RWE Renewables UK Dogger Bank South (West) Limited

RWE Renewables UK Dogger Bank South (East) Limited

Dogger Bank South Offshore Wind Farms

Design and Access Statement

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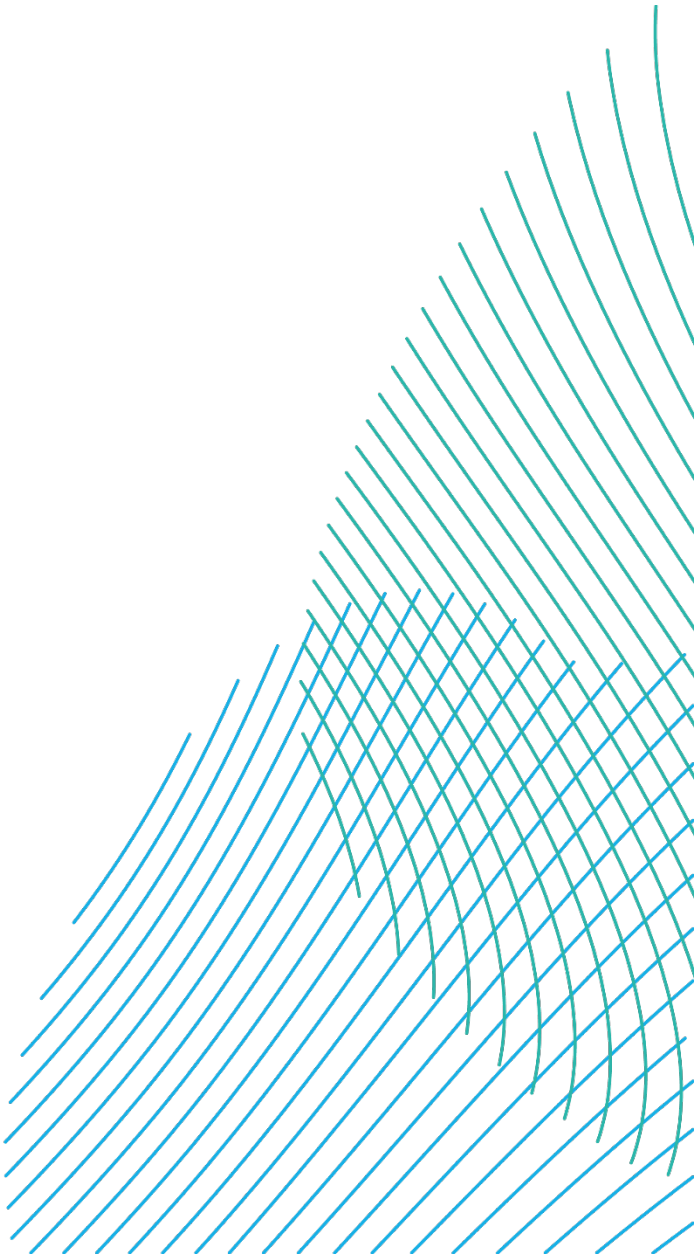

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Contents

Plates

Tables

Glossary

Term	Definition
Commitments Register	An Excel spreadsheet which identifies all of the Projects commitments and mitigation relating to each technical topic under consideration in the EIA process and where each commitment is secured in the DCO.
Concurrent Scenario	A potential construction scenario for the Projects where DBS East and DBS West are both constructed at the same time.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Project (NSIP).
Development Scenario	Description of how the DBS East and / or DBS West Projects would be constructed either in isolation, sequentially or concurrently.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	A document reporting the findings of the EIA and produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Habitats Regulations Assessment (HRA)	The process that determines whether or not a plan or project may have an adverse effect on the integrity of a European Site or European Offshore Marine Site.
Haul Road	The track along the Onshore Export Cable Corridor used by traffic to access different sections of the onshore export cable route for construction.

Term	Definition
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current (HVDC)	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
Horizontal Directional Drilling (HDD)	HDD is a trenchless technique to bring the offshore cables ashore at the landfall and can be used for crossing other obstacles such as roads, railways and watercourses onshore.
In Isolation Scenario	A potential construction scenario for one Project which includes either the DBS East or DBS West array, associated offshore and onshore cabling and only the eastern Onshore Converter Station within the Onshore Substation Zone and only the northern route of the onward cable route to the proposed Birkhill Wood National Grid Substation.
Jointing Bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point on the coastline at which the Offshore Export Cables are brought onshore, connecting to the onshore cables at the Transition Joint Bay (TJB) above mean high water.
Landfall Zone	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) and the Transition Joint Bays (TJBs) inclusive of all construction works, including the landfall compounds, Onshore Export Cable Corridor and intertidal working area including the Offshore Export Cables.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.

Term	Definition
National Policy Statement (NPS)	A document setting out national policy against which proposals for NSIPs will be assessed and decided upon.
Nationally Significant Infrastructure Project (NSIP)	Large scale development including power generating stations which requires development consent under the Planning Act 2008. An offshore wind farm project with a capacity of more than 100 MW constitutes an NSIP.
Offshore Development Area	The Offshore Development Area for ES encompasses both the DBS East and West Array Areas, the Inter-Platform Cable Corridor, the Offshore Export Cable Corridor, plus the associated Construction Buffer Zones.
Offshore Export Cable Corridor	This is the area which will contain the offshore export cables (and potentially the ESP) between the Offshore Converter Platforms and Transition Joint Bays at the landfall.
Offshore Export Cables	The cables which would bring electricity from the offshore platforms to the Transition Joint Bays (TJBs).
Onshore Converter Stations	A compound containing electrical equipment required to transform HVDC and stabilise electricity generated by the Projects so that it can be connected to the electricity transmission network as HVAC. There will be one Onshore Converter Station for each Project.
Onshore Development Area	The Onshore Development Area for ES is the boundary within which all onshore infrastructure required for the Projects would be located including Landfall Zone, Onshore Export Cable Corridor, accesses, Temporary Construction Compounds and Onshore Converter Stations.
Onshore Export Cable Corridor	This is the area which includes cable trenches, haul roads, spoil storage areas, and limits of deviation for micro-siting. For assessment purposes, the cable corridor does not include the Onshore Converter Stations, Transition Joint Bays or temporary access routes; but includes Temporary Construction Compounds (purely for the cable route).

Term	Definition
Onshore Export Cables	Onshore Export Cables take the electric from the Transition Joint Bay to the Onshore Converter Stations.
Onshore Grid Connection Points	The Onshore Grid Connection Points is the location where the electricity produced by the Projects would be transferred to the national grid. There are two Onshore Grid Connection Points, one for each Project, which will be located in the same place.
Onshore Substation Zone	Parcel of land within the Onshore Development Area where the Onshore Converter Station infrastructure (including the haul roads, Temporary Construction Compounds and associated cable routeing) would be located.
Other trenchless techniques	Other techniques (aside from HDD) for installation of ducts or cables where trenching may not be suitable such as micro tunnelling or auger boring.
Preliminary Environmental Information Report (PEIR)	Defined in the EIA Regulations as information referred to in part 1, Schedule 4 (information for inclusion in environmental statements) which has been compiled by the applicants and is reasonably required to assess the environmental effects of the development.
Sequential Scenario	A potential construction scenario for the Projects where DBS East and DBS West are constructed with a lag between the commencement of construction activities. Either Project could be built first.
Temporary Construction Compound	An area set aside to facilitate construction of the Projects. These will be located adjacent to the Onshore Export Cable Corridor and within the Onshore Substation Zone, with access to the highway.
The Applicants	The Applicants for the Projects are RWE Renewables UK Dogger Bank South (East) Limited and RWE Renewables UK Dogger Bank South (West) Limited. The Applicants are themselves jointly owned by the RWE Group of companies (51% stake) and Masdar (49% stake).

Term	Definition
The Projects	DBS East and DBS West (collectively referred to as the Dogger Bank South Offshore Wind Farms).
Transition Joint Bay (TJB)	The Transition Joint Bay (TJB) is an underground structure at the landfall that houses the joint between the offshore export cables and the onshore export cables.
Trenching	Open cut method for cable or duct installation.

Acronyms

Term	Definition
AONB	Area of Outstanding Natural Beauty
BEIS	Department for Business, Energy and Industrial Strategy, now succeeded by the Department for Energy Security and Net Zero
BNG	Biodiversity Net Gain
DBS	Dogger Bank South
DC	Direct Current
DCO	Development Consent Order
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
GIS	Gas Insulated Switchgear
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (Landscape Institute and Institute of Environmental Management and Assessment, 2013)
GW	Gigawatt
HDD	Horizontal Directional Drill
HND	Holistic Network Design
HV	High Voltage
HVAC	High Voltage Alternative Current
HVDC	High Voltage Direct Current
IEMA	Institute of Environmental Management and Assessment

Term	Definition
ILA	Important Landscape Area
LCA	Landscape Character Area
LCT	Landscape Character Type
LMP	Lighting Management Plan
LVIA	Landscape and Visual Impact Assessment
MW	Megawatt
NCA	National Character Area
NCN	National Cycle Network
NE	Natural England
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NTS	Non-Technical Summary
OCoCP	Outline Code of Construction Practice
OCP	Offshore Converter Platform
OCTMP	Outline Construction Traffic Management Plan
OECC	Offshore Export Cable Corridor
OLEMP	Outline Landscape and Environment Management Plan
OS	Ordnance Survey
OSP	Offshore Substation Platform
PEI	Preliminary Environmental Information

Term	Definition
PEIR	Preliminary Environmental Information Report
PRoW	Public Rights of Way
RHDHV	Royal HaskoningDHV
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
TCC	Temporary Construction Compound
TCE	The Crown Estate
TJB	Transition Joint Bay
TS	Transport Statement
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility

1 Design and Access Statement

1.1 Introduction

1. LUC has been commissioned by RWE Renewables UK Dogger Bank South (West) Limited and RWE Renewables UK Dogger Bank South (East) Limited to prepare a Design and Access Statement (DAS). The report has been prepared to support the Development Consent Order (DCO) application for the Dogger Bank South Offshore Wind Farms (hereafter referred to as the Projects).

1.2 Purpose of Document

2. The DAS sets out a series of design principles that will be applied to the detailed design of the Projects and explains how the Onshore elements have developed and will achieve good design, reflecting guidance and policy including the National Infrastructure Commission's Design Principles for National Infrastructure, and the National Policy Statements (NPS) for Energy (EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and the NPS for Electricity Networks Infrastructure (EN-5). These were published in November 2023 and were designated in January 2024.

3. Key design principles within the DAS include coordinating development, avoiding sensitive features and landscape restoration. Implementing the various design principles will ensure that a sense of place is considered and integrated throughout the design process and adverse environmental effects are mitigated where possible whilst respecting landscape character.

4. The DAS addresses the Onshore Development Area of the Projects, which includes the Landfall, Onshore Export Cable Corridor and Substation Zone. Offshore has been scoped out of the DAS as the array would not be visible from the shore. The DAS also focuses primarily on the operational phase of the Projects considering how design and embedded mitigation measures have influenced the route selection and good design of the Landfall, Onshore Export Cable Corridor and the Substation Zone. Elements of the construction have been referenced where the chosen construction technique supports the design and embedded mitigation of the Onshore Development Area. The construction and operational phases are described in more detail in **Volume 7, Chapter 5 - Project Description (application ref: 7.5)** and the **Outline Code of Construction Practice (OCoCP) (Volume 8, application ref: 8.9)**.

5. The proposals within the DAS are supported by the wide range of technical documents that have been created as part of the DCO application. These documents include:

- **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4)**;
- **Volume 7, Chapter 5 Project Description (application ref: 7.5)**;
- **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**;
- **Volume 7, Chapter 20 Flood Risk and Hydrology (application ref: 7.20)**;
- **Volume 7, Chapter 22 Onshore Archaeology and Cultural Heritage (application ref: 7.22)**;
- **Volume 7, Chapter 23 Landscape and Visual Impact Assessment (application ref: 7.23**);
- **Outline Landscape Management Plan (Volume 8, application ref: 8.11**);
- **Commitments Register (Volume 8, application ref: 8.6)**; and
- **Draft Development consent Order (DCO) (Volume 3, application ref: 3.1)**.

6. The DAS will refence these documents and use them as an evidence base to ensure all proposed design decisions for the Projects including the Onshore Converter Stations are well considered.

7. This document also highlights the important role played by consultation and the way in which it has influenced the indicative layout and design of the Projects.

8. This DAS demonstrates how the Projects will fulfil the requirement for good design as set out within the Overarching NPS for Energy ('NPS EN-1', 2024). It explains the design evolution of the onshore elements of the Projects to date and the considerations that will inform the detailed design in a clear and structured way.

1.3 Delivering Good Design

1.3.1 What is Good Design

9. Good design provides a wide variety of benefits when delivering a project:

- Solves problems through innovative ideas;
- Enhances existing conditions and improves visual quality;
- Mitigates potential impacts; and
- Creates long lasting and efficient infrastructure.

10. Delivering good design will ensure that the Projects are:

- Functional;
- Unobtrusive; and
- Robust.

1.3.2 Sustainable Design

11. The Applicants are aiming to strike a balance between commercial, engineering, environmental and social considerations in the development of the Projects to achieve a sustainable design. The Environmental Statement (ES) provides more detail about the assessments and surveys which have been undertaken to identify any potential environmental, social and economic effects, and the measures proposed to mitigate them.

12. One of the principal purposes of the Projects is to make a contribution to mitigating climate change by generating renewable electricity, therefore helping decarbonise the United Kingdom's (UK) grid. The design lifetime of the Projects is expected to be 32 years and will represent a significant contribution towards the UK's net zero targets over the majority of the lifetime of the Projects.

13. Projects will be designed in accordance with the Applicants' technical requirements and specifications, which are based on industry-leading engineering codes and standards in the offshore wind sector. The design will prioritise resilience against hazards posed by existing extreme weather events and climate conditions. Additionally, where relevant, the design will incorporate adaptations to address future impacts of climate change.

14. The Applicants are committed to adopting a circularity framework which has three core circular principles, namely:

- Reducing consumption & increasing inflow of circular materials;
- Enhancing material (re)use and lifetime; and
- Minimising end-of-life treatment.

15. The construction, operation and decommissioning of the Projects, will create Green House Gas Emissions (GHG), but there are also carbon benefits of the Projects which results in the Projects being carbon positive. Repowering may be considered at or near the end of the design life, once all scenarios for maintenance and repair are carried out. Repowering would be subject to a separate application.

16. Project-level GHG mitigation is being incorporated into the design development process for the Projects wherever it is practicable to do so. At each stage of the design, steps will be taken to determine the climate change impact of the offshore wind farms, providing a better understanding of which measures will be effective in reducing it. Through this process the Projects will reduce GHG emissions associated with the offshore foundation structures, which will be optimised with the aim of minimising steel mass. The Applicants would also seek to adopt recent advances in technology where possible on the Projects, such as the use of recycled materials in wind turbines.

17. The Applicants have undertaken a detailed GHG Assessment outlined in **Volume 7, Chapter 30 Climate Change (application ref: 7.30)** that provides a quantified assessment of greenhouse gas emissions over the lifetime of the Projects. The assessment considered emissions from the extraction and manufacture of materials, marine vessel and road traffic movements, and the use of plant and equipment.

18. Whilst the Projects will produce some GHG emissions, mainly during the construction phase, overall, the GHG assessment calculated the potential for the avoided emissions by replacing electricity that would have been generated from natural gas. Avoided emissions were estimated to be approximately 91 million and 183 million tonnes for the In Isolation and Sequential Scenarios respectively, resulting in a beneficial effect.

1.3.3 Consultation

19. Undertaking consultation is another core part of achieving good design. This ensures that stakeholder opinions have been heard and independent professionals can provide advice on a variety of topics.

20. The Applicants have conducted a comprehensive and transparent pre-application consultation in relation to the EIA process, with a wide range of stakeholders and Expert Topic Group (ETG) consultees.

21. An overview of the consultation process can be found in **Volume 7, Chapter 7 Consultation (application ref: 7.7)**. A summary of technical consultation responses and their consideration by the Projects where relevant are given in each technical chapter of the ES.

22. Consultation feedback has informed site selection and design. A summary of the key design decisions is included in section 4.4 of **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4)**. This is also outlined in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**.

1.3.4 Summary of Design Decisions

23. A summary of the most salient design decisions that have been made by the Applicants relating to the Onshore works are summarised below:

- Site selection that avoids areas with substantial infrastructure, identified in local plans for housing, existing built up areas, including residential areas, coastal defences, recreation spaces, other energy infrastructure;
- Site selection that minimises ecological impacts and avoids disturbances to mature and historic woodlands, significant hedgerows and internationally and nationally designated areas, where possible;
- Landfall Zone selected to avoid areas with a cliff height over 20m and impacts on the Withow Gap SSSI and Holderness Inshore Marine Conservation Area;
- Undergrounded Onshore Cables to reduce above ground infrastructure;
- Ensuring the cable route is as straight and as short as practicable – avoiding tight bends;
- Coordinating the development of the Projects through utilising one Cable Corridor and sharing a Haul Road during construction;
- Implemented trenchless crossings to avoid disturbance to sensitive locations and transport networks;
- Reduced working widths along the Onshore Export Cable Corridor following selection of HVDC electrical transmission technology;
- Committing to reinstating the majority of land between Jointing Bays within two years;
- Co-locating two Onshore Converter Stations within the same Zone to keep infrastructure together and reduce the overall visual impacts;
- Restoring landscape and vegetation within the Onshore Development Area, where possible; and
- Provide on-site and off-site measures to deliver no net loss and net gain, where possible.

24. The siting, design and refinement of the Projects' offshore and onshore infrastructure has followed a detailed site selection process, taking into account environmental, physical, technical, commercial and social considerations and opportunities, as well as engineering requirements. The aim was to identify locations that would be environmentally acceptable, deliverable and consentable, whilst also being economic and efficient.

