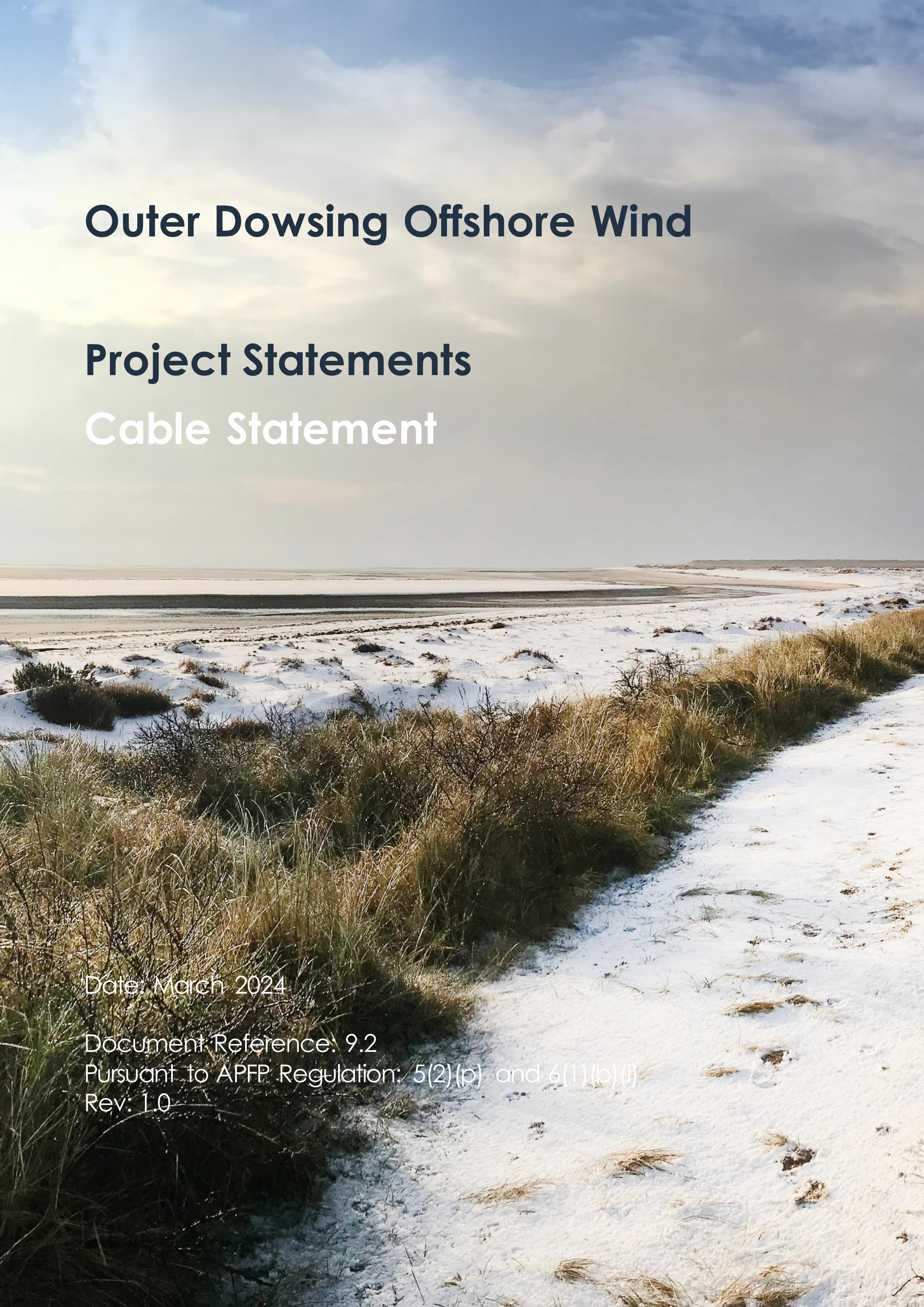

Outer Dowsing Offshore Wind

Project Statements

Cable Statement

Date: March 2024

Document Reference: 9.2
Pursuant to APFP Regulation: 5(2)(p) and 6(1)(b)(i)
Rev: 1.0

Company:	**Outer Dowsing Offshore Wind**	Asset:	**Whole Asset**
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Acronyms & Definitions

