate influence on business case and deliverability for the Projects.
- 4 – Medium-high probability of impact occurring, medium-high impact constraint, moderate influence on business case and deliverability for the Projects.
- 5- High probability of impact occurring, high impact of constraint; high influence on business case and deliverability for the Projects (high expectation of serious delivery risk and potential feasibility problems).
- No Go – Area to be excluded from consideration for the Projects.
- OOS = Out of scope of the assessment.

34. The results of this exercise are detailed in **Table 4-4** and **Table 4-5** respectively for each individual engineering constraint and relevant environmental receptor. Mitigation measures are also presented.

Table 4-4 Potential Engineering Constraints Relating to the Original Array Areas for the Projects

Constraint	Risk	Score	Mitigation
Boulders	Cable laying risk. If project needs to clear many boulders, it presents a consenting risk due to benthic habitat disturbance.	3 - High density boulder fields 2- Lower density boulder fields	Avoid as much as possible
Glacial tectonic deformation (western thrust formation)	Uncertain/variable ground conditions and requirement for conservative foundation design	3	Avoid as much as possible
Channelised Unit	Jack-up vessel punch through risk due to low strength clays Need to consider OCP location	2	Potential jack-up vessel health and safety concern OCP micrositing Avoid as much as possible

Constraint	Risk	Score	Mitigation
Seismic anomalies	Cable laying challenges Need to consider OCP location	2	Avoid as much as possible
Water depth required for installation of OCP top side	Vessel required for heavy lift of offshore converter platform (OCP) topside would require deep water (28m+). Risk of limited vessels available to perform the lift in shallower water.	1	Fix OCP location in deeper water (>28m). Possible alternative topside installation approach (floatover etc) to mitigate water depth constraint
Foundation installation vessel	More expensive vessel spread required for foundation installation water depth under 19m.	1	Consider more expensive vessel spread for foundation installation under 22.5m.

Table 4-5 Potential Risks of Original Array Areas to Relevant Environmental Receptors

Receptor	Risk	Score	Mitigation
Offshore Ornithology	Bird collision and displacement with wind turbines Potential for project delay or consenting refusal	Razorbill - 4 Kittiwake - 2 Guillemot - 3 Gannet - 1	Avoid as much as possible
Aviation and Radar	Risk of disruption to Staxton Wold MOD radar from taller wind turbines in DBS West only Potential for project delay	5 – 250m above monthly mean sea level (mMSL) 4 – 300m above mMSL 3 – 336m above mMSL 2- 350m above mMSL 1 - 400m above mMSL	Avoid as much as possible. Mitigation to be agreed with the MoD.
Benthic habitats	Consider cable burial risk assessment. If increased cable protection required within the Array Areas, this poses a consenting risk. Limited differential across Array Areas due to homogenous habitat.	Out of Scope (Limited Impacts)	Reduction in cable protection within Array Areas where feasible.
Wrecks	For surveyed wrecks apply buffer that allows for foundation footprint and micrositing	No Go	No works to take place within buffer zone around identified wrecks.
Shipping & Navigation	Very low activity in the Array Areas with no differential in data.	Out of Scope (Limited Impacts)	Project boundary alignments to be considered with regard to health and safety and shipping and navigation receptors.

35. As a result of this exercise, the following key constraints were identified:

- Potential for interference with the MOD's Staxton Wold air defence radar:
- Areas of high boulder density;
- Required water depth for OCP installation; and
- Area of elevated non-breeding guillemot and razorbill presence (based on one-year of survey data).

36. Due to the presence of these potential constraints, the Array Areas were subsequently refined as shown in **Volume 7, Figure 4-2 (application ref: 7.4.1)**. These refined boundaries were a step towards the Projects requirement to meet the minimum 5MW per km power density requirements in a manner that gave due consideration to engineering and environmental constraints. Hence, they were selected as the final array area boundaries in the DCO application. It should be noted that further refinement of the Array Areas would be conducted prior to construction commencing to ensure the area of each array is within the maximum allowed by the Projects Agreement for Lease. Further refinements will be based on the minimum power density requirements and layout optioneering undertaken post DCO submission.

4.8 Areas of Search

37. Areas of Search (AoS) for the landfall, onshore substations, Offshore Export Cable Corridors and Onshore Export Cable Corridors were identified in parallel as part of an iterative site selection process.

4.8.1 Identification of the Landfall Area of Search

38. The landfall AoS identified a potential area where the Offshore Export Cables could be brought onshore. It was based on the DBS East and DBS West Array Areas and the indicative grid connection point that was provided to the Applicants by National Grid ESO.

39. The landfall AoS stretched from the south of Bridlington to north of the Dimlington Gas Terminal. Environment Agency LiDAR data was used to assess cliff height in this region. It was determined that the area north of Bridlington would not be practicable as the average cliff height is between 20 and 30m. These cliff heights present thermal constraints on the cables resulting in limited ampacity which ultimately constrains the power output of the wind farm. There were also environmental constraints, including the Flamborough Head and Filey Coast Special Protection Area (SPA) and the Flamborough Head Special Area of Conservation (SAC) which helped to eliminate the area north of Bridlington from the AoS. The area south of the Dimlington Gas Terminal was ruled out due to a high number of pipeline crossings (see **Volume 7, Figure 4-3 (application ref: 7.4.1)**).

40. The landfall AoS was drawn to Mean Low Water Springs (MLWS). It is shown in **Volume 7, Figure 4-3 (application ref: 7.4.1)**.

4.8.2 Identification of the Onshore Substation Area of Search

41. The onshore substation AoS (see **Volume 7, Figure 4-4 (application ref: 7.4.1)**) was defined using a 3km radius from the grid connection point provided by National Grid ESO[1].

42. The 3km radius was set to minimise the length of the connection between the Onshore Substations and onshore grid connection points. Minimising this distance as far as is reasonably practicable is beneficial because it minimises the cable reactive power component and losses.

[1] An updated Area of Search was investigated following confirmation of the proposed Birkhill Wood substation, see section 4.10.2 for further information.

4.8.3 Identification of the Onshore Export Cable Corridor Area of Search

43. The Onshore Export Cable Corridor AoS (see **Volume 7, Figure 4-5 (application ref: 7.4.1)**) was drawn by connecting the onshore substation AoS (section 4.8.2) to the landfall AoS (section 4.8.1). This area was then refined in the south to avoid urban areas including Hull, Hedon, Preston and Bilton. After reviewing the proposed route of the Hornsea Project Four offshore wind farm onshore cable corridor, the AoS was also expanded in the west to allow more room to route the Onshore Export Cable Corridor west of Hornsea Project Four onshore cable corridor if necessary.

4.8.4 Identification of the Offshore Export Cable Corridor Area of Search

44. The Offshore Export Cable Corridor AoS (see **Volume 7, Figure 4-6 (application ref: 7.4.1)**) connected the landfall AoS (section 4.8.1) to the northern and southern most points of the Projects' Array Areas. Operational wind farms (such as Westermost Rough and Hornsea Two offshore wind farms) within the area were excluded from the Offshore Export Cable Corridor AoS.

4.9 Landfall

4.9.1 Landfall Design Principles and Engineering Assumptions

45. Potential areas where the offshore cables could be brought onshore were identified based on the following:

- Avoidance of areas with substantial infrastructure or urban land use e.g., areas of housing, coastal defences, other energy infrastructure; and
- Avoidance of areas with a cliff height over 20m, where possible.

46. All the potential areas identified were larger than the footprints required at the landfall to allow flexibility to refine the options at a later stage in the process when more information was available.

47. The process identified a long list of 28 potential landfall options which are shown on **Volume 7, Figure 4-7 (application ref: 7.4.1)**.

4.9.2 Review of the Landfall Long List

48. A key engineering decision made at this stage of the process was to decrease the target cliff height to 15m. This was based on a trenchless landfall installation technique (e.g. Horizontal Directional Drill (HDD)) depth of 20m below ground level and an assumption that the trenchless drills or drives would be at least 5m below the toe of the cliff. This design requirement was applied because trenchless landfall installations over 20m below ground level could impact on cable ampacity and project viability. Six landfall options (CB11, CB14, CB15, CB19, CB20 and CB28) were identified as being above the target cliff height of 15m across the entirety of their boundaries. As such, these options were removed from the site selection process at this stage.

49. Engineering and environmental BRAG assessments were then completed for the 22 remaining possible landfalls. The assessments were reviewed by the multi-disciplinary team and a decision was made to remove 14 landfall options from consideration.

50. A workshop was subsequently held on the 9th March 2022 to discuss the remaining eight landfalls. This resulted in the removal of landfall CB17 from consideration due to engineering feasibility as the land was recorded as sloping from approximately 11m in the south to a height of 18m in the north and it was assessed that there was insufficient area below the 15m cliff height criteria.

51. **Table 4-6** outlines the 15 landfalls which were not taken forward at this stage and reasoning for each decision.

Table 4-6 Landfalls Removed Following Multi-Disciplinary Review of the Long List and 9th March 2022 Workshop

Landfall	Reason for Removal
CB2	When compared to the nearby CB1 and CB3 options. constraints to onward cable routeing included the Earl's Dyke watercourse to the south of this option, the Fraisthorpe Onshore Wind Farm to the north of this options, and an area of archaeological remains recorded on OS mapping immediately south of Fraisthorpe.
CB5	The construction compound at landfall would need to be located west of Southfield Lane, reducing the distance achievable offshore for the trenchless crossing exit point. The onward cable routeing crossed flood zones and was closer to other constraints. Landfall 6 was considered preferable.
CB7	This option was removed due to the proximity of Seaside Caravan Park and Skipsea Sands Holiday Park which meant there was insufficient area to host the TJB.
CB10	Although the landfall was considered technically and environmentally viable, the presence of Atwick and the Atwick Gas Storage Facility meant that there was insufficient space to facilitate the onward routeing from this landfall option.
CB12	This landfall would have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs). This landfall was also situated in close proximity to a known area of high unexploded ordinance (UXO) concentrations. Higher numbers of cable and pipeline crossings would also have been required to reach this landfall than for other options retained in the process.
CB13	Flood zones, foul ground and potential UXO constraints limited the space available in this area. This landfall would also have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs).

Landfall	Reason for Removal
CB16	Predicted coastal erosion extents within this landfall option reduced the area available for any trenchless landfall compounds. This would then require the compound to be located in close proximity to Thorpe Garth Farm due to the required set back distance from the cliffs. This would then have impacted on the onward onshore export cable routeing. Additional constraints including steep slopes and drains would impact on suitable space for compounds. This landfall would also have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs).
CB17	Land recorded as sloping, with c.11m in the south and c.18m in the north so option discounted due to cliff height over 15m. This landfall would also have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs).
CB21	Constraints associated with the Westernmost Rough offshore wind farm and other onshore infrastructure constrain space available for landfall trenchless crossing and compound. Landfall Zone could be extended northwards slightly to avoid Westernmost Rough infrastructure and possible pond on western side of Pastures Lane however, other options were preferable in comparison. This landfall would also have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs).
CB22	The onshore export cable route from this landfall was considered to be very constrained by proximity to residential properties. This landfall would also have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs).
CB23	This landfall resulted in the need for the offshore cable route to traverse across and have pipeline crossings within both the Holderness Inshore and Offshore MCZs, plus higher numbers of cable and pipeline crossings than other retained landfall sites.

Landfall	Reason for Removal
CB24	This landfall resulted in the need for the offshore cable route to traverse across and have pipeline crossings within both the Holderness Inshore and Offshore MCZs, plus higher numbers of cable and pipeline crossings than options retained in the process. As such it was discounted from the process.
CB25	This landfall had limited space and conflicted with an old / disused airfield. This landfall would also have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs).
CB26	Predicted coastal erosion extents within this option meant that that areas available for trenchless landfall compounds and orientations of drill alignment were constrained. To the north of the sewage works the landfall compound would need to be located west of Holmpton Road and trenchless crossing alignments would be constrained by residential properties to the north and sewage works and likely outfall to the south. In the south the space available for trenchless crossing compounds is very constrained due to the presence of residential properties along Holmpton Road, which would also impact onward cable routeing immediately following landfall. This landfall would also have resulted in the need for the Offshore Export Cable Corridor to traverse across, and have pipeline crossings within, the Holderness Inshore and Offshore Marine Conservation Zones (MCZs).
CB27	Based on the review of the offshore cable route options, the option that connects to this landfall was considered less favourable than those that connected to the northern cluster of landfalls, namely 1 – 9, due to cable length and number of crossings, some of which may need to be in the Holderness offshore MCZ.

52. Based on the review of the long list, seven remaining landfall options were shortlisted for further evaluation:

- CB1;
- CB3;
- CB4;
- CB6;
- CB8;

- CB9; and
- CB18.