Plate 1-1 Overview of the DBS site selection process

1.4 Project Overview

25. A description of the key components of the Projects and details of how they will be constructed, operated, maintained and decommissioned is provided in **Volume 7, Chapter 5 Project Description (application ref: 7.5).**

26. The Projects comprise two separate Nationally Significant Infrastructure Projects (NSIPs), DBS East and DBS West. When operational, DBS East and DBS West combined would have the potential to generate renewable power for up to 3 million UK homes. Between 113 to 200 wind turbines would be installed across both Projects.

Plate 1-2 Onshore and Offshore development areas

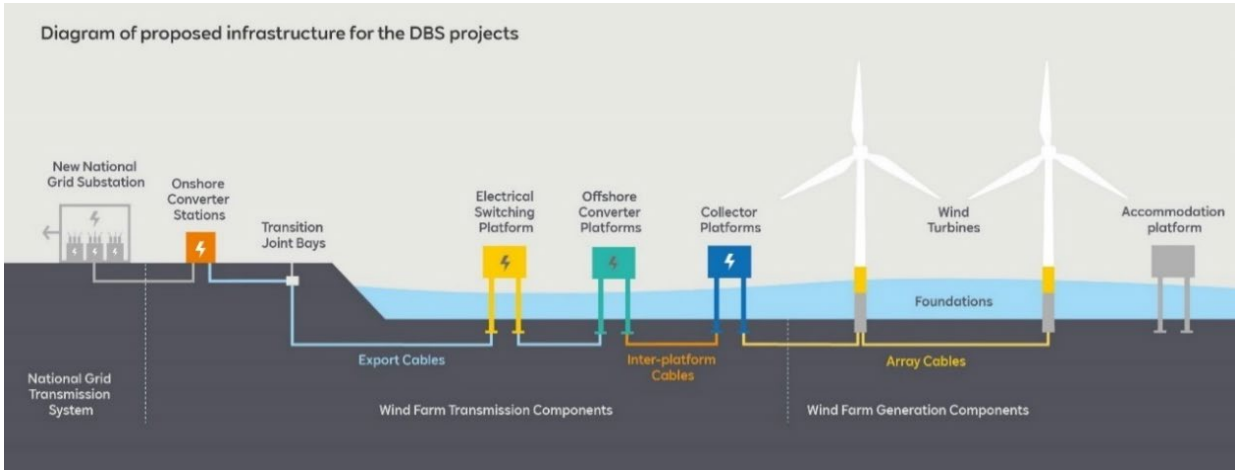
27. The DBS West and DBS East Array Areas are located in a shallow offshore area of the North Sea known as Dogger Bank, situated at a minimum of 100km and 122km from the northeast coast of England, respectively.

28. The proposed Onshore Export Cables as shown in , will make Landfall on the East Riding of Yorkshire coastline near Skipsea. The Onshore Export Cable Corridor will then run to the two newly constructed Onshore Converter Stations, near the hamlet of Bentley to the south of Beverley, before routeing to a proposed new Birkhill Wood National Grid substation (hereafter referred to as the National Grid Substation) near Creyke Beck Substation.

29. The main onshore components of the Projects as shown in **Plate 1-3**, will include:

- Landfall and associated Transition Joint Bays (TJBs) which are used to connect the onshore and offshore cables at the landfall, located within the Landfall Zone;
- Onshore Export Cables installed underground from TJBs at the landfall to the Projects' Onshore Converter Stations, located in the Substation Zone;
- Onward 400 kilovolt (kV) connection to the National Grid Substation; and
- Onshore Converter Stations (up to two).

Plate 1-3 DBS East and DBS West Overview Schematic (N.B. Not to Scale)



30. The proposals outlined in this DAS are indicative, but they are based on the maximum parameters which would occur as a result of the maximum land take, longest durations of operation and maximum height / size of development.

31. Responding to the maximum parameters ensures that the delivered Projects will provide good design, mitigation and enhancements where possible.

1.4.1 Project Development Scenarios

32. As set out in **Volume 7, Chapter 5 Project Description (application ref: 7.5)**, a single DCO application is being made for both Projects to provide for consistency in the approach to the assessment, consultation and examination. Therefore, the DCO application seeks to consent a range of development scenarios. These include:

- In Isolation - where only DBS East or DBS West is constructed;
- Sequential – where DBS East or DBS West are both constructed in a phased approach with either DBS East or DBS West being constructed first; or
- Concurrent – where DBS East and DBS West are both constructed at the same time.

33. If the Projects are built out using a phased approach, there would also be a phased approach to starting the operational stage. The operational lifetime of the Projects is expected to be 32 years.

34. Whilst DBS East and DBS West are the subject of a single DCO application (with a combined Environmental Impact Assessment (EIA) process and associated submissions), the assessments consider both Projects being developed in isolation, sequentially and concurrently, so that mitigation is specific to each development scenario.

35. As discussed in section 1.3.4, during concurrent and sequential development scenarios there will be a number of design considerations and collaborations during the development of the two Projects to deliver good and sustainable design in an efficient way. These include optimising construction logistics, sharing temporary works and Temporary Construction Compounds. This will reduce the overall environmental impact and any potential disruption to local communities.

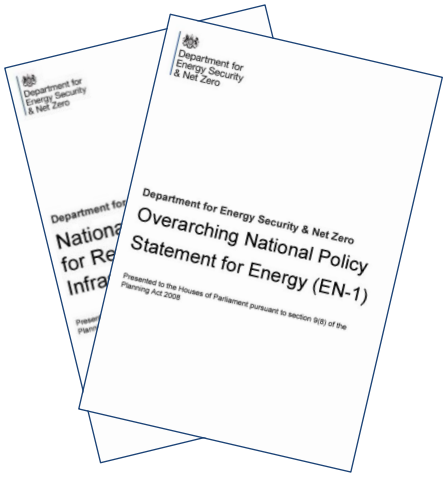
2 Guidance and Policies

2.1 National Policies and Guidance

2.1.1 National Policy Statements for Energy Infrastructure (NPS, 2024)

2.1.1.1 Overarching NPS for Energy, EN-1 (2024)

36. Section 4.7 of EN-1 identifies the criteria for 'Good Design' for energy infrastructure. The key policy requirements and considerations have been summarised and include:



- *'The visual appearance of a building, structure, or piece of infrastructure, and how it relates to the landscape it sits within, is sometimes considered to be the most important factor in good design. But high quality and inclusive design goes far beyond aesthetic considerations. The functionality of an object – be it a building or other type of infrastructure – including fitness for purpose and sustainability, is equally important'.*
- *'Applying good design to energy projects should produce sustainable infrastructure sensitive to place, including impacts on heritage, efficient in the use of natural resources, including land-use, and energy used in their construction and operation, matched by an appearance that demonstrates good aesthetic as far as possible. It is acknowledged, however that the nature of energy infrastructure development will often limit the extent to which it can contribute to the enhancement of the quality of the area'.*
- *'Whilst the applicant may not have any or very limited choice in the physical appearance of some energy infrastructure, there may be opportunities for the applicant to demonstrate good design in terms of siting relative to existing landscape character, land form and vegetation'.*
- *'Given the benefits of good design in mitigating the adverse impacts of a project, applicants should consider how good design can be applied to a project during the early stages of the project lifecycle'.*
- *'Design principles should be established from the outset of the project to guide the development from conception to operation. Applicants should consider how their design principles can be applied post-consent'.*

- *'To ensure good design is embedded within the project development, a project board level design champion could be appointed, and a representative design panel used to maximise the value provided by the infrastructure'.*
- *'Applicants should also, so far as is possible, seek to embed opportunities for nature inclusive design within the design process'.*
- *'Applicants must demonstrate in their application documents how the design process was conducted and how the proposed design evolved. Where a number of different designs were considered, applicants should set out the reasons why the favoured choice has been selected'.*
- *'Applicants should also consider taking independent professional advice on the design. In particular, the Design Council can be asked to provide design review for nationally significant infrastructure projects'.*
- *'In the light of the above and given the importance which the Planning Act 2008 places on good design and sustainability, the Secretary of State needs to be satisfied that energy infrastructure developments are sustainable and, having regard to regulatory and other constraints, are as attractive, durable, and adaptable (including taking account of natural hazards such as flooding) as they can be'.*
- *'In doing so, the Secretary of State should be satisfied that the applicant has considered both functionality (including fitness for purpose and sustainability) and aesthetics (including its contribution to the quality of the area in which it would be located, any potential amenity benefits, and visual impacts on the landscape or seascape) as far as possible'.*

2.1.1.2 NPS for Renewable Energy Infrastructure, EN-3 (2024)

37. Section 3.5 outlines some of the considerations of good design for energy infrastructure. Paragraph 3.5.2 states '*Proposals for renewable energy infrastructure should demonstrate good design, particularly in respect of landscape and visual amenity, opportunities for co-existence/co-location with other marine uses, and in the design of the project to mitigate impacts such as noise and effects on ecology and heritage.*'

38. Paragraphs 3.7.61 also states '*Good design that is sympathetic and contributes positively to the landscape character and quality of the area will go some way to mitigate adverse landscape and visual effects.*'

2.1.1.3 NPS for Electricity Networks Infrastructure, EN-5 (2024)

39. Paragraph 2.4.3 acknowledges that '*electricity networks infrastructure must in the first instance be safe and secure, and that the functional design constraints of safety and security may limit an applicant's ability to influence the aesthetic appearance of that infrastructure*'. As such good design opportunities for such infrastructure should be maximised (including through avoiding/mitigating potential adverse impacts) these should not threaten the functional performance of the infrastructure in respect of security of supply and public and occupational safety.

40. The following table outlines how the NPS requirements have been responded to in the DAS.

Table 2-1 NPS Assessment Requirements

NPS Requirement	NPS Reference	ES Response
EN-1 NPS for Energy (2024)		
Section 4.7 sets out criteria for good design for energy infrastructure. It notes that the visual appearance of energy infrastructure and how it relates to the landscape is often considered to be the most importance factor in good design.	Paragraph 4.7.1 of NPS EN-1	The **DAS (Volume 8, application ref: 8.8)** sets out principles for good design and provides examples for how this will be applied to all elements of the Projects, and what the outcomes of this design process may look like.
The Secretary of State should consider whether the project has been designed carefully, taking account of environmental effects on the landscape and siting, operational and other relevant constraints, to minimise harm to the landscape, including by appropriate mitigation.	Paragraph 5.10.37 of NPS EN-1	The **DAS (Volume 8, application ref: 8.8)** outlines the various site selection optioneering, mitigation measures and other design principles that have been considered to ensure the project minimises any adverse effects.
The Secretary of State would have to judge whether the visual effects on sensitive	Paragraph 5.10.14 of NPS EN-1	Section 4 of the **DAS (Volume 8, application ref: 8.8)** considers various design principles and considerations

NPS Requirement	NPS Reference	ES Response
receptors, such as local residents, and other receptors, such as visitors to the local area, outweigh the benefits of the project.		that can be addressed to mitigate the visual impact of the Projects.
The Secretary of State should consider the benefits of the landscape and visual mitigation against the functionality of the project.	Paragraph 5.10.26 of NPS EN-1	Section 4 of the **DAS (Volume 8, application ref: 8.8)** has outlined the various design principles and considerations that will be addressed to mitigate the visual impact of the Projects.
Adverse landscape and visual effects may be minimised through appropriate siting of infrastructure within its development site and wider setting. The careful consideration of colours and materials would support the delivery of a well-designed scheme, as would sympathetic landscaping and management of its immediate surroundings.	Paragraph 5.10.27 of NPS EN-1	Section 3 and Section 4 of the **DAS (Volume 8, application ref: 8.8)** outline the various site selection and optioneering considerations for Landfall, Onshore Export Cable Corridor and Onshore Converter Stations. Sections 4.3.3.2, 4.3.3.3 and 4.3.3.4 of the **DAS (Volume 8, application ref: 8.8)** consider from the ways in which form, colour and materials can be utilised to mitigate the visual impact of the Projects.
The assessment should also address the landscape and visual effects of noise and light pollution, and other emissions, from construction and operational activities on residential amenity and on sensitive locations, receptors and views, how these would be minimised.	Paragraph 5.10.22 of NPS EN-1	Sections 4.3.3.7 and 4.3.3.12 of the **DAS (Volume 8, application ref: 8.8)** consider the impacts and mitigation measure of light and noise pollution.
EN-3 NPS for Renewable Energy Infrastructure (2024)		

NPS Requirement	NPS Reference	ES Response
Proposals for renewable energy infrastructure should demonstrate good design, particularly in respect of landscape and visual amenity, opportunities for co-existence/co-location with other marine and terrestrial uses, and in the design of the project to mitigate impacts such as noise and effects on ecology and heritage.	Paragraph 2.5.2 of NPS EN-3	Section 3 and Section 4 of the **DAS (Volume 8, application ref: 8.8)** outline the various site selection and optioneering considerations for Landfall, Onshore Export Cable Corridor and Onshore Converter Stations.
Good design that is sympathetic and contributes positively to the landscape character and quality of the area will go some way to mitigate adverse landscape and visual effects.	Paragraph 2.7.60 of NPS EN-3	Section 3 and Section 4 of the **DAS (Volume 8, application ref: 8.8)** outlines the various site selection and optioneering considerations for Landfall, Onshore Export Cable Corridor and Onshore Converter Stations. Section 4 of the **DAS (Volume 8, application ref: 8.8)** considers various design principles and considerations that can be addressed to mitigate the visual impact of the Projects.
EN-5 NPS for Electricity Networks Infrastructure (2024)		
Electricity networks infrastructure must in the first instance be safe and secure, and that the functional design constraints of safety and security may limit an applicant's ability to influence the aesthetic appearance of that infrastructure.	Paragraph 2.4.3 of NPS EN-5	Sections 4.3.3.1 and 4.3.3.2 cover the likely function, layout and built form of the Onshore Convertor Stations. Sections 4.3.3.6 and 4.3.3.10 consider the site access and boundary treatments to ensure safety, security and also a sympathetic aesthetic.

2.1.2 National Infrastructure Commissions Design Principles for National Infrastructure (NIC, 2020)

41. The most prominent guidance document is the National Infrastructure Commission's (NIC) Design Principles for National Infrastructure, 2020. The NIC outlines four key design principles, that should be key considerations throughout the design process of any large infrastructure project to shape a positive future for design in the UK. These are:

- **Climate**: Mitigate greenhouse gas emissions and adapt to climate change;
- **People**: Reflect what society wants and share benefits widely;
- **Places**: Provide a sense of identity and improve our environment; and
- **Value**: Achieve multiple benefits and solve problems well.

Plate 2-1 NIC key design principles

2.1.3 IEMA Environmental Impact Assessment Guide to Delivering Quality Development (IEMA, 2016)

42. This guide advises on the delivery of mitigation associated with new development, so that efforts at the design and pre-application stage to develop mitigation are realised at the implementation and management stages. The guide outlines three key principles, which include:

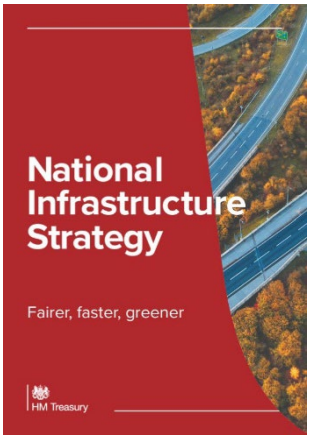
- ***Principle 1*** *- Pro-active collaboration with stakeholders, both internally within the project team and externally.*
- ***Principle 2*** *- Present mitigation in a manner that generates buy-in and helps ensures transfer to mechanisms for delivery.*
- ***Principle 3*** *- Establish* an effective change management process to ensure that mitigation set out in the initial consenting documentation is kept relevant.

43. The guide also states that the design and incorporation of mitigation measures should be an iterative process, continuing beyond the pre-application process.

2.1.4 National Infrastructure Strategy (NIS, 2020)

44. The National Infrastructure Strategy sets out guidance for the delivery, design and funding of infrastructure projects. The NIS '*sets out the government's plans to transform its approach to infrastructure policy and delivery, to meet both the short- and long-term challenges facing the UK*'.

45. The NIS sets out three methods for embedding good design that reflect the NIC design principles. These are:



- Local plans which set clear rules rather than general policies for development, so that quality cannot be negotiated away, nor can the lived experience of the consumer be ignored too readily;
- A reformed planning system which brings forward a new focus on design and sustainability in national policy and practice, building on the National Design Guide; and
- Requiring all infrastructure projects to have a board level design champion in place by the end of 2021 at either the project, programme or organisational level, supported where appropriate by design panels.

2.1.5 National Planning Policy Framework (NPPF, Ministry of Housing, Communities and Local Government, 2023)

46. The NPPF states, in paragraph 180, that '*Planning policies and decisions should contribute to and enhance the natural and local environment … by protecting and enhancing valued landscapes … recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services … minimising impacts on and providing net gains for biodiversity*'.

2.2 Local Policies and Guidance

2.2.1 The East Riding of Yorkshire Local Plan 2012-2029: Strategy Document (East Riding of Yorkshire Council, 2016)

47. This document sets out the overall strategic direction for the Local Plan and provides strategic policies to guide decisions on planning applications. The policy relevant to the DAS is Policy ENV2: Promoting a high-quality landscape.

48. The Draft East Riding Local Plan Update 2020-2039 (East Riding of Yorkshire Council, 2021) updates the existing Local Plan to reflect changes in the NPPF. To ensure consistency with the NPPF, Policy ENV2: Promoting a high quality landscape has been amended to ensure that proposals are compatible with the landscape character of an area.

49. This revised policy states: '*Development proposals should be sensitively integrated into the existing landscape, demonstrate an understanding of the intrinsic qualities of the landscape setting and, where possible, seek to make the most of the opportunities to protect and enhance landscape characteristics and features. To achieve this, development should:*

- *Protect and enhance views across valued landscape features including flood meadows, chalk grassland, lowland heath, mudflats and salt marsh, sand dunes and chalk cliffs;*
- *Protect and enhance the undeveloped coast; and*
- *Proposals should protect and enhance existing landscape character in the East Riding Landscape Character*'.

