NORTH FALLS

Offshore Wind Farm

CABLE STATEMENT

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NORTH FALLS
Offshore Wind Farm

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CONTENTS

Tables

Figures

Glossary of Acronyms

CBRA	Cable Burial Risk Assessment
CBS	Cement Bound Sand
CPS	Cable Protection System
EACN	East Anglia Connection Node
ECC	Export Cable Corridor
FoC	Fibre optic Cable
HDD	Horizontal Directional Drilling
km	kilometre (unit of length)
KP	Kilometre Point
kV	kiloVolt (the unit of voltage)
m	Meter (unit of length)
mm	Millimetre (unit of length)
OCP	Offshore Converter Platform
OSP	Offshore Substation Platform
PLGR	Pre-Lay Grapnel Run
TCC	Temporary Construction Compound
TJB	Transition Joint Bay
UTROV	Utility Remotely Operated Vehicle
UXO	Unexploded Ordinance
XLPE	Cross-Linked PolyEthylene
WTG	Wind Turbine Generator

Glossary of Terminology

400kV onshore cable route	Onshore route within which the onshore substation to National Grid connection point onshore export cables and associated infrastructure would be located.
Array area	The offshore wind farm area, within which the wind turbine generators, array cables, platform interconnector cable, offshore substation platform(s) and/or offshore converter platform will be located.
CBS	Engineered backfill to improve the thermal properties of the backfilled trench
EACN	The National Grid Substation that North Falls connects into.
Haul road	The track along the onshore cable route used by construction traffic to access different sections of the onshore cable route.
Horizontal directional drill (HDD)	Trenchless technique to bring the offshore cables ashore at the landfall. The technique will also be used for installation of the onshore export cables at sensitive areas of the onshore cable route.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Landfall compound	Compound at landfall within which HDD or other trenchless technique would take place.
Offshore cable corridor	The corridor of seabed from array area to the landfall within which the offshore export cables will be located.
Offshore converter platform	Should an offshore connection to a third party High Voltage DC Cable (HVDC) cable be selected, an offshore converter platform would be required. This is a fixed structure located within the array area, containing High Voltage Alternating Current (HVAC) and HVDC electrical equipment to aggregate the power from the wind turbine generators, increase the voltage to a more suitable level for export and convert the HVAC power generated by the wind turbine generators into HVDC power for export to shore via a third party HVDC cable.
Offshore export cables	The cables which bring electricity from the offshore substation platform(s) to the landfall, as well as auxiliary cables.
Offshore project area	The overall area of the array area and the offshore cable corridor.
Offshore substation platform(s)	Fixed structure(s) located within the array area, containing HVAC electrical equipment to aggregate the power from the wind turbine generators and increase the voltage to a more suitable level for export to shore via offshore export cables.
Onshore cable corridor(s)	Onshore corridor(s) considered at PEIR within which the onshore cable route, as assessed at ES, is located.
Onshore cable route	Onshore route within which the onshore export cables and associated infrastructure would be located.
Onshore project area	The boundary within which all onshore infrastructure required for the Project will be located (i.e. landfall; onshore cable route, accesses, construction compounds; onshore substation and cables to the National Grid substation).
Onshore scoping area	The boundary in which all onshore infrastructure required for the Project will be located, as considered within the North Falls EIA Scoping Report.
Onshore substation	A compound containing electrical equipment required to transform and stabilise electricity generated by the Project so that it can be connected to the National Grid.
Onshore substation construction compound	Area set aside to facilitate construction of the onshore substation. Will be located adjacent to the onshore substation.
Onshore substation works area	Area within which all temporary and permanent works associated within the onshore substation are located, including onshore substation, construction compound, access, landscaping, drainage and earthworks.

Onshore substation zone	The area considered at PEIR, within which the onshore substation will be located.
National Grid connection point	The grid connection location for the Project. National Grid are proposing to construct new electrical infrastructure (a new substation) to allow the Project to connect to the grid, and this new infrastructure will be located at the National Grid connection point.
National Grid substation connection works	Infrastructure required to connect the Project to the National Grid connection point.
Platform interconnector cable	Cable connecting the offshore substation platforms (OSP) or the OSP and offshore converter platform.
Temporary construction compound	Area set aside to facilitate construction of the onshore cable route. Will be located adjacent to the onshore cable route, with access to the highway where required.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project Or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Transition Joint Bay	Transition Joint Bay is an underground concrete unit where the offshore cable is jointed to the onshore cable.
Trenchless crossing	Use of a technique to install limited lengths of cable below ground without the need to excavate a trench from the surface, used in sensitive areas of the onshore cable route to prevent surface disturbance. Includes techniques such as HDD.
Trenchless crossing compound	Areas within the onshore cable route which will house trenchless crossing (e.g. HDD) entry or exit points.
~~The Project~~ ~~Or~~ ~~'North Falls'~~	~~North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.~~
Wind Turbine String	A wind farm is made up of a number of wind turbine strings. A wind turbine strings is where, due to limits on the power transfer of the cable, a few turbines (typically 5-8) are connected together by inter-array cables and feed into the substation for export to shore.

1 Introduction

1. This Cable Statement has been prepared in accordance with Regulation 6(1)(b)(i) of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009 (the APFP Regulations) which requires the applicant for a Development Consent Order (DCO) for the construction of an offshore generating station to provide a statement regarding the route and method of installation of any cable connecting the generating station to the onshore electricity transmission network.

1.1 Project overview

2. The North Falls Offshore Wind Farm project (herein ‘North Falls’ or ‘the Project’) is located approximately 40km from the East Anglian coast. Up to 57 turbines will be placed within the proposed array area. The power from the windfarm will be transmitted via cables to an onshore connection to the National Grid at National Grid Electricity Transmission (NGET)’s new proposed East Anglia Connection Node (EACN) substation west of Little Bromley.