Abbreviations / Acronyms

Abbreviation / Acronym	Description
AIS	Air Insulted Switchgear
APFP	Applications: Prescribed Forms and Procedure (Regulations)
CFE	Controlled Flow Excavation
DCO	Development Consent Order
ECC	Export Cable Corridor
GIS	Gas Insulated Switchgear
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
IAC	Inter-array Cable
MFE	Mass Flow Excavation
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
NGSS	National Grid Substation
NSIP	Nationally Significant Infrastructure Project
OFTO	Offshore Transmission Owner
OnSS	Onshore Substation
OSS	Offshore Substation
TCE	The Crown Estate
TJB	Transition Joint Bay
TSHD	Trailing Suction Hopper Dredger
WTG	Wind Turbine Generator
XLPE	Cross Linked Polyethylene (Cable)

Terminology

Term	Definition
400kV cables	High-voltage cables linking the OnSS to the NGSS.
400kV cable corridor	The 400kV cable corridor is the area within which the 400kV cables connecting the onshore substation to the NGSS will be situated.
The Applicant	GT R4 Ltd. The Applicant making the application for a DCO. The Applicant is GT R4 Limited (a joint venture between Corio Generation, Tota Energies and Gulf Energy Development (GULF)), trading as Outer Dowsing Offshore Wind. The Project is being developed by Corio Generation (a wholly owned Green Investment Group portfolio company), TotalEnergies and GULF.
400kV cables	High-voltage cables linking the OnSS to the NGSS.
Array area	The area offshore within which the generating station (including wind turbine generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling will be positioned.

Term	Definition
Cable Circuit	A number of electrical conductors necessary to transmit electricity between two points bundled as one cable or taking the form of separate cables, and may include one or more auxiliary cables (normally fibre optic cables).
Cable ducts	A duct is a length of underground piping which is used to house the Cable Circuits.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the sensitivity of the receptor, in accordance with defined significance criteria.
Environmental Statement (ES)	The suite of documents that detail the processes and results of the EIA.
Export cables	High voltage cables which transmit power from the Offshore Substations (OSS) to the Onshore Substation (OnSS) via an Offshore Reactive Compensation Platform (ORCP) if required, which may include one or more auxiliary cables (normally fibre optic cables).
Haul Road	The track within the onshore ECC which the construction traffic would use to facilitate 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.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Indicative Working Width	The indicative working width within the Onshore Export Cable Corridor (ECC), required for the construction of the onshore cable route.
Inter-array cables	Cable which connects the wind turbines to each other and to the offshore substation(s) , which may include one or more auxiliary cables (normally fibre optic cables).
Interlink cables	Cable which connects the Offshore Substations (OSS) to one another, which may include one or more auxiliary cables (normally fibre optic cables).
Intertidal	The area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS)
Joint bays	An excavation formed with a buried concrete slab at sufficient depth to enable the jointing of high voltage power cables.
Landfall	The location at the land-sea interface where the offshore export cables and fibre optic cables will come ashore.
Link boxes	Underground metal chamber placed within a plastic and/or concrete pit where the metal sheaths between adjacent export cable sections are connected and earthed.
Maximum Design Scenario	The project design parameters, or a combination of project design parameters that are likely to result in the greatest potential for change in relation to each impact assessed
Mitigation	Mitigation measures are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.
National Grid Onshore Substation (NGSS)	The National Grid substation and associated enabling works to be developed by the National Grid Electricity Transmission (NGET) into which the Project's 400kV Cables would connect.
Offshore Export Cable Corridor (ECC)	The Offshore Export Cable Corridor (Offshore ECC) is the area within the Order Limits within which the export cables running from the array to landfall will be situated.

Term	Definition
Offshore Reactive Compensation Platform (ORCP)	A structure attached to the seabed by means of a foundation, with one or more decks and a helicopter platform (including bird deterrents) housing electrical reactors and switchgear for the purpose of the efficient transfer of power in the course of HVAC transmission by providing reactive compensation
Offshore Substation (OSS)	A structure attached to the seabed by means of a foundation, with one or more decks and a helicopter platform (including bird deterrents), containing— (a) electrical equipment required to switch, transform, convert electricity generated at the wind turbine generators to a higher voltage and provide reactive power compensation; and (b) housing accommodation, storage, workshop auxiliary equipment, radar and facilities for operating, maintaining and controlling the substation or wind turbine generators
Onshore Export Cable Corridor (ECC)	The Onshore Export Cable Corridor (Onshore ECC) is the area within which, the export cables running from the landfall to the onshore substation will be situated.
Onshore Infrastructure	The combined name for all onshore infrastructure associated with the Project from landfall to grid connection.
Onshore substation (OnSS)	The Project's onshore HVAC substation, containing electrical equipment, control buildings, lightning protection masts, communications masts, access, fencing and other associated equipment, structures or buildings; to enable connection to the National Grid
Outer Dowsing Offshore Wind	The Project.
The Project	Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure.
Project Design Envelope	A description of the range of possible elements that make up the Project's design options under consideration, as set out in detail in the project description. This envelope is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact engineering parameters are not yet known. This is also often referred to as the "Rochdale Envelope" approach.
Subsea	Subsea comprises everything existing or occurring below the surface of the sea.
Transition Joint Bay (TJBs)	The offshore and onshore cable circuits are jointed on the landward side of the sea defences/beach in a Transition Joint Bay (TJB). The TJB is an underground chamber constructed of reinforced concrete which provides a secure and stable environment for the cable.
Trenched technique	Trenching is a construction excavation technique that involves digging a trench in the ground for the installation, maintenance, or inspection of pipelines, conduits, or cables.
Trenchless technique	Trenchless technology is an underground construction method of installing, repairing and renewing underground pipes, ducts and cables using techniques which minimize or eliminate the need for excavation. Trenchless technologies involve methods of new pipe installation with minimum surface and environmental disruptions. These techniques may include Horizontal Directional Drilling (HDD), thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.
Wind turbine generator (WTG)	A structure comprising a tower, rotor with three blades connected at the hub, nacelle and ancillary electrical and other equipment which may include J-tube(s), transition piece, access and rest platforms, access ladders, boat access systems, corrosion protection systems, fenders and maintenance equipment, helicopter landing facilities and other associated equipment, fixed to a foundation