2.2.2 East Riding Design Code (ERDC, 2023)

50. The ERDC has been created to cover a wide range of development typologies. It seeks to inform best design practices to improve the quality of new developments.

51. The first relevant typology is the countryside. The ERDC states that '*The countryside and its rural hamlets are distinctive features of the East Riding. Their working landscape and agricultural context create a sense of pride and indicate productivity and prosperity*'.

52. Aspirations for countryside developments include:

- *Any new building or group will be well integrated into the wider landscape setting;*
- *A development scale that reflects the context and does not detract from views across the countryside; and*

- *Retention and enhancement of existing landscape and natural assets.*

53. The second relevant typology is business, non-central retail and industrial. The ERDC states that '*business, non-central retail and industrial are most often contained within the countryside or settlement fringes … The countryside setting is a significant characteristic, benefiting from a rural landscape and creating links with agricultural history*'.

54. Aspirations for business, non-central retail and industrial developments include:

- *Sustainably located;*
- *Of a scale and materiality that is appropriate to its context;*
- *High quality hard and soft landscape environment with significant boundary planting;*
- *Biodiversity within the landscape environment through the selection of native species, integration of SuDS and creation of diverse habitats; and*
- *Integration of renewable energy solutions.*

3 Site Context

55. The Onshore Development Area includes the Landfall Zone, Onshore Export Cable Corridor and Onshore Converter Stations, which are located in the Substation Zone. The Onshore Cable will pass through all of these zones before connecting to the Proposed Birkhill Wood National Grid Substation.

56. An extensive review of the wider site context of the Onshore Development Area, including topics such as landscape, flood risks, terrestrial ecology and ornithology and the historic environments, was undertaken to provide an evidence base for the Onshore site selection. This was reviewed over a number of stages as the Onshore Development Area sought to avoid settlements, sensitive habitats, historically significant sites and has taken into account other technical and environmental constraints. Further information of the process can be found in **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4).**

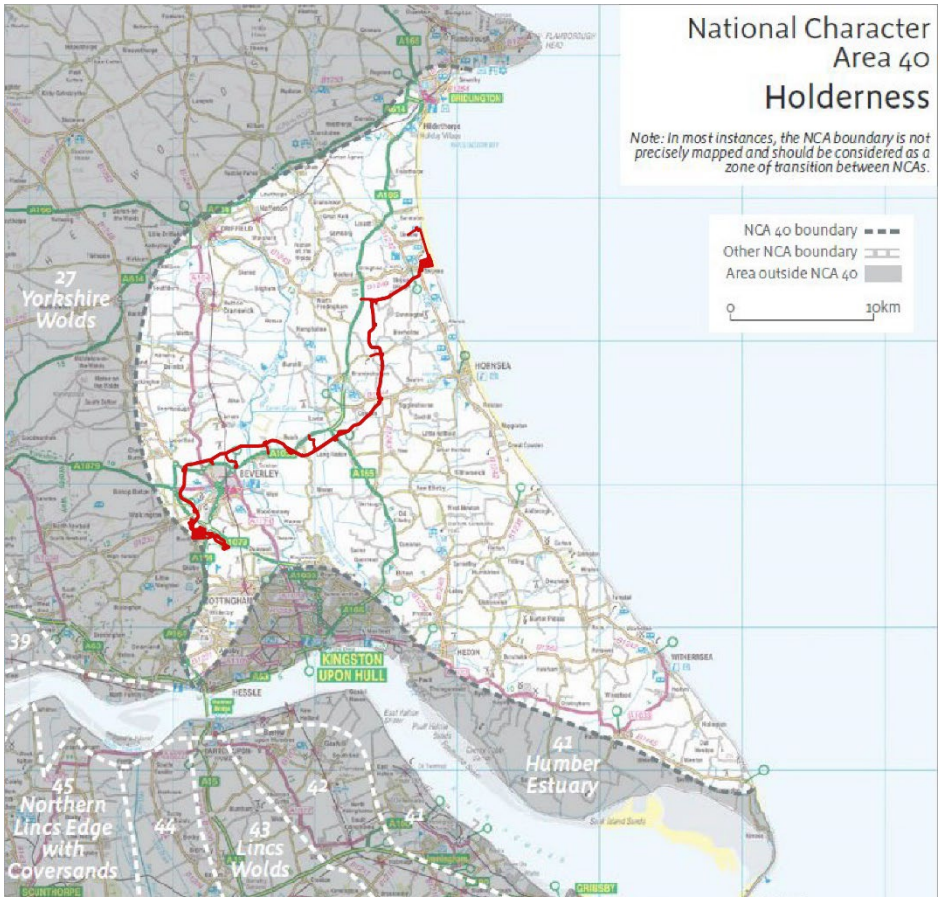
57. The wider site context also influences the appropriate selection of design principles and considerations, as presented in section 4. For example, elements such as the planting or earthworks need to reflect the existing local context, conditions and structure to ensure that new planting integrates the site into the landscape and does not create an additional visual impact.

3.1 Landscape

3.1.1 National Landscape Character

58. The Landfall Zone, the Onshore Export Cable Corridor and the Onshore Converter Stations are all located within National Character Area (NCA) 40 Holderness. The Onshore Converter Stations are located at the transition between NCA27 Yorkshire Wolds to the west and NCA40 Holderness to the east as shown in . This has been taken into account in the Landscape and Visual Impact Assessment (LVIA) set out in **Volume 7, Chapter 23 Landscape and Visual Impact Assessment (application ref: 7.23).**

Plate 3-1 National Character Area mapping



59. The Holderness key characteristics to consider includes:

- Broad, low-lying plain with few hills, bounded by the curving chalk escarpment of the Yorkshire Wolds and Flamborough Head to the west and north respectively;
- The fertile floodplain of the River Hull is important for agriculture, exhibiting large scale field patterns and linear drainage channels;
- Both arable and livestock farming occur as dominant industries, with farmland interspersed by occasional tree cover in the form of shelter belts and hedgerows;
- Settlements are generally dispersed, traditional style villages linked by a mesh of minor roads; and
- Panoramic views offered as a result of the gentle topography.

3.1.2 Local Landscape Character

60. The landfall lies within Landscape Character Area (LCA) 20C Bridlington to Hornsea Coast, which is part of the Coastal Farmland Landscape Character Type (LCT) as identified in the East Riding of Yorkshire Landscape Character Assessment (2018).

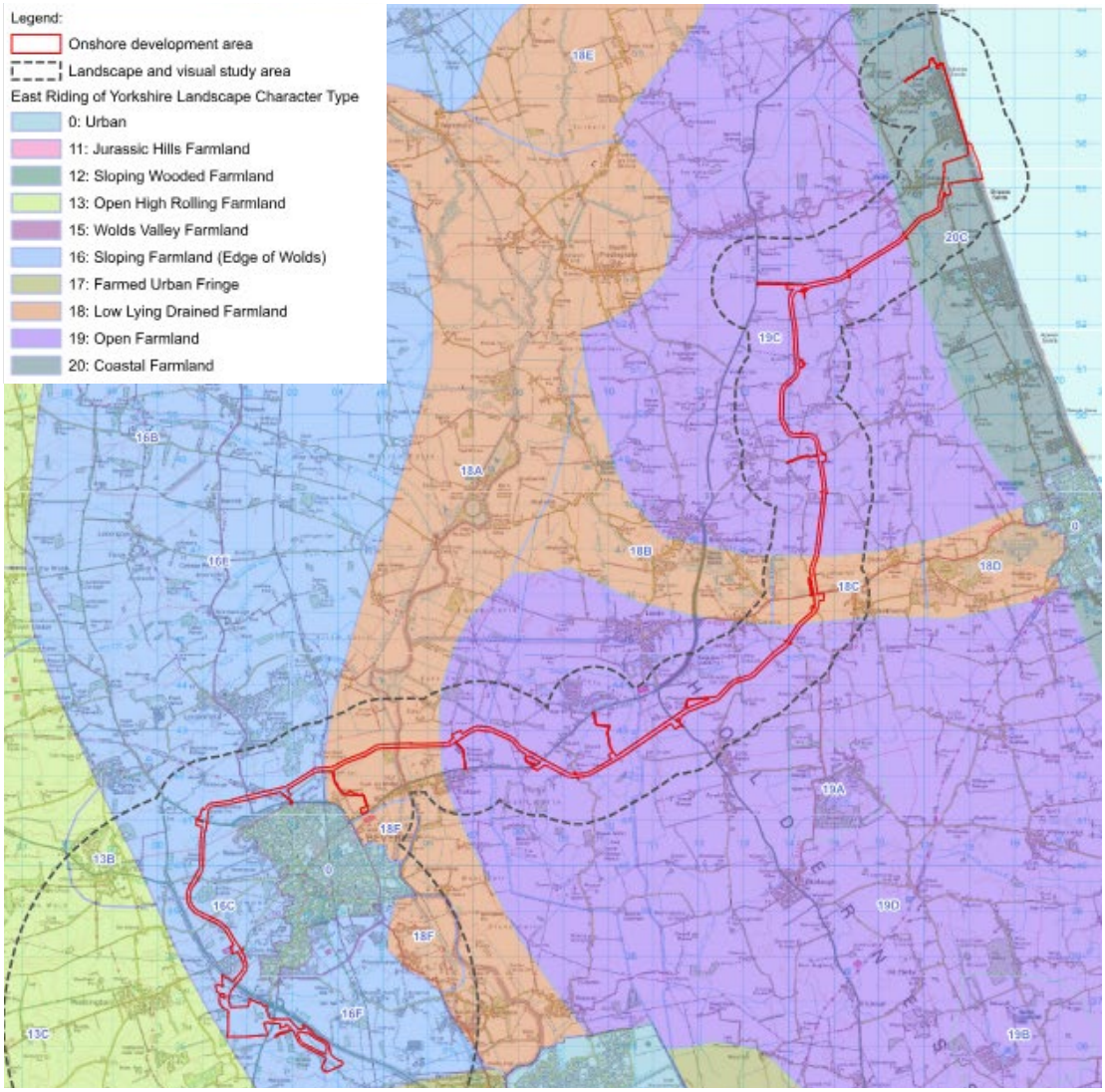
61. Key characteristics to consider include:

- Flat to gently undulating topography sloping gently eastwards;
- Boulder clay cliffs eroding into the sea;
- Seaside resorts of Bridlington, Hornsea and Withernsea;
- Coastal static caravan parks are prominent;
- Limited tree cover due to exposed windswept coastal landscape;
- Smaller villages and farmsteads and minor roads threatened by erosion;
- Fragments of historic field pattern around villages and hamlets;
- Tourism development along the coast; and
- Large scale turbine development visible within the landscape, both within this LCT and within adjoining LCTs.

62. The Cable Corridor passes through a number of LCTs as shown in **Plate 3-2**, these include:

- 13 - Open High Rolling Farmland;
- 16 - Sloping Farmland (Edge of Wolds);
- 17 - Farmed Urban Fringe;
- 18 - Low Lying Drained Farmland;
- 19 - Open Farmland; and
- 20 - Coastal Farmland.

Plate 3-2 East Riding of Yorkshire landscape character areas



63. The relevant characteristics of these areas are outlined in **Table 23-19** of **Volume 7, Chapter 23 Landscape and Visual Impact Assessment (application ref: 7.23)**.

64. The Onshore Substation Zone is located within LCT 16 - Sloping Farmland, and more locally situated within LCA 16F - Beverley Parks Farmland.

65. Key characteristics to consider include:

- Gently rolling landform sloping gradually down to the east;
- Intermittent scattered woodland blocks throughout and hedgerow in places;

- Intensively farmed rectilinear arable fields of large to medium size interspersed with less regular early enclosure fields particularly around villages;
- A number of turbine developments within the landscape with others visible beyond. Pylons are also a dominant visual feature in the landscape; and
- The under lying solid geology is chalk from the Cretaceous period.

66. There are a number of people (visual receptors) that have the potential to be affected temporarily by the construction of the Landfall, Onshore Export Cable and Onshore Substation Zone, and also due to the visual impact of the Onshore Converter Stations.

67. Key types of visual receptors to consider include:

- Residential and community receptors in nearby settlements;
- Recreational users of the landscape (residents or visitors);
- Workers operating in nearby industry; and
- Travelling receptors who may be passing through the area by road.

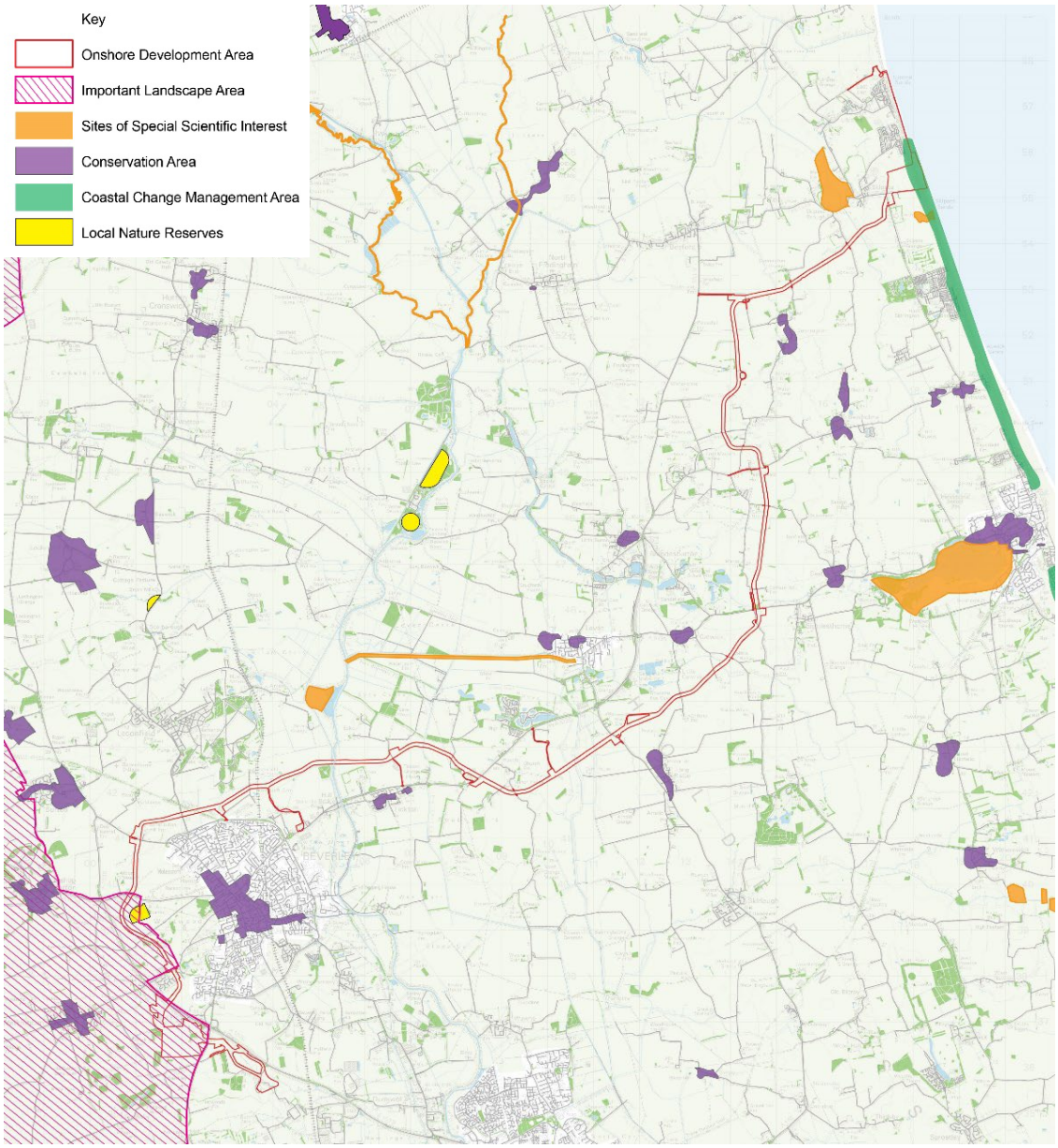
68. There will likely be visual receptors of the Onshore Substation Zone across the wider surrounding area, due to the scale of the proposed Converter Stations. Further detail on the variety of key visual receptors for each area outlined in sections 23.5.3 and 23.5.4 of **Volume 7, Chapter 23 Landscape and Visual Impact Assessment (application ref: 7.23)**. Nationally valued landscapes are recognised by designation, which may have a formal statutory basis that varies in different parts of the UK. In England, National Parks and AONBs (the latter recently renamed as National Landscapes) have the highest status of protection for landscape and scenic beauty. There are no statutory landscape designations (National Parks or AONBs) within or near to the Onshore Development Area, therefore no additional mitigation is required for the Projects.

69. Local authorities also identify locally valued landscapes and recognise them through local designations of various types. As with national designations, the criteria that underpin them vary and so it is important to consider the relevant reasons for the designation.

70. The Onshore Substation Zone and a small section of the Onshore Cable Corridor are within the Yorkshire Wolds Important Landscape Area (ILA), as shown in **Plate 3-3**. The landscape of the Yorkshire Wolds ILA comprises gently rolling agricultural land which rises in the form of a prominent chalk escarpment in the west and drops away to the plain of Holderness in the east.

71. Paragraph 8.33 of the Local Plan notes that within the Yorkshire Wolds ILA the areas of the highest quality are "*on the western scarp slope and around Sledmere*". This area is over 24km from the Onshore Converter. Further information is covered in **Volume 7, Chapter 23 Landscape and Visual Impact Assessment (application ref: 7.23)**.

