NORTH FALLS

Offshore Wind Farm

Report to Inform Appropriate Assessment

Part 1 Introduction

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Glossary of Acronyms

AEoI	Adverse Effect on the Integrity
AfL	Agreement for Lease
AIS	Air insulated switchgear
cSAC	Candidate Special Areas of Conservation
DCO	Development Consent Order
Defra	Department for Environment Food and Rural Affair
DESNZ	Department for Energy Security and Net Zero
EACN	East Anglia Connection Node
EC	European Commission
ES	Environmental Statement
EU	European Union
FCS	Favourable Conservation Status
GBS	Gravity Base Structures
GGOW	Greater Gabbard Offshore Wind Farm
HDD	Horizontal Directional Drilling
HDPE	high-density polyethylene
HGV	Heavy Goods Vehicle
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
IROPI	Imperative Reasons of Overriding Public Interest
LSE	Likely Significant Effect
O&M	Operation and Maintenance
OCP	Offshore Converter Platform
OCSS	Offshore Coordination Support Scheme
OSP	Offshore Substation Platform
OTNR	Offshore Transmission Network Review
OWF	Offshore Wind Farm
MCZ	Marine Conservation Zones
MHWS	Mean High Water Springs
NFOW	North Falls Offshore Wind Farm Limited
NGET	National Grid Electricity Transmission
NPS	National Policy Statements
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
pSAC	Possible Special Areas of Conservation
pSPA	Potential Special Protection Area
RIAA	Report to Inform Appropriate Assessment
SAC	Special Areas of Conservation
SCADA	Supervisory Control and Data Acquisition

SCI	Sites of Community Importance
SoS	Secretary of State
SNCB	Statutory Nature Conservation Bodies
SPA	Special Protection Area
TCCs	Temporary Construction Compounds
UK	United Kingdom
UPS	Uninterruptible Power Supply
UXO	Unexploded Ordnance
VEOWL	Five Estuaries Offshore Wind Farm Limited
WTG	Wind Turbine Generators

Glossary of Terminology

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.
Array cables	Cables which link the wind turbine generators with each other, the offshore substation platform(s) and/or the offshore converter platform.
Cable ducts	Housing for the onshore export cables, typically comprising plastic high-density polyethylene (HDPE) pipes buried underground. Each cable circuit will potentially comprise up to seven individual ducts (i.e. one per cable).
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 landfall. The technique will also be the primary trenchless technique 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.
Link boxes	Underground chambers or above ground cabinets next to the onshore export cables housing low voltage electrical earthing links.
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.
Offshore cable corridor	The corridor of seabed from the 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 HVDC cable be selected, an offshore converter platform would be required. This is a fixed structure located within the array area, containing 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 export cables	The cables which take the electricity from landfall to the onshore substation. These comprise High Voltage Alternative Current (HVAC) cables, buried underground.
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 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 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.
Platform interconnector cable	Cable connecting the offshore substation platforms (OSP); or the OSP and offshore converter platform (OCP)
Scour protection	Protective materials to avoid sediment being eroded away from the base of the wind turbine generator foundations and offshore substation platform (OSP) or / and offshore converter platform (OCP) foundations as a result of the flow of water.
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.
Transition joint bay	Underground structures that house the joints between the offshore export cables and the onshore export cables
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.
Wind turbine generator (WTG)	Power generating device that is driven by the kinetic energy of the wind

1 Introduction

1.1 Introduction

1.1.1 Purpose of this document

1. The purpose of the Report to Inform Appropriate Assessment (RIAA) is to provide the information necessary for the competent authority to carry out the Appropriate Assessment of the North Falls Offshore Wind Farm (hereafter 'North Falls' or 'the Project').

1.1.1.1 Structure of the RIAA

2. The RIAA is provided in the following Parts:

- Part 1 Introduction (this document);
    - Appendix 1.1 Habitats Regulations Assessment (HRA) Screening (Document Reference: 7.1.1.1);
- Part 2 Annex I Habitat in Special Areas of Conservation (SACs) and Special Protection Area (SPA) supporting habitat (Document Reference: 7.1.2);
- Part 3 Marine Mammals (Annex II species) (Document Reference: 7.1.3);
    - Appendix 3.1 Unexploded Ordnance Clearance Information and Assessment (Document Reference: 7.1.3.1);
- Part 4 Offshore Ornithology (Birds Directive Annex 1 and Migratory Species) (Document Reference: 7.1.4);
    - Appendix 4.1 Modelling the abundance of red-throated divers in the area of overlap between North Falls digital aerial surveys (12km buffer) and the Outer Thames Estuary SPA (Document Reference: 7.1.4.1);
    - Appendix 4.2 Population Viability Analysis (Document Reference: 7.1.4.2);
- Part 5 Onshore European and Ramsar Sites (Document Reference: 7.1.5); and
- Part 6 Summary (Document Reference: 7.1.6).

1.1.2 Project background

3. North Falls is an extension to the existing Greater Gabbard Offshore Wind Farm (GGOW) and would be located approximately 40km (at its nearest point) off the East Anglian coastline. GGOW was commissioned in 2012 and in February 2017, The Crown Estate launched an opportunity for existing wind farms to apply for project extensions. North Falls Offshore Wind Farm Limited (NFOW) applied for a lease to develop an extension located immediately adjacent to the western boundary of the existing GGOW array areas. In August 2019, The Crown Estate consulted on and then concluded a plan-level HRA for the proposed extension projects and confirmed that North Falls (formerly 'Greater Gabbard Extension') would be among seven projects that would be awarded an Agreement for Lease (AfL).