3. The offshore export cables will make landfall between Holland-on-Sea and Frinton-on-Sea on the Essex coast.

1.2 Grid connection optionality

4. One area of optionality is in relation to the National Grid connection point. As discussed in Chapter 1, NFOW is committed to working with the Department for Energy Security and Net Zero (DESNZ) to explore grid connection options and as such, NFOW has co-operated with the Offshore Transmission Network Review (OTNR) process. In addition, NFOW has applied to the OCSS scheme in consortium with National Grid Electricity Transmission (NGET) and Five Estuaries Offshore Wind Farm Ltd (VE OWFL) for an offshore connection to Sea Link, a marine cable between Suffolk and Kent proposed by NGET as part of their Great Grid Upgrade. Therefore, the following grid connection options are included in the Project design envelope:

- Option 1: Onshore electrical connection at a National Grid connection point within the Tendring peninsula of Essex (discussed in Section 5.8), with a project alone onshore cable route and onshore substation infrastructure;
- Option 2: Onshore electrical connection at a National Grid connection point within the Tendring peninsula of Essex, sharing an onshore cable route and onshore cable duct installation (but with separate onshore export cables) and co-locating separate project onshore substation infrastructure with Five Estuaries; or
- Option 3: Offshore electrical connection, supplied by a third party.

1.3 Coordination with Five Estuaries

5. The North Falls project is located in close proximity to the Five Estuaries project. Both projects have been provided with the same connection point (EACN), have similar locations for their onshore substations (in the vicinity of Little Bromley), both projects have the same onshore export cable route and similar offshore export cable routes.

6. Due to regulations and electrical requirements, both projects need separate export systems, including separate cables (and ancillary equipment), and separate transformers. Therefore, the projects are located in proximity to each other, but cannot share electrical equipment e.g. cables or substations.

7. The two projects are working together to minimise the disruption for onshore construction activities. The two projects have developed three possible build-out scenarios for both projects which are described in the Co-ordination report (Document Reference 2.5), and shown here for ease:

8. **Scenario 1** – North Falls proceeds to construction and undertakes the additional onshore cable trenching and ducting works for Five Estuaries as part of a single construction activity (i.e. ducting for four electrical circuits). North Falls would undertake the cable installation and onshore substation construction for its project only (i.e. two electrical circuits). The two projects would share accesses from the public highway for onshore cable installation and substation construction. The projects would utilise and share the same Temporary Construction Compounds (TCC) for the cable installation works.

9. Note that alternatively, under this scenario, Five Estuaries may instead proceed to construction and undertake the additional onshore cable trenching and ducting works for North Falls, in which instance the only infrastructure built out under the North Falls consent would be the cable installation and onshore substation construction for the North Falls project (i.e. two electrical circuits).

10. **Scenario 2** – Both North Falls and Five Estuaries projects proceed to construction on different but overlapping timescales (between 1 and 3 years apart), with onshore cable trenching and ducting works undertaken independently but opportunities for reuse of enabling infrastructure e.g. haul roads / site accesses etc., with the other project then reinstating once complete.

11. **Scenario 3** – Five Estuaries does not proceed to construction; or both Five Estuaries and North Falls projects proceed to construction on significantly different programmes (over 3 years apart). In the latter case the significantly different programmes would mean that haul roads and TCCs are reinstated prior to the second project proceeding. In such case cumulative impacts are for a potential construction period of 6 years+. This scenario presents no reduction in overall impacts for the projects from the sharing of infrastructure.

1.4 Cable components of the Project under Options 1 & 2

12. The cable components of the Project are:

- Inter-array cables connecting up to 57 WTG (wind turbine generators) to each other and to two offshore substation platforms (OSP)).
- offshore interconnector cable between the two OSPs;
- up to two offshore export cable circuits, to connect to the onshore export cable circuits at the landfall;
- up to two onshore export cable circuits, each in its own trench, to connect the landfall to the Project substation; and
- up to two onshore 400kV cable circuits, each in its own trench to connect the Project substation to the EACN substation.

1.5 Cable components of the Project under Option 3

13. In the event that North Falls decides to progress with an option to connect to Sea Link as per the OCSS scheme as co-ordinated by DESNZ, the following components would be needed (the onshore works and offshore cable corridor would no longer be required):

    - Array cables connecting up to 57 WTG (wind turbine generators) to each other and to the OSP(s);
        - Platform interconnector cable between the OSP and OCP;

2 Offshore cable components

2.1 Array Cables

14. Subsea array cables will connect the WTGs to each other in strings. The array cable strings will also connect the WTGs to the OSP(s) and/or the OCP. Each array cable will likely comprise a three core, armoured cable with copper or aluminium conductors covered in insulation material. The array cables will also contain fibre-optic cores that will be used for protection, control and communications systems. The array cables will be up to 132kV, and the length of cable will be dependent on the distance between the WTGs. The total maximum array cable length is expected to be 170km. Table 2-1 presents the key assessment assumptions for the array cables.

Table 2-1 – Maximum offshore array cable assessment assumptions

Assessment Assumptions	Maximum Value
Total array cable length	170km
Rated Voltage	Up to 132kV
Target minimum array cable burial depth	0.6m
Cable trench width	1m
Cable diameter	220mm

2.2 Platform interconnector cable

15. The Project may use an offshore interconnector cable to link together the platforms in the array area (either the two OSPs in the case of Options 1 & 2 or the OSP and the OCP in the case of Option 3). In the case of Options 1 & 2, this cable maximises the export of power through the remaining export cable.

16. The interconnector cables are likely to be armoured and have three core cables with copper or aluminium conductors and cross-linked polyethylene (XLPE) insulation, with a voltage up to 275kV. The interconnector cables will also contain fibre-optic cores that will be used for protection, control and communications systems.

Table 2-2 – Maximum offshore interconnector cable assessment (for all cables defined as platform interconnector in Options 1, 2 & 3) assumptions.

Assessment Assumptions	Maximum Value
Number of circuits	1

Assessment Assumptions	Maximum Value
Total interconnector cable length	20km
Rated Voltage	Up to 275kV
Target minimum interconnector cable burial depth	0.6m
Cable trench width	1m
Cable diameter	310mm

2.3 Offshore Export Cables

17. ~~The~~ Under Option 1&2, offshore export cables circuit will connect the OSP(s) to the landfall. They are likely to be armoured and have three core cables with copper or aluminium conductors and XLPE insulation, at a voltage up to 275kV. The cross-section of a typical XLPE insulated three copper core export cable. The export cables will also contain fibre-optic cores that will be used for protection, control, and communications systems.