Reference Documentation

Document Number	Title
2.4	Location Plan Offshore
2.18	Onshore Crossing Plan
6.1.3	Chapter 3 Project Description
6.1.4	Chapter 4 Site Selection and Consideration of Alternatives
6.3.3.2	Chapter 3 Appendix 2 Onshore Crossing Schedule
6.3.3.3	Chapter 3 Appendix 3 Offshore Crossing Schedule

1 Introduction

1.1 Document purpose

1. This Cable Statement (the Statement) has been prepared by GT R4 Limited (the Applicant) pursuant to Regulation 6(1)(b)(i) of The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (the APFP Regulations), which requires details of the proposed route (see Application document reference 2.4 Location Plan Offshore) and method of installation for any cable to be provided.
2. This Statement forms part of the Development Consent Order (DCO) Application to the Secretary of State to construct and operate an offshore generating station, Outer Dowsing Offshore Wind (the Project).
3. This Statement provides a summary of the relevant information contained within the DCO Application, including the ES and references to associated documentation.

1.2 Project Overview

4. The Project will consist of up to 100 Wind Turbine Generators (WTGs), with an expected total estimate output of 1.5GW. The export capacity of the Project will exceed 100MW, therefore is classed as a Nationally Significant Infrastructure Project (NSIP) as defined under sections 14(1)(a) and 15(3) of the Planning Act 2008.
5. The Project array area lies approximately 54km east of the Lincolnshire coast at its closest point. Further information on the location and design of the Project is set out in the accompanying Environmental Statement (ES) Chapter 3 Project Description (document reference 6.1.3).

2 Offshore Transmission Network Review (OTNR) and the Pathway to 2030 Holistic Network Design (HND)

6. The Offshore Transmission Network Review (OTNR) was established by the then Secretary of State for the Department of Business, Enterprise Energy and Industrial Strategy (BEIS) (now the Department for Energy Security and Net Zero (DESNZ)) in July 2020 to look into the way that the offshore transmission network is designed and delivered, consistent with the ambition to deliver net zero emissions by 2050 and more immediately the Government's ambition to deliver 50GW of offshore wind by 2030.
7. BEIS and Ofgem requested that National Grid (NGESO) undertake a Holistic Network Design (HND) process in consultation with a Central Design Group (CDG) and working under a Terms of Reference (ToR). The HND ToR required NGESO to deliver an HND that considered the onshore and offshore network required to connect offshore wind and also required the HND to be economic and efficient, deliverable and operable, and minimise the impact on the environment and local communities.
8. At an early stage NGESO identified a study area for the East coast projects of relevance to the HND (including the Project), which encompassed grid connection options across Yorkshire, Lincolnshire, and Norfolk (discussed in Section 4.5). These were refined as the HND study progressed with the HND recommendations being published in July 2022, identifying two possible connection options for the Project in Lincolnshire: one at the 'Lincolnshire Node', and one at Weston Marsh (discussed in Section 4.7).
9. The Applicant was in discussion with NGESO throughout the development of the process and provided information to support the HND work. In parallel the Applicant progressed a number of options for grid connection and associated cable route and substation sites, aligned with the options that were developed and evaluated by the HND, in order to ensure the development could progress, as far as possible, in parallel with the HND process. This site selection and alternatives report sets out the detail of those options and their evaluation focusing on the grid connection locations that were ultimately identified by the HND.