4.9.3 Review of the Landfall Short List

53. Seven possible landfall options were taken forward as part of the short list, as shown on **Volume 7, Figure 4-8 (application ref: 7.4.1)**. This short list was reviewed by the multi-disciplinary design team in a workshop on the 6th April 2022, in the context of the remaining Onshore Export Cable Corridor and onshore substation options, in addition to further investigation and discussions around existing and proposed infrastructure (such as the Hornsea Project Four offshore wind farm). This ensured that the landfall was not considered in isolation, thus giving account to the constraints and opportunities of the wider onshore project development area. As a result of this review, the following four landfall options were removed from the process (**Table 4-7**).

Table 4-7 Landfalls Removed Following Multi-Disciplinary Review of the Short List

Landfall	Reason for Removal
CB3	At this stage in the process, it was confirmed that the permanent infrastructure associated with Hornsea Project Four would take up the majority of this landfall option, therefore it was discounted from the process due to the potential lack of space to accommodate the Projects' infrastructure.
CB4	This option was removed from the process due to the uncertainty over the space requirements of Hornsea Project Four combined with the potential Continental Link multi-purpose interconnector and the risk that there would not be adequate space left to accommodate the Projects.
CB6	This option was removed due to the uncertainty over the space requirements for Dogger Bank A & B offshore wind farms and the risk that there would not be adequate space left to accommodate the Projects.
CB18	This landfall resulted in the need for the offshore cable route to traverse across and have pipeline crossings within both the Holderness Inshore and Offshore MCZs. In addition, the associated Onshore Export Cable Corridor from this landfall option would be constrained by the SSE Aldbrough storage facility and associated infrastructure.

54. Therefore, based on the review of the short list there were three remaining landfall options:

- CB1;
- CB8; and
- CB9.

4.9.3.1 Technical Consultation on Landfall

55. The three remaining landfall options were presented to the Site Selection Expert Topic Group in two separate meetings on the 4th May 2022 and 23rd May 2022 (**Volume 7, Figure 4-9 (application ref: 7.4.1)**). **Table 4-8** outlines the comments received from stakeholders regarding the remaining landfall options at this stage.

Table 4-8 ETG Comments on Landfall Options CB1, CB8 and CB9

Organisation	Comment
Environment Agency	The coastline at CB8/9 may be subject to the Coastal Transition Accelerator Programme.
Natural England	Significant concerns over potential offshore impacts to Smithic Bank (CB1), indicated a preference for CB8/9 as it would be preferable to cross Holderness Inshore MCZ if required.
North Eastern Inshore Fisheries and Conservation Authority	Further investigation needed into potential impacts on the Flamborough Head reef if CB1 is taken forward.
Yorkshire Wildlife Trust	Further investigation needed into potential impacts on the Flamborough Head reef if CB1 is taken forward.
MMO, Historic England, RSPB, York Consortium of Drainage Boards, National Highways, East Riding of Yorkshire Council, The Wildlife Trusts	No comments received.

4.9.4 Landfall Options Presented at PEIR

56. Following stakeholder engagement with the ETG, an internal project workshop was held on 25th May 2022 in order to review the feedback from the ETG meetings and select the preferred landfall option(s) to be taken forward for the PEIR (see **Volume 5, Appendix F Non-statutory Consultation and Engagement (application ref: 5.7)** for further details). **Table 4-9** outlines this decision making undertaken during this meeting. As a result of the discussions, it was decided that Creyke Beck Landfalls 8 and 9 would be taken forward as the preferred options (see **Volume 7**, **Figure 4-10 (application ref: 7.4.1)**).

Table 4-9 Landfall Options Presented at PEIR

Landfall	Status	Reason
CB1	Removed	This option was discounted following feedback from Natural England and others that there was a strong preference to avoid crossing the Smithic Bank sandbank. Removing this option also removed the potential direct interaction of the Offshore Export Cable Corridor with the Flamborough Head SAC.
CB8	Option taken forward to PEIR	These landfalls provide options with optimal cliff height, sufficient space to co-locate the Projects and avoid the Smithic Bank sandbank.
CB9		

57. Therefore, based on the review of the remaining options the following landfalls were presented for Section 42 consultation:

- CB8; and
- CB9.

4.9.5 Preferred Landfall Option for ES

58. The remaining two landfall options were subject to further multi-disciplinary review. From an engineering perspective, each landfall was compared to the other in regards to various constraints in relation to both the onshore and offshore environment. From this exercise it was concluded that CB8 was the least constrained option from an engineering perspective, primarily for the following reasons:

- The onshore topography for the trenchless landfall compound would be more conducive to development at CB8, with the presence of the nearby Withow Gap, Skipsea Site of Special Scientific Interest (SSSI) at CB9 presenting spatial and consenting constraints;
- The maximum height differential of the trenchless landfall from the assumed indicative trenchless landfall compound location is lower at CB8 compared to CB9;
- There are less extensive areas of outcropping/sub-cropping glacial till in the offshore approach to CB8 when compared to that of the approach to CB9;
- There is a lesser risk of encountering potential Unexploded Ordnance (UXOs) near CB8, with an increased potential presence of suspected organic material at CB9; and
- There are lesser seafloor gradients on the approach to CB8 when compared to CB9.

59. From an environmental perspective, a BRAG assessment of both landfall options was conducted which considered potential effects on each topic area assessed in the EIA. This assessment also took into account the proposed changes to the offshore terminus of the Export Cable Corridor, which narrowed the width of the corridor running into the landfall. The results of this BRAG assessment are presented in **Table 4-10.**

60. It was determined that CB8 was the preferred option from an environmental perspective primarily due to the considerations on ecological designated sites (avoiding overlap between the permanent burial corridor and the Holderness Inshore MCZ) and geological designated sites (avoiding the Withow Gap SSSI). CB8 also allowed the avoidance of greater extents of areas of high potential for archaeology (based on known information at the time) (see **Volume 5, Appendix F Non-statutory Consultation and Engagement (application ref: 5.7)** for further details regarding consultation regarding geological sites at the Landfall), and was the preferred option when presented to inshore fisheries stakeholders due to the nearshore routing to CB8 being within an area of lesser static fishing intensity compared to CB9 (see **Volume 5, Appendix F2 (application ref: 5.7)** for further details on meeting minutes with inshore fisheries stakeholders).

61. When considering the outcome of all of the assessments, it was concluded that CB8 was the preferred option of the Applicants as it was considered the least impactful from an environmental perspective, with opportunities for micrositing around potential archaeological constraints and greater feasibility from an engineering perspective. Following the completion of this assessment, a technical note was issued to select offshore stakeholders presenting the evidence of the assessment undertaken (see **Volume 5, Appendix F Non-statutory Consultation and Engagement (application ref: 5.7)** for further details). This note indicated the preference for CB8. Feedback received from Natural England and the MMO on this note confirmed their agreement with CB8 being the preferred landfall option (see section 4.11.6.3 for further information). No other issues were raised as part of this consultation. Following this feedback from stakeholders, CB8 was selected as the final preferred landfall option to be assessed for ES.

Table 4-10 Environmental BRAG Assessment of the Preferred Landfall Options

Topic	CB8	CB9
Marine Physical Environment	This option does not fall within any designated site or feature but is located directly to the south of Smithic Bank which is a sandbank feature of interest. This option falls within the area of coast known as the Holderness Cliffs which are not designated but a feature of geological interest due to rapid coastal erosion.	This option falls within the Holderness Inshore MCZ which is designated due to the diversity of seabed substrates which can support a range of benthic habitats. Further mitigation would be required to reduce potential impacts. This option also falls within the area of coast known as the Holderness Cliffs which are not designated but a feature of geological interest due to rapid coastal erosion.
Benthic Habitats	This option does not fall within any SACs designated for benthic and/or intertidal ecological features. This option falls within the northern extent of the Greater Wash SPA. As such any potential impact on benthic features could impact on designating bird features of this site (loss of feeding habitat, reduction in prey availability). Only the temporary construction buffer zone of the Offshore Export Cable Corridor would overlap with the Holderness Inshore MCZ if this landfall was selected,	This option does not fall within any SAC's designated for benthic and/or intertidal ecological features This option falls within the northern extent of the Greater Wash SPA. As such any potential impact on benthic features could impact on designating bird features of this site (loss of feeding habitat, reduction in prey availability) Routing to this Landfall 9 would result in installation of the Offshore Export Cable within the Holderness Inshore MCZ, designated for several benthic habitat features. As such there would be direct impacts on these features from cable

Topic	CB8	CB9
	with no permanent infrastructure being located within the MCZ site boundary. The only potential direct impact on the MCZ would be from vessel anchoring events.	trenching activities, or placement of any required cable protection measures.
Marine Mammals	No significant issues identified with this option.	No significant issues identified with this option.
Offshore Ornithology	This option would result in direct effects upon Greater Wash SPA, effects upon which will be restricted to temporary disturbance rather than permanent displacement.	This option would result in direct effects upon Greater Wash SPA, effects upon which will be restricted to temporary disturbance rather than permanent displacement.
Commercial Fisheries	Static fishing effort present at this option, but at reduced intensity in comparison with CB9. No mobile activity.	Static fishing effort present, at an increased intensity in comparison with CB8. No mobile activity.
Infrastructure and Other Marine Users	Due to the proximity of the option to the Infrastructure associated with Dogger Bank A&B offshore wind farm,	No significant issues identified with this option.

Topic	CB8	CB9
	there may be a requirement for a Proximity Agreement to be put in place.	
Offshore Archaeology and Cultural Heritage	Potential for previously unrecorded archaeological remains in the intertidal zone but will likely be avoided by use of a trenchless crossing technique (e.g. HDD). Scheduled monument nearby but unlikely to be affected by offshore infrastructure.	Potential for previously unrecorded archaeological remains in the intertidal zone but will likely be avoided by use of a trenchless crossing technique (e.g. HDD).
Terrestrial Ecology and Ornithology	No significant issues identified with this option.	No significant issues identified with this option.
Geology and Land Quality	No significant issues identified with this option.	The Withow Gap SSSI (designated for geological features) is located within this option.

Topic	CB8	CB9
Flood Risk and Hydrology	No significant issues identified with this option.	No significant issues identified with this option.
Land Use	Agricultural Land Classification (ALC) Grade 2 and 3 land is present within this option.	Agricultural Land Classification (ALC) Grade 2 and 3 land is present within this option.
Onshore Archaeology and Cultural Heritage	Moderate-high potential for known and unknown heritage assets to survive and heritage setting considerations. Geophysical survey has identified comparatively less extensive probable archaeological anomalies within CB8 than in CB9. Within CB8 there are a group of linear, curvilinear and subrounded trends in the north west corner (which match the general typologies in CB9) and a group of linear trends within south east corner which appear to have been truncated. Otherwise, there are various trends of unclear origin in pockets around and between the probable archaeology mentioned above.	High potential for significant archaeological remains to be impacted. The geophysical survey has recorded a complex range of anomalies across the areas surveyed within CB9. Within the north west of CB9, a fragmentary circular anomaly enclosed by a rectangular enclosure has been detected. These anomalies do not correspond with any features recorded in the HHER or on NMP and APS transcriptions. The WWII battery that overlay the north-western of these responses have not been mapped, aside from limited areas of magnetic disturbance. This appears to be part of an extensive network of linear anomalies forming a series of

Topic	CB8	CB9
	There are also various anomalies recorded as geological spreads and spreads of unclear origin across CB8.	interlinked enclosures detected across Fields 42, 50 and 53 to the south.
Landscape and Visual Impact	This option is not located in any nationally or locally designated landscapes. No Public Rights of Way (PRoW) pass through the option[2], though views may be available from PRoW at the edge of Skipsea within 250m of the western boundary. Close proximity views into this option will be available from Skipsea Sands Holiday Park adjacent to the northern boundary. Views into this option from the Strawberry Fields Holiday Park adjacent to the southern boundary will be largely screened by trees and hedgerows within the grounds. Oblique views into this option may be available from properties at the edge of Skipsea, including Smiddy Farm. Some oblique views into	This option is not located in any nationally or locally designated landscapes. No PRoW pass through the option[1]. Views from PRoW immediately to the west of the option and the B1242 will be limited by intervening hedgerows. There is a small grouping of properties within 200m to the west of this option, adjacent to the B1242. Views from these properties will be limited by trees/hedgerows within their respective curtilages and along field boundaries. Views from Southfield House to the north, will be limited by hedgerows and trees surrounding the property curtilage. Views from the golf course immediately to the south of this option will be limited due to a dense tree lined boundary. Hedgerows alongside

[2] The King Charles III PRoW (Easington to Filey Brigg branch) is planned to be located within both CB8 and CB9. This route had not been designated at the time of writing of this comparative assessment.