18. Electricity from the OSP(s) will be transmitted via a maximum of two export cables circuit to the transition joint bays located at the landfall near Frinton-on-Sea, Essex. It is anticipated the offshore export cable circuits will be laid in separate trenches at different times and installed via either ploughing, jetting, trenching, or post-lay burial techniques. The choice of technique will be dependent on ground conditions along the specific export cable routes, considering specific requirements from stakeholders in the area.

19. The export cables have a target minimum cable burial depth of 0.6m below the seabed surface depending on the outcome of the cable burial risk assessment. (CBRA) The exact routing of the export cables within the offshore cable corridor will be determined during the detailed design of the Proposed Development, with consideration of seabed conditions and environmental sensitivities. There are no known existing third-party cables within the offshore export cable corridor for the Proposed Development, although a number of proposed developments are known about, including Five Estuaries, Sea Link and Neuconnect. Table 2-3 provides the assessment assumptions for the offshore export cables.

Table 2-3 – Maximum Offshore export cable assessment assumptions

Assessment Assumptions	Maximum Value
Number of circuits	2
Cable length	125.4km
Rated voltage	Up to 275kV

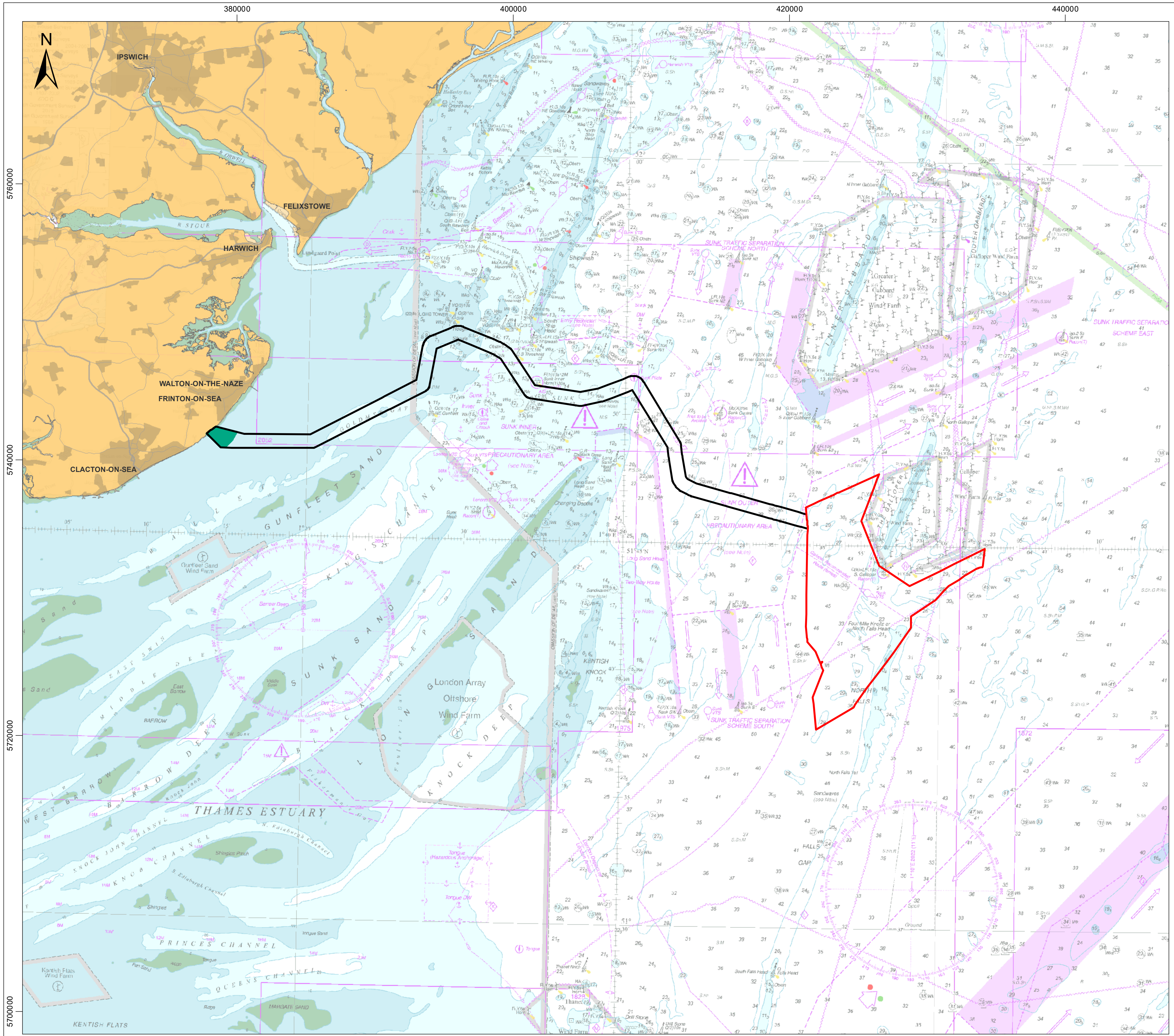
Assessment Assumptions	Maximum Value
Number of export cable trenches	2
Total export cable length	125km
Export cable corridor length	57km
Target minimum export cable burial depth	0.6m
Cable trench width	1m
Cable diameter	310mm

2.4 Offshore export cable route

20. There are currently no defined routes for any of the offshore cables within the offshore cable corridor route, shown in Figure 2-1, subject to the outcomes of the CBRA and detailed design. The offshore cable corridor is shown as Work No. 3, Work No 4A and Work No 4B on the Works Plans (Document Reference: 5.7).

21. Following discussions with stakeholders, the project is undertaking the feasibility of routing the cables within the southern half of the cable corridor between KP28 and KP42, shown in Figure 2-2. This will be subject to the results of the Geotech surveys, and will include discussions with the affected stakeholders to minimise overall impacts of time and location.