Plate 3-3 Landscape and designation site context



3.2 Flood Risks

72. Large areas of the East Riding of Yorkshire are defended against fluvial and coastal flooding. As such, much of the flood risk posed to the area is residual, as a result of flood events exceeding the standard of protection afforded by: the defences; defence or pumping failure; or flooding behind defences due to local runoff or groundwater (*East Riding of Yorkshire Council, 2019*).

73. Environment Agency mapping shows that most of the Onshore Development Area lies outside of Flood Zones 2 and 3 areas, as shown in **Plate 3-4** .

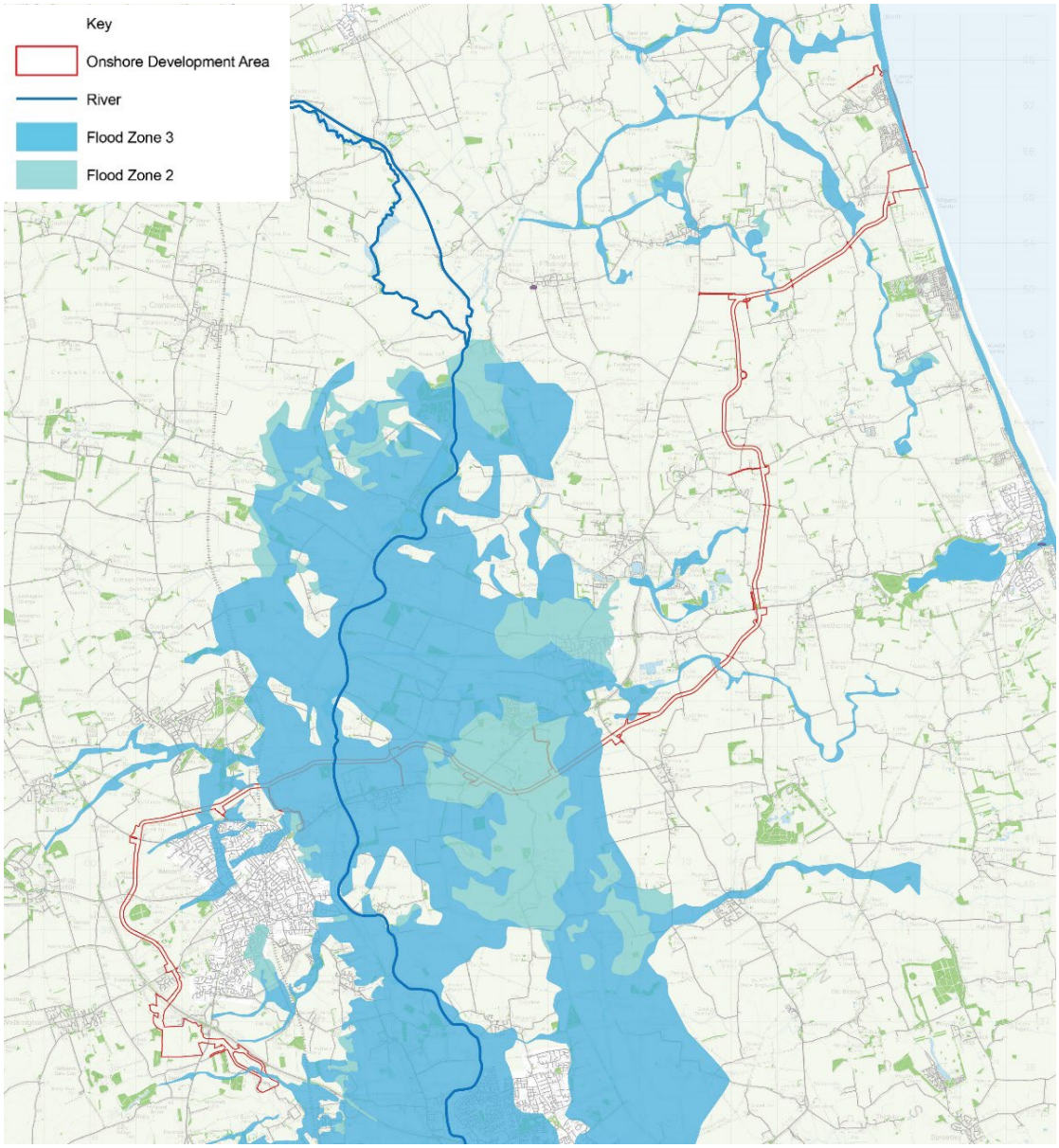
74. There are four main higher risk areas within the Onshore Development Area:

- In the Landfall Zone, the coastline is in Flood Zone 3, due to the risk of tidal flooding;
- Between Skipsea and Dunnington there are two narrow (~75-100m wide) areas in Flood Zones 2 and 3 associated with Skipsea Drain (West Branch) and Dunnington Sewer;
- South of Catwick the Onshore Development Area crosses a ~200m wide area of floodplain in Flood Zone 3 (with some small peripheral areas in Flood Zone 2) associated with Stream Dike; and
- From the junction of the A1035 and A165, south of Leven, the Onshore Development Area crosses a wide swathe of floodplain in Flood Zones 2 and 3.

75. Given the low-lying topography of the Onshore Development Area, the risk of surface water flooding is higher in many places. The Onshore Converter Stations are located in an area which is not susceptible to groundwater flooding and falls within Flood Zone 1.

76. Further detail on the landscape designation is outlined in **Volume 7, Chapter 20 Flood Risk and Hydrology (application ref: 7.20)**.

Plate 3-4 Onshore Development Area flood risk mapping



3.3 Terrestrial Ecology and Ornithology

77. Over 400ha of land, and over 20,000m of linear habitats within the Onshore Development Area have been mapped and surveyed to define the baseline information. This has enabled a better understanding of the potential implications of the Onshore Development for local Ecology and Ornithology, which has been considered in the design of the Onshore Development Area.

78. Within the Onshore Development Area, the following habitats were recorded (as per UKHab (v1) definitions):

- Cropland and arable field margins - 378.945 ha (83.14%);
- Grassland habitats - 30.556ha (6.7%);
- Urban habitats - 23.837ha (5.23%);
- Woodland and forest habitats - 3.873ha (0.85%);
- Beach - 1.621ha (0.36%);
- No access road verges - 1.584ha (0.35%);
- Wetland habitats - 1.481ha (0.33%);
- Heathland and shrub - 0.536ha (0.12%);
- Rivers and lakes - 0.37ha (0.08%);
- Maritime cliff and slopes - 0.168ha (0.04%); and
- For linear habitats hedgerows amounted to 15,024m, standing open water amounted to 4,880m, and line of trees amounted to 546m,

79. The habitat surveys recorded that the Onshore Development Area runs through predominantly agricultural land, including improved grassland, with most field boundaries marked by hedgerows. Arable fields are typically of low biodiversity value and are suboptimal for use by protected and notable species. However, they are an important food source for some terrestrial mammals and wintering birds and can also provide nesting habitat for birds, including marsh harriers (*Circus aeruginosus*). Further information about ecology and ornithology can be found in **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**.

80. Some of the habitats recorded have the potential to meet the criteria as Priority Habitats. These Priority Habitats were avoided during site selection wherever possible. When it was not possible, techniques such as trenchless crossings have been proposed to limit any impact. Trenchless crossings will be used to avoid habitats such as the Lowland Fens, with other elements such as the Haul Road also being rerouted to avoid ancient woodland habitats across the Onshore Development Area.

81. Statutory and non-statutory designated nature conservation sites have been avoided through the site selection wherever possible. Where the Onshore Development Area crosses non-statutory nature conservation sites, such as Local Wildlife Sites (LWS), trenchless crossing techniques will be used to limit any impact to the sites, wherever possible. This approach has also been used to limit any impact on statutory nature conservation sites, as the Burton Bushes, which is 0.12km outside of the Onshore Development Area. The Greater Wash SPA is located immediately adjacent to Landfall. The site is designated for its breeding sandwich tern (*Thalasseus sandvicensis*), common tern (*Sterna hirundo*) and little tern (*Sternula albifrons*). The Landfall site was selected as it does not provide suitable breeding habitat for these species.

82. Protected species surveys were undertaken to establish the presence or likely absence of various protected species throughout the Onshore Development Area. Overall, it was found that there will be a minor adverse residual effect on great crested newts (GCN) (*Triturus cristatus*), badger (*Meles mels*), bats foraging and commuting, over-wintering birds, otter (*Lutra lutra*), reptile species, hedgehog (Erinaceus europaeus (, brown hare (Lepus europaeus), and water vole (Arvicola amphibius) as a result of the Projects, which is not significant in EIA terms.

83. Findings also show there will be a moderate adverse residual effect on breeding birds and roosting bats as a result of the Projects during construction. The ecological mitigation measures during construction and operation are set out within **Outline Ecological Management Plan (Volume 8, application ref: 8.10)**. The finding of the surveys informed the site selection and design considerations presented in the DAS. Examples of design mitigation measures identified include, but are not limited to:

- Permanent habitat loss has been minimised during the site selection and route refinement process of the Projects, with the most sensitive habitats, being avoided where possible;
- Avoiding sites such as the Nunkeeling Lane LWS, Lowland Fens and Main Rivers through the selection of trenchless crossing techniques;
- Areas allocated for Temporary Construction Compounds (TCCs) and Haul Roads will be reinstated when construction has been completed;
- Where possible trees within the Onshore Development Area will be retained. Where this is not possible, any trees that require removal would be replanted in a suitable location within the Onshore Development Area, but not directly over the Onshore Export Cables;

- For Concurrent and Sequential Scenarios, the anticipated maximum width for hedgerow removal is up to 24m and only 5m where the crossing of a hedgerow can be limited to a Haul Road;
- All vegetation requiring removal will be undertaken outside of the bird breeding season, where possible;
- Construction site lighting will only operate when required and will be positioned and directed to avoid unnecessary illumination to residential properties, sensitive ecological receptors, footpath users, and minimise glare to users of adjoining public highways; and
- All ponds identified during the route planning and site selection process have been avoided, where possible.

84. Further detail on the ecology is outlined in **Volume 7, Chapter 18 Terrestrial Ecology and Ornithology (application ref: 7.18)**.

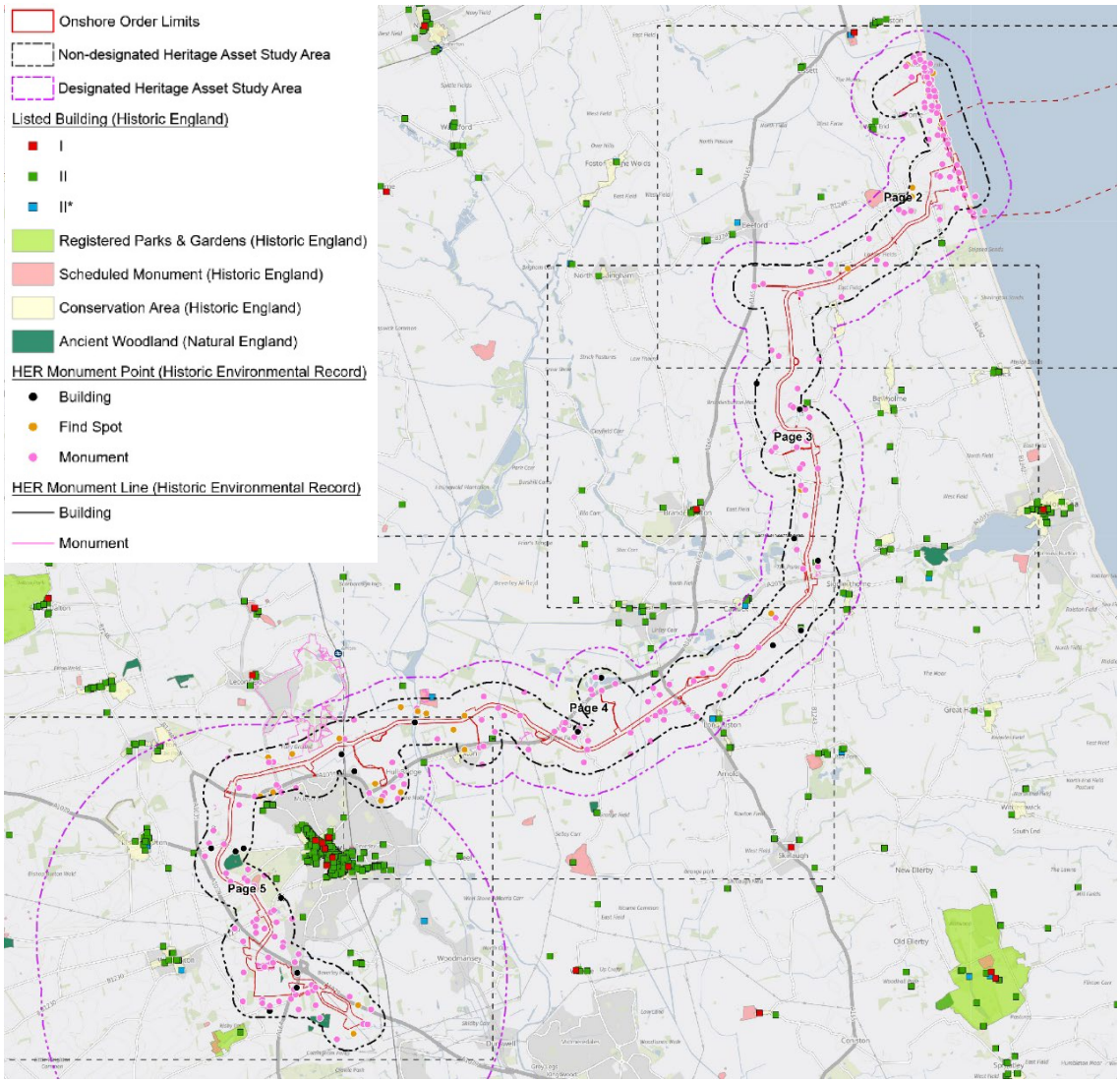
3.4 Historic Environment

85. The Historic Landscape Characterisation (HLC) identifies a distinctly rural landscape, the history of which is mostly related to the period of Enclosure, from the 16th century onwards. There are links to the earlier history of the landscape, however, with surviving earthworks of medieval villages and medieval moated manors.

86. Two study areas were considered for the Onshore archaeology and cultural heritage, as shown on **Plate 3-5**, on the basis of:

- Non-Designated Heritage Assets Study Area - known non-designated heritage assets, potential buried archaeological remains and previously unrecorded above ground heritage assets within 500m of the Onshore Development Area; and
- Designated Heritage Assets Study Area - designated heritage assets within 1km of the Onshore Development Area and 5km of the Onshore Substation Zone, to inform a setting assessment of heritage assets identified as potentially being affected by the development through a change in their setting.

Plate 3-5 Existing historic environment assets



87. A series of assessments were undertaken in these study areas in order to provide site specific and up to date information on the existing historic environment within the Onshore Development Area. These assessments included a review of aerial photographic and LiDAR data and historic map regression, a heritage walkover survey, geoarchaeological desk-based assessment, archaeological geophysical surveys and targeted trial trenching at the Landfall and Onshore Substation Zones with the Onshore Export Cable Corridor.

88. The assessments defined heritage assets and their settings, to further identify which may be impacted by the Onshore Development Area. The impacts are not limited to just direct (physical) impacts, but also possible indirect (physical) impacts upon heritage assets which may arise as a result of changes to hydrological processes and changes to the setting of heritage assets, whether visually, or in the form of noise, dust and vibration, spatial associations and a consideration of historic relationships between places.

89. The overall archaeological potential within the Onshore Development Area, as assessed in **Appendix 22-2** of **Volume 7, Chapter 22 Onshore Archaeology and Cultural Heritage (application ref: 7.22.22.2), and** prior to the assessment of the geophysical survey data, is considered to be moderate, with the following key themes drawn out based on information available to date:

- There is limited potential for encountering archaeology of Palaeolithic date within the Onshore Development Area;
- Evidence of Mesolithic and Neolithic settlement activity largely comprises of stray finds of flint objects, with some evidence of settlement along the Onshore Export Cable Corridor suggesting a moderate potential for encountering unrecorded assets;
- Neolithic funerary activity is recorded within the Onshore Substation Zone and across the surrounding landscape suggesting a moderate to high likelihood for unrecorded assets relating to funerary practice;
- Evidence for Bronze Age and Iron Age activity is far more common within the Onshore Development Area with settlement activity recorded to the east of Routh and north of Long Riston, as well as evidence for funerary activity to the southeast of the Onshore Substation Zone. This suggests a moderate to high likelihood for unrecorded assets relating to settlement activity and funerary practice;
- Evidence of Roman occupation within the Onshore Development Area is limited to a single Romano-British settlement site. Within the wider study area further activity is recorded including two Roman enclosures and various chance finds. This suggests a low to moderate likelihood for further unrecorded assets relating to settlement activity;
- High likelihood of unrecorded assets relating to the medieval period (and potentially the early medieval period) as evidenced by the agricultural use of the land and will likely relate to settlement particularly around Nunkeeling, Catfoss and Eske;

- Unrecorded assets of Post Medieval date are likely to relate to settlement, commerce, agriculture and industry activity concentrated around established villages and towns. Concentrated evidence is noted around Skipsea, Riston Grange, Routh, Hull Bridge and the southern outskirts of Beverley; and
- Moderate likelihood of surviving unrecorded evidence relating to defensive measures during WWII particularly around the coastal areas.

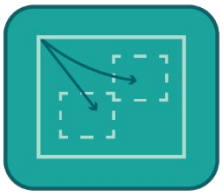
90. There are no designated heritage assets and 26 non-designated heritage assets located within the Onshore Development Area. These assets, potential heritage assets areas and other findings from the assessments informed the site selection and design considerations presented in the DAS. A total of 18 areas were highlighted as areas of possible high archaeological significance from the Phase 1 geophysical surveys. These fed into route refinement and micro-siting of the Onshore Export Cable Corridor with a total of nine areas being totally or partially avoided within the final Onshore Development Area. This included a significant route change around Nukeeling to avoid an area of likely significant importance. Additional trial trenching has also been undertaken at the Landfall Zone, which has identified extensive archaeology and will feed into the detailed design and location of the compounds.