3 Selection of the Export Cable Corridor

10. A number of fundamental principles have been applied to the site selection process for the offshore and onshore Export Cable Corridor. These are drawn from the experience of the Applicant and based on the technical expertise of consultants supporting the process and include, but are not limited to:

- A preference for the shortest route for cable routing to reduce environmental and social impacts by minimising footprint for the offshore and onshore ECCs, as well as minimising cost *(ultimately reducing the cost of energy to the consumer)* and minimising transmission losses;
- Avoidance, wherever feasible, of key sensitive features and where not feasible, seeking to mitigate any resulting impacts;
- Minimising the disruption to populated areas;
- The need to accommodate the Maximum Design Scenario (MDS) for each of the Project element; and
- The need to take on board the feedback from stakeholders and the local communities in developing the Project.

11. Subsequent to the award of Preferred Bidder status, the Applicant commenced work to determine options for the connection of the Project to the National Electricity Transmission System, through the development of offshore and onshore export cable route options, cable landfall options and grid connection options (interface points with the transmission network).
12. To a great extent the export cable routing and onshore substation siting has been predominantly driven by the Offshore Transmission Network Review (OTNR)1 which was launched by UK Government in July 2020. The OTNR evaluated grid connection options for all Round 4 projects, leading to a Holistic Network Design (HND)[2] and identification of specific grid connection options for the Applicant.
13. Offshore export cable routing for the Project has been broadly considered at a high level through a number of third-party studies; specifically, and at a conceptual level, by the Round 4 Plan-Level HRA process and as part of the HND process. The study area for the Project's offshore ECC routing has been informed by the study areas developed for offshore ECC routing by both the Round 4 Plan-Level HRA and the HND and through the ongoing discussions with NGESO over the developing grid connection options as the HND study progressed.

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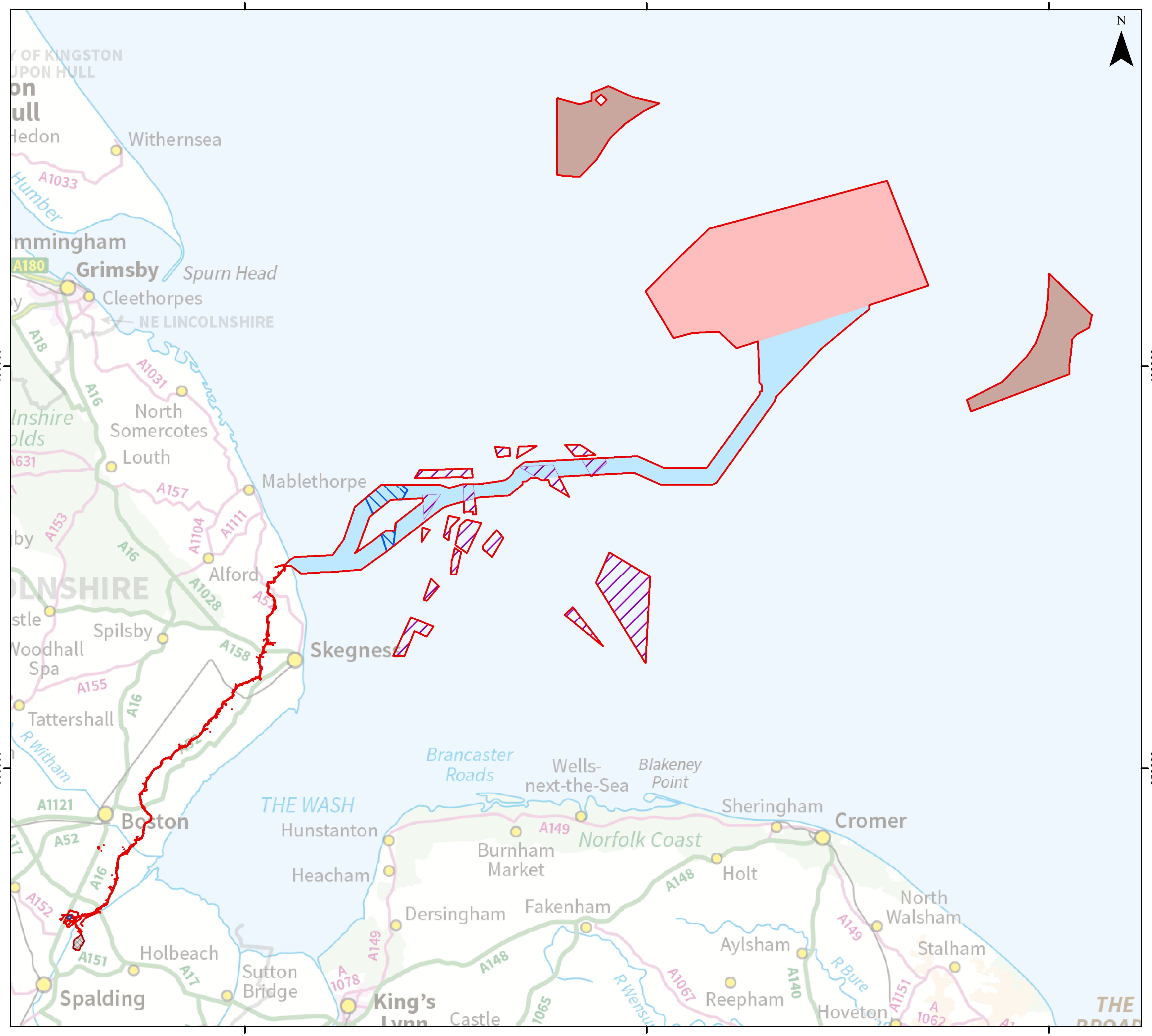
[1] OTNR Pathway to 2030 Central Design Group and Network Design Terms of Reference (May 2023).