Figure 2-1 – offshore cable corridor



Legend

- North Falls Array Area
- Offshore Cable Corridor
- Offshore Landfall HDD

0 1.25 2.5 5 nm

0 2.5 5 10 km

Drawing Title

Offshore Project Components

Rev	Date	Remarks	Drwn	Chkd
01	19/01/2024	First issue	SB	GK

Drawing Number	Figure Number
PB9244-RHD-ZZ-OF-DR-GS-0463	5.1

Scale	Plot Size	Datum	Projection
1:275,000	A3	WGS84	UTM31N

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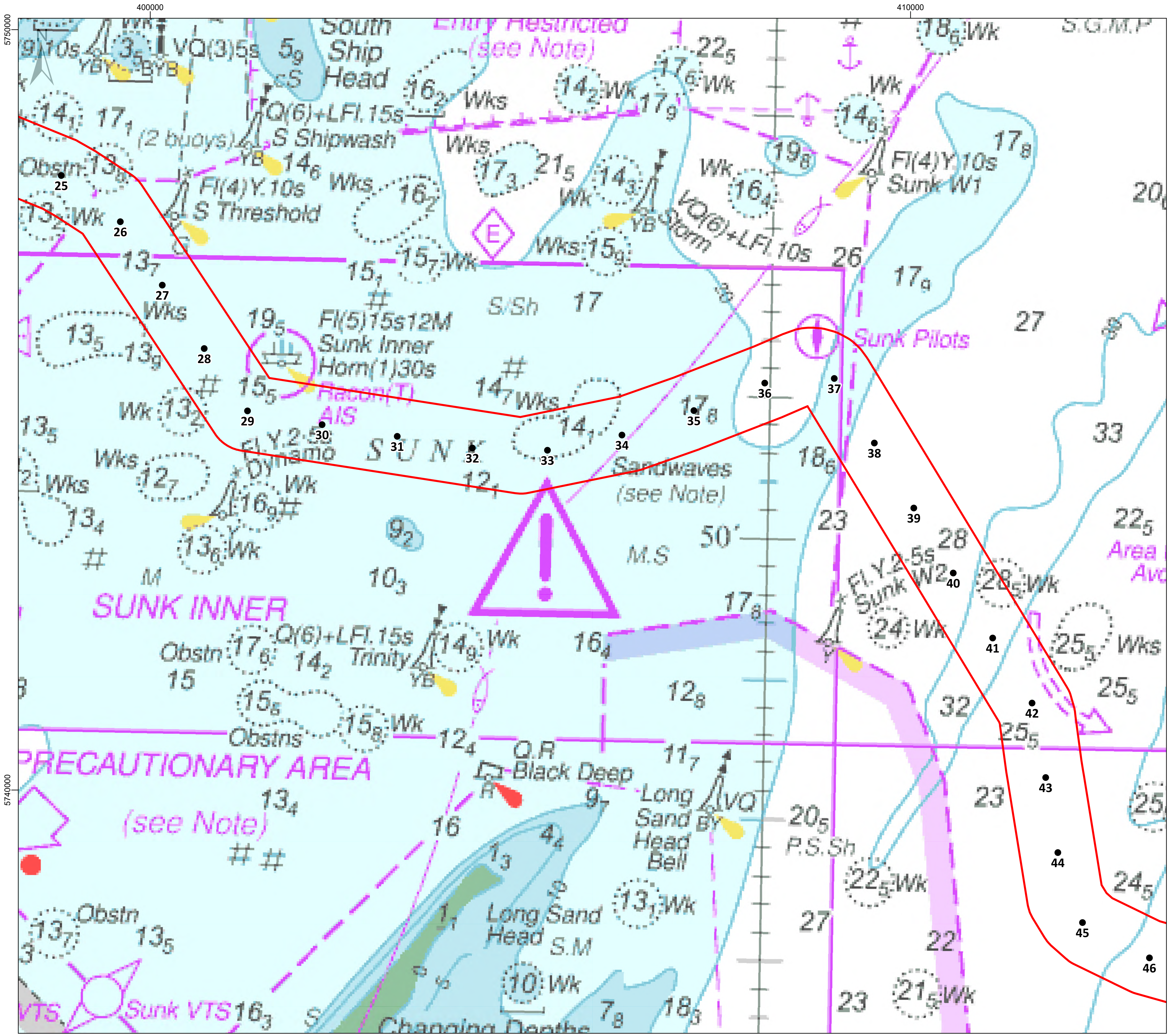
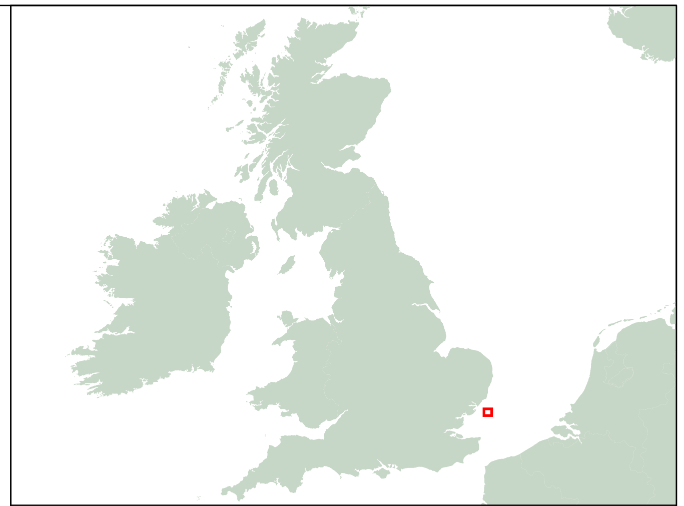
File ref: C:\Users\923509\Royal HaskoningDHV\Project-PB9244-North-Falls-Team-Space - Team\WIP\E02 GIS\02_Shared\02_Figures\08_ES\Ch_5_ProjectDescription\PB9244-RHD-ZZ-OF-DR-GS-0463_OffshoreProjectComponents.mxd

Figure 2-2 - offshore cable corridor between KP28 and KP42





Legend

- Export Cable Corridor
- ● ECR KP

0 0.45 0.9 1.8 nm

0 0.5 1 2 km

Drawing Title

ECR and KPs

Rev	Date	Remarks	Drwn	Chkd
00	15/07/2024	First Draft	FC	DR

Drawing Number

NF-M-PHYS-0006-0002

Scale	Plot Size	Datum	Projection
1:50,000	A3	WGS84	UTM31N

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Offshore Wind Farm

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3 Seabed preparation

22. Following the completion of all preconstruction activities, including satisfying preconstruction statutory consent conditions, engineering, design and procurement and detailed site surveys, seabed preparation is one of the first elements of the offshore construction process for the offshore cables.