91. Further detail on the historic environment is outlined in **Volume 7, Chapter 22 Onshore Archaeology and Cultural Heritage (application ref: 7.22).**

4 Onshore Design Principles

92. The following design principles have been developed to represent how the design of the Landfall, Onshore Export Cable Corridor and Onshore Converter Stations has responded to the variety of technical and environmental development criteria. An overview of each design principle is provided in **Table 4-1**.

Table 4-1 Overarching design principles

Key Design Principles	
Principle	Description
	**Coordinated Development** *Where possible, development and construction will be coordinated to simplify the Onshore Development Areas delivery, mitigate any unnecessary environmental impacts and limit local receptor and stakeholder disruption.*
	**Responsive Construction** *Onshore Development Area construction will be responsive to existing conditions and designations to reduce impact. This will include undergrounding cables to reduce above ground infrastructure, reducing corridor widths and implementing trenchless crossings to minimise disturbance, where appropriate.*
	**Avoid Sensitive Features** *Cable routing and Converter Station locations will be selected to avoid sensitive features such as settlements, ecologically valuable or designated sites and habitat areas.*
	**Landscape Restoration** *Where landscape features have been removed, they will be restored wherever possible.*
	**Ecological Enhancement** *Design proposals will seek to compensate for loss and provide ecological enhancements through reinstating and creating new habitats and vegetation. There will be no net loss to biodiversity and biodiversity net gain, where possible.*

	**Visual Mitigation** *The Onshore Converter Stations will be screened appropriately through material choice and boundary treatments.*
	**Stakeholder Consultation** *Consultation has been undertaken throughout the Onshore development to ensure it responds to the developing technical and environmental requirements advised by key stakeholders.*

93. The following sections outline the design proposals for Landfall, Onshore Export Cable Corridor and Onshore Substation Zone. They describe how the design has evolved, and will continue to evolve, in response to the site context, project requirements and the design principles.

4.1 Landfall

4.1.1 Overview

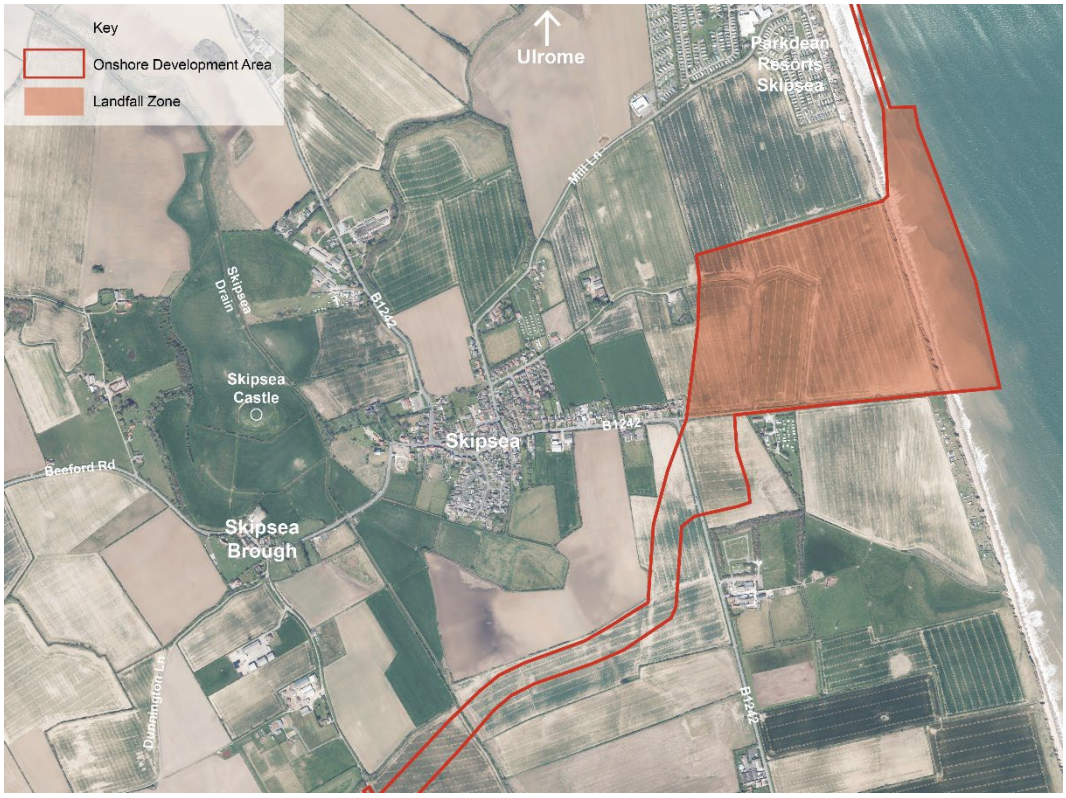
94. The Offshore Export Cables make landfall near Skipsea, as shown on **Plate 4-1**. The Offshore Export Cables would be connected to the Onshore Export Cables in the Transition Joint Bays (TJB), which would be constructed prior to the installation of the Offshore Export Cables. TJBs are permanent infrastructure where the Offshore and Onshore Export Cables are joined.

95. Potential Landfall areas were reviewed based on the following criteria:

- Avoidance of areas with substantial infrastructure or urban land use e.g. areas of housing, coastal defences, other energy infrastructure; and
- Avoidance of areas with a cliff height over 15m, where possible.

96. The landfall location near Skipsea was chosen as this area provides options with optimal cliff height, provides beach emergency access without accessing Seaside Caravan Park at Ulrome, avoids the Holderness Inshore Marine Conservation Area, also avoids the Withow Gap SSSI to the South, provides sufficient space to co-locate the Projects and avoids Smithic Bank, which is a shallow sandbank offshore. Further site selection information considering environmental and technical constraints is described in **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4).**

Plate 4-1 Landfall Zone site context



4.1.2 Parameters

97. The total Landfall Zone is approx. 420,000m^2. The majority of this area is required for construction purposes only, with a relatively small area required for the operational easement of the TJBs.

98. Landfall Zone works are likely to include:

- Construction of a temporary access to the landfall compounds;
- Construction of the landfall TJB Temporary Construction Compound and Satellite Temporary Construction Compound a to support the construction of the TJBs within the Landfall Zone;
- Trenchless crossings;
- Construction of four TJBs, within the TJB Temporary Construction Compound;
- Pull-in of duct from barge (alternatively, they may be pushed from landfall side);
- Pull-in of offshore high voltage cables from vessel;

- Transition jointing of offshore / Onshore Export Cables;
- Backfilling of TJBs ; and
- Reinstatement works.

Table 4-2 Landfall Zone Onshore Maximum Constructed Parameters

Landfall Zone	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
Number of complete trenchless crossing ducts	(maximum): 3 (2 for power cables, 1 for fibre optic cables)	Number of completed trenchless crossing ducts: 6 (4 for power cables, 2 for fibre optic cables)
Indicative trenchless crossing depth (m)	20	20
Number of Transition Joint Bays	2	4
Transition Joint Bay(s) dimensions (m) – each	5 x 20	5 x 20
Permanent land take for total number of TJBs (m^2) – including below ground infrastructure	200	400
Number of Link Boxes – the only above ground infrastructure	2	4
Link Box Dimensions (m)	2.5 x 4	2.5 x 4
TJB Temporary Construction Compound dimensions (m)	110x75	190x75
Satellite Temporary Construction	75x75	75x75

Landfall Zone	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
Compound dimensions (m)		
Duration of construction works at landfall zone (months)	Up to 18 (not continuous)	Concurrently - Up to 18 (not continuous) Sequentially - Up to 48 (not continuous)

4.1.3 Design Considerations

99. The chosen Landfall area lies along the beaches of Skipsea Sands and nearby Ulrome Sands and Atwick Sands, which comprise of narrow sandy and shingle beaches backed by boulder clay cliffs that have a height between 7.5m and 13m. These beaches are used for recreation with access and parking provided at the holiday parks at Ulrome, Skipsea, Skirlington and Atwick. Each of these holiday parks are visible features along this coast, with the church steeples in Skipsea and Ulrome forming prominent landmarks on the skyline.

100. The beaches are locally distinctive, although they do not form an integral part of the local Landscape Character, being largely obscured from the immediate coastal edge. The beaches will remain open and operational during the construction of the Landfall area.

101. A commitment to trenchless techniques has been made by the Applicants to achieve the Responsive Construction design principle by minimising construction activity on the beach and minimising any impact to the local environment.

102. The cables will be installed in ducts under the beach using a trenchless solution (likely to be an HDD). Trenchless crossing techniques can be used to avoid physical obstacles and environmental constraints by drilling underneath them for cable installation. No permanent above-ground infrastructure, other than cable markers and manholes (up to four within landfall), will be visible during the operation of the Projects.

103. The Landfall Zone extends inland to allow the TJBs to be located beyond any areas at risk of natural coastal erosion, and to provide space for temporary construction logistics and access requirements.

104. During construction, some temporary disturbance will occur at the Landfall compound located inland. These areas will be backfilled with subsoil and topsoil and reinstated to pre-construction condition, which includes reinstating planting if necessary. Reinstating/introducing planting achieves the Landscape Restoration, Ecological Enhancement and Visual Mitigation design principles.

105. Specific replanting specifications will be set out within **Volume 8, Outline Landscape Management Plan (application ref: 8.11)** and **Volume 8, Outline Ecological Management Plan (application ref: 8.10)**, produced post-consent.

4.2 Onshore Export Cable Corridor

4.2.1 Overview

106. The Onshore Export Cable Corridor works includes all the infrastructure necessary to connect the Offshore Export Cables via TJBs, in the Landfall Zone (see section 4.1) to the Onshore Converter Stations. The cables will be buried along the Onshore Export Cable Corridor.

107. Inland from the cable Landfall Zone, the Onshore Export Cable Corridor is primarily agricultural land. It comprises open, exposed farmland with large fields, bounded by fragmented hedgerows with occasional small trees.

108. From the landfall near Skipsea, the Onshore Export Cable Corridor travels west, crossing Hornsea Road (B1242), and continuing to Dunnington Lane before turning and heading south past Dunnington, Nunkeeling, Catfoss, and across West Road (A1035) at Sigglesthorne, as shown on.

109. The Onshore Export Cable Corridor then turns southwest and continues past the village of Riston Grange, crossing Whitecross Road (A165) and again crossing Hornsea Road (A1035) as it heads west north of Tickton. The route then crosses Driffield Road (A164) to the north of Beverley before turning south crossing Constitution Hill (A1035) to the west of Beverley It crosses York Road, Newbald Road, and Broadgate (B1230), before reaching the Onshore Substation Zone located at Beverley Road along the A1079 and A164.

Plate 4-2 Onshore and Offshore development areas

110. Further site selection information explaining how environmental and technical constraints were considered is described in **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4).**

4.2.2 Parameters

111. The Onshore Export Cables would not be visible during operation of the Projects, as they will be buried along the full route. A worst case scenario of a 75m wide Onshore Export Cable Corridor from the TJBs to the Onshore Converter Stations, widening to 90m at complex trenchless crossings, is being considered for the purposes of the DAS.

112. The Onshore Export Cable works include:

- Initial site investigation works;

- Site survey and environmental pre-construction activities such as authorised vegetation clearance required in preparation for construction;
- Preparation of the cable corridor for main construction activities such as erecting fencing and preliminary right of way works;
- Construction of temporary access to the cable corridor infrastructure;
- Temporary strip and storage of topsoil from agricultural areas;
- Construction of Main and Satellite Temporary Construction Compounds (TCC), cable joint bays, trenchless crossing compounds on the cable route and temporary Haul Roads to facilitate the Onshore Export Cable installation;
- Excavation of trenches and installation of cable ducts;
- Installation of below ground chamber at the Jointing Bay/Link Box locations, required to provide maintenance and inspection access to the cable system;
- Laying or pull-in of high voltage cables within duct;
- Installation of ground level 'Link Boxes' and marker posts;
- Backfilling of Jointing Bays and cable trenches with suitable material for electrical performance and protection of cables;
- Reinstatement works;
- Design and construction of crossings or protective measures required due to close proximity or crossing of export cable to existing infrastructure and natural features. This includes roads, railways, rivers and streams. This may be achieved by construction of culverts/cable structures or trenchless methods including HDD or other appropriate methodologies; and
- Installation of ducts and cable in hard ground or road carriageways where required including temporary traffic management and reinstatement of the surface.

Table 4-3 Onshore Export Cable Corridor Onshore Maximum Constructed Parameters

Onshore Export Cable Corridor	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
Onshore Export Cable Corridor length from the Landfall Zone to the Onshore	32	32

Onshore Export Cable Corridor	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
Substation Zone (km) (approximate)		
Number of earth cables per circuits	1	1
Number of trenches	Up to 2 (2 x HVDC)	Up to 4 (4 x HVDC)
Number of Temporary Construction Compounds	17 2 main compounds 15 satellite compounds	17 2 main compounds 15 satellite compounds
Size of Temporary Main Construction Compound (m^2)	10,000 (roughly 100x100m)	10,000(roughly 100x100m)
Size of Temporary Satellite Construction Compounds(m^2)	5625 (roughly 75x75m)	5625(roughly 75x75m)
Cable corridor width (m)	41m	75m
Cable corridor width at complex trenchless crossings (m)	45m	90m
Depth of trench to top of duct / cables (m) (approximate)	1.3 – 1.7	1.3 – 1.7
Burial depth (m) where restrictions are not present	2	2
Indicative burial depth (m) (approximate)	1.6	1.6
Typical Jointing Bay frequency (km)	Every 0.75 – 1.5	Every 0.75 – 1.5

Onshore Export Cable Corridor	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
No. Jointing Bays (approximate)	103	205
Jointing Bay construction dimensions (m)	10 x 25	10 x 25
Jointing Bay infrastructure dimensions (all below ground) (m)	3 x 8	3 x 8
Jointing Bay burial depth from existing ground level to bottom of Jointing Bay (m)	2.2	2.2
Jointing Bay burial depth from existing ground level to top of Jointing Bay (m)	1.35	1.35
Number of Earth / Link Boxes and associated manhole covers	103	205
Link Box construction dimensions (m)	6.5x8	6.5x8
Link Box dimensions / manhole cover permanent infrastructure above ground (m)	2.5x4	2.5x4
Haul Road Width (m)	5 (increasing to 8 at passing places)	5 (increasing to 8 at passing places)
Permanent easement	15m along the cable corridor.	24m along the cable corridor
Temporary lighting during working hours	Temporary out-of-hours	Temporary out-of-hours security lighting.

Onshore Export Cable Corridor	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
	security lighting.	
Duration of works	33 months	Concurrently - 33 months Sequentially - 57 months (not continuous)

4.2.3 Design Considerations

113. All onshore cabling will be underground in accordance with industry best practice, which avoids the need to install new pylons and overhead cables. This achieves the Responsive Construction and Visual Mitigation design principles.

114. The Cable Corridor route was also designed to Avoid Sensitive Features, such as crossing woodlands and areas or groups of trees, designated site such as SSSIs and Conservation Areas and significant watercourses where possible. Settlements are also avoided to reduce potential visual receptors ensuring Visual Mitigation and minimising as much as possible, disruptions to local residents during the construction period.

115. Where cables are installed via open cut trenching, existing vegetation such as hedgerows, trees and field margin habitats would need to be removed within the temporary construction area. In order to minimise the loss of existing vegetation and ensure the development provides Landscape Restoration and Ecological Enhancements, the Applicants have committed to a reduced working width at field boundary crossing points (typically up to 24m wide for the construction of the Projects concurrently or sequentially). Existing hedgerow gaps will be utilised where possible to minimise loss.

116. During the operational phase a permanent easement would need to be maintained along the Onshore Export Cable Corridor. This would be 20m wide for the construction of the Projects concurrently or sequentially. No tree planting would be possible within this operational easement, but other habitats and the existing previous land uses can be restored.

117. Where practicable and as agreed with the landowner, Landscape Restoration and Ecological Enhancement will be undertaken within the Onshore Export Cable Corridor. This would include:

- Trees and woodland replanted within the construction corridor / Order Limits but outside the final permanent cable corridor easement where conditions allow to retain/increase tree cover;
- Hedgerows re-planted in all scenarios on their original alignment to an improved ecological standard, wherever possible;
- New planting to infill gaps in existing hedgerows to create new habitats and improve habitat connectivity, wherever possible; and
- Reinstate areas of agricultural land to pre-construction condition as quickly as possible and within two years to maintain the character and nature of the landscape.

118. A suitable list for planting (that comprises UK and local provenance species) would be provided for each section of hedgerow or hedgerow tree to be reinstated, to ensure continuity and suitability. All planting would be implemented during the first planting season following the completion of construction of the Onshore Export Cable installation works.

119. Species mixes will be developed along with the detailed landscape proposals in line with the principles set out in **Volume 8, Outline Landscape Management Plan (application ref: 8.11)**. All species mixes will be subject to approval by East Riding of Yorkshire Council (ERYC) prior to construction of the works.

120. The size and maturity of planting stock will be considered in terms of availability, reliability and the level of screening provided. **Table 4-4** and **Table 4-5** provide a list of typical native species likely to be included.