1.1.3 Legislation, policy and guidance

1.1.3.1 Overview

4. The HRA process covers features designated under the European Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').

5. The UK exited the European Union (EU) on 31st January 2020. However, as described in Section 1.1.3.3 below, the application of the HRA process currently remains largely unchanged due to the introduction of the EU Exit Regulations 2019.

1.1.3.2 European legislation

1.1.3.2.1 The Birds Directive

6. The EU Directive on the Conservation of Wild Birds (2009/147/EC) (hereafter called the Birds Directive) provides a framework for the conservation and management of wild birds in Europe. The relevant provisions of the Directive are the identification and classification of SPAs for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). The Directive requires national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive have effectively been replaced by the Article 6 provisions of the Habitats Directive.

1.1.3.2.2 The Habitats Directive

7. The Habitats Directive provides a framework for the conservation and management of natural habitats, wild fauna (except birds) and flora in Europe. Its aim is to maintain or restore natural habitats and wild species at a favourable conservation status (FCS). The relevant provisions of the Directive are the identification and classification of SAC (Article 4) and procedures for the protection of SACs and SPAs (Article 6). SACs are identified based on the presence of natural habitat types listed in Annex I and populations of the species listed in Annex II. The Directive requires national Governments to establish SACs and to have in place mechanisms to protect and manage them.

1.1.3.2.3 The Ramsar convention

8. The Convention on Wetlands of International Importance especially as Waterfowl Habitat, as amended in 1982 and 1987 (the 'Ramsar Convention') is an international treaty for the conservation and sustainable use of wetlands of international importance. Ramsar site selection has had an emphasis on wetlands of importance to waterbirds, however non-bird features are increasingly taken into account, both in the selection of new sites and when reviewing existing sites. The UK government has issued a policy statement which extends to Ramsar sites the same protection at a policy level as SACs and SPAs. Ramsar sites are therefore included in the HRA process.

1.1.3.3 UK national legislation

1.1.3.3.1 The Conservation of Habitats and Species Regulations 2017, the Conservation of Offshore Marine Habitats and Species Regulations 2017 and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019

9. These regulations (hereafter the 'Habitat Regulations') together with the Wildlife and Countryside Act 1981 transpose the Habitats and Birds Directives into UK legislation, together applying to England and Wales, onshore and offshore.

10. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 make changes to the Habitats Regulations so that they continue to be operable following the UK's exit from the EU on 31st January 2020. While the basic legal framework for HRA is maintained, the EU Exit Regulations transfer functions previously undertaken by the European Commission (EC) to UK Ministers.

11. The Habitats Regulations place an obligation on 'competent authorities' to carry out an Appropriate Assessment of any proposal which is likely to have a significant effect on a European site; to consult Statutory Nature Conservation Bodies (SNCBs) e.g. Natural England; and not to approve an application for a plan or project that would have an adverse effect on the integrity (AEoI) of a European site, except under very tightly constrained conditions known as a "derogation". The competent authority in the case of the Development Consent Order (DCO) application for the Project is the Secretary of State (SoS) for the Department for Energy Security and Net Zero (DESNZ).

12. NPS EN-1 Overarching National Policy Statement for Energy defines Habitats sites as follows (which aligns with the legal definition of "European site" in the Habitats Regulations):

    "Any site which would be included within the definition at regulation 8 of the Conservation of Habitats and Species Regulations 2017 for the purpose of those regulations, including candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation, Special Protection Areas and any relevant marine sites."

13. In addition, paragraph 181 of the National Planning Policy Framework states:

    "The following should be given the same protection as habitats sites:

    (a) potential Special Protection Areas and possible Special Areas of Conservation;

    (b) listed or proposed Ramsar sites; and

    (c) sites identified, or required, as compensatory measures for adverse effects on habitats sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites."

1.1.3.4 Policy

14. National Policy Statements (NPS) are the principal decision-making policy documents for Nationally Significant Infrastructure Projects (NSIPs). Those relevant to North Falls are:

    - Overarching NPS for Energy (EN-1) (DESNZ, 2023a);

- NPS for Renewable Energy Infrastructure (EN-3) (DESNZ, 2023b); and
- NPS for Electricity Networks Infrastructure (EN-5) (DESNZ, 2023c).

1.1.3.5 Guidance

15. The following guidance has been considered during the development of the RIAA:

- European Commission (2001): Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites.
- European Commission (2020): EU Guidance on wind energy development in accordance with EU nature directives.
- The Planning Inspectorate Advice Note Nine (2018): Rochdale Envelope.
- The Planning Inspectorate Advice Note Ten (2022): Habitat Regulations Assessment relevant to nationally significant infrastructure projects.
- The Planning Inspectorate Advice Note Seventeen (2019): Cumulative Effects Assessment.
- Department of Energy and Climate Change (2015): Guidelines on the Assessment of Transboundary Impacts of Energy Developments on Natura 2000 Sites outside the UK.
- Ministry of Housing, Communities & Local Government (2019): Guidance on the use of Habitats Regulations Assessment.
- Department for Environment, Food & Rural Affairs, Natural England, Welsh Government, and Natural Resources Wales (2021): Guidance; Habitats regulations assessments: protecting a European site; How a competent authority must decide if a plan or project proposal that affects a European site can go ahead.
- Natural England and Department for Environment Food and Rural Affairs (Defra) (2022) Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards; Phase III: Expectations for data analysis and presentation at examination for offshore wind applications.

1.1.4 Overview of HRA process

16. The HRA process consists of several phases that are described further below.

1.1.4.1 Stage 1 – Screening (see Appendix 1.1)

17. For all plans and projects which are not wholly, directly connected with or necessary to the conservation management of a site's qualifying features (such as North Falls), Stage 1 Screening is required, as a minimum.