23. Geophysical and geotechnical surveys would be carried out before construction works commence and the information from those surveys will provide further detail and clarify the presence of boulders, unexploded ordnance (UXO) and other obstructions on the seabed. Requirements for seabed preparation will vary according to the specific ground conditions and the type of infrastructure being installed.

3.1 UXO clearance

24. If UXO are found, a risk assessment will be undertaken and items of UXO will either be avoided, removed or detonated in situ. UXO clearance will be subject to a separate Marine Licence. The methods of UXO clearance considered may include:

- High-order detonation;
- Low-order detonation (deflagration); and
- Removal/ relocation.

3.2 Boulder clearance

25. Geophysical surveys will be undertaken post-consent to inform the need for boulder clearance requirements. Where large volumes of boulders are present, micro siting of cables around these may not be possible. If left in situ, boulders could present the following risks:

- Exposure of cables and/ or not achieving target burial depth for cables;
- Obstruction risk to the cable installation equipment leading to damage and/or delays; and
- Risk of damage to the cable assets themselves.

26. Boulders may be cleared using a number of methods, depending on the density of boulders encountered. Where boulders are present in high density, a boulder clearance tool, for example, SCAR plough or similar may be employed. In areas of low density, it may be more efficient to use a grab to target and re-locate individual boulders. Typical grab tools may be used such as the Utility Remotely Operated Vehicle (UTROV) tine grab or a clamshell grab. There is the potential that boulders may be removed by the use of a boulder clearance tool and/ or a grab tool at any location in the offshore Order Limits.

3.3 Pre-lay grapnel run

27. Following the pre-construction route survey and boulder clearance works, a Pre-Lay Grapnel Run (PLGR) may be undertaken prior to cable installation. A vessel will be mobilised with a series of grapnels, chains, recovery winch and suitable survey spread.

28.22. These works will take place within the PLGR clearance corridor with up to 11.87 km2 of seabed disturbed - the actual disturbed area is expected to be much smaller as the grapnels used for PLGR operations are typically only 1-2m wide. For the majority of the route a single pass with the PLGR grapnels would be expected to be performed but for certain sections multiple passes may be required.The methods for seabed preparation are defined in 9.53 Outline Cable Specification and Installation Plan, with the volumes of material defined in ES Chapter 5 Project Description [APP-019].

4 Offshore cable installation

4.1 Array cable installation

~~29.~~23. The array cables will be buried below the seabed where practicable, with a target burial depth to be defined post-consent in a CBRA taking account of the ground conditions and other factors such as the potential for impacts upon cables such as trawling and vessel anchors.

~~30.~~24. Possible installation methods for array cables include one or a combination of:

- Pre-cut and/ or post-lay ploughing;
- Simultaneous lay and burial;
- Jet trenching;
- Mechanical trenching;
- Dredging (Trailer suction hopper dredger, water injection dredger, cutter suction dredger or backhoe dredger);
- Mass flow excavation;
- Vertical injector; and/or
- Rock cutting.

4.2 Export cable installation

25. The methods for export cable installation are defined in 9.53 Outline Cable Specification and Installation Plan, with the volumes of material defined in ES Chapter 5 Project Description [APP-019].

~~31. Up to two export cable circuits will be buried below the seabed where practicable to a defined target burial depth that will be defined post-consent in the CBRA taking account of the ground conditions and other factors.~~

~~32. The possible installation methods for export cables include one or a combination of:~~

- ~~Pre-cut and/ or post-lay ploughing;~~
- ~~Simultaneous lay and burial;~~
- ~~Jet trenching;~~
- ~~Mechanical trenching;~~
- ~~Dredging (Trailer suction hopper dredger, water injection dredger, cutter suction dredger or backhoe dredger);~~
- ~~Mass flow excavation;~~
- ~~Vertical injector; and/or~~
- ~~Rock cutting.~~

4.3 Cable crossings

26. The methods for cable crossings are defined in 9.53 Outline Cable Specification and Installation Plan, with indicative locations defined in the Export Cable Crossing Zone Plan [REP1-059].

33. It is necessary to cross existing cables in the offshore area to achieve the offshore connection from the array to the landfall and then onshore to the National Grid connection point. Offshore cable crossings will be subject to crossing agreements pre- or post-consent with the owners of those existing assets, and are necessary to provide protection to both assets, and to ensure a minimum separation so that cables do not overheat.

34. Cable crossings usually consist of a layer of protection over the existing asset (the separation layer) over which the North Falls cables would be installed. A secondary layer would then be installed over the North Falls cable for protection. Cable crossings may utilise rock protection or concrete mattresses or bridging typically of steel or concrete construction. Due to most projects being in development, the exact numbers of crossings are still being confirmed, however, the protection for such crossings is contained within the volume of surface cable protection used within the environmental assessments.

4.4 Cable protection

27. The methods for export cable installation are defined in 9.53 Outline Cable Specification and Installation Plan. Similar methods will be employed for the Array Cables. The volumes of material are defined in ES Chapter 5 Project Description [APP-019].

35. In some cases, where burial cannot be applied, or where the minimum cable burial depth cannot be achieved, it is necessary to use alternative methods such as rock placement, concrete mattresses or other solutions such as Cable Protection Systems (CPS) or protective aprons to protect the cable from external damage. It should be stressed that cable burial is the preferred method of installation, and additional cable protection will only be used as a contingency where cable burial is not appropriate or achievable.