[2] Pathway to 2030: Holistic Network Design Report (July 2022).

14. The Location of the onshore ECC and 400kV Cable Corridor is presented in ES Volume 2, Figure 3.4 (document 6.2.3.4). The onshore ECC has undergone significant site selection and refinement activities to avoid and/or minimise impacts on residential and environmental receptors as much as practicable. See ES Chapter 4 Site Selection and Consideration of Alternatives (document reference 6.1.4) for more information.
15. From the Transition Joint Bays (TJBs) at the Landfall Compound, the onshore ECC will run south (west of the A52) underground, to the Project's OnSS location at Surfleet Marsh, located on agricultural land on the north side of the River Welland, east of the A16 and south of the Risegate Eau (Drain) to the north of Spalding (document reference 2.3).
16. 400Kv cables will then run underground between the OnSS and the National Grid substation (NGSS) that will be built, owned, and operated by the National Grid Electricity Transmission (NGET) and is anticipated to be located within, or near to, an area identified by the Project as the "Connection Area".
17. The location of the ECC is shown in Figure 1.1



Legend

- Onshore and Offshore Order Limits
- Array Boundary
- Offshore Export Cable Corridor
- Offshore Reactive Compensation Platform (ORCP) Area
- Biogenic Reef Restoration Area
- Artificial Nesting Structure Area
- Onshore Substation (OnSS) Footprint
- Connection Area

Coordinate System: British National Grid

0 10 20 km

Scale: 1:450,000

A3 Page Size

Project Statements

Offshore and Onshore Order Limits

Figure 1.1

OUTER DOWSING OFFSHORE WIND

Date: 27/02/2024
Produced By: JRS
Revision: 0.2

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4 Electrical Solutions & Equipment

18. The Project has committed to utilising High Voltage Alternating Current (HVAC) technology. HVAC cabling will be used:
    - For the inter-array cables and between the WTGs and the offshore Substations (OSSs);
    - For the interlink cables between the OSSs;
    - Between the OSSs and Offshore Reactive Compensation Platforms (ORCPs);
    - Between the ORCPs and the Transition Joint Bays (TJBs);
    - Between the Transition Joint Bays (TJBs) and the onshore project substation (OnSS); and
    - For the 400kV cabling between the OnSS and National Grid Substation (NGSS).

4.1.1 Offshore Electrical Solutions

4.1.1.1 Inter-array

19. Inter-Array cables (IAC) will link the WTGs to the OSSs. A small number of WTGs will typically be grouped together on the same cable string, branch or loop connecting to the OSSs, and multiple array cables will connect each string back to each OSS.
20. The IAC will consist of several conductor cores, usually made from copper or aluminium surrounded by layers of insulating material, as well as material to armour the cable for protection from external damage. The cables may also include one or more auxiliary cables (e.g. fibre optic) as part of their construction. The maximum design parameters for the array cables are presented in Table 4-1.

Table 4-1 Indicative key maximum design parameters for the array cables

Parameter	Design Envelope
Indicative external cable diameter (mm)	260
Total length of cable (km)	377.42
Voltage (kV)	66 or 132

4.1.1.2 Offshore Export Cables

21. Offshore and onshore export cables are used for the transfer of power from the offshore substations to the landfall point via the ORCPs and then to the project OnSS. The cables may also include one or more auxiliary cables (e.g. fibre optic) as part of their construction.

22. The maximum design parameters for offshore export cables are presented in Table 4-2. The average width of the offshore ECC is 2 km though this varies in a few locations along the offshore ECC, notably at landfall, close to existing infrastructure and where the offshore ECC widens out to meet the array.