18. In Stage 1, European sites are screened for Likely Significant Effect (LSE), either alone or in-combination with other plans or projects. Where an LSE on the qualifying features of a site cannot be ruled out, that site is 'screened in' to the Appropriate Assessment. It is important to note that in order to 'screen out' a European Site, the burden of evidence is to show, on the basis of objective information, that there will be no LSE. If the effect may cause LSE, or is not known, this would trigger the need for an Appropriate Assessment.

19. In accordance with the 2018 European Court of Justice ruling in the case of People Over Wind, Peter Sweetman v Coillte Teoranta (C-323/17), mitigation, including embedded mitigation has not been taken into account in Stage 1 Screening.

20. In accordance with the law and policy outlined in Section 1.1.3.4, the classes of designations considered within the RIAA are:

- SPAs;
- Potential SPA (pSPA) – SPAs that are approved by the UK Government but are still in the process of being classified;
- SACs;
- Possible SACs (pSACs) – A site which has been identified and approved to go out to formal consultation;
- Candidate SACs (cSACs) – Following consultation on the pSAC, the site is submitted to the EC for designation and at this stage it is called a cSAC;
- Sites of Community Importance (SCI) – Once UK Ministers approve the site it becomes a SCI, before the national government then designates it as a SAC;
- Sites identified as compensatory measures for adverse effects on any of the above sites; and
- Ramsar sites - protect wetland areas and extend only to “areas of marine water the depth of which at low tide does not exceed six metres”.

21. In addition, an assessment of the Project’s potential impacts on Marine Conservation Zones (MCZs) is provided in the MCZ Assessment (Document Reference: 7.3).

1.1.4.2 Stage 2 – Appropriate assessment

22. As discussed in Section 1.1.3.3.1, the Appropriate Assessment must be carried out by the competent authority, however information is required from the Applicant for those sites where LSE cannot be ruled out in Stage 1.

23. This report provides an assessment of whether the Project alone or in-combination could adversely affect the integrity of a European site, in view of its conservation objectives. Mitigation measures are taken into account during the assessment at this stage.

1.1.4.3 Stage 3 – HRA Derogation

24. In cases where the competent authority concludes in the Appropriate Assessment that an AEoI of a European site cannot be ruled out beyond reasonable scientific doubt, consent should not be granted unless the Project satisfies each of the following tests:

- There are no feasible alternative solutions that would be less damaging or avoid damage to the site;
- The proposal needs to be carried out for imperative reasons of overriding public interest (IROPI); and
- Any necessary compensatory measures can be secured.

25. Evidence to support a HRA Derogation case for the Project is provided with the DCO application (HRA Derogation: Provision of Evidence, Document Reference: 7.2).

1.2 Project description

26. This section provides a summary of the relevant infrastructure parameters of the Project, as well as construction, operation, maintenance and decommissioning strategies. Further detail is provided in Chapter 5 of the Environmental Statement (ES) (Document Reference: 3.1.7) and the relevant worst case scenario for each topic is described in Sections 2.2.2, 3.2.2, 4.2.2 and 5.2.2 of the RIAA (Document References: 7.1.2, 7.1.3, 7.1.4 and 7.1.5).

27. At this stage of the Project's development, some optionality is required in order to future proof the DCO. This is a standard approach and is discussed further in ES Chapter 5, Project Description (Document Reference: 3.1.7).

28. One area of optionality is in relation to the National Grid connection point. As discussed in ES Chapter 1 Introduction (Document Reference: 3.1.3), NFOW is committed to working with the 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 Offshore Coordination Support Scheme (OCSS) in consortium with National Grid Electricity Transmission (NGET) and Five Estuaries Offshore Wind Farm Limited (VEOWL) 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 option of an onshore connection must be retained in the interim. The following grid connection options are therefore included in the Project design envelope:

- Option 1: Onshore electrical connection at a National Grid connection point within the Tendring peninsula of Essex, 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 Offshore Wind Farm; or
- Option 3: Offshore electrical connection, supplied by a third party.

29. For the purposes of the HRA, grid connection Option 2 is considered the realistic worst case scenario. For the onshore SACs and SPAs, this is because the build out requires four sets of cable ducts and associated joint bays to be installed, impacting upon the largest footprint of the three grid connection options. For the offshore SACs and SPAs, options 1 and 2 are the same and for option 3 there would be no project offshore export cables to shore, as the Project's connection to the national grid would be offshore at an OCP.