36. Cable protection may consist of one or more of the following methods:

- Rock placement;
- Concrete mattresses;
- Flow dissipation devices;
- Protective aprons, coverings, cladding or pipes; and/ or
- Rock bags.

37. The cable protection parameters used for assessments are:

Table 4-1 - Cable parameters used for assessments

Parameter	Value
Array cables (All grid connection options)	
Maximum length of array cable protection (m)	34,000
Width of cable protection on seabed (m)	1.0 – 6.0
Height of cable protection (m)	1.4
Area of cable protection (m^2)	204,000
Volume of cable protection (m3)	119,000
Platform interconnector cable protection (All grid connection options)	
Length of export cable protection (m)	4,000
Width of cable protection on seabed (m)	6
Height of cable protection (m)	1.4
Area of cable protection (m2)	24,000
Volume of cable protection (m3)	14,000
Export cables (Options 1 and 2 only)	
Maximum length of export cable protection (m)	12,540
Width of cable protection on seabed (m)	6
Height of cable protection (m)	1.4
Area of cable protection (m^2)	75,240
Volume of cable protection (m3)	43,890

5 Landfall

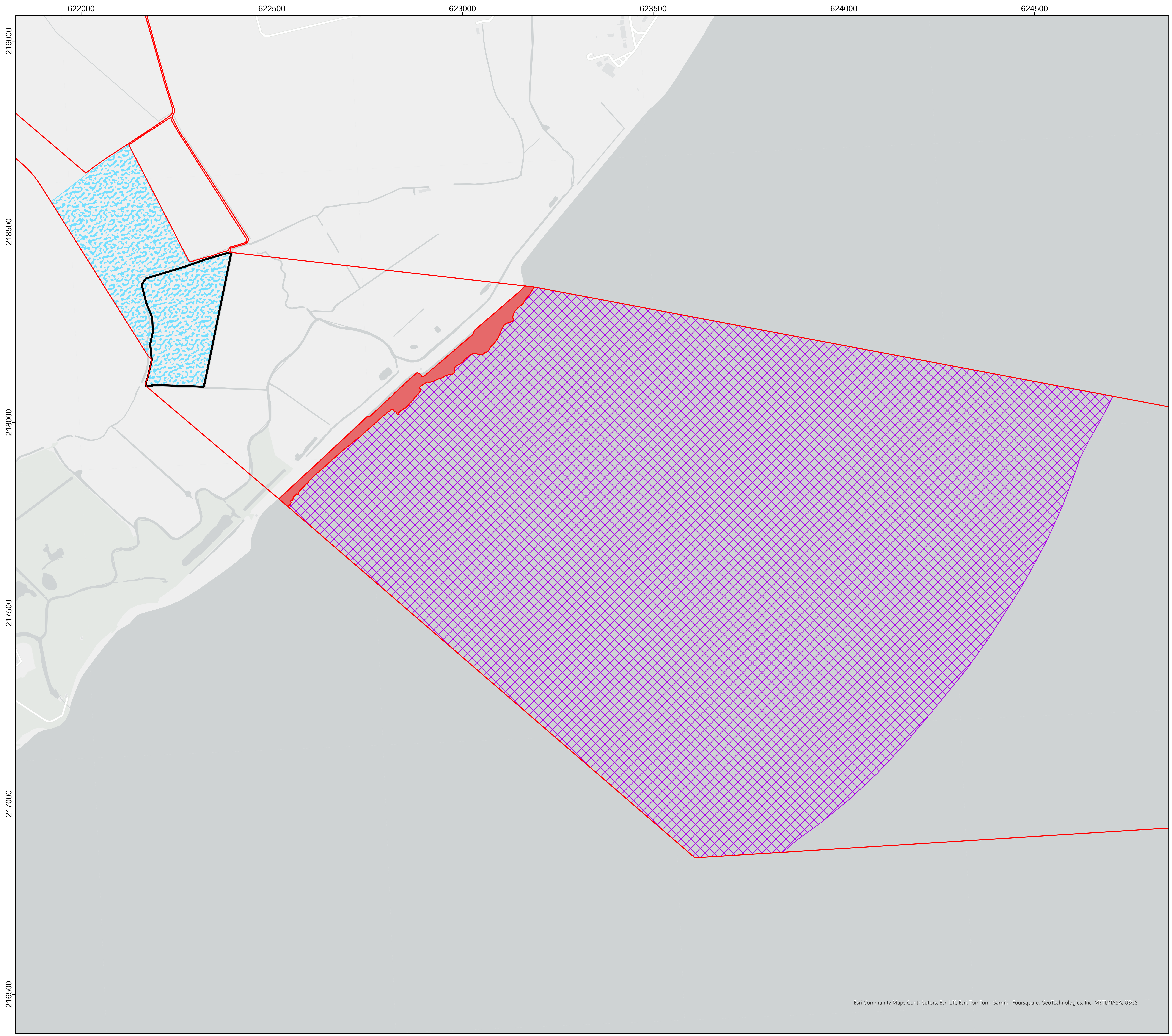
~~38.~~28. The landfall denotes the location where the offshore export cables are brought ashore and jointed to the onshore export cables in TJBs (located onshore). The TJB, where the offshore cables join the onshore cables, would be located at the landfall between Frinton-on-Sea and Holland-on-Sea (see Figure 5-1). To enable the export cables from North Falls to be brought through to the TJBs, horizontal directional drillings (HDD) would be made, and ducts would be installed to pull through and accommodate the cables.

29. The works included for the landfall, and the creation of the exit pits, are defined in 9.53 Outline Cable Specification and Installation Plan, with the volumes of material defined in ES Chapter 5 Project Description [APP-019].