Topic	CB8	CB9
	this option may be available from a row of cliffside properties that extends between the two option areas to the north of Withow Gap. Views into the option will be available from the surrounding road network including Mill Lane approximately 150m to the north and Hornsea Road, immediately to the south.	the B2142 will limit views into this option from the road. Some oblique views into this option may be available from a row of cliffside properties that extends between the two option areas to the north of Withow Gap.
Traffic and Transport	Access to this option would be provided from the main B1242, few constraints to accesses are identified. A temporary Haul Road (approximately 850m long) would need to be constructed from B1242 to the landfall area. To avoid construction traffic having to access via the narrow Hornsea Road a temporary haul crossing road would be provided at this option. This would allow traffic to access from the B1242 and cross over Hornsea Road. Construction traffic would be required to travel north from the access along the B1242 impacting sensitive communities at Skipsea.	Access would be provided from the main B1242, few constraints to accesses are identified. A temporary Haul Road (approximately 750m long) would need to be constructed from B1242 to the landfall area. Construction traffic would be required to travel north from the access along the B1242 impacting sensitive communities at Skipsea.

Topic	CB8	CB9
Noise	There are residential noise sensitive receptors close to the western and southern boundaries this option, along with recreational receptors which are likely to be occupied at night (a caravan park) to the north.	There are residential noise sensitive receptors to the north and west. It is likely that this option provides a wider area in which the landfall could be sited than CB8, whilst maintaining a sufficient distance to receptors to avoid significant noise and vibration effects from the landfall works.
Socio-Economics, Tourism and Recreation	Parkdean Resorts Skipsea Sands caravan park and associated assets located in close proximity to this option.	This option is located in close proximity to the Far Grange Holiday Park and Golf Club.

4.9.6 Refinement of Landfall Option for ES

62. Following the confirmation of CB8 as the preferred landfall option for ES, the landfall was refined further to optimise the site as far as possible and to account for environmental, engineering and land constraints, and to directly respond to consultation feedback. A summary of the refinements are outlined below and the final landfall zone for ES is shown in **Volume 7, Figure 4-11 (application ref: 7.4.1)**:

- The overall extents of the landfall boundary were amended due to the following:
  - Overall extent of the landfall boundary was reduced to minimise the total amount of land required for development;
- The distance from the landfall boundary and the existing caravan park was maximised to help mitigate potential temporary impacts during construction, such as trenchless crossing operations;
  - The landfall boundary was reviewed against any existing planning applications and refined to avoid land proposed for development as an extension to the nearby caravan park;
  - The landfall boundary was reviewed against the geophysical survey results to inform micrositing for Temporary Construction Compounds and exit pits around archaeological features as far as possible based on known information; and
  - Results of the archaeological trial trenching conducted within CB8 highlighted areas of higher archaeological potential to avoid within the landfall zone. This information will be used to inform the siting of the TJB and TJB compound, and also the location of the satellite compound within the landfall zone.
- Amendment to emergency access route:
  - The emergency access route was amended to route along the North Turnpike Road, as opposed to routing through the caravan park. This change reduces the potential for noise and air quality impacts on the caravan park and associated temporary construction impacts. The proposed emergency access is shown on **Volume 7, Figure 4-11 (application ref: 7.4.1).**
- Extend the landfall zone into the intertidal zone;
- Avoid old residential titles north of the landfall zone within locations which are now part of the beach;

- Offshore extents of the landfall zone were amended to ensure the boundary between LWS and land registry were aligned;

4.10 Onshore Substations

4.10.1 Onshore Substation Design Principles and Engineering Assumptions

63. As part of the commencement of the site selection process in 2021, both HVAC and HVDC technology were accounted for to fully consider locations for the onshore substations for the development of the Projects.

64. The initial onshore substation AoS (see section 4.8.2) was refined to:

- Avoid residential properties (including whole gardens) where possible;
- Avoid housing land allocations identified in local plans where possible;
- Avoid direct impacts to internationally and nationally designated areas (e.g., SACs, SPAs and Sites of Special Scientific Interest (SSSI) etc.) where possible;
- Avoid significant impacts to the special qualities of Areas of Outstanding Natural Beauty where possible;
- Avoid mature woodland and historic woodland where possible;
- Avoid areas that fall within Flood Zone 3 and where possible preference was given to locating infrastructure in Flood Zone 1; and
- Avoid recreation spaces such as golf courses where possible.

65. The refined onshore substation AoS[3] is shown on **Volume 7, Figure 4-12 (application ref: 7.4.1)**.

66. The next step was to identify large substations zones within the refined AoS which were suitable for siting substation infrastructure. As a minimum, all of the substation zones could accommodate the minimum footprint scenario for one HVDC substation (200 x 130m) and a Temporary Construction Compound (TCC) (250 x 150m). The majority of zones were large enough to allow multiple configurations of the required infrastructure.

67. Nine potential substation zones were identified as shown on **Volume 7, Figure 4-13 (application ref: 7.4.1)**.

[3] An updated Area of Search was investigated following confirmation of the proposed Birkhill Wood substation, see section 4.10.2 for further information.

4.10.2 Review of the Onshore Substation Zone Long List

68. Engineering and environmental BRAG assessments were completed for the long list of nine substation zones. The assessments were then reviewed by the multi-disciplinary team and a number of options were not taken forward in the process. **Table 4-11** outlines which substation zones were not taken forward from the process at this stage and reasoning for each decision.

Table 4-11 Substation Zones Removed Following Multi-Disciplinary Review of the Long List

Substation Zone	Reason for Removal
Substation Zone 2	The main consideration as to why this option was ruled out was because it had limited suitable access options for the delivery of the required transformers and limited options for routeing of the associated Onshore Export Cable Corridor, in addition to the presence of an existing wind turbine and farm buildings immediately to the north of the zone. In addition, review of the location of the nearby INEOS ethylene pipeline revealed it would be a constraint on the routing of the Onshore Export Cable Corridor to this substation zone. In addition, this Zone was unable to accommodate a single HVAC substation (250 x 200m plus a TCC).
Substation Zone 8	The removal of this zone was largely due to the steep southern boundary reducing available space and limiting access routes to the zone, in addition to a high number of required infrastructure crossings. In addition, a review of the location of a nearby pipeline revealed it would be a constraint on the routing of the Onshore Export Cable Corridor to this substation zone. Therefore it was agreed to discount this substation zone from the process.

69. Therefore, based on the review of the long list there were seven remaining substation zones:

- Substation Zone 1;
- Substation Zone 3;
- Substation Zone 4;
- Substation Zone 5;
- Substation Zone 6;
- Substation Zone 7; and
- Substation Zone 9.

4.10.2.1 Review of the Original National Grid Substation Location

70. The multidisciplinary team also undertook an exercise to assess if the original location provided by National Grid ESO for the Creyke Beck 1 location for the National Grid Electricity Transmission (NGET) substation (**Volume 7, Figure 4-36 (application ref: 7.4.1)**) would be suitable for the Projects' Onshore Substations.

71. This exercise included:

- Review of an updated 3km AoS centred on the new location for the NGET substation at Birkhill Wood to determine if any new substation zones could be brought into the substation site selection process, and
- A review of the original NGET Creyke Beck 1 land parcel to see if it could accommodate the Projects' substations.

72. The review concluded that additional locations provided by the updated AoS did not bring in any new suitable field parcel locations, as the extended AoS largely comprised areas in the city of Hull or were constrained by existing infrastructure. The review also concluded the original Creyke Beck 1 location for the NGET substation did not provide any improvements on those remaining substation zones on the short list due to constraints from existing infrastructure and the small size of the parcel.

4.10.3 Review of the Onshore Substation Zone Short List

73. Following the removal Substation Zone Options 2 and 8, seven zones were taken forward as part of the short list, as shown on **Volume 7, Figure 4-14 (application ref: 7.4.1)**.

74. The short list was reviewed again by the multi-disciplinary design team and the following options were removed from the process (**Table 4-12**).

Table 4-12 Substation Zones Removed Following Multi-Disciplinary Review of the Short List

Substation Zone	Reason for Removal
Substation Zone 3	A planning application for a solar farm was approved by East Riding of Yorkshire Council, which covers the same parcels of land as this zone. As such, this zone was removed from the process.
Substation Zone 7	The zone is in an elevated location which would make the substations themselves more prominent in the surrounding landscape. The zone is also located within the Yorkshire Wolds Important Landscape Character Area.

Substation Zone	Reason for Removal
Substation Zone 9	The settlement of Woodmansey is very close to this substation zone and there are limited options for mitigation / screening. Landscape and visual impact issues would pose a high risk for consenting. Onward routing to the grid connection points is difficult for this site and the railway crossing would be very constrained, making it difficult to engineer. As such it was discounted from the process.

75. Substation Zone 5 and Substation Zone 6 were refined with the aim of reducing potential impacts on landscape and visual impacts so they were retained as part of the short list. **Table 4-13** summarises these decisions.

Table 4-13 Substation Zone Refinement

Substation Zone	Refinement
Substation Zone 5	The engineering team assessed the western part of this substation zone to be unsuitable as significant earthworks would be required to form a substation platform. The Landscape team identified the north eastern part of this substation zone to be the most preferable as it is the lowest lying and screened by the Platwoods Bar Plantation. The north eastern part of the zone was also identified as the most preferable by the heritage team as it was the furthest away from the heritage assets associated with Risby Hall and Park. Therefore, the zone was reduced to the north eastern section of the original zone.
Substation Zone 6	The engineering team assessed the northern part of this substation zone to be unsuitable as significant earthworks would be required to form a substation platform. In comparison the southern part of the substation zone is gently sloping and was therefore considered to be a more suitable location. The Landscape and Heritage teams identified the southern part of the substation zone to be more suitable as the existing landscape features (e.g. woodland at Folly Wood, Gorse Plantation, Blackdike Plantation and Sodwall Plantation) could be used to contain the development and provide screening. Therefore the zone was reduced to the southern section of the original zone.

76. Based on the review of the short list there were four remaining substation zones:

- Substation Zone 1;
- Substation Zone 4;
- Substation Zone 5; and
- Substation Zone 6.

77. **Volume 7, Figure 4-15 (application ref: 7.4.1)** shows the substation zones which remained in the process.

4.10.3.1 Technical Consultation on Onshore Substations

78. The remaining options (Substation Zones 1, 4, 5 and 6) were presented to the Site Selection ETG in May 2022. **Table 4-14** outlines the comments received from stakeholders regarding the substation zones.

Table 4-14 ETG Comments on Substation Zones

Organisation	Comment
East Riding of Yorkshire Council	View from Beverley Minster will be a key consideration if Substation Zone 1 is taken forward. There has been significant interest in the areas being considered from solar farm developers and recommend discussions are held with developers to better understand what other projects are being considered for the land within the substation zones.
Natural England	The proposed new Yorkshire Wolds Area of Outstanding Natural Beauty does not need to be given material consideration by the Projects until the proposals are submitted to the Secretary of State, which is currently timetabled for mid-2024.
Yorkshire Wildlife Trust, North Eastern Inshore Fisheries and Conservation Authority, Environment Agency, MMO, Historic England, RSPB, York Consortium of Drainage Boards, National Highways, The Wildlife Trusts	No comments received.

4.10.3.2 Updated Onshore Substation Parameters

79. In July 2022, the HND recommended that the Projects were both connected via a HVDC connection. However, in order to fully consider the assessment of alternatives, the Applicants retained flexibility for one of the Projects to be connected via a HVAC connection as both technologies have different advantages in terms of infrastructure size and requirements, operability, efficiency and economics.

80. As part of the HND process at the time, National Grid ESO increased the grid connection requirements for the substations from 1500MW per project to 1800MW per project. In line with the co-ordinated element of the HND process the capacity increases would promote grid stability, whilst also allowing capacity generated from other projects to reach the national grid in a co-ordinated way. The co-ordinated approach to grid championed by the HND process reduced the need for additional landfall and cable corridor disturbances which would be associated with all projects connecting to the grid individually. Therefore, after discussion with the supply chain over the electrical infrastructure solution to deliver the 1,800MW required by HND for each Project, the overall permanent footprint required for the Projects was increased. The minimum footprint scenario for one HVDC substation was increased from 200 x 130m to 244 x 264m.

81. Although the area of the Temporary Construction Compound was also amended at this point in light of the new permanent footprint requirements, for HVDC this was assumed to decrease from 37,500m^2 to 30,000m^2. The minimum footprint scenario for one HVAC substation was also increased from 250 x 200m to 450 x 300m with the Temporary Construction Compound increasing from 37,500m^2 to 45,000m^2.

82. As a result of the increased substation footprint requirements the substation zones were reviewed in order to identify the preferred footprint locations within the remaining zones. This process was led by the engineering team who considered earthworks, drainage and access requirements alongside the increased footprints. As a result of this work Substation Zones 1 and 4 were increased.

83. Substation Zone 6 was not able to be increased in size to the south due to the presence the Risby Hall Grade II Listed Park & Garden. Areas to the north had already been removed from the zone due to issues set out in **Table 4-13**. The space available could not accommodate the larger footprint requirements for an HVAC substation although could support a single HVDC converter station. Although the site is contained by woodland, it is still relatively high in the landscape and therefore would be more visible than the remaining substation zones in the site selection process. The area is also less developed than in other zones and therefore the substation would be more out of place. In addition, feedback from landowners in the area (see **Volume 5, Consultation Report (application ref: 5.1)**) indicated that Zone 6 (alongside Zone 3) was least favourable from their perspective. Given the zone's potential landscape impacts generally, its proximity to a listed parkland and its relatively small size, Zone 6 was not taken forward.