1.2.1 Project locations

1.2.1.1 Offshore project area

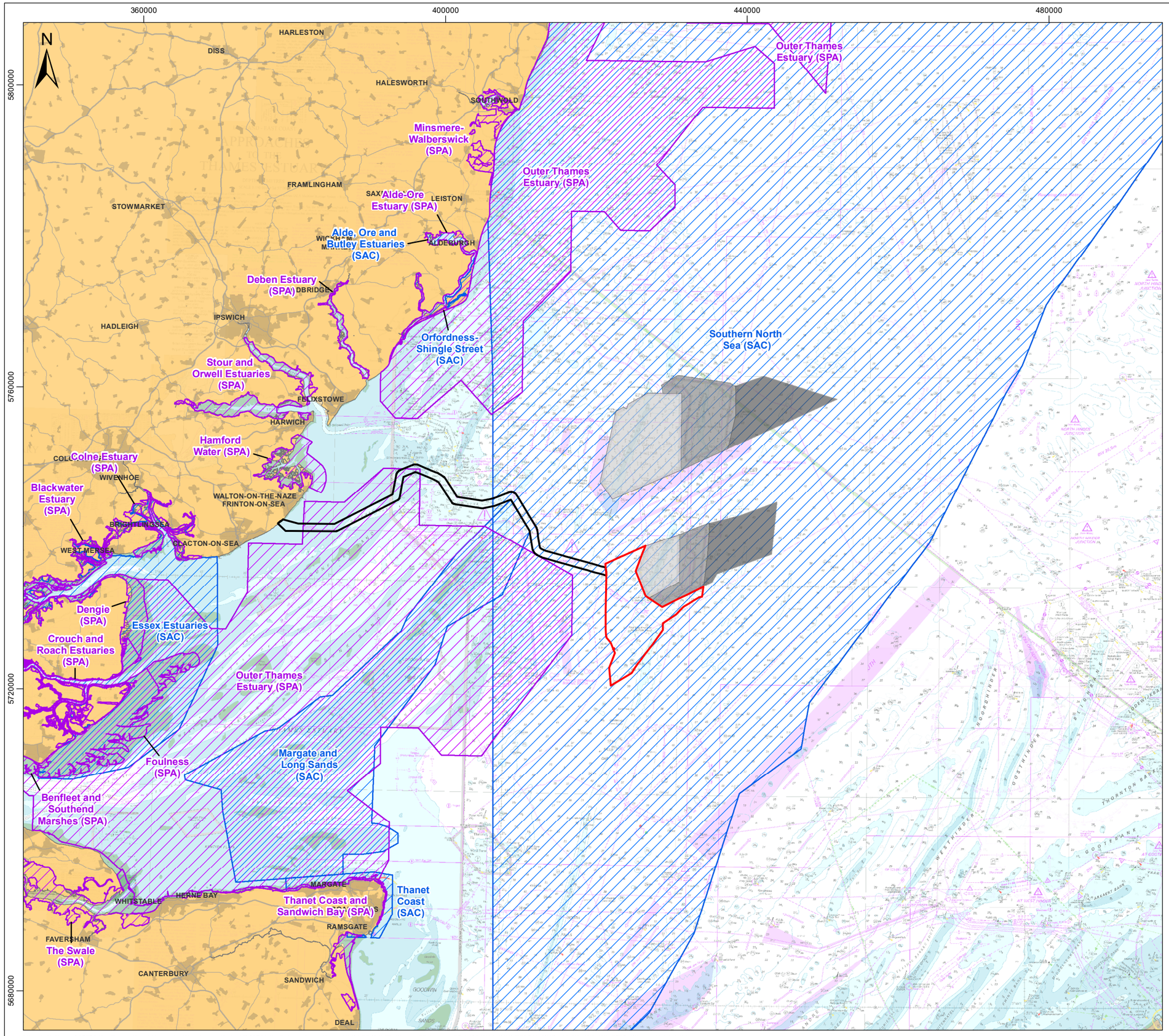
30. In the context of this report, “offshore” refers to the area below mean high water springs (MHWS). The offshore project area lies in the region of the Outer Thames Estuary, in the southern North Sea.

31. The North Falls array area will include wind turbine generators (WTGs), array cables, offshore substation platform(s) (OSP(s)), an offshore converter platform (OCP, if required) and a platform interconnector cable. The array area is approximately 95km^2.

32. The electricity generated by the WTGs will be brought to shore by the offshore export cables, which will be located within the offshore cable corridor which runs from the array area to the landfall location at Kirby Brook on the Tendring Peninsula, Essex. The offshore cable corridor runs along and sits outside of the northern boundary of the Margate and Long Sands SAC and has a small area of overlap with the Outer Thames Estuary SPA. The offshore cable corridor was selected in consultation with Natural England and other stakeholders and was designed to seek to minimise effects on designated sites.

33. The North Falls array area and offshore cable corridor are collectively referred to as the ‘offshore project area’ (Figure 1.1).

34. The seabed in the array area is between 5m and 58m below sea level and the substrate is predominantly sand and gravel.



Legend

- North Falls Array Area
- Offshore Cable Corridor
- Greater Gabbard Offshore Wind Farm
- Galloper Offshore Wind Farm
- Five Estuaries Offshore Wind Farm
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