Table 4-4 Indicative Hedgerow Species

Latin name	Common name
Crataegus monogyna	Hawthorn
Corylus avellana	Hazel
Ilex aquifolium	Holly
Lonicera periclymenum	Honeysuckle
Prunus spinosa	Blackthorn
Rosa arvensis	Field rose
Rosa canina	Dog rose

Latin name	Common name
Viburnum opulus	Guelder rose

Table 4-5 Indicative Woodland Species Mix

Latin name	Common name
Acer campestre	Field maple
Alnus glutinosa	Alder
Betula pendula	Silver birch
Corylus avellana	Hazel
Euonymus europaeus	Spindle
Ilex aquifolium	Holly
Malus sylvestris	Crab apple
Pinus sylvestris	Scots pine
Prunus avium	Wild cherry
Quercus robur	Oak
Sorbus torminalis	Wild Service Tree

121. Further detail in regards to the implication of this commitment on the Projects' **Biodiversity Net Gain Strategy** can be found in **Volume 7 Appendix 18-10 (application ref: 7.18.18.10).**

122. The use of trenchless techniques along the Onshore Cable Corridor will ensure that flood risks remain low in the immediate and surrounding area due to reduced disturbance and infrastructure requirements. This achieves the Responsive Construction and Avoiding Sensitive Features design principles.

123. The **Outline Code of Construction Practice (OCoCP) (Volume 8, application ref: 8.9)** considers the requirement to divert surface water away from the location of excavations and the construction footprint of cable trenches and JBT construction. A Surface Water Management Plan will be developed post-consent as part of the detailed CoCP(s), approved under DCO Requirement 19 upon appointment of a Principal Contractor(s).

124. The Surface Water Management Plan will be developed following Stakeholder Consultation with landowners, the Lead Local Flood Authority (East Riding of Yorkshire Council), the Environment Agency and relevant Internal Drainage Board.

125. The **Outline Drainage Strategy (Volume 8, application ref: 8.12)** identifies measures to adequately mitigate the risk of surface water flooding through the incorporation of Sustainable Drainage Systems (SuDS) principles at the Onshore Converter Stations. It also identifies measures to manage surface water run-off from hardstanding areas at the and demonstrates that existing surface water flows can be managed appropriately on site during operation.

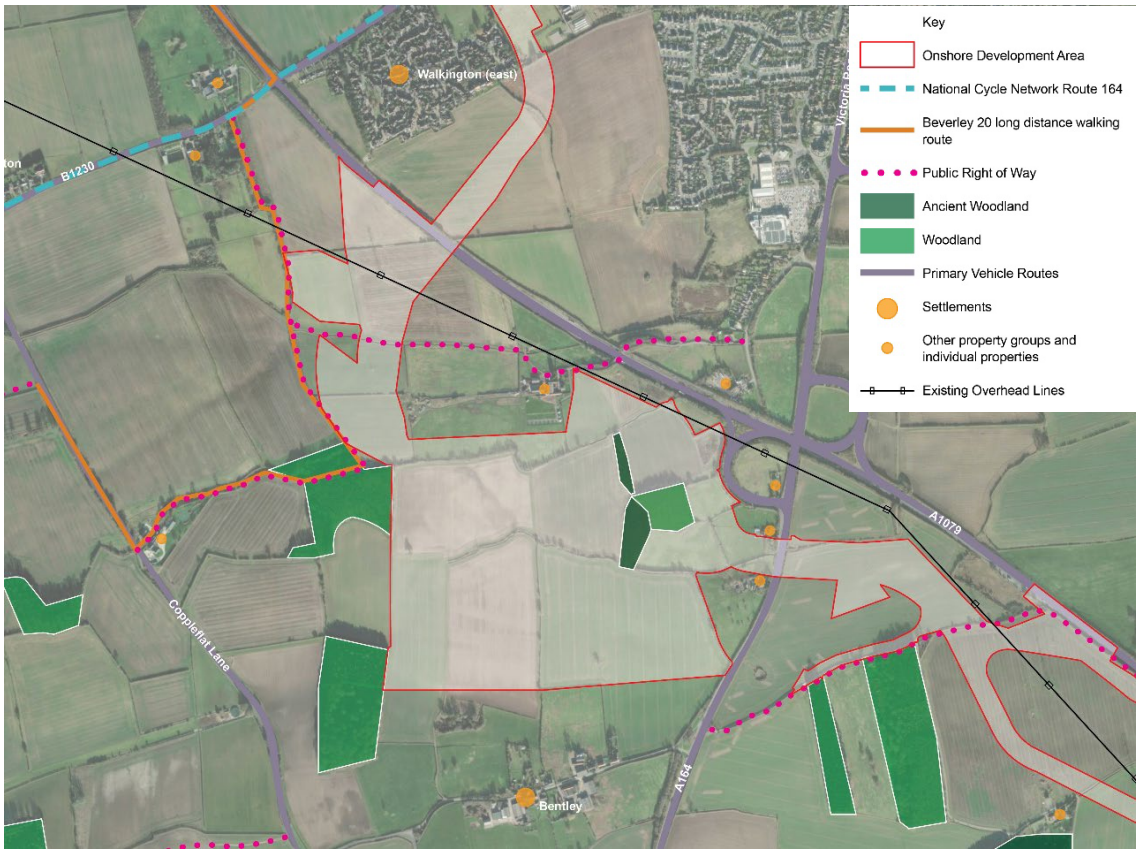
4.3 Onshore Converter Stations

4.3.1 Overview

126. Initially the Onshore Converter Stations search area was refined to:

- Avoid residential properties (including gardens);
- Avoid housing land allocations identified in local plans;
- Avoid direct impacts to internationally and nationally designated areas, and significant impacts to the special qualities of Areas of Outstanding Natural;
- Avoid mature woodland and Ancient Woodland;
- Avoid areas that fall within Flood Zone 3 and where possible preference was given to locating infrastructure in Flood Zone 1; and
- Avoid recreation spaces such as golf courses where possible.

Plate 4-3 Onshore Development Area



127. Further site selection process information considering environmental and technical constraints is described in **Volume 7, Chapter 4 Site Selection and Assessment of Alternatives (application ref: 7.4)**.

4.3.2 Parameters

128. The Onshore Substation Zone is of sufficient size to accommodate the maximum footprint required for both DBS East and DBS West Converter Stations, as shown in **Plate 4-3**, which achieves the Coordinated Development design principle.

129. The permanent footprint of one Onshore Converter Station would be up to 64,000m^2. The permanent footprint of two Onshore Converter Stations would be up to 129,000m^2.

130. The Onshore Substation Zone may include:

- Control building;
- GIS building (if required);

- External fire barriers;
- Static var compensator (SVC) building (if required);
- Valve halls;
- Transformers;
- Lightning protection masts
- Palisade fencing
- Switchgear;
- Shunt reactors;
- Emergency diesel generators;
- Service buildings;
- Spare part building
- Cooling systems;
- Earth mat
- Harmonic filters if required;
- Lighting;
- SuDS systems;
- Soft landscape works; and
- Access roads – for operation and maintenance access to equipment.

Table 4-6 Onshore Convertor Stations Maximum Constructed Parameters

Onshore Converter Stations	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
Permanent Onshore Converter Stations area (m^2)	64,416 (244m x 264m) (based on one HVDC convertor station)	128,832 (244m x 264m plus 244m x 264m) (based on two HVDC convertor stations)
Total construction area (m^2)	94,000 (based on one HVDC convertor station + temporary construction compound area)	189,000 (based on two HVDC convertor station + temporary construction compound areas)
Build duration (years)	4	6
Onshore Converter Stations buildings	• Tallest structure (m): 27 (lightning masts) • Building height (m): 24	• Tallest structure (m): 27 (lightning masts) • Building height (m): 24

Onshore Converter Stations	DBS East or DBS West In Isolation	DBS East and DBS West Sequentially or Concurrently
	• Largest building footprint (m): 60x45	• Largest building footprint (m): 60x45
Layout orientation	Convertor Station laid out with large buildings to the south	Convertor Stations laid out with large buildings to the south
Security and lighting	Operational lighting within the compound	Operational lighting within the compound
Construction disturbances and screening	All other construction disturbance restored to pre-existing condition Implementation of landscape screening in accordance with **Volume 2, Figure 23-6 Indicative Landscape Plan (application ref: 7.23.1)**. Worst case considers year 1, before planting matures	All other construction disturbance restored to pre-existing condition Implementation of landscape screening in accordance with **Volume 2, Figure 23-6 Indicative Landscape Plan (application ref: 7.23.1)**. Worst case considers year 1, before planting matures
Operation duration (years)	32	32

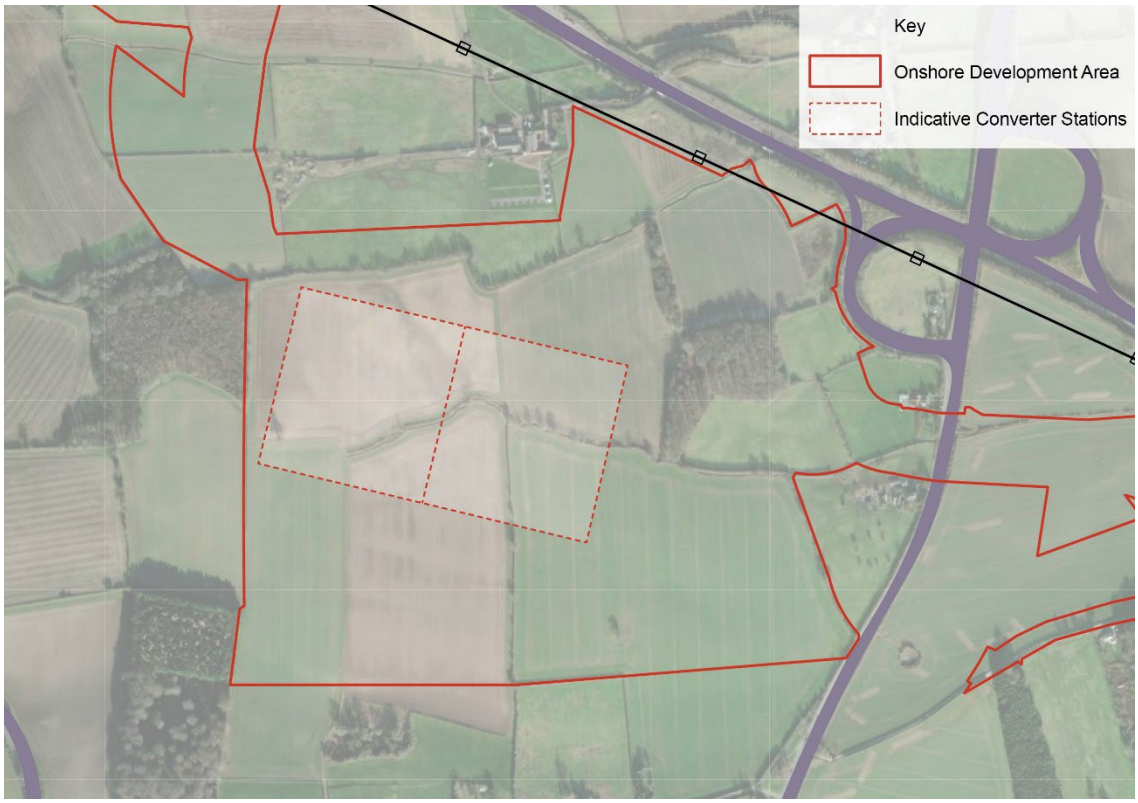
131. Further information on the Onshore Substation Zone can be found in section 5.7.2 of **Volume 7, Chapter 5 Project Description (application ref: 7.5)**.

4.3.3 Design Considerations

132. The design principles, as shown in **Table 4-1**, were considered throughout the development of the site selection and design development of the Onshore Converter Stations. They will be further implemented during the detailed design and construction phase of the project, subject to further survey and feasibility.

133. The proposed Onshore Substation Zone was selected as it is at a lower elevation than other zones, with existing woodland providing existing landscape structure and screening. There are a limited number of nearby visual receptors. The zone is located in the vicinity of similar developments including the Dogger Bank A & B Offshore Wind Farm Substation. The selected zone was also the closest to the Onshore Grid Connection point at the National Grid Substation which lies approximately 2.5km to the South East of the Onshore Substation Zone, requiring the least amount of earthworks to complete the connection.

Plate 4-4 Onshore Substation Zone



134. The Applicants have developed DBS East and DBS West transmission infrastructure as co-ordinated projects in accordance with the National Grid Electricity System Operator (ESO) evolving Holistic Network Design (HND), as updated in February 2024 (HND, 2024). The HND has confirmed the Projects will have a radial connection to the proposed National Grid Substation at Birkhill Wood.

135. The proposed Onshore Substation Zone design will reflect the existing landscape context and explore various best practice solutions to integrate the development into the surrounding landscape, minimise visual impact where possible and enhance the ecological value of the development.

136. The design considerations for the Substation Zone are described in the following sections.

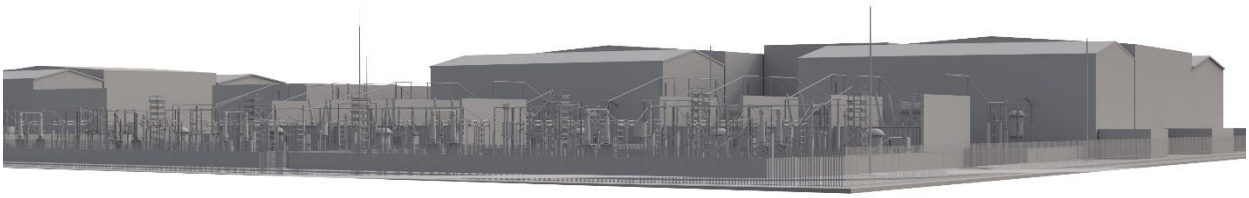
4.3.3.1 Function & Layout

137. The Onshore Converter Stations, located in the Substation Zone will be constructed to accommodate the connection of the Projects to the transmission grid.

138. The largest building within the Onshore Substation Zone is up to 24m in height. The tallest features within the Onshore Substation Zone will be the lightning protection masts at a maximum height of 27m above ground level, as shown in .

139. The layout of the Converter Stations electrical infrastructure is prescribed by the functional and technical requirements of the Converter Stations, which must be set out in a sequential order in accordance with all electrical transmission systems. shows the indicative layout and various component types of the Converter Stations site based on HVDC proposals, the space available will be used as efficiently as possible.

Plate 4-5 Indicative appearance of the DBS Onshore Converter Stations

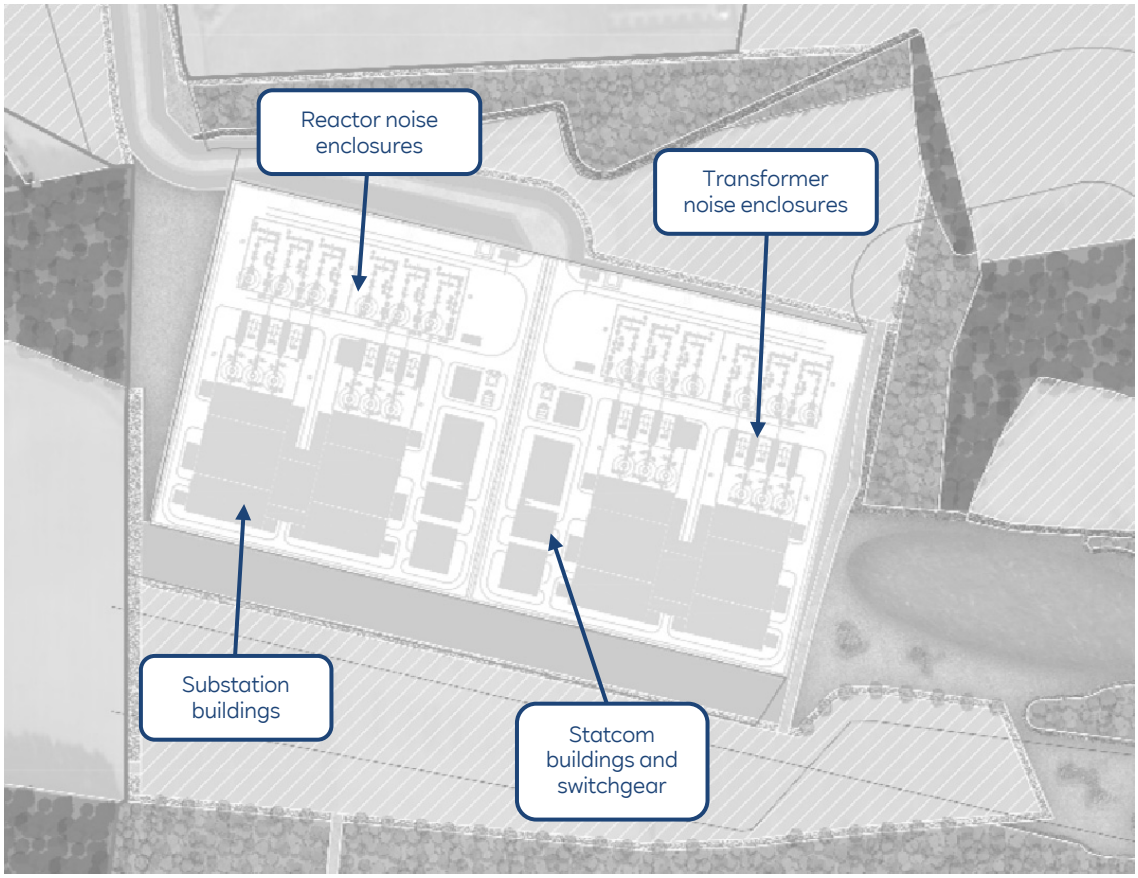


140. The Onshore Converter Station will be HVDC utilising either a Gas Insulated System (GIS) or an Air Insulated System (AIS) switchgear design. The Onshore Converter Stations would contain the necessary electrical and auxiliary equipment and components for transforming the power from the Projects to 400kV to meet the UK Grid Code for connection to the transmission grid.

141. The Onshore Converter Stations would not be manned. Access would be required periodically for routine maintenance activities, estimated at an average of one visit per week.