84. In addition, Substation Zone 5 was also removed at this stage as it was recognised that there was potential for significant landscape and visual impacts in comparison to the other remaining substation zones to the relatively prominent area of high ground. Heritage setting and the potential for unknown archaeology to be present surrounding this Zone 5 also posed a material consenting risk.

85. Therefore, based on the review of the short list two Substation Zones were taken forward to be presented at PEIR (see **Volume 7, Figure 4-16 (application ref: 7.4.1)**:

- Substation Zone 1; and
- Substation Zone 4

4.10.4 Onshore Substation Options Presented at PEIR

86. At the PEIR stage, co-locating the substations and locating them on separate sites was still an option under consideration. However, due to spatial constraints within Substation Zone 1, co-location of HVDC substations within this zone was not considered possible.

87. The potential electrical solutions considered within PEIR were as follows:

- Two HVDC substations in Substation Zone 4 (co-located);
- One HVDC substation in Substation Zone 1 and one HVAC substation in Substation Zone 4;
- One HVDC substation in Substation Zone 4 and one HVAC substation in Substation Zone 1; or
- One HVDC substation in Substation Zone 1 and one HVDC substation in Substation Zone 4.

88. Feedback received on these potential options from statutory and community / landowner feedback is detailed in the relevant DCO Application documents, including **Volume 7, Chapter 21 Land Use (application ref: 7.21)** and **Volume 7, Chapter 23 Landscape and Visual Impact (application ref: 7.23)**. Key points noted by consultees included:

- Beverley Ramblers Association
  - Noted their preference to keep Substation Zone 1 as the final Zone.
- Econergy International Ltd (White Hall Solar Farm)
  - Did not indicate a preference for any of the noted substation options, but did request that the area of Substation Zone 1 that overlapped with the solar farm development area was excluded from environmental enhancement activities for the Projects.

4.10.5 Preferred Onshore Substation Options for ES

89. Following PEIR consultation discussions by the Applicants with the supply chain, it appeared unlikely that HVAC infrastructure would be available to meet installation timelines for the Projects. There were also unlikely to be any cost savings if HVAC infrastructure was used. Given these limitations and the larger onshore footprint of HVAC infrastructure leading to generally larger environmental impacts it was decided to remove HVAC from the Projects design envelope.

90. Removing the two HVAC options left the only options as:

- Two HVDC converter stations in Substation Zone 4 (co-located); or
- One HVDC converter station in Substation Zone 1 and one HVDC converter station in Substation Zone 4.

91. The remaining substation options were re-appraised, with a further BRAG assessment being conducted to determine whether a co-located or split HVDC substation design was the better solution from an environmental, engineering and technical perspective.

92. The outcome of this assessment and subsequent internal multi-disciplinary team meeting on the 18th September 2023 determined that the co-located substation option was more suitable when compared to a split design. This was primarily due to the following reasoning:

- Having two HVDC converter station construction sites would be less favourable from a health and safety management perspective;
- Substation Zone 1 was considered less favourable than Zone 4 due to presence of 33kV overhead power lines, geological risk from a linear feature traversing the eastern part of the Substation Zone 1 footprint,

crossing of the National Gas Transmission (NGT) High Pressure Gas Main, areas of poor ground associated with alluvium to the north of the Zone and small areas at risk of surface water flooding within the north of the Substation Zone 1 footprint.

- A co-located option was the overall preference across all environmental topic areas; and
- A split substation design was the least favourable from a construction costs and land rights perspective.

93. As such, it was decided to remove Substation Zone 1 from the site selection process and proceed with a co-located substation design within Substation Zone 4.

4.10.6 Refinement of Onshore Substation Options for ES

4.10.6.1 Further Refinements of Substation Zone 4

94. Following selection of Substation Zone 4 as the preferred option to be taken forward for assessment, a number of further refinements have been made in order to balance the requirements of the Projects during construction and operation whilst aiming to reduce the overall amount of land take required for development and take into account any potential impacts as a result of the construction and operation of the Onshore Converter Station(s). The main considerations which have fed into the final Onshore Substation Zone include the commitment to HVDC technology, planting and screening proposals to take into account the heritage setting and landscape and visual impacts, accommodating drainage requirements, construction compounds engineering technical considerations, landowner feedback, utilities (such as the NGT and Ineos ethylene high pressure gas pipelines, water mains) and known existing ecological and environmental receptors. The final Onshore Substation Zone for the Projects is detailed in **Volume 7, Figure 4-17 (application ref: 7.4.1)**. Potential impacts associated with the construction and operation of the Onshore Converter Station(s) such as heritage setting are being discussed with stakeholders through the ETG process.

4.10.6.1.1 Onshore Converter Station Footprint Optimisation

95. Following the decision to proceed with a co-located onshore converter station design within Substation Zone 4, a further engineering assessment in relation to the Onshore Converter Station footprint locations was undertaken. This assessment was based on indicative layout details showing:

- The Onshore Export Cable Corridor entering Substation Zone 4 on the western side;
- The onward cable route to the proposed Birkhill Wood National Grid Substation exiting Substation Zone 4 on the eastern side of the zone; and
- The permanent access road (from the A1079) linking into the Substation Zone footprint on the same side as the onward cable route to the proposed Birkhill Wood National Grid Substation.

96. The engineering assessment identified restrictions on cable routeing posed by the likely location of the SUDS Basin to the east, required 50m standoffs to existing pipelines to the south and Ancient Woodland to the east. As such, it was determined that onward cable route would need to exit Substation Zone 4 on the northern side of the Substation Zone footprint. This amendment to the onward cable route also resulted in the relocation of the permanent access road entry to the northern side of the Substation Zone, thereby providing a more direct route toward the A1079.

97. The Onshore Export Cable Corridor would then need to enter from the south of the Onshore Converter Station footprint. Within the positioning of the Onshore Converter Station footprints, an approximate 10m working area was added outwith the combined Onshore Converter Station footprints. This was done to allow for earthworks and drainage. Therefore, the Onshore Converter Station footprints were moved approximately 10m to the north to provide the appropriate distance from the required 50m standoff to the Ineos ethylene pipeline to the south of Substation Zone 4, and to increase space to the west of the Substation Zone for routeing of the Onshore Export Cable Corridor (see **Volume 7, Appendix 5-3 (application ref: 7.5.5.3)** for further details regarding Onshore Converter Station layouts).

98. As a result of these amendments, it was determined that for either DBS East or DBS West being constructed in isolation, the Onshore Converter Station footprint would be required to be located in the eastern footprint within Substation Zone 4.

99. In addition, amendments were also made to exclude the southern boundary of Substation Zone 4, due to the following reasons:

- Any compounds located in the southern portion of Substation Zone 4 would require crossing of the Ineos Ethylene pipeline; and
- Initial trial trenching conducted in the area uncovered high archaeological value in the southern portion of Substation Zone 4.

4.10.6.2.1 Development Scenario

100. The development scenarios being considered for the application are:

- Either DBS East or DBS West is built In Isolation; or
- DBS East and DBS West are both built either Sequentially or Concurrently.

101. If an In Isolation Scenario is taken forward, only the eastern Onshore Converter Station within the Onshore Substation Zone would be constructed. In either the Concurrent or Sequential scenario, both Onshore Converter Station locations within the substation zone would be taken forward for the onshore assessment.

4.10.6.3.1 Substation Accesses

102. Following PEIR and the selection of a preferred zone for the Onshore Converter Station(s), the design of the proposed access to the onshore converter station(s) from the A1079 layby was further refined. These refinements included providing additional overrun areas within the junction footprint to accommodate abnormal indivisible loads and detailing visibility splays.

4.10.6.4.1 Planting / Screening Proposals

103. **Volume 7, Chapter 23 Landscape and Visual Impact Assessment (application ref: 7.23)** recommends planting and screening proposals which have been considered as part of the final Onshore Substation Zone. **Volume 7, Figure 23-6 (application ref: 7.23.1)** shows the indicative landscape mitigation plan for the Onshore Substation Zone. The northern boundary of the Onshore Substation Zone has been extended since PEIR to accommodate additional planting of trees to provide screening of the Onshore Converter Station(s) to for example the nearby Butt Farm, as requested by stakeholders through the LVIA ETG. **Volume 8, Outline Landscape Management Plan (application ref: 8.11)** outlines the soft landscaping proposals.

104. The main areas of woodland planting within the Onshore Substation Zone are as follows:

- To the north, either side of the existing hedgerow, to provide a substantive area of screening between the Onshore Converter Stations and Butt Farm;
- To the east, to provide screening between the Onshore Converter Stations and Rose Villa by the A164; and,

- To the south, along the southern boundary, to provide a substantive area of screening between the Onshore Converter Stations and Bentley village – the location of the planting is removed from the Onshore Converter Station due to constraints posed by the location of utilities in the vicinity of the Onshore Converter Station as shown in section 4.3.3 of **Volume 8, Design and Access Statement (application ref: 8.8).**
- Where practical, advance landscape mitigation planting would be established as early as reasonably practicable in the construction stage. This will allow planting to become more effective at an earlier stage
- Along these and other boundaries, new hedges will be established to define woodland edges, and to provide further visual containment and integration. The western boundary of the Onshore Substation Zone will comprise a double hedgerow to maximise biodiversity net gain as outlined in section 1.5.2 of **Volume 8, Outline Landscape Management Plan (application ref: 8.11).**

4.10.6.5.1 Drainage strategy

105. Since PEIR, the surface water drainage system has been developed. This system would be required for the operational Onshore Converter Stations and would be designed to meet the technical requirements set out in the National Planning Policy Framework (NPPF) through the use of sustainable drainage techniques. These would be accommodated within the Onshore Substation Zone and surface water discharge rates controlled to prevent any increase in flood risk to surrounding land from present day levels. More details are provided within **Volume 8, Outline Drainage Strategy (application ref: 8.12)** submitted with the DCO application.

106. Some form of surface water attenuation would be required with sufficient capacity to retain a peak rainfall event (100-year event + 40% climate change) with controls to ensure that water discharge back to the surrounding area matches the existing greenfield runoff rates, discharging into the closest watercourse or sewer connection. The full specification for the water attenuation and drainage system will be addressed as part of detailed design post-consent

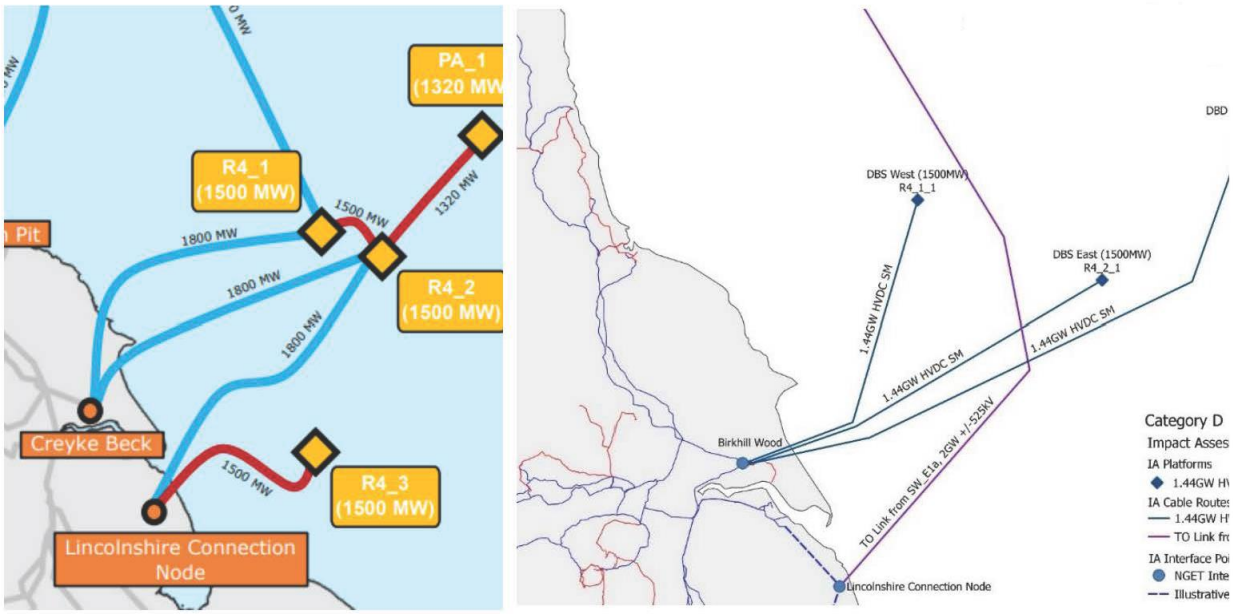
4.10.6.6.1 HND Strategy

107. At this point in the site selection process, the HND was updated from a non-radial connection solution to a radial connection solution (see **Volume 7, Appendix 4-1 (application ref: 7.4.4.1)** for further information). When the HND was amended in early 2024 such that DBS West and DBS East should have radial connections, the Applicants carried out a check on the infrastructure which could be available for the Projects at the time of construction.