23. The Project requires flexibility in type, location, depth of burial and protection measures for export cables within the ECC to ensure that anticipated physical and technical constraints and changes in available technology and project economics can be accommodated within the design.

Table 4-2 Indicative key maximum design parameters for the export cables

Parameter	Design Envelope
Maximum number of circuits	4
Maximum cable voltage (kV)	275kV
Indicative external cable diameter (mm)	390
Maximum offshore cable length per export cable (km)	110

4.1.1.3 Offshore Interlink Cables

24. The Project may require cables to interconnect between the OSSs to provide redundancy in the case of cable or grid transformer failure elsewhere, or to connect to the offshore accommodation platform to provide power for operation. The cables will have a similar design and installation process to the array and/or export cables. The parameters for design and installation of the offshore interlink cables are presented in Table 4-3.

Table 4-3 Indicative maximum design parameters for offshore interlink cables

Parameter	Design Envelope
Number of circuits/cables	6
Indicative external cable diameter (mm)	390
Voltage (kV)	66, 132, 220 or 275
Total length of cables/circuits (km)	123.75

4.1.2 Onshore Electrical Solutions

25. Whilst the width of the cable corridor may fluctuate along the route to account for specific environmental and engineering constraints, the Project is expected to require a typical working width of 80m during cable construction within which a typical 60m wide permanent corridor will be located. Further detail on the site selection of the onshore ECC and OnSS taken forward for DCO Application and assessment within the ES has been included in Volume 1, Chapter 4 Site Selection and Assessment of Alternatives (document reference 6.1.4).

26. Where trenchless crossing techniques are proposed, this working width may need to be larger to accommodate this type of crossing. The maximum extent of the temporary footprint would be up to 220m, at the River Haven Crossing (document reference 2.18 and 6.3.3.2). The length of the ECC from the landfall to the Surfleet OnSS is approximately 70km.

4.1.3 Project Onshore Substation

27. A single project OnSS containing the electrical components for transforming and converting the power exported through the onshore cables to 400kV and to adjust the power quality and power factor, as required to meet the NGESO Grid Code for supply to the NGSS, including 400kV cables between the OnSS and the NGSS.

28. The function of the OnSS is to:

- Collect the power generated by the turbines via the export cables.
- House equipment such as transformers, switchgear units, electrical filters etc. to enable the power from the project infrastructure to be exported to the National Grid electricity network.

29. The location of the OnSS has been selected based on environmental and technical considerations as well as taking consideration of interfaces with the NGSS. For details of the site selection of the OnSS location and consideration of alternatives see ES Chapter 4 (document reference 6.1.4).

The Project have retained the option for two types of technology for the OnSS; Air Insulted Switchgear (AIS) and Gas Insulated Switchgear (GIS). The selection of substation technology will be made during the detailed design phase.

5 Offshore Cable Installation Methods

30. Offshore cables will be installed using the techniques set out below in addition to the main cable lay process. Cable installation is designed to install the cables and protect them from damage that may occur due to fishing, shipping or physical processes that naturally occur on the seabed. The cables will be loaded onto specialist cable lay vessels and then installed on the seabed using these vessels, then buried where possible with associated specialist equipment using the techniques described below.
31. The following installation (burial) methodologies are considered appropriate for the export, array and interlink cables:

- Jet-trenching – High powered jets use water to liquify the seabed sediments allowing the cable to be lowered a certain depth. The jet tool is usually pulled via a vessel but can also be operated on a tracked machine working on the seabed.
- Pre-cut and post-lay ploughing or simultaneous lay and plough – A Plough is used to create a trench on the seabed in which the cable is laid. The trench is then filled with the previously ploughed seabed sediments to cover and protect the cables.
- Mechanical trenching (such as chain cutting) – A special wheel or chain type mechanism is used to create a trench for the cable to be laid. These may be used for harder/high-strength seabed soils not suitable for ploughs.
- Dredging (typically Trailer Suction Hopper Dredger (TSHD) and backhoe dredging or water injection dredging). Dredging involves the removal of material from one location and deposited or stored for backfilling purposes.
- Mass flow excavation (MFE)/Controlled flow excavation (CFE) – A specialised excavator tool is used to create a trench. If used it is typically at specific locations along the cable route where other techniques are not suitable.
- Rock cutting. Rock cutting utilises large cutting wheels or equipment to cut through very hard rock, typically a circular saw blade;
- Burial sledge – Similar installation method to jet trenching however the tool is a different design.
- Jet sledding - Hybrid of jet trencher and cable plough.
- Vertical injector burial – Elongated water jet type tool that is used to install the cable under the seabed at greater depths compared to most other options.