142. During the initial five year maintenance period the site would be visited approximately four times a year to ensure the landscaping is well established, though no access to the internal Projects areas would be needed. Further information on the establishment and maintenance of planting is described in **Volume 8, Outline Landscape Management Plan (Volume 8, application ref: 8.11).**

Plate 4-6 Indicative Onshore Substation Zone layout



4.3.3.2 Built Form

143. The worst case design scenarios for the Projects are laid out in **Table 4-6**. This provides the outline of built form that may be present on site. The built form design approach will be led by engineering requirements, and will follow best practice in Converter Stations design, whilst also reflecting local vernacular such as agricultural buildings where possible.

144. The tallest feature within the Onshore Substation Zone will be the lightning protection masts, which will reach 27m above ground. These are subject to a detailed lightning protection study and may not be required in the final scheme.

145. Building form will be simple cube or cuboid shaped, as shown in **Plate 4-7**. This is dictated by functional and technical requirements, whilst also reflecting the prominent agricultural buildings in the local landscape. The choice of materials and colour implementation on these buildings will assist with integrating the site into the local landscape.

Plate 4-7 Example of the Projects built form after construction on the left and 10 years after the planting is established on the right. Viewpoint 2: Coppleflat Lane, Bentley as show in the LIVA

4.3.3.3 Materials

146. Materials should achieve the functional, technical and structural requirements set out within guidance and best practice, whilst also providing the opportunity to reduce visual impact and integrate the site within the local landscape. The chosen material should be:

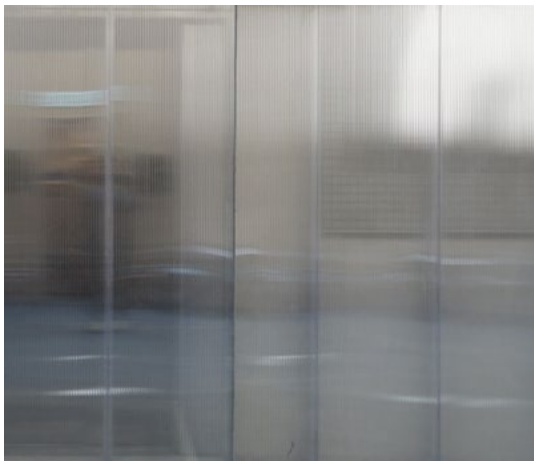
- Hardwearing and long-lasting;
- Provide a variety and colour options, where appropriate;
- Reflect local building materials, if possible; and
- Sustainably sourced and locally available where possible, with potential to be used reused or recycled at the end of its operational life.

147. Material options include:

- Metal cladding (**Plate 4-8**) – this is hardwearing, available in a variety of colours and finishes, readily available but in could create an industrial aesthetic if misused increasing the visual impact; and
- Polycarbonate (**Plate 4-9**) – this is lightweight and easy to install, can be easily formed, provide higher acoustic insulation if necessary, but it is more expensive, may be non-recyclable and requires additional maintenance.

Plate 4-8 Metal cladding

Plate 4-9 Polycarbonate cladding



4.3.3.4 Colour

148. The application of colour on the Onshore Converter Stations buildings and structures will help to further reduce visual impact and integrate the site into the local landscape. A detailed Environmental Colour Assessment will be carried out post-consent to identify prominent colours within the local landscape. This will inform a colour palette to be applied within the Onshore Substation Zone to better integrate structures and fencing into the local landscape.

149. As noted in the Environmental Colour Assessment Technical Information Note (Landscape Institute 2018) '*Light falling on a surface can substantially alter the perceived colour, making it appear both lighter and brighter in the landscape. Among the common building materials, paint finished steel can be highly reflective*'. It also states: '*When seen from a distance, the perceived colour of built form or surfaces tends to look less dark and more chromatic or brighter than the inherent colours of the construction material*'.

150. Using lighter colours, specifically near the roofline may increase the prominence of a structure in the landscape. Seasonality and particular viewpoints around the site will impact the success of the colour application. For example, lighter green blocks will become more prominent in winter if located next to a deciduous woodland.

151. The choice of colour tones will also impact the prominence of a structure. The global standard Natural Colour System (NCS), should be used when selecting colours, to ensure that tones are based on colours found in nature.

152. Colour choices will be reliant on chosen materials, manufacturer limitations and availability. Material and colour choices will be finalised during the detailed design stage, in consultation with ERYC, following best practice to ensure that it meets functional, technical and stakeholder requirements.

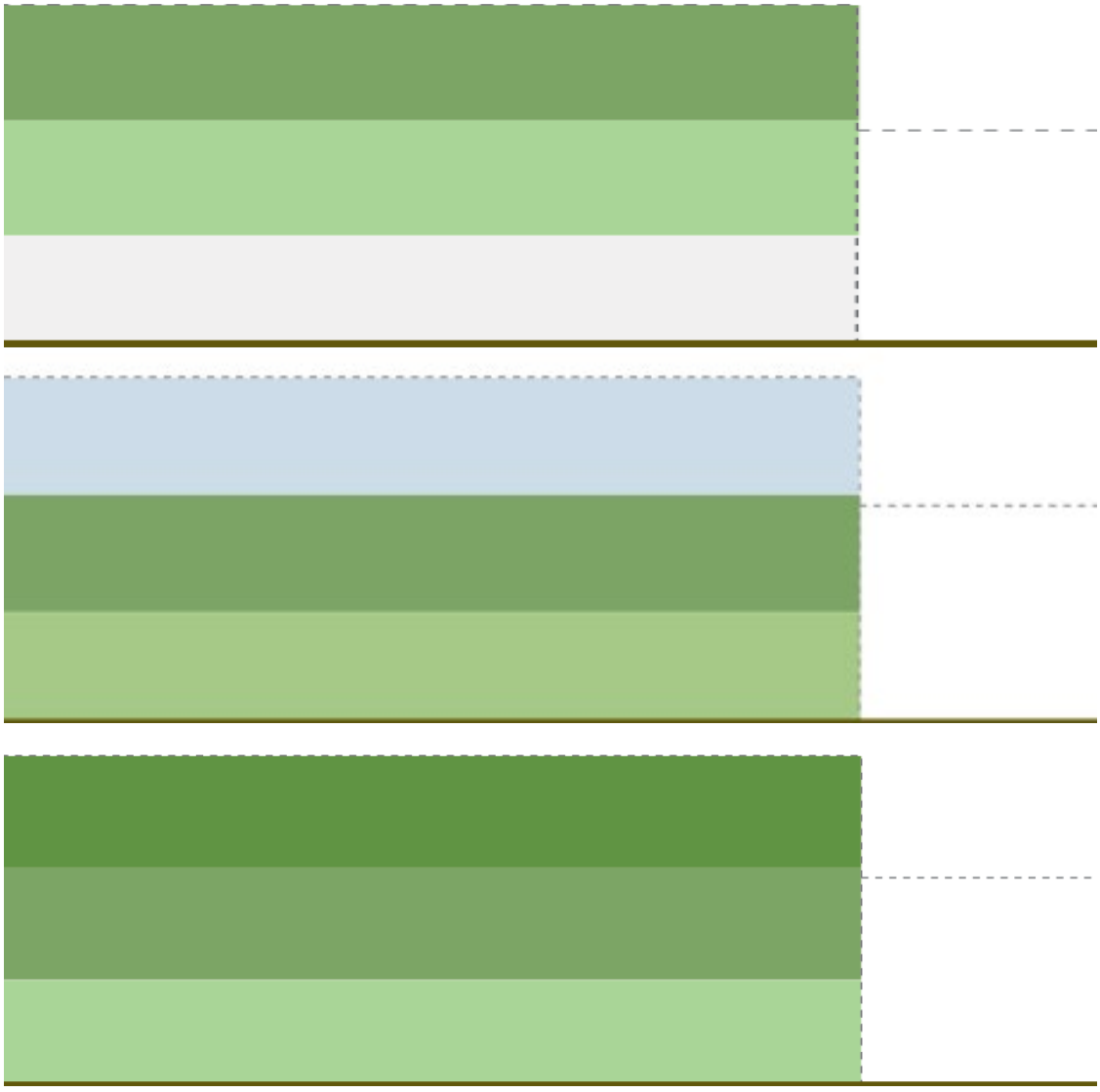
153. An initial colour sampling exercise has been undertaken, as shown in **Plate 4-10** and **Plate 4-11**. This shows how colour can be identified in the local landscape. Given the rural context of the site, the colours dark grey, blue, green and brown will likely be the most prominent. These reflect the sky, surrounding vegetation and local agricultural functions.

Plate 4-10 Existing view from Oriel Close (viewpoint 4 as show in the LIVA)

Plate 4-11 Initial colour sampling exercise to determine dominant landscape colours

154. The initial colour sampling exercise highlights that darker colours are more prominent on the horizon line. Colour panelling could be applied as blocks, banding or mixed patterns. Bright, bold colours would be inappropriate as they would make the buildings more visible rather than reducing the visual impact. Chosen colours should be muted and be matt where possible to reduce reflection and glare from the built forms. The following examples on **Plate 4-12**, show how banding various coloured panel can mitigate visual impacts.

Plate 4-12 example of colour panelling applied to the development block to better integrate the built form into the landscape



4.3.3.5 Hard Landscaping

155. Hard landscaping within the Onshore Converter Stations will be prescribed by the site's safety, maintenance and technical requirements. A limited palette of materials will include concrete paver, concrete hard-standing, shingle and asphalt.

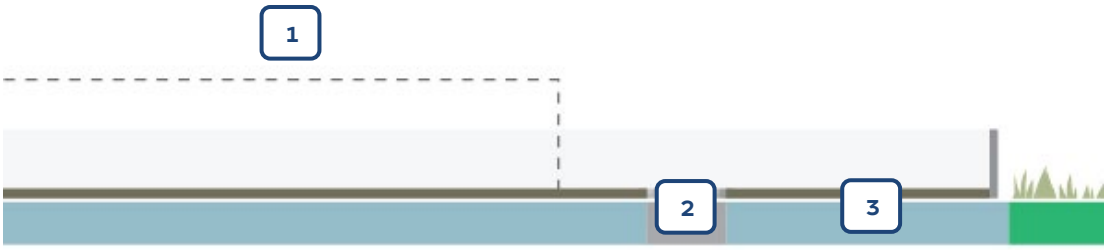
Plate 4-13 Example of asphalt

Plate 4-14 Example of shingle (Source: geosyn.co.uk)

Plate 4-15 Example of concrete pavers/ hardstanding

156. The hard landscaping should be robust, durable and easily maintained. Where possible, consideration should be given to the use of permeable hardstanding to assist with drainage across the site.

Plate 4-16 Indicative hard landscape section



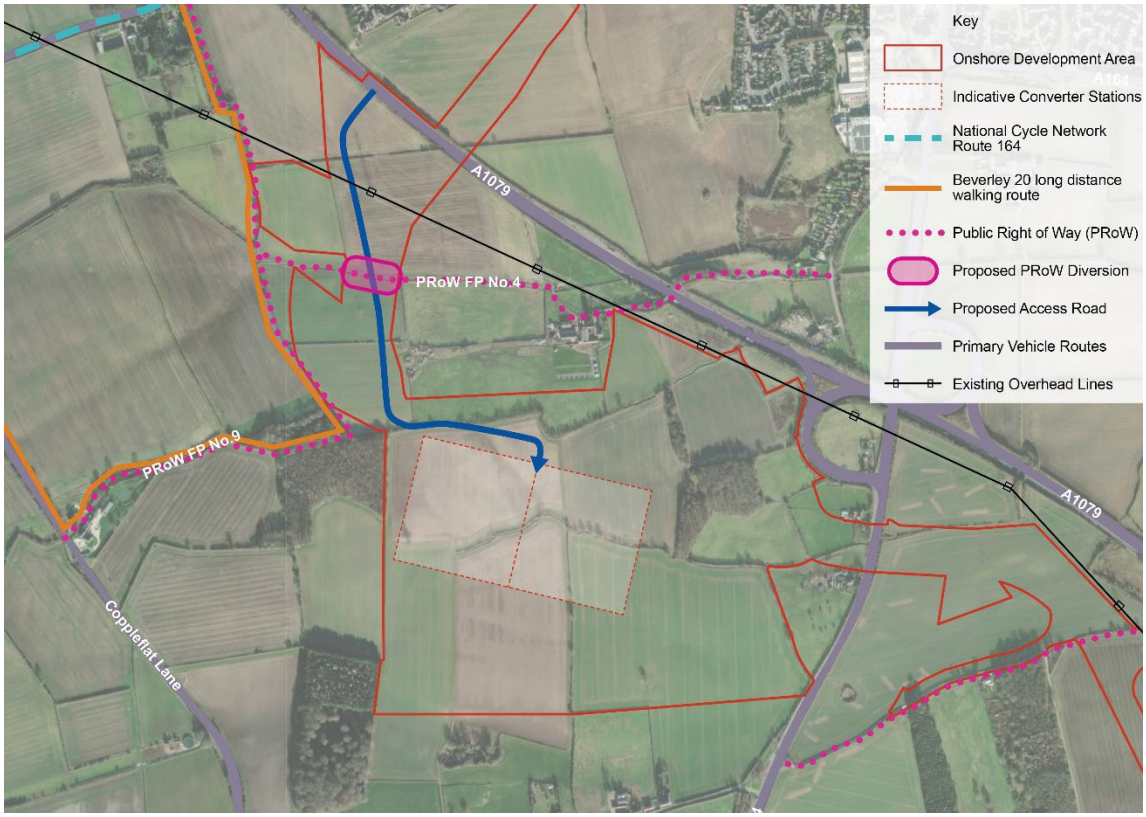
- **1** - Proposed Onshore Converter Station electrical components
- **2** - Internal vehicular route - *Asphalt surfacing*
- **3** - Onshore Convertor Stations Zone - *concrete pavers/hardstanding around built form and electrical equipment with areas of shingle to allow permeability*

4.3.3.6 Access

157. Vehicular access to the Onshore Converter Stations will be required for routine operation and maintenance. The majority of vehicles accessing the Onshore Converter Stations will be vans and cars, however, the access must be able to accommodate larger vehicles that may be required for the removal and replacement of larger Converter Stations equipment such as transformers.

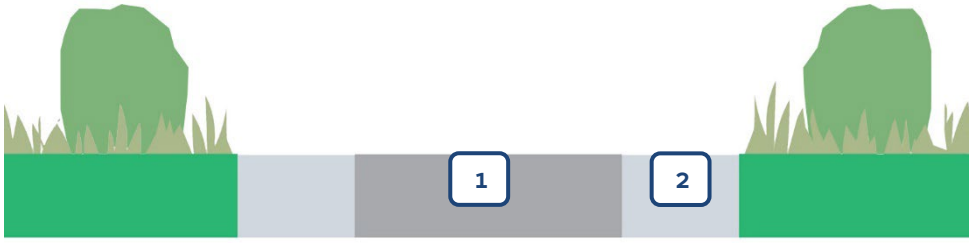
158. Access to the site will likely head south from the A1079 entering the Onshore Substation Zone at the northern extent, as shown on **Plate 4-17**.

Plate 4-17 Proposed site access and PRoW network



159. Appropriate security infrastructure needs to be implemented to ensure the site is safe and secure, with appropriate screening of the entrance route to limit the sites impact for local receptors.

Plate 4-18 Proposed access road with potential permeable passing areas



- **1** - Asphalt surfacing
- **2** - Potential permeable passing areas

160. There are some public rights of way (PRoW) to the north of the Onshore Converter Stations. These include Walkington Footpath No.4 and Walkington Footpath No.9. Neither PRoW enter the Onshore Substation Zone, but Footpath No.4 does cross the likely route of the access road.

161. Walkington Footpath No. 4 will require a permanent diversion. The current location of the PRoW is shown on **Plate 4-17**. The proposed diversion would include two slopes, designed at a suitable gradient to divert Walkington Footpath No. 4 from its current route to cross the access road, accounting for a change in level. Prior to construction the detailed design of the diversion including the gradient of the slopes would be agreed with ERYC. All current proposals are indicative.

4.3.3.7 Lighting

162. The Onshore Converter Stations will only require lighting during maintenance and operational visits for health and safety and security reasons. Areas that will likely require lighting include:

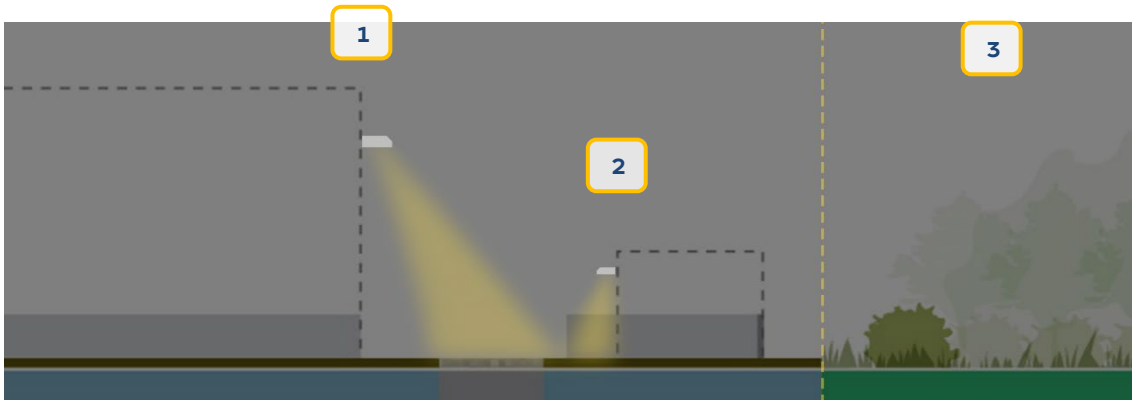
- Key routes;
- Wayfinding;
- Safety signage; and
- Building entrances.

163. Lighting should only operate when required and be directional within the site boundary only, as shown in **Plate 4-19**, to reduce light spill into the surrounding landscape. Some of the lighting examples that would ensure this includes:

- Building mounted lighting;
- Motion detecting lighting above entrances;
- Signage lighting; and

- Low level lighting such as bollards to reduce light spill along routes.