108. These investigations determined that, the only systems currently available in the supply chain for 2 x 1.5GW radial connections were either 2GW or 1.3GW systems. The infrastructure associated with the 2GW system has a larger footprint than the 1.3GW system, and therefore has been assessed as the worst case scenario in the ES and included in the DCO.

109. See **Plate 4-2** for a comparison between the previous non-radial connection and the final radial connection solution.

Plate 4-2 Comparison between the Previous Non-Radial Connection (left) and the Final Radial Connection Solution (Right)



a. Original cluster design *b. New cluster design*

4.11 Offshore Export Cable Corridor

4.11.1 Offshore Export Cable Corridor Design Principles and Engineering Assumptions

110. Using the following design principles, a set of potential corridors were drawn within the Offshore Export Cable Corridor AoS to connect the Array Areas to the landfall options:

- Be able to connect to viable landfall locations;
- Be as short as possible;
- Minimise number of crossings of existing offshore cables and pipelines, where crossing is required, cables and pipelines to be crossed at approximately 90°;
- Maintain required separation distances with other offshore cables and pipelines;
- Maintain sufficient space for offshore cable installation (including anchor spread of installation vessels whilst maintaining an appropriate safety buffer with existing sub-sea cables and pipelines);
- Avoid known historic wrecks as far as possible;
- Minimise sterilisation of aggerate dredging areas and other lease areas;
- Avoid direct significant impacts to sites designated for nature conservation as far as possible (SACs, SPAs, MCZs); and
- Avoid direct significant impacts to ecologically important sandbanks and potential reefs as far as possible.

111. From the design principles outlined above, 14 potential Offshore Export Cable Corridors were created (see **Volume 7, Figure 4-18 (application ref: 7.4.1**). The initial Offshore Export Cable Corridors were 2km wide, with each corridor funnelling out wider when approaching the Array Areas to allow for greater flexibility in routing. The corridors also branched out in the nearshore area to allow for connections to be made to each option of the landfall long list options (see section 4.9.2).

4.11.2 Review of the Offshore Export Cable Corridor Long List

4.11.2.1 BRAG Assessment

112. Engineering and environmental BRAG assessments were completed for the long list of 14 Offshore Export Cable Corridors. An internal project workshop was held with a multi-disciplinary team on 8th December 2021 in order to review the BRAG assessments and decide which options could be removed from the process at that stage. The environmental and engineering considerations for each of the Offshore Export Cable Corridor options were discussed and it was decided that no options should be removed from the process at this stage until further details of the Landfall options to be taken forward was decided (see section 4.9.2).

113. In addition, a further Offshore Export Cable Corridor option was identified, to route around areas identified by Forewind (developers of Dogger Bank A and B) as 'preferable to avoid' (Forewind, 2014) due to ground conditions. This option was included for all relevant landfall options (CB Routes 15 – 21), therefore increasing the number of Offshore Export Cable Corridors from 14 to 21.

114. 21 Offshore Export Cable Corridors were recognised as part of the site selection process at this juncture, with the majority of these being spurred off three main corridor trunks (see **Volume 7, Figure 4-19 (application ref: 7.4.1)**.

4.11.2.2 Long List Refinement

115. Following a review of the long list of landfall options in December 2021 (see section 4.9.2), any Offshore Export Cable Corridors connecting solely to landfall options excluded from the process were also removed from further consideration. The cable corridors removed at that stage were, Offshore Cable Route 10, 12 and 14.

116. Following the removal of these options, 18 Offshore Export Cable Corridors remained under consideration.

117. In January 2022 the Offshore Export Cable Corridors were further appraised. It was decided to remove options connecting to landfall options 12, 17, 23 and 24 from the process (see section 4.9.2 for further information). The reasons for the removal of these options from the site selection process are presented in **Table 4-15** below along with relevant Offshore Export Cable Corridor options.

Table 4-15 Offshore Export Cable Corridors Removed Following Multi-Disciplinary Review of the Long List

Offshore Export Cable Corridor ID	Reason for Removal
8	This corridor connected to Landfall 12 which was in close proximity to an area of foul ground. Landfall 12 was also adjacent to a UXO disposal area, increasing the likelihood of ordnance on and offshore. This corridor also involved crossing of and the installation of pipeline crossings in both the Holderness Inshore and Offshore MCZs. This would add an additional consenting risk, with the potential need for implementing 'measures of equivalent environmental benefit' if the impacts on the MCZ were deemed to hinder the achievement of the conservation objectives of the MCZs. If this was the case, the Projects would need to demonstrate there was no other way to proceed in another manner, or at another location, which could be difficult based on the alternative landfall locations available.
9	This corridor connected to Landfall 17 which was in close proximity to an area of foul ground. This corridor also involved crossing of and the installation of pipeline crossings in both the Holderness Inshore and Offshore MCZs. Rationale as per Corridor 8 above.
11	This corridor connected to Landfall 23 and was less favourable as it was longer in length than those retained in the process and required greater numbers of infrastructure crossings. Two of these crossings would potentially lie in close proximity, or within, the Holderness Inshore and Offshore MCZs. Rationale as per Corridor 8 above.
13	This corridor connected to Landfall 24 and was less favourable as it was longer in length than those retained in the process and required greater numbers of infrastructure crossings. Two of these would potentially lie in close proximity, or within, the Holderness Inshore and Offshore MCZs. Rationale as per Corridor 8 above.

118. Following the removal of these routes, 14 Offshore Export Cable Corridors remained under consideration. All of the remaining options were connected to one main corridor trunk.

4.11.3 Defining the Offshore Export Cable Corridor Short List

119. Further reviews of the remaining Offshore Export Cable Corridors indicated the potential to re-incorporate branching routes from the Array Areas to connect the remaining Offshore Export Cable Corridors. As a result, a new 'fan' area was developed to allow additional options to be explored. In addition to the remaining nearshore routes **(see Volume 7, Figure 4-20 (application ref: 7.4.1)**.

4.11.3.1 Offshore Export Cable Corridor – Fan Options

120. The Offshore Export Cable Corridor fan was broadly split into options routing to the north and/or west, and options routing to the south and /or east. The options to the north and/or west were included as there was greater confidence on the available information. However, they were longer and had potentially greater transits through, and more infrastructure crossings within, the Dogger Bank SAC. The options to the south and /or east were either shorter or had fewer crossings within/shorter transits through the Dogger Bank SAC, but there was less confidence in the ground conditions on the basis of available information. The corridor options within the fan were labelled:

- Fan Option A;
- Fan Option B;
- Fan Option C;
- Fan Option D; and
- Fan Option E.

121. A preliminary geophysical survey was undertaken on the options within the fan to provide additional information which would be used in deciding which option to take forward.

4.11.3.2 Offshore Export Cable Corridor – Nearshore Options

122. The routes extending from the main branch to the landfall were identical to those from the refined long list, with the exception of one additional route being added to connect into Landfall Option 18, which remained in the site selection process at this time.

123. It was acknowledged that the previous Offshore Export Cable Corridor serving Landfall Option 18 was sub-optimal compared with that serving Landfalls 1, 3, 4, 6, 8 and 9. This was primarily due to this route being longer than the routes connecting into Landfalls 1, 3, 4, 6, 8 and 9, resulting in an increased number of cable crossings. As such, the Offshore Export Cable Corridor serving these landfalls was modified, with the main benefit of the refinement removing the need for cable crossings within the Holderness Offshore MCZ. As a result of the modification of this cable route, the nearshore Offshore Export Cable Corridors were labelled as follows.

- Nearshore Creyke Beck Offshore Cable Corridor 1 (previously referred to as Creyke Beck Offshore Cable Route 1);
- Nearshore Creyke Beck Offshore Cable Corridor 2 (previously referred to as Creyke Beck Offshore Cable Route 2);
- Nearshore Creyke Beck Offshore Cable Corridor 3 (previously referred to as Creyke Beck Offshore Cable Route 3);
- Nearshore Creyke Beck Offshore Cable Corridor 4 (previously referred to as Creyke Beck Offshore Cable Route 4);
- Nearshore Creyke Beck Offshore Cable Corridor 5 (previously referred to as Creyke Beck Offshore Cable Route 5);
- Nearshore Creyke Beck Offshore Cable Corridor 6 (previously referred to as Creyke Beck Offshore Cable Route 6);
- Nearshore Creyke Beck Offshore Cable Corridor 7 (previously referred to as Creyke Beck Offshore Cable Route 7); and
- Nearshore Creyke Beck Offshore Cable Corridor 22 (added to provide an option to connect to Landfall 18).

124. The Offshore Export Corridor Fan Options detailed in section 4.11.3.1, and the Nearshore Offshore Export Cable Corridor detailed in 4.11.3.2 were all taken forward as part of the short list. The short list is also presented in **Volume 7, Figure 4-20 (application ref: 7.4.1)**.

4.11.4 Review of the Offshore Export Cable Corridor Short List

4.11.4.1 Landfall Refinement

125. Due to the iterative nature of the site selection process when options were removed from the landfall short list (section 4.9.3) a number of Offshore Export Cable Corridors were also removed as outline in **Table 4-16**.

Table 4-16 Offshore Export Cable Corridors Removed Following Landfall Option Refinement

Landfall Removed	Offshore Export Cable Corridor Removed
Landfall 3	3
Landfall 4	4
Landfall 6	6
Landfall 18	22

4.11.4.2 Technical Consultation on Offshore Export Cable Corridors

126. The remaining Offshore Export Cable Corridor options (shown in **Figure 4-20**) were presented to the ETG in May 2022 (see **Volume 5, Consultation Report (application ref: 5.1)** for further details regarding this consultation). **Table 4-17** outlines the comments received from stakeholders regarding the Offshore Export Cable Corridors, which are similar to those received on the landfall short list.

Table 4-17 ETG Comments on Offshore Export Cable Corridors

Organisation	Comment
Natural England	Significant concerns over potential offshore impacts to Smithic Bank (Offshore Cable Routes 1 and 2) and indicated a preference to cross Holderness Inshore MCZ instead (Offshore Cable Routes 5 and 7).
North Eastern Inshore Fisheries and Conservation Authority	Further investigation needed into potential impacts on the Flamborough Head reef if Landfall Option 1 (and therefore Offshore Cable Route 1) is taken forward.
Yorkshire Wildlife Trust	Further investigation needed into potential impacts on the Flamborough Head reef if Landfall Option 1 (and therefore Offshore Cable Route 1) is taken forward.

Organisation	Comment
East Riding of Yorkshire Council, MMO, Historic England, RSPB, York Consortium of Drainage Boards, National Highways, Environment Agency, The Wildlife Trusts	No comments received.

127. Following the ETG meetings and the advice from Natural England that Smithic Bank should be avoided Offshore Export Cable Corridors 1 and 2 were not taken forward.

4.11.4.3 Refinement of the Fan Options

128. Survey results from initial reconnaissance surveys undertaken in 2022 were reviewed by the engineering team. It was decided to drop the southernmost option within the fan due to the widespread presence of large high amplitude bedforms (sandbanks), the addition of the extra pipeline crossing and the length of the route. This combination of factors made this option the least economically, environmentally and technically attractive. Therefore, the following Offshore Export Cable Corridor options within the fan were removed from the process:

- Creyke Beck Fan Option C;
- Creyke Beck Fan Option D; and
- Creyke Beck Fan Option E.

4.11.5 Offshore Export Cable Corridor Options Presented at PEIR

129. Following the removal of options from the short list, the width of the remaining Offshore Export Cable Corridors was refined from 2km to an optimized 1km wide corridor within the existing 2km, in recognition that a 1km wide corridor would be sufficient for the installation of the Projects' required infrastructure. The optimization process involved avoidance of known wrecks and built infrastructure as far as possible, maintaining achievable bend radii, and ensuring cable and pipeline crossings could be made at as close to 90 degrees as possible. A 500m wide buffer was included on either side of the 1km corridor to allow for construction activities such as anchor placement. The design assumptions outlined in section 4.11.1 were applied alongside identifying optimised crossings of infrastructure and providing space for the corridor splays around the landfall.

130. Within these options an area was identified for a reactive compensation platform (RCP)[4], which under the previous HVAC design scenario would have been required to limit electrical losses for the Projects. This identified area was also an option for the location of the potential electrical switching gear platform (ESP)[5], however the ESP itself was not a determining factor in the final area of search decided.

131. To identify the area of search for the RCP / ESP, the distance between the Array Areas and the onshore connection point was considered to position the RCP / ESP approximately half way between the two to minimise loses in the electrical transmission. The area of search is shown on **Figure 4-21**.