0 2.5 5 10 nm

0 5 10 20 km

Drawing Title

North Falls Offshore Project Area and Surrounding European Sites

Rev	Date	Remarks	Drwn	Chkd
01	18/06/2024	First issue	FC	GK

Drawing Number	Figure Number
PB9244-RHD-ZZ-OF-DR-GS-0600	1.1

Scale	Plot Size	Datum	Projection
1:500,000	A3	WGS84	UTM31N

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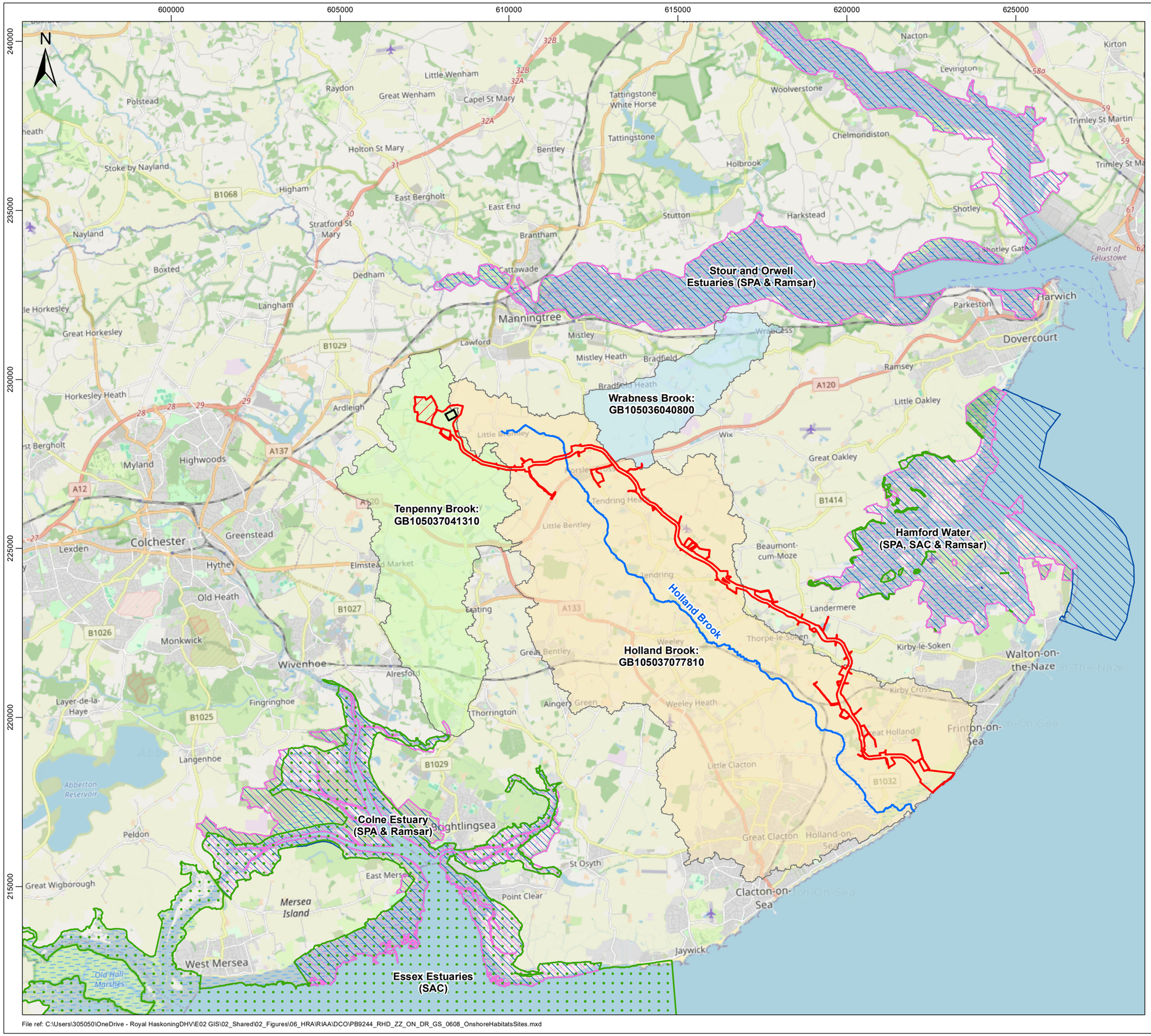
1.2.1.2 Onshore project area

35. The Project's onshore infrastructure is proposed to be located entirely within the Tendring peninsula of Essex, and includes the following, as shown on Figure 1.2:

    - Onshore cable route, between 72 - 130m wide and including space for temporary works for the installation of cable ducts and the installation of onshore export cables, including areas for temporary construction compounds (TCCs), construction and operation and maintenance accesses;
    - Onshore substation, proposed to be located west of Little Bromley;
    - Onshore substation works area, which includes land required for temporary construction, export cables, means of access, drainage, landscaping, environmental mitigation; and
    - The search area for the East Anglia Connection Node (EACN) (the Project's National Grid connection point) within which the cables from the onshore substation will connect to the national grid.

36. Collectively, the footprint of the Project's onshore infrastructure is referred to herein as the 'onshore project area' and is shown in Figure 1.2.



Legend

- Onshore Project Area
- Onshore Substation
- East Anglia Connection Node (EACN)
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar
- WER River Water Body

WER River Water Body Catchment

- Holland Brook
- Tenpenny Brook
- Wrabness Brook

0 1.25 2.5 5 km

Drawing Title

North Falls Onshore Project Area and Surrounding European Sites

Rev	Date	Remarks	Drwn	Chkd
01	10/07/2024	First issue	FC	GC

Drawing Number	Figure Number
PB9244-RHD-ZZ-ON-DR-GS-0608	1.2

Scale	Plot Size	Datum	Projection
1:110,000	A3	OSGB36	BNG

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1.2.2 Offshore infrastructure

1.2.2.1 Wind turbine generators

37. The project has the potential to consist of:

    - Up to 57 WTGs of its smallest WTG model within the project envelope. The rotor size of these WTG would be up to 236m in diameter with a rotor tip height of 276m (above MHWS); or
    - Up to 34 WTGs of its largest WTG model within the project envelope. The maximum rotor diameter would be 337m, with a maximum rotor tip height of 377m (above MHWS).

38. The minimum air gap between the sea surface and the rotor tip would be 27m above MHWS for all WTG sizes in the design envelope.

39. The WTGs will incorporate tapered tubular towers and three blades attached to a nacelle housing mechanical and electrical generating equipment.

40. The layout of WTGs across the array area will be informed by site investigation works post consent. It is possible that more than one WTG model will be used across the site.

1.2.2.2 Foundations

41. The design of foundations for the WTGs and OSPs/OCP will be informed by site investigation and procurement, post consent. A number of factors will influence the choice of foundation and the parameters of each foundation option (e.g. the type and size of WTG selected, the nature of the ground conditions, the water depth, metocean characteristics and supply chain constraints). It is possible that more than one type of foundation will be used across the Project area. The following foundation design options are currently being considered:

    - Monopiles;
    - Mono-suction bucket;
    - Jackets on pin piles (3 or 4 legs);
    - Jackets on suction bucket (3 or 4 legs);
    - Jackets on gravity/ballast legs (3 or 4 legs); and
    - Gravity Base Structures (GBS).

42. A number of options will be considered to protect the foundations from scour[1] if required, including rock and mattressing.

1.2.2.3 Offshore electrical infrastructure

43. Offshore electrical infrastructure will include the following components:

    - Array cabling;

[1] Scour: sediment eroded away from the base of the foundations as a result of the flow of water.