5.1.1 Cable Crossings

32. Within the Project offshore ECC and Array area there are several oil and gas pipelines that connect to production wells in the North Sea, which the array, interlink and/or export cables may have to cross. The design and methodology of these crossings will be confirmed in agreement with the relevant asset owners. An example of a type of crossing is that a berm of rock will be placed over the existing asset for protection, known as a pre-lay berm, or separation layer. The Project cable will then be laid across this, at an angle close to 90 degrees. The Project cable will then be covered by a second post lay berm to ensure that the export cable remains protected and in place (document reference 6.3.3.4).

5.1.2 Cable protection

33. While cable burial to a sufficient depth is the preferred method of installation and protection, cable protection may be installed under certain circumstances where the target burial depth has not been achieved. This could be required at areas such as the landfall exit pit, local to WTG/OSS entry points, cable crossings and other areas if sufficient burial hasn't been achieved or deemed impossible.

6 Landfall Cable Installation Method

34. The offshore cables will be brought ashore at the landfall site located at Wolla Bank, south of Anderby Creek, north of the Wolla Bank Beach car park. The trenchless technique that will be adopted at the landfall is a Horizontal Directional Drilling (HDD) which is a proven technique. This method has been selected to avoid impacts on the coastal features and habitat in the area, as well as the existing infrastructure, sea defence and ornithological and ecological receptors.
35. Landfall works would use Transition Joint Bays (TJBs), where the offshore export cables join the onshore export cables at the Wolla Bank landfall location. Horizontal directional drilling (HDD) would be used from the landfall area, east of Wolla Bank to a punch out point in the subtidal zone. Export cables from the Project would be brought through the HDD to the transition joint bays (TJBs), through ducts that would be installed to pull through and accommodate the cables.
36. During the project's landfall works, a landfall compound will be required to accommodate the drill rig, TJBs, cable storage, installation activities and welfare facilities. The location will be within the landfall area set back 80m west of Roman Bank. The maximum design parameters for the TJBs and Project intertidal area are presented in Table 6-1. Each drill would start from the landfall compound to the west of Roman bank road, to drill eastward below Roman Bank road, Anderby Marsh LNR, the sea defences, and beach and exit the subtidal zone at a suitable depth below Mean Low Water Springs (MLWS).

Table 6-1 Maximum design parameters for landfall (HDD) works

Parameters	Design Envelope
Trenchless (HDD) cable ducts	6
Diameter of ducts (m)	1.2
Length of ducts (km)	2
Trenchless (HDD) launch pit area (m^2)	200
Trenchless (HDD) launch pit depth (m)	6
Trenchless (HDD) burial depth maximum (m)	25
Trenchless (HDD) burial depth minimum (m)	5
Trenchless (HDD) exit pits number	6
Trenchless (HDD) exit pits – Total area (m^2)	1000
Trenchless (HDD) exit pits excavated material volume (m^3)	5000
Trenchless (HDD) exit pits depth (m)	5

37. Pits will be excavated at the planned start and end point of each drilled section. These are referred to as the launch pit (onshore) and exit pit (offshore). The arrangement allows the drilling to proceed at the correct angle into the ground, manage the fluid mud returns, and install the ducts. The adjacent ground to the drill point will be prepared for the rig to be suitably placed to facilitate drilling operations; this may include localised sheet piling (silent pile method) and pushing a steel casing into the ground at the launch pit to control the drill direction and manage the fluid mud returns. This installation will be required for the duration of the drilling work only. The above arrangement will be required per drill, one each on the landward side and one each offshore. The HDD receiver offshore submarine exit pits will be up to 2,000m from the TJBs (at least 500m below MLWS). The onshore HDD site will be suitably bunded to manage and control potential water backflow during the drilling operations.

6.1 Transition joint bays

38. The offshore export cables will be jointed to the onshore export cables in TJBs on the landward side of the landfall site.
39. The TJB is an underground concrete structure hosting the joint between the offshore and onshore export cables. TJBs are located near the landfall area to facilitate the strategic connection of the offshore export cables to the onshore export cables. The strategic location of the TJBs also minimises the installed pulling tension on the specialised submarine cable. One TJB arrangement is required per export cable circuit. Up to six TJBs will be built within the Landfall Compound in order to provide contingency in the event of up to 2 unsuccessful HDDs.