132. Landscape and Visual impacts from the coastline were also considered in determining the potential locations for the platforms. It was determined that the location should avoid any significant effects on the onshore receptors. The potential location is over 52km from the landfall and 37km from the closest land at Flamborough Head.

[4] The RCP was removed from the Projects design envelope following the removal of HVAC technology in 2023.
[5] An ESP was required as part of the original HND. A radial connection has now been confirmed by the HND. However, to allow for further evolution of the HND, the ESP is included for assessment in this application.

133. Vessel densities in the potential area were also reviewed to ensure the proposed area was avoiding areas of higher vessel densities. This ensured the potential area was within areas that were identified as low or medium-low risk for any vessels within the area.

134. **Volume 7, Figure 4-21 (application ref: 7.4.1)** shows the remaining Offshore Export Cable Corridors which formed the preferred options taken forward to PEIR.

4.11.6 Preferred Offshore Export Cable Corridor for ES

135. Following the removal of HVAC technology from the Projects design envelope, the RCP (as detailed in section 4.11.5) was also removed from the design envelope. As such, the area of search along the Offshore Export Cable Corridor became exclusively for the potential positioning of the ESP, and was thereafter referred to as the Export Cable Platform Search Area. At the time of application there has been no confirmation from NGESO as to whether an ESP is required. Previous communication with NGESO had required the Projects to be "mesh ready", which the Applicants understood to mean the provision of an ESP in either DBS East or DBS West Array Area or the Offshore Export Cable Corridor to allow connections to other infrastructure in the HND. The latest HND statements from NGESO and Ofgem (see **Volume 7, Appendix 4-1 (application ref: 7.4.4.1)** for further information) do not explicitly include the need for an ESP. The Applicants' will have further discussions with NGESO during the Examination process to ascertain if the ESP can now be removed from the application.

4.11.6.1 Preferred Offshore Export Cable Corridor for DBS West

136. Further review of the remaining Offshore Export Cable Corridor options was undertaken following stakeholder responses to the PEIR submission, in addition to further consideration of the site-specific data collected to date. The routes under consideration were labelled as Route Option A, Route Option A1 and Route Option B (see **Volume 7, Figure 4-21 (application ref: 7.4.1)**). Route Option A1 was added to allow for additional flexibility between Routes A and B.

137. Each route option was compared against the others in relation to a range of potential constraints. Such constraints included:

- Cable length;
- Environmental considerations (i.e. proximity to designated sites, spawning/nursery grounds etc.);
- Potential for encountering shallow sub-cropping till or outcropping till;
- Potential for encountering shallow bedrock;

- Numbers of identified seafloor targets (i.e. boulders and other obstructions);
- Variable sediment conditions and geotechnical properties;
- Seafloor gradients;
- Potential for encountering mobile sediments;
- Burial potential (i.e. percentage of route allowing for sufficient cable burial);
- Potential UXO risk/magnetic target presence;
- Presence of buried channels;
- Presence of rippled scour depressions;
- Number of cable crossings;
- Potential to encounter wrecks/archaeological exclusion zones (AEZs); and
- Site investigation data coverage.

138. Following this review, it was decided that Route Option B (see **Volume 7, Figure 4-21 (application ref: 7.4.1)**) was the preferred route for DBS West. This was due to several factors, primarily:

- Cable burial is likely across a large percentage of the route, and the route being approximately 21km and 18km shorter than Route Option A and Route Option A1 respectively;
- It featured no discernible difference in the length of the route through the Dogger Bank SAC; and
- The shorter route length also reduced the area in which fishing activities would be affected during construction.

139. The remaining constraints examined were similar across each Route Option, or where present within Route B, could be mitigated such as not to warrant de-selection of the option.

4.11.6.2 Offshore Export Cable Corridor – DBS East

140. As with DBS West, the remaining route options for DBS East were reviewed following stakeholder responses to the PEIR submission and further consideration of the site-specific data collected to date. The routes under consideration were labelled as Route Option A2 (plus A), Route Option A2 (plus B), Route Option A2 (plus A1), Route Option C and Route Option C (Plus A1)[6] (see **Volume 7, Figure 4-21 (application ref: 7.4.1)**). Route Option A2 routes along the southern edge of the DBS East and DBS West Array Areas and was added to provide additional flexibility in route options to DBS East.

141. Each route option was compared against the others in relation to the range of potential constraints detailed in section 4.11.6.1 above.

142. Following this review, it was decided that Route Option C (see **Volume 7, Figure 4-21 (application ref: 7.4.1)**) was the preferred route for DBS East. This was due to several factors, primarily:

- Cable burial is likely across a large percentage of the route. In addition, the route is the shortest of the five remaining routes (being between approximately 5km to 15km shorter depending on route) and provides greater sand cover across the route, allowing for lesser geotechnical variability for cable burial.
- The shorter route length reduces the length of cabling required within the Dogger Bank SAC, thus reducing the number of potential cable crossings and reducing trenching distances within the SAC.
- The shorter route length also reduces the area in which fishing activities would be affected during construction.

4.11.6.3 Stakeholder Engagement

143. A summary report detailing the site selection decision making for the Projects Landfall and Offshore Export Cable Corridor options was issued to relevant stakeholders in September 2023. This report detailed the Offshore Export Cable Corridor options to be assessed for ES, and provided an opportunity for stakeholders to provide feedback on these options prior to their finalisation. **Table 4-18** outlines the comments on the proposed options received back from stakeholders.

[6] Where a route is defined as Route Option X (plus X), this indicates the Route Option diverges from its defined corridor to connect into a separate route.

Table 4-18 Stakeholder Comments on the Proposed Offshore Export Cable Corridors to be Assessed for ES

Organisation	Comment
MMO	The MMO agreed with the approach taken by the Applicants to identify and assess the potential impacts associated with the proposed Offshore Export Cable Corridor. The MMO agreed with Route Option B and Route Option C being the preferred Offshore Export Cable Corridors.
Natural England	Natural England are satisfied that the above will be taken forward for further assessment at the ES stage. We welcome that the final export cable corridor options and / or landfall option will avoid routing through Smithic Bank sandbank and Holderness Inshore Marine Conservation Zone (MCZ).
Environment Agency, Historic England, RSPB, Wildlife Trusts, East Riding of Yorkshire Council, Yorkshire Wildlife Trusts, Lincolnshire Wildlife Trust	No comments received.

144. Following the above responses received from stakeholders, no further changes to the Offshore Export Cable Corridors were made. **Volume 7, Figure 4-22 (application ref: 7.4.1)** shows the Offshore Export Cable Corridors assessed for ES.

4.12 Onshore Export Cable Corridor

4.12.1 Onshore Export Cable Corridor Design Principles and Engineering Assumptions

145. Using the following design principles, a set of Onshore Export Cable Corridors were drawn to connect the Landfall options to the refined Onshore Substation AoS (see section 4.10.1):

- Routing should be kept as straight and as short as practicable – avoiding tight bends;
- Avoid residential titles (including whole gardens) where possible;
- Avoid areas identified in local plans for housing development where possible;
- Avoid direct significant impacts to internationally and nationally designated areas (e.g. SACs, SPAs, and SSSIs, etc.) where possible;
- Avoid direct significant impacts to mature woodland and historic woodland;
- Minimise the number and length of trenchless crossings;
- Minimise the number of crossings of assets (e.g. utilities);
- Minimise the number of road and rail crossings;
- Minimise the number of hedgerow crossings; and
- Minimise the number of watercourse crossings.

146. Initially, 1km wide Onshore Export Cable Corridors were drawn to allow flexibility to refine the options at a later stage to avoid potential engineering and environmental constraints.

147. This process identified nine broad onshore export cable route options with variations to link each landfall option to the refined substation AoS. The initial landfall review discounted a number of landfall options due to several factors (see section 4.9.2 for further information). As such, the longlist of Onshore Export Cable Corridors did not include routes to those Landfall options already discounted in the site selection process. There were 54 individual Onshore Export Cable Corridor options taken forward as part of the long list, as presented in **Volume 7, Figure 4-23 (application ref: 7.4.1).**

4.12.2 Review of the Onshore Export Cable Corridor Long List

4.12.2.1 BRAG Assessments

148. Engineering and environmental BRAG assessments were completed for the long list of 54 Onshore Export Cable Corridors. The assessments were reviewed by the multi-disciplinary team, with an internal project workshop being held on 12th January 2022 in order to review the BRAG assessments and decide on which options could be removed at this stage.

149. At this stage, Onshore Export Cable Corridors which passed through the ponds immediately west of Brandesburton were removed from the process. The ponds are likely to be representative of former sand and gravel quarries which following excavation were abandoned and left to flood. The engineering team assessed crossing these ponds to be unviable. This was due to the following reasons:

- Uncertainty in depth of former sand and gravel quarries and therefore required trenchless crossing depth;
- Nature of any backfill of former sand and gravel quarries which would affect trenchless crossing suitability and depth requirements;
- Risk of break out of drilling fluids into the pond due to decreased overburden pressures; and
- Risk associated with collapse of the trenchless crossing bore from drilling through unconsolidated granular deposits.

150. On a number of Onshore Export Cable Corridor options, no alternative route allowing avoidance of crossing beneath the former gravel pits was able to be identified within the immediate vicinity of the routes and therefore the route options through these constraints were removed from the review list.

151. Due to the removal of a number of Onshore Export Cable Corridors, no route options remained from Landfall 8 and 9 to the western side of the Creyke Beck 1 onshore substation search area. In order to maintain optionality, it was decided to include an additional Onshore Export Cable Corridor (CB8-CB9-S1-08 and CB8-CB9-S1-09) to allow a routeing option from Landfalls 8 and 9 north and west of Beverley to the substation AoS.

152. Therefore, based on the review of the long list there were 42 remaining Onshore Export Cable Corridors in the site selection process. The Onshore Export Cable Corridors which were removed or added to the process at this stage are shown on **Volume 7, Figure 4-24 (application ref: 7.4.1)**.

4.12.2.2 Landfall Refinement

153. Due to the iterative nature of the site selection process when options were removed from the landfall short list (section 4.9.2) a number of Onshore Export Cable Corridors were also removed from the site selection process. The remaining corridors are shown in **Volume 7, Figure 4-25 (application ref: 7.4.1)**.

154. In order to maintain flexibility for routing from Landfall 18 to route around the north of Beverley, new Onshore Export Cable Corridors were also added at this stage. These additional options are presented in **Volume 7, Figure 4-26 (application ref: 7.4.1)**:

4.12.3 Review of the Onshore Export Cable Corridor Short List

4.12.3.1 Initial Review

155. An internal project workshop was held on 9th March 2022 in order to review the results of additional site selection studies that had taken place since the long-list review stage, and confirm the short list of options to be taken forward. During this meeting, it was decided that further Onshore Export Cable Corridor options should be removed for the following reasons:

- Wansford Pinch Point – At Wansford the crossing of the River Hull, Driffield Canal and Main Drain is impacted by the shallow chalk aquifer with artesian groundwater expected at this location (i.e. the groundwater is under pressure and trenchless crossing would risk flooding the local area). A detailed intrusive and geophysical investigation would be required to confirm feasibility. If feasible, it is also likely that 24-hour work would be required close to residential properties. It was deemed this crossing would be too complex and therefore all routes associated with this pinch point were dropped.
- The southern option for crossing the A1147 was dropped after confirmation that the Ineos ethylene pipeline and a NGT High Pressure Gas Main Run through the only feasible gap for crossing the road.

156. The routes removed at this stage and those that remained are detailed in **Volume 7, Figure 4-27 (application ref: 7.4.1).**

4.12.3.2 Further Refinement of the Short List

157. Following the project workshop on the 9th March 2022, the remaining Onshore Export Cable Corridors were refined down from 1km to 500m width, as shown in **Volume 7, Figure 4-28 (application ref: 7.4.1)**. The design assumptions outlined in section 4.12.1 were applied alongside identifying engineering preferences for complex crossings and considering newly acquired utilities data and preliminary land information.

158. Further environmental and engineering BRAG assessments where then undertaken on the Onshore Export Cable Corridors, with the outcomes of these assessments being discussed in an internal project workshop on the 6th April 2022. These assessments were conducted in the context of the remaining landfall and onshore substation options, alongside further investigation and discussions around existing and proposed infrastructure within the vicinity of the potential corridors (such as the Hornsea Project Four offshore wind farm). As a result of this review, further Onshore Export Cable Corridors were removed for the following reasons (as shown in **Volume 7, Figure 4-28 (application ref: 7.4.1)**:

- The options were less favourable from an engineering perspective as they would require acute bends and a crossing of the NGT High-Pressure Gas Main. Dropping such options also avoided the need for construction to travel through the village of Lisset;
- These options were removed due to engineering constraints at Greengrass Caravan Park where there is limited space between the ponds, unknown infrastructure associated with an existing pumping station and poor ground conditions. From an environmental perspective, there was an ecology risk as these options also required a crossing of the Level Canal SSSI and from a traffic perspective these options required a higher number of roads to be widened and a number of sensitive communities would be impacted by traffic movements; and
- Corresponding landfalls were removed from the site selection process.