~~39. The works at the landfall include:~~

- ~~Construction of the landfall compound;~~
- ~~HDD works (or other suitable alternative trenchless techniques such as micro-boring) including temporary construction of HDD exit pits in the shallow subtidal;~~
- ~~Construction of TJBs;~~
- ~~Installation of offshore export cables (cable pulling);~~
- ~~Installation of and jointing to onshore export cables; and~~
- ~~Backfilling and re-instatement works.~~

Figure 5-1 - landfall areas



Legend

- Order Limits
- Max extents of HDD drill and exit pit
- Intertidal zone
- TJB and entry pit
- Landfall compound

0 0.05 0.1 0.2 0.3 nm

0 75 150 300 450 m

N

Data source:
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Drawing Title

Landfall Area

Rev	Date	Remarks	Drwn	Chkd
00	15/07/2024	First issue	FC	DR

Drawing Number

NF-T-DES-0015-0002

Scale	Plot Size	Datum	Projection
1:5,000	A1	OSGB36	BNG

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Offshore Wind Farm

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6 Onshore cable components

6.1 Overview

~~40.~~30. The onshore cable corridor is routed from the landfall near Frinton-on-Sea, through to a proposed new onshore substation at Little Bromley, and then onto the new National Grid EACN substation (see Onshore Works Plan, Document Reference: 5.6).

~~41.~~31. The HVAC export cable will be up to 275kV, connecting the landfall to the onshore substation, and the cable between the onshore substation and the National Grid EACN will be 400kV.

6.2 Onshore cable corridor

~~42.~~32. The corridor will be approximately 22 km from the landfall compound to the onshore substation, and then onto National Grids proposed EACN substation. A longer length of cable has been assessed (24 km), to allow for micrositing within the onshore cable corridor in the event that unknown constraints are found.

~~43.~~33. The standard temporary construction corridor will generally be up to 72m wide to facilitate the construction of both the North Falls and Five Estuaries cable corridors, as well as depending on the ducting installation technique used. It will consist of the trenches, excavated material storage and space for up to 2 temporary construction haul roads, facilitating access to the onshore substations. The temporary construction corridor may require widening beyond the standard 72m width in predetermined locations to allow enough space for access / equipment at trenchless crossings and to avoid obstacles. The proposed DCO Order Limits have been defined considering this enlargement at potential locations. Sufficient space to provide temporary drainage infrastructure has also been included in the onshore part of the proposed DCO Order Limits. The standard width is reduced in certain locations for limited lengths to mitigate impacts on road crossings, e.g. Little Clacton Road.

6.3 Pre-construction

~~44.~~34. Pre-construction activities are to secure and prepare all sites and access for the construction activities. These include:

- site clearance,
- demolition,
- pre-planting of landscaping works
- archaeological investigations, which may include intrusive investigations including archaeological trial trenching,
- environmental surveys,
- investigations for the purpose of assessing ground conditions,

- remedial work in respect of any contamination or other adverse ground conditions,
- diversion and laying of services,
- erection of any temporary means of enclosure,
- creation of site accesses; and
- the temporary display of site notices or advertisements.

~~45.~~35. Temporary means of enclosure such as fencing will be used to mark out the onshore cable corridor area. Vegetation will be cleared, where appropriate, from the working width of the onshore cable corridor at the appropriate time of year.

6.4 Construction

~~46.~~36. Main Construction activities for each section of the onshore ECC are likely to include:

- Topsoil removal (to edge of working area);
- Temporary haul road installation along all sections of the route;
- Trenchless duct installation beneath obstacles (such as major roads, railways, rivers and ecological features);
- Installation of header or interceptor drains at cable corridor boundaries;
- Trench excavation (typically up to four trenches for scenario 1; or up to 2 trenches for scenario 2 and 3), each of width of up to 3.5m wide at the base and up to 2m deep;
- Duct and tile installation (the main cable installation method will be through the use of open-cut trenching with High Density Polyethylene (HDPE) ducts installed, the trench backfilled, though this may be by hand or using a specialist ducting trailer / machine);
- Trench backfilling (where required, a layer of engineered backfill, likely sandy material, will be deposited for the purposes of protection under the cable ducts. The cable ducts will then be positioned in the trenches, and where required due to the thermal properties of the soil, a layer of thermally engineered backfill placed around the cable ducts);
- Existing field drainage repairs (where disruption occurs); and
- Jointing pit installation (including French drains to prevent water pooling above jointing pit).

~~47.~~37. Once the ducts are installed cable installation will commence for the two North Falls circuits which includes:

- Cable installation (pulled through ducts from each joint pit);
- Cable jointing; and
- Cable testing and commissioning.

6.5 Haul road

~~48.~~38. Temporary construction access points are required along the onshore cable corridor to allow the transportation of materials, equipment, and personnel to and from the construction sites. These temporary construction access points will allow access to the construction corridor where there will be a temporary construction haul road running along the length of the onshore cable route, except for locations where there are trenchless or road crossings. Key assessment assumptions of the temporary construction access and haul roads are presented in Table 1-10.

~~49.~~39. The use of temporary culverts, flume pipes or bridges may be required where obstacles are encountered along the haul road.

~~50.~~40. The temporary construction haul road will comprise crushed aggregates and a geotextile membrane where the existing ground is not considered stable enough. It will be used during installation works and construction activities and be removed prior to final reinstatement.

~~51.~~41. Temporary construction access points are proposed along the onshore cable corridor based on suitability for the Proposed Development requirements, likely environmental and social impacts, highway safety and connection to key road infrastructure. Existing access points and tracks have been utilised where possible.

Table 6-1 - Haul road parameters used for assessment

Parameter	Value
Haul road carriageway width	6m
Haul road width passing places and drainage	10m

6.6 Temporary construction compounds

~~52.~~42. Temporary construction compounds are required for:

- landfall works;
- trenchless crossings; and
- logistics; storage of materials and equipment, location of CBS batching plant, also includes welfare facilities and office space as appropriate.

~~53.~~43. All temporary construction compounds are located within the proposed DCO Order Limits.

~~54.~~44. Along the onshore cable route 11 sites have been identified as locations for temporary construction or logistic compounds, along with a further location identified at the landfall. Depending on the construction scenario, upon completion of constructions works for North Falls, the temporary construction compound facilities will be removed, and each compound site will be returned to its original state or will be retained for use by Five Estuaries.