7 Onshore Cable Installation Methods

7.1 Onshore Export Cable Installation

40. The Onshore ECC runs from the landfall TJB sites to the OnSS and will contain the HVAC onshore export cables and associated fibre optic cables buried underground within ducts. The onshore export cables will require trenches to be excavated or trenchless techniques to be adopted to install ducts to house the cable circuits. The Onshore ECC has a typical working width of 80m and includes a haul road to deliver equipment to the installation site from the identified construction compounds, storage areas for topsoil, and subsoil, and drainage.
41. The cable installation works can be described as five key stages:
    1. Pre-construction works (pre-mobilisation preparation works).
    2. Enabling works (mobilisation, access, and welfare establishment).
    3. Cable infrastructure and cable duct installation.
    4. Cable installation (cable pulling through the pre-installed cable ducts).
    5. Reinstatement works & demobilisation.
42. These discrete construction activities broadly consist of trenchless works, cable trenching, cable duct installation, cable pulling, reinstatement works, and associated traffic management works. The pre-construction and enabling works, which broadly consist of fencing, vegetation clearance, preparation of access routes, drainage works, topsoil removal and storage, and construction of the haul road, aim to secure and prepare the cable route corridor for the main construction activities. These pre-construction and enabling works would move progressively along the entire cable route, allowing full access to the cable route for the main construction activities to follow.
43. The cable duct installation works are continuous, with each work front progressing a section at a time. In any given location, once the cable ducts have been installed, the trench will be backfilled, and the work front will continue moving onto the next section to minimise the amount of land being worked on at any one time. The haul road will, however, need to be retained along much of the cable corridor to maintain access to the work fronts. Installing the onshore cable ducts and export cables is anticipated to take up to 42 months.
44. The installation of export cables involves several discrete activities undertaken along the length of the cable route, the duration of each activity at any location being dependent on the nature of the construction activity being undertaken.

45. The main construction activities of trenchless works, cable trenching, installation, and jointing would move along the corridor in sections, optimal progress being dependent on the availability of resources, weather conditions, or other engineering challenges that may arise during the work. To allow maximum flexibility in completing the works safely and efficiently, the main activities are completed sequentially at any location before the next activity commences. As such, works at any location would be intermittent; the nature of the activity determines the duration until all the main construction works are completed, and all cables are installed, jointed and successfully tested.
46. The Project considers that a construction working width of approximately 80m would provide sufficient design flexibility to allow for micro-siting, except for trenchless crossings where the working width would be greater to allow for increased cable spacing. This is based on experience from similar operations on previous projects. The design, spacing, and configuration of this and all trenchless works will be defined in the detailed design phase once a contractor is appointed and crossing methodologies are agreed upon with affected third parties.
47. Upon completion of the cable installation work, the corridor would be prepared for reinstatement activities, including removal of the haul road, installation of further drainage, reinstatement of topsoil, and removal of temporary fencing and access arrangements. In certain sections, where cable installation has been completed, but it is necessary to retain the haul road to provide access to other areas, the corridor will be partially reinstated. This will involve spreading topsoil across the areas where the cables have been installed, leaving the haul road to be reinstated once all works have been completed.
48. Major crossings, such as rivers, flood defences, IDB owned or maintained drains, railway lines, and major roads, will be undertaken using trenchless construction techniques such as HDD. Such methods enable the Project to avoid impacting upon existing infrastructure by drilling underneath the feature, resulting in little to no impact on the feature. The Project has also committed to utilising these methods at other key sensitive locations along the route such as to avoid a key area of archaeological interest.

49. The process uses a drilling head to drill a pilot hole along a predetermined profile based on ground conditions and cable requirements. Subject to the cable arrangement, the bore diameter may vary. Upon completion of the pilot drill, the pilot hole is widened using larger drilling heads until the drill bore is wide enough to fit the cable duct. Throughout the drilling operations, a fluid mix of water and bentonite (drilling mud) is used to assist in the downhole drilling operations; this is to control the drilling temperature, remove drill cuttings and manage and maintain the stability of the hole. Once the HDD drilling is complete, the ducts are installed (pulled) through the completed drill path. The CoCP will include risk assessment and management measures to minimise the likelihood of an unplanned release of drilling mud. In the event of a release, the Onshore Pollution Prevention and Emergency Response Plan will be implemented, an outline of which has been submitted as part of this Application (document reference 8.1.4).
50. When crossing under main rivers (Environmental Agency) or IDB maintained drains, the HDD entry and exit pits will be at least 9m from the banks of the watercourse, and the cable will be at least 2m below the hard bed of the channel. The separation between the cable entry / exit points will be increased to a minimum of 16m for tidal rivers.

7.2 400KV Cable Installation

51. The 400kV cables from the Project's OnSS to the National Grid Substation (NGSS) would be installed within ducts. This method will require a trench per circuit to be excavated between the OnSS and NGSS (approximately 4km in length) including a trenchless crossing under the River Welland. The construction methods and design parameters for the 400kV installation would be the same as some of those described in 7.1.