159. **Volume 7, Figure 4-29 (application ref: 7.4.1)** details the final shortlisted Onshore Export Cable Corridors.

4.12.4 Onshore Export Cable Corridor Options Presented at PEIR

160. Following the decision in the internal workshop on 25th May 2022 to take Creyke Beck Landfall 8 and 9 forward as the preferred option for landfall (see section 4.9.4), the remaining Onshore Export Cable Corridor associated with Creyke Beck Landfall 1 was removed from the site selection process.

161. At this stage a single preferred corridor between Landfalls 8 and 9 and the town of Routh was identified. From Routh, the Onshore Export Cable Corridor split into five possible routes around the town of Beverley. These options were labelled 1 to 5 (**Volume 7, Figure 4-30 (application ref: 7.4.1)**) and presented to the ETG for comment in two workshops held on 4th May 2022 and 23rd May 2022.

162. **Table 4-19** outlines the comments received from stakeholders regarding the Onshore Export Cable Corridors.

Table 4-19 ETG Comments on Onshore Export Cable Corridors

Organisation	Comment
East Riding of Yorkshire Council	Construction on Figham Common could be limited to summer months only as land gets particularity wet in the winter. Any crossing of Figham Common would require consultation with Beverly Pasture Masters.
Environment Agency	Construction on Figham Common could be limited to summer months only as land gets particularity wet in the winter. A preference for all main rivers, in particularly River Hull and Barmston Drain should be crossed using trenchless techniques.
Historic England, Environment Agency, MMO, IFCA, RSPB, Yorkshire Wildlife Trust, York Consortium of Drainage Boards, Natural England, The Wildlife Trusts, Humber Archaeology Partnership	No comments received.

163. Following the stakeholder engagement with the ETG and the selection of the Onshore Substation options to be presented at PEIR (section 4.10.4) the Onshore Export Cable Corridor for PEIR was selected. **Table 4-20** outlines this decision making.

Table 4-20 Onshore Export Cable Corridor Options

Onshore Export Cable Corridor	Status	Reason
Option 1	Removed	This option was assessed as least favourable due to poor ground conditions, the crossing of a residential title, increased flood risk in comparison to other options and difficult access and therefore was removed from the process.
Option 2	Removed	This option was not taken forward as it would require a crossing of Figham Common which is common land and therefore the Projects may require Special Parliamentary Procedures to undertake the work.
Option 3	Option taken forward to PEIR	This option could accommodate a connection to both Substation Zone 1 and Substation Zone 4 and was therefore taken forward as the preferred option.
Option 4	Removed	This option was removed as the available gap between the Hornsea Project Four DCO application boundary and the houses on Beverley Road was not sufficient to accommodate both DBS East and DBS West.
Option 5	Removed	This option was removed due to having a high potential to impact on buried archaeology, having significant engineering constraints compared to the remaining Onshore Substation Zone options, and following the removal of Substation Zone 5 this was the longest and therefore least favourable option from an environmental and social perspective.

164. In addition, the Onshore Export Cable Corridor options were refined from 500m to 200m using the design principals outlined in section 4.12.1. These refined routes included wider areas of search along the corridors within which TCCs could be located. **Volume 7, Figure 4-31 (application ref: 7.4.1)** presents the Onshore Export Cable Corridor options considered in the PEIR

4.12.5 Preferred Onshore Export Cable Corridor at ES

165. Following the conclusion of the Section 42 consultation process and the Applicants decision to remove HVAC technology from the Projects design envelope, the Onshore Export Cable Corridor was refined to a width of 75m for the DCO application, increasing to a width of 90m for trenchless crossing zones, such as Main Rivers and A roads. This refinement process was informed by consultation feedback, as well as landowner engagement, technical studies and ongoing environmental survey and assessment work. The removal of HVAC resulted in a reduction in the number of cables required, therefore the width of the Onshore Export Cable Corridor could be reduced.

166. Continued engineering feasibility work was undertaken to identify the preferred Onshore Export Cable Corridor within the Onshore Development Area presented at PEIR (with three notable exceptions, see section 4.12.5.1, 4.12.5.2 and 4.12.5.3). This took into consideration factors such as cable tolerances, land accessibility, transport routes, crossing requirements and newly acquired data from the ongoing surveys including ecological data sets, heritage walkover survey, archaeology geophysical survey and traffic count data. In addition, individual landowner requests were reviewed and accommodated where practicable.

167. Multidisciplinary workshops were then held bringing together engineering, land and environmental specialists. These workshops included targeted discussions and an iterative decision-making process on the cable routeing and sought to mitigate by design and identify preferred options in light of all the identified constraints and feedback from stakeholders and the community.

4.12.5.1 Nunkeeling Re-route

168. Following further engagement with NGT regarding the stand-off distance required between the Onshore Export Cables and the existing NGT High Pressure Gas Main it became clear that it would not be possible to route the Onshore Export Cables safely next to the NGT High-Pressure Gas Main without significantly impacting the Deserted Medieval Village at Nunkeeling (**Volume 7, Figure 4-32 (application ref: 7.4.1)**).

169. Therefore, the following alternative options were considered:

- Trenchless crossing of the Deserted Medieval Village;
- Re-route to the west, re-joining the PEIR Onshore Development Area at Acorn Hill Farm;

- Re-route to the west, re-joining the PEIR Onshore Development Area at Catfoss; or
- Re-route to the east, re-joining the PEIR Onshore Development Area at Acorn Hill Farm.

170. The trenchless crossing option was deemed unfeasible due to the length of trenchless crossing required. The re-route to the east was discounted it was the least preferable option from an engineering point of view as it introduced two additional crossings of the High Pressure Gas Main.

171. The re-route to the west, re-joining north of Acorn Hill Farm was selected as the preferred option as it was the shortest diversion and also avoided an area of potential valuable habitat at Catfoss Road which was crossed by the alternative re-route to the west.

4.12.5.2 Riston Grange Re-Route

172. Following a desk based review and consultation with East Riding of Yorkshire Council, it was found that the Onshore Export Cable Corridor routed through an Area of Search and Preferred Area for Sand and Gravel near Riston Grange. Through this consultation the East Riding of Yorkshire Council expressed their preference for the Onshore Export Cable Corridor to be re-routed, as the area is considered an important site in context of regional sand and gravel resource given its designation as a 'Preferred Area', and their being known aspirations from the existing landowner to extend the existing adjacent quarry.

173. As such, three possible options were assessed to minimise the impacts to Riston Grange:

- A limited re-route to the south of the PEIR Onshore Development Area which still clipped a small portion of the mineral safeguarding area;
- A re-route to the south of the PEIR Onshore Development Area which avoided the mineral safeguarding area;
- A significant re-route to the south of the PEIR Onshore Development Area which avoided the Glaciofluvial sand and gravel crossed by the other proposed re-routes.

174. Following a multi-disciplinary review, the second re-route option was initially selected as the preferred option as it was the shortest available route which minimised impacts to the Area of Search / Preferred Area for Sand and Gravel, while also minimising noise and visual impacts to nearby residential receptors. This option was then further amended to minimise impacts to a holiday cottage that was located within the re-routed option. The final option (and other options considered) are presented in **Volume 7, Figure 4-33 (application ref: 7.4.1)**.

4.12.5.3 Lowland Fen

175. Extended Phase 1 Habitat surveys conducted in 2023 identified an area of Priority Habitat. This Priority Habitat was discussed in consultation with ERYC Nature Conservation Team and as a result, possible re-route options were identified and assessed to avoid direct impacts on the lowland fen:

- Option A: A re-route of haul road to south of the priority habitat crossing an area of grassland;
- Option B: A re-route of the Onshore Export Cable Corridor to south of priority habitat avoiding area of grassland; and
- Option C: A re-route taking a spur off the access to south.

176. It should be noted that for Options A and C, the original Onshore Export Cable Corridor alignment was retained, with a commitment to undertake a trenchless crossing of the Priority Habitat.

177. Additional habitat surveys were conducted in November 2023 in order to understand the wider ecological considerations associated with the potential re-routes, and were considered in the context of wider engineering, land, and environmental constraints. Option A presented the shortest option for re-routing over the neutral grassland and therefore was considered preferable.

4.12.5.4 Construction Access

178. An access strategy has been developed that seeks to reduce the impact of construction traffic upon the most sensitive communities and to minimise travelling via narrow roads. The access strategy would be facilitated by the construction of new temporary accesses and crossings that would be linked by a temporary haul road.

179. Where possible all accesses have been located to minimise impacts upon sensitive locations. To provide safe access for construction vehicles along the Onshore Export Cable Corridor, a temporary haul road would be constructed from each of the accesses reducing the requirement for vehicles to travel via the public highway. To avoid vehicle access at sensitive locations, where possible no direct access would be provided to the Onshore Export Cable Corridor and vehicles would only be permitted to cross the highway via temporary vehicle crossovers (crossings).

180. All accesses and crossings have been designed in accordance with the requirements of the Design Manual for Roads and Bridges and include appropriate visibility splays (allowing drivers to observe oncoming traffic and safely access/egress). The location and design of all accesses and crossings have also been shared and agreed with East Riding of Yorkshire Council as the local highway authority.

181. Where construction traffic would be required to travel via narrow roads, a range of potential mitigation measures have been outlined (within the OCTMP), such as road widening, providing new / additional passing places or the use of mobile traffic management (e.g. pilot/escort vehicles).

182. The emergency access route to the landfall zone was also amended at this stage of the site selection process. See section 4.9.6 for further details. Further details of the development of the access strategy are provided within **Volume 7, Appendix 4-2 (application ref: 7.4.4.2)**.

4.12.5.5 Satellite / Main Temporary Construction Compounds

183. Satellite Temporary Construction Compounds (TCCs) were identified adjacent to proposed construction accesses which have been identified at locations where the cable route intersect the public highway which has been considered suitable for HGV access. Satellite TCCs have been identified at construction accesses to provide space for material storage / welfare facilities etc for each section of the route. Additional Accesses and associated Satellite TCCs have been identified in locations where there are 'lock-outs' and access may not be available along the onshore cable corridor. One such 'lock-out' is between the River Hull and the Railway line where no construction access over either constraint is being considered and therefore the access off the A1035 to the south is required with the long off-route haul road.

184. The locations of the TCCs along the Onshore Export Cable Corridor have been selected. A preferred Satellite TCC location was selected within each area of search identified within the PEIR Onshore Development Boundary. The initial proposals for each location and final decision making reasons for selecting the preferred location for the Satellite TCCs are outlined in **Table 4-21.**

185. Three of the satellite TCCs identified in **Table 4-21** have also been identified as possible locations for 'main' Temporary Construction Compounds to support the cable duct installation and cable pulling works. The final main TCC location would be selected post-consent during the detailed design process, however it is proposed that the main TCC would be located at one of two locations or potentially both. The locations include either a main TCC off the A165 (south of Leven), off the A1035 (north west of Beverley) or off the A1079 (south west of Beverley. These locations were selected noting their relatively central locations along the Onshore Export Cable Corridor, their proximity to the main A roads and their distance from local communities.

186. Further information regarding the locations of the TCCs is detailed in **Volume 7, Appendix 5-3 (application ref: 7.5.5.3)**.

Table 4-21 Selection of Temporary Construction Compounds

Location	Initial Proposal	Final Decision
Landfall 8	Option A – Only option TCC considered for TJB. Option B – limited practical use, no direct access to cable route. Next to caravan park. Access of B-Road (Mr Moos). Or through cable corridor but interacts with cable route. Permissive path heavily trafficked. Option C – in proximity to primary school – vulnerable receptor – noise / air quality. Option D – more remote from access, but still viable. Proposed to proceed with Option D.	Option 01 D – Amended to avoid archaeological constraints. Following reduction in width of the Onshore Export Cable Corridor, Option B was re-introduced as a option due to the appropriate stand off from local receptors becoming available and the options having better access to the public highway. Decision to retain Option 01 B.

Location	Initial Proposal	Final Decision
Landfall 9	Landfall 9 dropped from site selection process, no further consideration of TCC's at this location.	No TCC at this location.
Cliff Road	Option 01 A proposed to be taken forward as the only option. The TCC has been located to minimise impacts on Skipsea Primary School, the caravan parks in the area and the permissive path running from Hornsea Road to the beach. The orientation of the TCC has been selected to minimise landscape and noise impacts on Southfield House and the surrounding tourism assets.	Option 01 A selected as final TCC location, boundary moved north due to archaeological constraints.
Dunnington Lane	Option 01 I – Affected by presence of high pressure pipeline Option 01 J – Affected by presence of high pressure pipeline Option 02 A – Road widening minimised at this location. Option 02 B – More road widening required than Option A for access. Proposal: Retain Option 02 A	Option 02 A reduced in size, selected as final TCC location.