- Platform interconnector cable;
- OSP(s)/OCP; and
- Offshore export cables to bring the electricity from the array area to landfall.

1.2.3 Summary of offshore parameters

Table 1.1 Worst case offshore parameters

Feature	Worst case parameters
Number of WTGs	57
Array areas	95km^2
Distance to shore (closest distance)	40km
Offshore cable corridor length	57km
No. of offshore export cable circuits	2
Target minimum cable burial depth (where buried)	0.6m
Maximum WTG rotor diameter	337m
Maximum rotor tip height	377m above MHWS
Minimum clearance above sea level	27m above MHWS
Minimum separation between WTGs	5 x the rotor diameter in the downwind direction (i.e. 1180m for the smallest turbines with 236m rotor diameter or 1,685m for the largest turbines with 337m rotor diameter); and 4 x the rotor diameter in the cross wind direction (i.e. 944m for the smallest turbines with 236m rotor diameter or 1,348m for the largest turbines with 337m rotor diameter).
Maximum no. of OSP	2
Maximum estimated array/platform interconnector cable length	190km

1.2.4 Offshore construction

1.2.4.1 Seabed preparation

1.2.4.1.1 Pre-construction surveys

44. A pre-construction survey would be undertaken in advance of cable and foundation installation works. The results of this survey would be used to plan micrositing, where appropriate.

1.2.4.1.2 Unexploded Ordnance clearance

45. The pre-construction surveys will also be analysed to identify unexploded ordnance (UXO) which is required to be cleared prior to construction. For the purposes of assessment, an estimated 40 clearance operations are predicted based on engineering experience (15 in the array area and 25 in the offshore cable corridor). The maximum net explosive quantity of individual UXO in this region is predicted to be 750kg.

46. The UXO clearance procedure would be subject to additional marine licensing, to be progressed once the area in which UXO clearance activities are proposed and type of UXO are known.

1.2.4.1.3 Boulder clearance

47. Pre-construction surveys will identify any requirement for boulder clearance. An estimated 25 boulders in the array area (required for all grid connection options) and 15 boulders in the offshore cable corridor (Options 1 and 2 only), of up to 5m in diameter has been included in the assessments. Boulders would be relocated within the offshore project area, outside the foundation locations or route of the cable installation.

1.2.4.1.4 Pre-lay grapnel run

48. Before cable-laying operations commence, it would be necessary to ensure that the route is free from obstructions such as discarded trawling gear or abandoned cables identified as part of the pre-construction survey. A survey vessel would be used to clear all such identified debris, in a 'pre-lay grapnel run'.

49. The maximum width of seabed disturbance along the pre-grapnel run would be 24m per cable.

1.2.4.1.5 Sandwave levelling

50. Mobile sandwaves could result in exposure and scouring of the cable, or the cable being held in suspension over time. To prevent this, sandwave levelling may be undertaken to enable the cables to be buried into stable sediment beneath the sandwaves. In addition, some foundation options, in-particular GBS would require a level seabed prior to installation.

51. An interim cable burial study has been completed to inform the project design envelope, along with analysis of the predicted sandwave levelling. The maximum volume of sandwave levelling for the array cables and export cables is 28.7Mm^3 and 1.5Mm^3, respectively.

1.2.4.2 Pile driving

52. The maximum hammer energy used for pile installation would be 4,400kJ for pin piles and 6,000kJ for monopiles.

53. A soft start (gradual ramping up of hammer energy over consecutive blows) procedure, starting with a hammer energy of approximately 15% of the maximum energy for 10 minutes and then ramping up for a further 20 minutes for the 4,400kJ hammer or a further 2 hours for 6000kJ.

54. During the soft start, approximately 10 hammer blows per minute will be used and during ramp up this will increase to 20 blows per minute. Once the ramp up procedure is complete hammer blows would be a maximum of 34 per minute.

55. The average predicted time for installation of a monopile is 7.5 hours. For a pin pile the total piling duration would be 4.5 hours per pile and with up to 8 piles per jacket, the total piling duration would be 28 hours (not including breaks in between to move and set up the next pile).

56. There could be two piling operations occurring simultaneously. Within a 24 hour period, three monopiles could be installed or six pin-piles.

1.2.4.3 Offshore construction programme

57. The final design (e.g. number of WTGs, OCP, OSPs, cables, etc.) and supply chain will affect the construction programme, as well as weather conditions during construction.

58. Indicative programmes are provided below in Table 1.2. Offshore working hours during construction are anticipated to be 24/7.

Table 1.2 Indicative offshore construction programme

	Year 1 -3	Year 4			Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Substation installation	No offshore construction expected							
Substation commissioning								
Export cable installation								
Foundation installation								
Array cable installation								
Wind turbine installation								
Commissioning								

1.2.5 Offshore operation and maintenance

1.2.5.1 Operation

59. The operation and control of the wind farm would be managed by a Supervisory Control and Data Acquisition (SCADA) system, connecting each WTG to the onshore control room. The SCADA system would enable the remote control of individual WTGs, the wind farm in general, as well as remote interrogation, information transfer, storage and the shutdown or restart of any wind turbine if required.

1.2.5.2 Maintenance

60. All offshore infrastructure including WTGs, foundations, cables and offshore substations would be monitored and maintained during the operation and maintenance (O&M) period in order to maximise operational efficiency and safety for other sea users.

61. Typical maintenance activities would include:

- General scheduled service of wind farm components (e.g. WTG and Electrical Equipment);
- Unscheduled repair and maintenance of wind farm components (e.g. WTG and electrical equipment)
- Oil sampling / change;
- UPS (uninterruptible power supply) battery change;
- Service and inspections of WTG safety equipment, nacelle crane, service lift, high voltage system, blades;
- Cable burial inspection;
- Cable repair and replacement;
- Foundation inspection and repair; and
- Cable crossing inspection and repair.