Table 6-2 - Temporary Construction Compound sizes used for assessment

Parameter	Value
Temporary construction compound footprints	150 x 150m (main) 100 x 100m (satellite) 75 x 150 (trenchless crossing compounds)

6.7 Joint bays

~~55.~~45. Along the onshore cable route, joint bays will be constructed to enable cable installation and cable jointing. The joint bays are subsurface structures, with no infrastructure shallower than 900mm below the surface.

~~56.~~46. The locations of the joint bays will be determined during the detailed design phase. Typically, they are located every 500 to 800m however the location depends on factors such as needing to avoid surface features, crossings and bends.

~~57.~~47. Link boxes, to enable electrical checks and testing to be carried out on the cable system during operation and maintenance, will be required at a number of these joint bays, the exact number requires detailed design of the cable route. These require some surface infrastructure, and the project will aim to place these, where possible, at field boundaries.

Table 6-3 - joint bay parameters used for assessment

Parameter	Value
Joint bay dimensions	4 x 15m
Number of joint bays	The exact joint bay separation is dependent on the final cable route and the cable design. As a worst case, joint bays every 500m have been assumed.

6.8 Cable crossings

~~58.~~48. HDD (or other trenchless crossing techniques) will be used at a number of locations as an alternative methodology to open-cut trenching to cross significant environmental and physical features such as main rivers, major drains, roads, and railways. When using a trenchless technique, the ducts require greater spacing, a width of up to 90m for the corridor is sufficient where standard trenchless techniques are required. A wider corridor of up to 130m has been allowed for at more complex crossing points (e.g., the railway crossing and Swan Road / Thorpe Road junction).

~~59.~~49. The HDD process involves drilling under the feature being avoided. Typically, a drilling head is used to drill a pilot hole along a predetermined alignment, before this pilot hole is widened using larger drilling heads to the required bore size. Bentonite pumped to the drilling head is used to stabilize the hole and ensure it doesn't collapse.

~~60.~~50. Alternative trenchless crossing methodologies that may be considered where appropriate include pipe jacking, direct pipe or auger boring. For assessment purposes, it is considered the plant and equipment identified for HDD would be representative of that required for other techniques, in terms of maximum numbers of equipment on site and the potential environmental impacts.

~~61.~~51. A number of minor obstacles are identified in the Obstacle Crossing Register as being crossed by trenchless techniques as they are adjacent to a major feature, such as a small ditch next to a main road and as a result will be crossed together as a group of obstacles. In addition, trenchless crossings are selected for some minor roads, as a result of sensitive hedgerow habitats either side, and the fact that trenchless crossing techniques, such as HDD minimises the impact on these (although haul road crossing / access is typically still needed).

~~62.~~52. Drilling compounds or launch and receptor pits (dependent on the technique chosen) will be set up within the cable corridor at suitable locations adjacent to each obstacle, or group of obstacles, to be crossed. The distance that each compound will be from the obstacles will be determined during the construction stage of the project and will depend on factors such as the length of the crossing, the height differential of the land either side of the obstacles, depth of the obstacle to be cleared, and the local ground conditions.

~~63.~~53. As the length of each crossing will not be finalised and known until the construction phase, the duration for each trenchless duct installation is not currently known.

6.9 Onshore export cables

~~64.~~54. The HVAC onshore export cable system, for North Falls only, (up to 275kV) along the onshore cable route will comprise a maximum of two cable circuits arranged as two cable circuits in separate trenches. These will run along the length of the onshore cable route. Each circuit will contain up to 7 cables, with three power cables, and up to two fibre optic cables (FOCs) and earthing cables, each drawn through its own pre-installed duct. These cables will run from the landfall TJB to the onshore substation near Little Bromley.

~~65.~~55. The 400kV cable system between the new onshore substation at Little Bromley and the existing National Grid EACN substation will comprise a maximum of two circuits.

~~66.~~56. Trenches will be backfilled with the originally excavated material or cement bound sand (CBS) to the layer of the protective tiles/tape (use of CBS is dependent on soil thermal resistivity). Protective cover tiles/tape will be placed on top of the material to prevent the cable from being damaged. These will typically be made of plastic and will have clear warning of the underlaid cable written on top of the tile. Any surplus material from excavation will be spread across the temporary construction corridor. The topsoil material will be reinstated, and the land returned to its original use.

~~67.~~57. FOCs will be installed alongside the transmission cables for communication and monitoring purposes. The power cables are likely to consist of an over sheath, a metallic sheath, a metallic screen, insulation and a conductor. Power cable cores are likely to be made of copper or aluminium with XLPE insulation.

7 Onshore substation

~~68.~~58. One onshore substation will be required for North Falls which will be sited north of the A120 to the west of Little Bromley, this area has been chosen to facilitate connection to the National Grid EACN substation (subject to a separate DCO application).

~~69.~~59. The substation will convert and condition the exported power to meet the requirements to feed into the National Grid, e.g. increase the voltage to 400kV (grid voltage). Connection to the National Grid EACN Substation will also include 400kV underground circuit(s) running from the proposed Project onshore substation to the new National Grid EACN Substation, and associated electrical infrastructure within the EACN Substation, such as switchgear bays.

~~70.~~60. The total land requirement for the onshore substation to the perimeter fence is 58,800 m², as well as additional land required for the TCC, roads, drainage and cut/fill. The largest structures within the onshore substation listed above would be the STATCOM building with an approximate height of 7m; the tallest height of any electrical equipment would be switchgear with a height of 13m; and the tallest height of any structure would be lightning masts, which would be a maximum of 18m tall.

~~71.~~61. The onshore substation is adjacent to the proposed Five Estuaries project substation and the proposed National Grid's EACN substation area, both of which are currently underway with their consenting programme. This has the potential for an increase in localised effects, but also provide greater opportunities for co-ordination on items such as site access and mitigation planting.

HARNESSING THE POWER OF NORTH SEA WIND

North Falls Offshore Wind Farm Limited

A joint venture company owned equally by SSE Renewables and RWE.

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