Location	Initial Proposal	Final Decision
Catfoss Road	Option 02 C – Not preferable due to residential property to south of option. Option 02 D – Affected by presence of high pressure pipeline. Option 03 A – Potential for ground source heat pump to be installed within this option. Option 03 B1 – Affected by presence of high pressure pipeline. Option 03 B2 – Potential to move the Onshore Export Cable Corridor west in this area, which would increase area available for compound. Existing access available. Visibility splay for this access would not interfere with trees Proposal: Retain Option 03 B2	Option 03 B1 & B2 combined to allow for additional space.
Sigglesthorne	Option 03 C – to be dropped – HDD could be accommodated in order limits. Option 04 A – Would not require road widening, however, in proximity to garden centre. Option 04 B – Good access from Catwick Heads Lane. Road widening required – up to 90m. Proposal: Proceed with Option 04 B.	Option 04 A taken forward. Moved westward on refinement of cable route to increase standoff from Garden Centre.

Location	Initial Proposal	Final Decision
A165 Riston Grange	Option 05 A – Least preferable Option 05 B – Presence of 11kv overhead line within this option. Option 05 C – May not be much usable space depending on final cable route alignment Option 05 D – Presence of 11kv overhead line within this option. No initial proposal made at this stage, further investigations were required.	Option 05 D taken forward. Moved north with refinement of cable route. Least constrained and better access to highway.
East of Meaux Lane	Option TCC 06A-A. Added due to constraints on haul road continuity from main river and solar farm to east and poultry farm to west.	Option TCC 06A–A taken forward.
Routh	Option 06 A – To be determined following work on access strategy being completed. Option 06 B – Option B more preferable if upgrading existing access. Option 06 C – To be determined following work on access strategy being completed. Option 06 D – Discounted Option 06 E – Discounted No initial proposal made at this stage, further investigations were required.	Option 06 B taken forward. Size of the area increased following Onshore Export Cable Corridor refinement.

Location	Initial Proposal	Final Decision
Eske Lane	Option 07 A – Preferable option. Larger option and located further away from the nearby glasshouses. Screening provided by trees along boundary. Option 07 B – In close proximity to the nearby glasshouses. Limited space when compared to Option 07 A. Proposal: Retain Option 07 A.	Option 07 A taken forward. The TCC has been located to reduce impacts on the greenhouses located on Eske Lane and to utilise existing screening along Eske Lane to minimise landscape impacts.
River Hull	Option 08 A – KCOM and northern power grid underground cables. Option 08 B – A number of utilities present to the north of the A1035 (appears just inside field), KKOM, Northern gas networks, northern power grid underground cables, Yorkshire water No initial proposal made at this stage, further investigations were required.	Option 08 B taken forward. Better access to the A1035.
Ings Road	Options 09 A,B,C,D No initial proposal made at this stage, further investigations were required.	Options 09 A & B discounted due to planning application for football facility. Option C dropped due to planning application for recycling centre. Option D dropped as further from the access point. Option E identified following refinement of the cable route. Option 09 E taken forward.

Location	Initial Proposal	Final Decision
A1035 Constitution Hill	Proposed to retain Options 10E and 10F to reduce impacts on Burton Bushes SSSI and Beverley Racecourse while utilising access from the A1035.	Both Options 10 E & F retained. Updated size & location following refinement of the cable route.
Broadgate / Walkington Road	Option 16 A – In close proximity to residential properties. Option 16 B – Adequate size, further away from residential properties. Option 16 C – Not enough space for TCC – option rejected. Option 16 D – Not enough space for TCC – option rejected. Proposal: Retain Option 16 B	Option 16 A retained due to access to the highway. Further away from residential property in east and Beverley Westwood. West side of TCC pulled in to increase stand off from residential development.
South of A1079	Option 14 B – Only option considered in this location.	Option 14 B moved to access point at refinement of the cable corridor. Other compounds identified for the development of the Converter Stations.
Substation Zone 1	Options 17 A and B. Concern around multiple haul road crossings of gas main. If one option is to be retained preference is Option 17 A.	Options dropped when Substation Zone 1 was removed from the Site Selection Process.

Location	Initial Proposal	Final Decision
Onward connection to National Grid (South of A1079, east of A164 and Coppleflat Lane)	Option 15 A – Was proposed to drop due to proximity to Jock's Lodge works and NGT gas diversion. Proposed: Option 15 B – Was proposed to Retain, due to possibility of relocating option further along the 400Kv export cable corridor.	Option 15 C identified during refinement of the onward connection. Corridor avoids interactions with the High Pressure Gas Main, overhead lines and the Jock's Lodge Road Improvement Scheme.

4.12.5.6 Onshore cable route to the proposed Birkhill Wood National Grid Substation

187. Following the conclusion of the Section 42 consultation process, the onward cable route to the proposed Birkhill Wood National Grid substation was refined. This section of cabling would be similar in design to the onshore cabling, but must be HVAC at 400kV, and would have a maximum of four circuits for an In Isolation scenario, and eight for a Concurrent and Sequential Scenario, installed within a 53.5m and 100m cable corridor respectively.

188. The onward cable route was considered in the context of the Onshore Substation Zone decision-making, combined with engineering environmental, commercial and health and safety considerations. The three potential onward routing options design options are outlined in **Table 4-22** and is presented in **Volume 7, Figure 4-34 (application ref: 7.4.1**). Option 2a was identified as the preferred option and extends approximately 2.5km South East from the Onshore Substation Zone.

Table 4-22 Comparison of Constraints in Relation to Onward Cable Routing Options 2a, 2b and 2c

Consideration	Option 2a	Option 2b	Option 2c
Health and Safety	Option in closer proximity to Ineos ethylene pipeline compared to Option 2b and Option 2c.	Option splits the cable corridor around or to the north of the Ineos ethylene pipeline, enabling the separation to be increased	Option splits the cable corridor around or to the north of the Ineos ethylene pipeline, enabling the separation to be increased
Engineering	Option may require a potential 500m trenchless crossing (e.g. HDD) under the proposed Albanwise solar farm.	Option routed alongside the Ineos ethylene pipeline, a potentially serious risk as mitigation would potentially not be devised until the cables were operational.	Less favourable option due to higher number of complex crossings required and wide corridor divergence requiring additional access roads.
Commercial	No additional considerations over the other remaining options.	No additional considerations over the other remaining options.	Land costs would be slightly elevated compared to the other options due to the increased 400kV cable easement required.
Environmental	No significant differences from an environmental perspective when compared to Option 2b. Option would result in increased temporary LVIA impacts during	No significant differences from an environmental perspective when compared to Option 2a.	Option would result in increased temporary LVIA impacts during construction due to the onward cable corridor splitting in two with the northern section travelling around the

Consideration	Option 2a	Option 2b	Option 2c
	construction due to the onward cable corridor splitting in two near Poplar Farm.	Preferred option from an LVIA perspective due to the onward cable routing remaining within one corridor for its entire length.	north of the A1079 junction near Beverley and towards White Hall. Option 2c requires a 750m long off-route temporary Haul Road and an access from the A164. Significant amenity and road safety effects were identified within the PEIR associated with the Projects traffic travelling via the A164. More than 100 residential receptors near Victoria Road would be affected (in relation to air quality) in comparison to option 2a and 2b (with fewer than 100 receptors being affected). The infrastructure detailed in this option impacts on key known non designated heritage assets recorded within Substation Zone 4.

189. The cable corridor splits part way along the route to form a northern and southern route, each accommodating one of the Projects cabling, as shown on **Volume 7, Figure 4-34 (application ref: 7.4.1)**. This is due to the presence of the Ineos ethylene pipeline, the Hornsea Project Four permanent access route and the existing A1079, which restricts the working area available for the Projects cabling to be co-located. It should be noted that the southern route option may require a trenchless crossing to avoid impacting the proposed Albanwise solar farm. The cable route reconverges at the proposed Birkhill Wood National Grid Substation. Should an In Isolation scenario be taken forward only the northern route of the onward cable route to the proposed Birkhill Wood National Grid Substation would be utilised as the northern option avoids the Albanwise solar farm, and hence would avoid the potential requirement for a trenchless crossing.

190. **Volume 7, Figure 4-35 (application ref: 7.4.1)** details the final Onshore Export Cable Corridor assessed for ES.

4.13 Onshore Grid Connection

191. National Grid Electricity Transmission own and maintain the high voltage electricity transmission network in England and Wales. National Grid ESO is responsible for operating the electricity transmission system in Great Britain.

192. In July 2020, the UK Government launched the Offshore Transmission Network Review (OTNR) to ensure offshore wind generation is delivered in the most appropriate way, taking into consideration the environment, cost to consumers, local communities and deliverability. Since its launch, the UK Government has set out its ambition to deliver 50GW of offshore wind by 2030.

193. In order to allow the site selection process for the Projects to progress alongside the OTNR, National Grid ESO provided the Applicants with an indicative location for the new National Grid substation. This location is shown on **Volume 7, Figure 4-36 (application ref: 7.4.1)**.

194. As part of the OTNR, in July 2022 National Grid ESO published a holistic and coordinated network design (Holistic Network Design (HND)) to support delivery of 2030 offshore wind ambitions. The HND integrates connecting offshore wind farms to shore with the capability to transport electricity around Great Britain. It balances deliverability and economics, plus environmental and community impacts, and is a first and significant step towards a more centralised and strategic approach to electricity network planning (National Grid ESO, 2022).

195. The HND recommended design is broken into regional zones, and the Projects fall within the East Coast Region covering the east of England and east of Scotland. As noted in section 4.10.6.6.1, the original recommended HND for the East Coast Region was based on a non-radial connection solution, which would have transferred power through the offshore network from the Eastern ScotWind zone to the south via the offshore wind developments off the east coast of England (including both DBS East and DBS West).

196. The recommended HND identified a new National Grid substation near the existing Creyke Beck substation in the East Riding of Yorkshire as the optimum location to connect the Projects to the National Electricity Transmission System (NETS). This design solution provides the benefit of co-ordinating the development, construction, operation and connection of both Projects, while also offering potential benefits of integrated connections to Scotwind and another UK offshore wind projects. This coordinated development is critical to achieving the UK government's target to reach 50GW of installed offshore wind capacity by 2030.

197. In November 2022, National Grid ESO confirmed the Projects would connect to the NETS at this new National Grid substation near Creyke Beck. In July 2023 National Grid Electricity Transmission launched an introductory consultation to gather feedback on the proposals for the new substation near Creyke Beck.

198. The HND was then amended in early 2024 to be based on a radial connection solution (see **Volume 7, Appendix 4-1 (application ref: 7.4.4.1)** for further information), therefore requiring offshore wind farms in the region to connect into the National Grid network on an individual basis. The design of the Projects may be further refined as more information is made available by National Grid ESO through the Detailed Network Design.

199. The proposed Birkhill Wood National Grid Substation is not part of the Projects and therefore not part of the DCO application. Ownership of the proposed Birkhill Wood National Grid Substation is with National Grid. Connection to the National Grid substation itself would be completed by National Grid or their appointed contractors. Construction of the proposed Birkhill Wood National Grid Substation is expected to be completed in 2029 at the earliest.

4.14 Summary

200. The site selection process undertaken for the Projects has concluded in the application for development consent for the areas and works assessed throughout this ES. Wherever possible and practicable, the Applicants have sought to accommodate preferences and concerns raised by stakeholders through the site selection process by adjusting the design.

201. Examples of this regard to stakeholder comments are set out in the ES and Consultation Report. The site selection process and alternatives considered have been through a process of detailed analysis of environmental, social, and engineering constraints, with key feasible alternatives taken forward for consultation either through the Scoping process, the Evidence Plan Process, or through the formal consultation undertaken on the PEIR. The consultation processes undertaken are summarised in this document and provided in full detail within **Volume 5**, **Consultation Report (application ref: 5.1)**.

202. As detailed in **Volume 7, Chapter 6 EIA Methodology (application ref: 7.6)**, the Projects have employed a Rochdale Envelope. Therefore, it is recognised whilst the site selection process undertaken to date has included a number of refinements to the development areas so far as practical, there remain some areas of flexibility in the final project design.

203. Whilst the detailed design of the offshore array and onshore substation has not yet been undertaken and is dependent on a number of factors including pre-construction baseline surveys, Site Investigation data, and further engineering studies, various documents within the application require subsequent agreement with the relevant authorities and constrain how these project components could be built out in future. These include:

- **Volume 3, Draft DCO (application ref: 3.1)** and **Volume 7, Chapter 5 Project Description (application ref: 7.5)** which prescribe the maximum extents of each component;
- **Volume 7, Biodiversity Net Gain Strategy (application ref: 7.18.18.10)** which outlines the approach for the Projects seeking to achieve BNG;
- **Volume 8, Outline Landscape Management Plan (application ref: 8.11)** which provided commitments on the detailed design of key components; and
- **Volume 2, Works Plans (application ref: 2.5 / 2.6)** which detail the total area within which works associated with each component can take place.

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