1.2.5.2.1 Cable repairs

62. During the life of the project, there should be no need for scheduled repair or replacement of the subsea cables, however, reactive (unscheduled) repairs and periodic inspection may be required.

63. An estimated four repairs of the offshore export cables (applicable to Options 1 and 2 only) and five repairs of the array cables/platform interconnector cable, approximately, over the Project life is included in the EIA. It is assumed 600m length of cable would be removed and replaced in the event of a repair operation.

64. In most cases a failure would be repaired by taking out the damaged part of the cable, cutting the cable, inserting a joint, bringing a new segment of cable and jointing the new segment with the old cable.

65. The cable would be unburied using jetting (or removal of mattress/rock protection) and then once the repair is done the opposite (reinstalling the mattress/rock protection, jetting or other methods of cable burial or protection).

1.2.5.2.2 Cable reburial

66. Periodic surveys would be required to ensure the cables remain buried and if they do become exposed, re-burial works would be undertaken. An estimated 2.75% of the array and platform interconnector cable length and 4% of the offshore export cable length requiring reburial over the project life is included in the HRA.

1.2.5.2.3 WTG maintenance

67. The wind farm would be maintained from shore using a number of O&M vessels (e.g. crew transfer vessels), possibly supported by helicopters.

68. Although it is not anticipated that large components (e.g. WTG blades or substation transformers) would frequently require replacement during the operational phase, the failure of one of these components is possible. Should this be required, a jack-up vessel may need to operate for a number of months to carry out these major maintenance activities at the affected turbines.

1.2.6 Offshore decommissioning

69. Offshore decommissioning is likely to include the removal of all of the WTG and OSP components and cutting of foundations to below seabed level. Cables, cable protection and scour protection may be left *in situ*.

70. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the Regulator.

1.2.7 Landfall infrastructure

71. 'Landfall' refers to the area between the subtidal horizontal directional drilling (HDD) exit pit and the location at which the offshore export cables are brought ashore and connected to the onshore export cables. It also refers to the land within the onshore landfall compound, where temporary works to facilitate cable installation at the landfall will take place.

72. Landfall works will comprise the installation of buried cable housing, typically comprised of high-density polyethylene (HDPE) ducts, beneath the coastline to house the export cables, using HDD methodology. Temporary works to undertake the landfall HDD will take place within a temporary landfall compound, located landward of the coastline.

73. The offshore export cables are then pulled through the pre-installed ducts to transition joint bays located within the temporary landfall compound, where they are jointed to the onshore export cables. The HDD would exit in the subtidal zone.

1.2.7.1 Onshore cable route

74. Buried export cables will be constructed to connect the landfall to the Project's onshore substation, and on to the National Grid connection point. The onshore cables would be laid within HDPE ducts in up to 4 trenches (one duct per trench), within a temporary working width of 72 – 130m. Cables would be installed a minimum of 0.9m (from top of protection tiles to surface) below ground level, and cables would typically be 150mm in diameter (the duct being larger).

75. Cable installation works will comprise duct installation using a combination of 'open cut' trench excavation and trenchless techniques (e.g. HDD) at obstacle crossings. Once ducts are installed, cable pulling will be undertaken using the pre-installed ducts. Cables will be joined within joint bays located along the onshore cable route. Temporary works required to facilitate construction will include construction accesses, TCCs (up to 11) and trenchless crossing compounds.

1.2.7.2 Onshore substation

76. A new onshore substation will be constructed west of the village of Little Bromley, Tendring district. The new onshore substation will comprise the electrical equipment required to connect the Project to the National Grid, including electrical transformers, air insulated switchgear, control and storage buildings, and other ancillary equipment. The onshore substation will also include hard and soft landscaping, environmental mitigation, drainage, and access infrastructure.

77. The onshore substation is proposed to be located within the onshore substation works area (see Figure 1.1). Landscaping, environmental mitigation, drainage, and access infrastructure are also proposed to be located within this area.

1.2.7.3 Connection to the National Grid

78. The North Falls onshore substation will connect into the National Grid at the new NGET East Anglia Connection Node 400kV substation (herein 'EACN substation'), proposed to be constructed west of the village of Little Bromley in Tendring, Essex.

79. The EACN substation will be consented separately as part of the DCO for the Norwich to Tilbury Project. The works to construct the new EACN substation will be undertaken by NGET.

80. The North Falls DCO application will include works for the cable connection between the new North Falls onshore substation and the new National Grid substation, and some specific works to facilitate the connection within the National Grid substation, namely installation of switchgear, troughs and ducts for incoming 400kV cables, protection and control equipment (if required), and temporary infrastructure to facilitate construction of this electrical equipment.

81. An indicative location for the EACN substation has been identified by NGET within their Preliminary Environmental Information Report (PEIR). This location is set within a wider area subject to associated works including drainage, access and environmental mitigation. This area is shown as the hatched area illustrated on Figure 1.2. As the EACN substation location is indicative and the precise location of cabling works between the North Falls onshore substation and the EACN substation has not been determined, the works anywhere within full extent of the area has been considered within this assessment.

1.2.8 Summary of onshore parameters

Table 1.3 Worst case landfall parameters

Feature	Worst case Parameters
Maximum number of export circuits	2
Maximum number of transition joint bays	2

Feature	Worst case Parameters
Permanent land take for each transition joint bay (per bay)	4 x 15m
Landfall construction compound dimensions	150 x 75m
Proposed landfall installation method	HDD
Maximum number of HDDs	3
Maximum length of HDD	1,100m
Drill exit location	Subtidal exit in the subtidal zone c.1.5km from MLWS.
Maximum depth of HDD	20m

Table 1.4 Worst case onshore export cable parameters

Feature	Worst case Parameters
Both onshore grid connection options (Options 1 and 2)	
Electrical connection type	High Voltage Alternating Current (HVAC)
Maximum number of onshore circuits	Up to 2 circuits, typically comprising up to 3 power cables, 3 telecommunications cables and 1 earth cable in each circuit (up seven cables in total).
Estimated number of TCCs	Up to 11
TCC footprint	150 x 150m (main) 100 x 100m (satellite) 75 x 150 (trenchless crossing compounds)
Indicative external cable diameter	150mm
Proposed onshore cable route construction width	Up to 72m (open cut trenching) Up to 130m (trenchless installation (e.g. HDD))
Approximate onshore cable length	24km
Number of joint bays	96
Joint bay dimensions	4 x 15m
Estimated number of link boxes	Up to 96
Cable trench dimensions	3.75 x 2m (width x depth)
Minimum target cable burial depth	1.2m
Minimum cable burial depth (to top of protection tile)	0.9m
Typical minimum depth of trenchless crossings below watercourses (bed level)	3m
Maximum depth at trenchless crossings	20m
Haul road carriageway width - allowable within the cable swathe	6m
Haul road width passing places and drainage – allowable within the cable swathe	10m
Estimated distance between haul road passing places	500m
Replanting restrictions	Shrubs max 5m high within 6m of each cable centre.
Grid Connection Option 1 only	
Number of sets of cable ducts installed (and number of trenches excavated)	2

Feature	Worst case Parameters
Number of trenches for all cables	Up to 2
Number of joint bays	(Approximately every 500m) or up to 96
Grid Connection Option 2 only	
Number of sets of cable ducts installed (and number of trenches excavated)	4
Number of trenches for all cables	Up to 4
Number of joint bays	(Approximately every 500m) or up to 192

Table 1.5 Worst case onshore substation parameters

Feature	Worst case Parameters
Maximum onshore substation platform footprint	280 x 210m
Maximum external equipment height (lightning masts)	18m
Construction compound indicative dimensions (m)	150 x 250m
Component transport indicative max. height on loaded transporter (m)	5m
Substation infrastructure type	Air insulated switchgear (AIS)

1.2.9 Landfall export cable installation

82. Cable landfall works will comprise installation of HDPE cable ducts through the use of HDD from the landfall compound to the exit in the sub-tidal zone, therefore avoiding direct impacts to the intertidal zone. Cables will be pulled through ducts and cable transition joint bays will be installed to connect the onshore to the offshore export cables. Installation by HDD would require a fenced landfall compound of up to 75 x 150m to undertake the works, with space for up to two transition joint bays.

1.2.10 Onshore construction

83. Construction activities required to facilitate construction of the Project's onshore infrastructure include, at the landfall and route:

- top-soil stripping;
- construction access, temporary haul road, construction compound and construction drainage construction. Construction access works including proposed improvement works to Bentley Road, which include road-widening and provision of a temporary non-motorised user route;
- trenching works;
- duct installation;
- trench back-filling and reinstatement;
- trenchless crossing techniques (e.g. HDD);
- cable-pulling and cable jointing in situ; and

- Installation of cable link boxes.

84. And at the onshore substation:

- top-soil stripping;
- construction and operational access, temporary haul road and construction compound construction;
- earthworks to create a substation platform;
- piling (if required);
- concrete pouring (for the substation platform);
- installation of electrical equipment;
- installation of drainage infrastructure;
- reinstatement and soft landscaping;
- environmental mitigation.

85. The works will require a range of equipment, including dozers, generators, excavators, HDD rigs etc., predominantly delivered by Heavy Goods Vehicle (HGV) (with the exception of electrical transformers, which are likely to constitute Abnormal Loads) using the local road network.

1.2.10.1 Onshore construction programme

86. Onshore construction is expected to commence around 2027 at the earliest, with the aim of being operational by 2030. Onshore construction works are expected to be undertaken 0700 - 1900 Monday – Saturday[2] (no activity Sundays or bank holidays), however 24 hour working may be required during drilling works at major trenchless crossing locations (e.g. landfall, crossings of major transport infrastructure).

87. The following approximate durations for different activities have been defined at this stage:

- Landfall: 13 months (of which HDD will take place over 6 months);
- Onshore cable corridor(s): 18 – 27 months (of which cable installation will take place over 12 months; Major HDD (each location) will take place over 8 months (of which HDD = 4 months); Minor HDD crossings will take place 2 months);
- Onshore substation: 21 – 27 months construction.

1.2.11 Onshore operation and maintenance

88. During the operational period, the onshore substation would not be manned, however access would be required periodically for routine maintenance

[2] NB: between 1300 – 1900 on Saturdays certain 'high impact' activities will be restricted. These will be specified in the Code of Construction Practice (CoCP) (the outline version of which is submitted with the DCO Application (Document Reference: 7.13)).

activities. Normal operating conditions would not require lighting at the onshore substation, although low level movement detecting security lighting may be utilised for health and safety purposes. Temporary lighting during working hours would be provided during maintenance activities only.

89. There is no ongoing requirement for regular maintenance of the onshore cables following installation, however access to the onshore cables would be required to conduct emergency repairs, if necessary.

1.2.12 Onshore decommissioning

90. No decision has been made regarding the final decommissioning policy for the onshore cables and substation, as it is recognised that industry best practice, rules and legislation change over time. Onshore decommissioning is likely to include the removal of all of the onshore substation equipment, and landscaping and reinstatement of the site. It is likely the cables would be removed from the ducts and recycled, with the transition pits and ducts capped and sealed then left *in situ*.

91. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator.

NORTH FALLS

Offshore Wind Farm

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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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