Plate 4-19 Lighting examples



- **1** - Example of building mounted lighting;
- **2** - Example of motion detecting lighting above entrances; and
- **3** - Proposed dark corridor outside of the site boundary.

164. There would be a need to maintain dark corridors around the site for ecological and habitat reasons as shown in **Plate 4-19** and **Plate 4-20**, in line with the latest industry guidance. These dark corridors will provide buffer zones around the Onshore Substation Zone for wildlife, reducing habitat disturbance. Wildlife friendly lighting needs to consider:

- Lighting locations - primarily away from sensitive habitats adjacent to the site such as hedgerow or woodland;
- Type of light source - LED luminairies offer low intensity lighting and can be adjusted/dimmed as required for seasonal benefits;
- Illumination levels - Low level and directional lighting will minimize light spill reaching buffers areas; and
- Warmth/tone of lighting - Warm tone lighting, avoiding white and blue wavelengths of the light spectrum, is more sensitive to bats in the local environment.

Plate 4-20 Dark corridor proposals

165. DCO Requirement 22 covers the control of artificial light emissions. The Onshore Converter Stations must not be brought into operation until a written scheme for the management and mitigation of artificial light emissions during the operation of the Onshore Converter Stations has been submitted to and approved by ERYC. Any scheme approved must also be implemented as approved.

166. A detailed assessment of lighting requirements would be defined at detailed design, as part of this written scheme. Outline operation and maintenance of the lighting proposal is specified **Volume 7, Chapter 5 Project Description (application ref: 7.5)**.

4.3.3.8 Soft Landscaping

167. The majority of the existing vegetation around the Onshore Converter Station will be retained, except where access or enabling works are required. Soft landscape treatments will be informed by the local landscape and environmental features such as vegetation, landform and existing habitats. Landscape treatments in this section are shown for illustrative purposes only and are not informed by detailed assessment of existing conditions. These detailed assessments will be carried out post-consent, in consultation with ERYC.

168. The Onshore Substation Zone is predominantly arable farmland (83.14%), with some areas of grassland (6.7%) and smaller areas of woodland (0.85%). There are a number of boundary hedgerows and blocks of deciduous and coniferous woodland adjacent to the site. This includes Bentley Moor Wood which is Ancient Woodland. New vegetation should be introduced with a layered approach which will improve appropriate screening, whilst providing landscape and ecological enhancements.

169. The following general principles have been applied in developing the soft landscape proposals for the Onshore Substation Zone:

- Landscape planting will provide visual mitigation;
- Where feasible, land will be returned to agricultural use;
- Native woodland planting will follow an organic layout;
- The landscape proposals and planting mixes will be informed by the trees and vegetation already present in the local area;
- Evergreen tree species will be minimised and kept to the outer edges of woodland blocks; and
- Hedgerows will comprise a species-rich mix of native plants.

170. Woodland planting should be implemented with an organic layout mimicking layers found in the wider countryside as this will help integrate the planting into the wider landscape. Planting around the existing ancient woodland should take care not to damage existing trees or their root networks as all areas will be retained and managed during the Projects operational life.

171. The shrub layer should be implemented with native species within the woodland understorey and as blocks of planting in the field layer. The field layer should include native meadow and grasslands mixes to increase biodiversity. This botanically and structurally varied habitat as shown in **Plate 4-21** will support a range of invertebrate species including moths, butterflies, bee, beetles, amongst others.

Plate 4-21 Soft landscape section

- **1** - Proposed meadow grassland
- **2** - Existing woodland and shrub understorey
- **3** - Proposed woodland and shrub understorey

Plate 4-22 Example of meadow grassland

Plate 4-23 Example of woodland and understorey

172. Existing hedgerows will be enhanced by planting gaps with locally native hedge plants and hedgerow trees that would provide additional screening, enhance the local landscape character and provide habitats and connectivity for wildlife.

173. Planting of trees will be avoided within the indicative areas for the proposed Onshore Cables and 400kV connection, as shown in **Plate 4-24**. Planting of trees within 6m of the existing pipelines should be avoided due to the potential for root ingress.

Plate 4-24 Soft landscape proposals

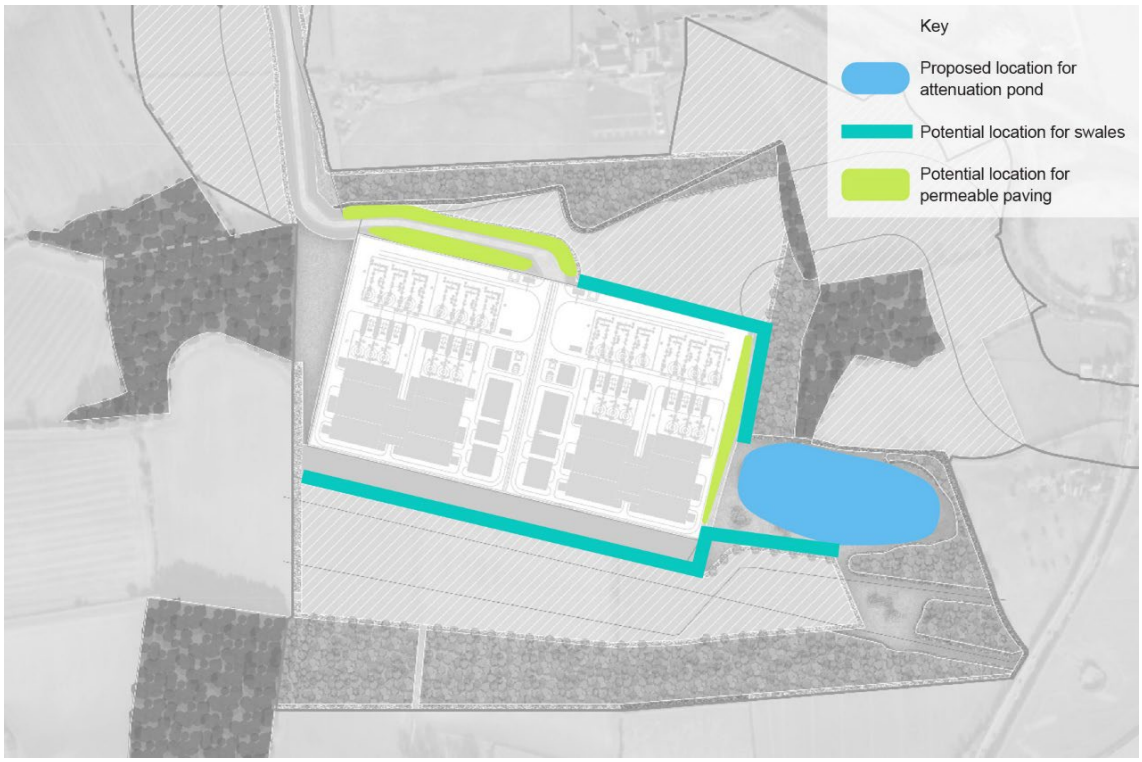
174. In addition to any visual mitigation, the soft landscape proposals aim to ensure no net loss of biodiversity. The typical species which would be implemented across the site are outlined in **Table 4-4** and **Table 4-5**.

175. **Volume 8, Outline Landscape Management Plan (Volume 8, application ref: 8.11)** has been developed for the Projects. The OLMP will form the basis for a final Landscape Management Plan (LMP), which will be prepared by the Principal Contractor, at the direction of the Applicants, and submitted prior to the commencement of the Projects for approval by the relevant planning authority (East Riding of Yorkshire Council). The OLMP provides further information on the landscape proposals, including establishment, maintenance and indicative species selection.

4.3.3.9 SUDs and Drainage

176. As noted in **Chapter 20 Flood Risk and Hydrology (application ref: 7.20)**, the surrounding low lying topography of the Onshore Substation Zone increases the risk of surface water flooding. This provides the opportunity to introduce natural drainage solutions to provide increased capacity and ecological enhancements. These types of drainage systems will likely be located outside the security fence and require further ground investigation to confirm siting, scale and viability. Indicative SuDS strategy is shown in **Plate 4-25**.

Plate 4-25 Example SuDS and drainage strategy subject to detailed design



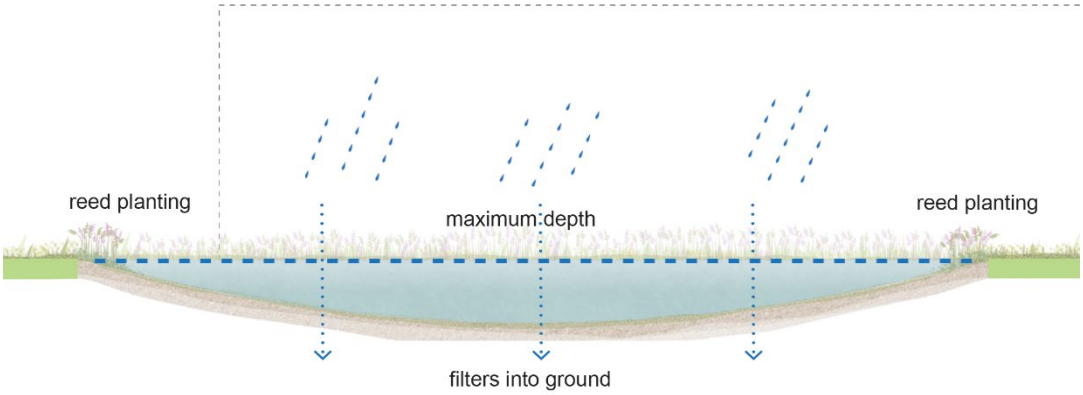
177. The final location and typology of SuDS used around the Onshore Substation Zone is subject to further detailed surveys and consultation with ERYC.

178. Possible forms of sustainable drainage include:

- **Attenuation Ponds (Plate 4-26)**: Attenuation ponds or basins can be situated within vegetated boundaries to create both a drainage solution and additional habitats providing biodiversity and climate resilience. The form and structure of attenuation ponds can create additional ecological value through varying water depths for wintering bird and smaller pools around the ponds margins to allow local fauna to use the

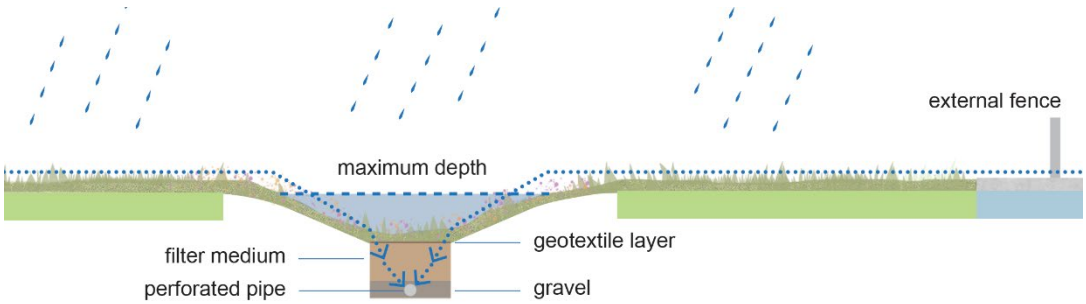
site. Water run-off from the surrounding infrastructure collects in the attenuation ponds and soaks back into the ground. The native aquatic and marginal planting creates habitats and increases biodiversity, whilst also having a secondary benefit of reducing levels of pollutants in run-off. The surrounding planting and scale of the attenuation features provide additional visual mitigation. Sufficient storage capacity should be provided to store yearly rainfall as well as storm flood frequencies, as stated in the relevant Standards, such as **NGET TS2.10.13** Flood Defences for Electricity Substations.

Plate 4-26 Example of attenuation pond



- **Swales (Plate 4-27)**: Swales can be implemented where there is restricted space and are beneficial where water needs to be directed away from certain areas. Swales consist of linear grass depressions that channel water run-off to attenuation features. Swales need to be located closer to the source of the run-off so could be situated along the site boundary or entrance roads. These areas will be dry prior to run-off or rain events, with planting around the upper edges. Implementing planting again provides biodiversity and climate resilience.

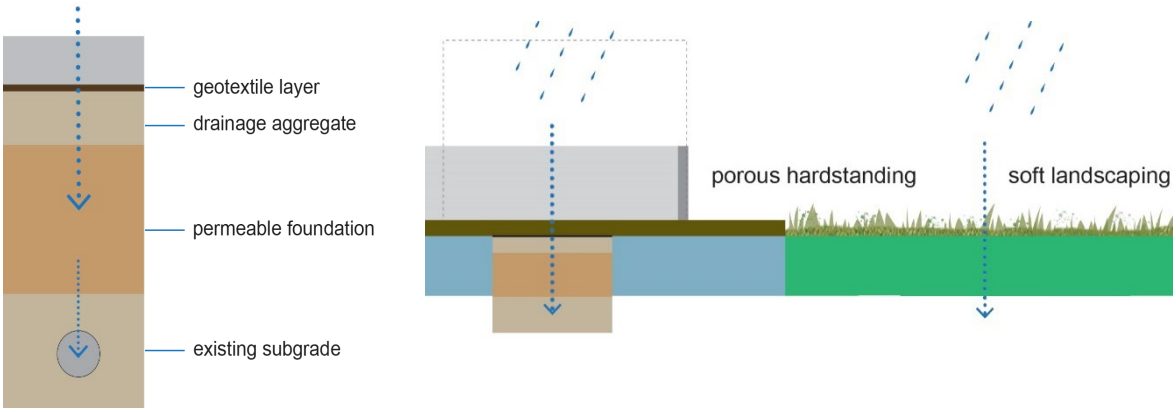
Plate 4-27 Example of swale



- **Filter Drains or Permeable Surfaces (Plate 4-28 and Plate 4-29)** : Filter drains and permeable surfaces allow water run-off to soak into the ground through drainage aggregate. Drainage aggregates can reduce pollutants in the run-off from soaking into the ground. Permeable surfaces could be introduced to lightly trafficked portions of the Onshore Converter Stations. Increasing permeability across the Projects will reduce the level of run-off ensuring that natural drainage solutions can provide ample capacity.

Plate 4-28 Example of reinforced shingle and grasscrete

Plate 4-29 Example of filter drains and permeable surfaces



179. Surface water would be discharged from the site at a controlled rate which will be determined during the detailed design stage. Appropriate consideration will be given to maintaining the existing floodplain capacity and / or flow conveyance during extreme rainfall events. Further detail on the drainage strategy and approach is outlined in **Outline Drainage Strategy (Volume 8, application ref: 8.12)**.

180. Traditional drainage methods such as underground pipes, gullies and controlled outflow will be required within the Onshore Converter Stations boundary to meet design guidance and technical requirements. These traditional drainage methods could connect with any proposed natural drainage systems to create an ecologically sustainable drainage solution, whilst introducing additional biodiversity, habitat opportunities and protect adjacent agricultural land.

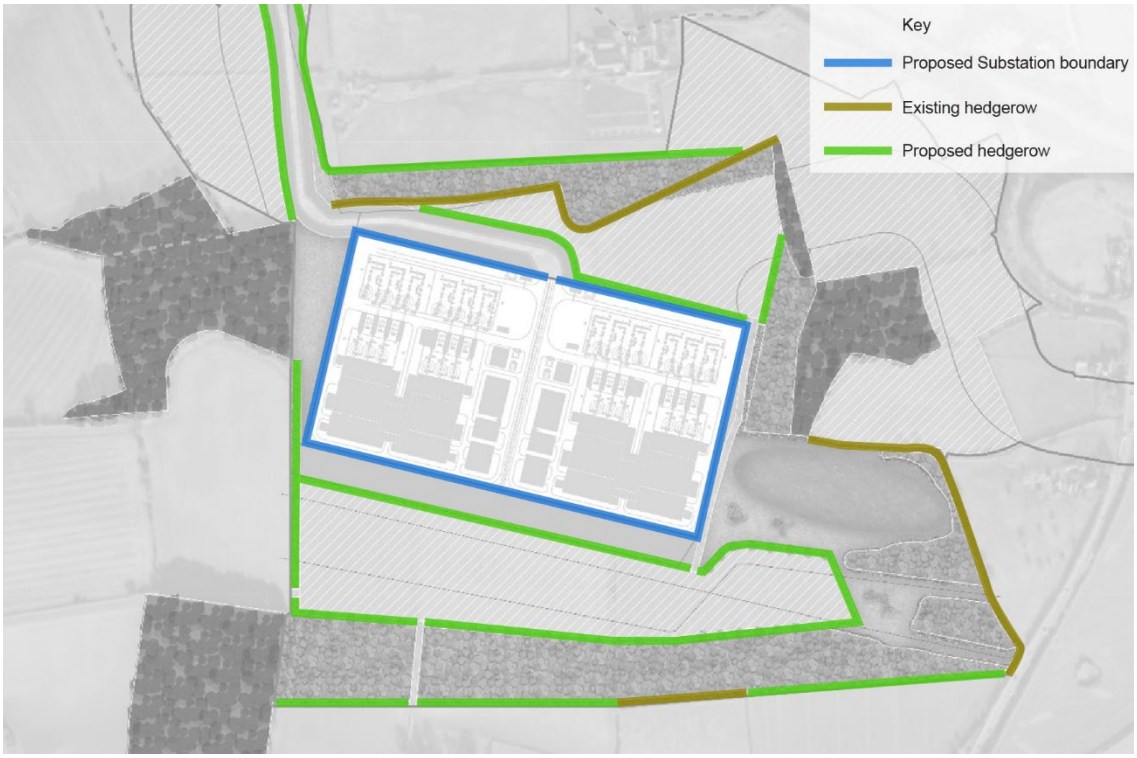
4.3.3.10 Boundary Treatments, Fencing and Hedgerows

181. Boundary treatments around the Projects need to be fit for purpose and provide robust site security. A variety of boundary treatments will be required around the Onshore Substation Zone, these include:

- Security fencing around the Projects;
- Visual screening and planted boundaries where there may be receptors; and
- Acoustic fencing if required in specific locations.

182. The security fence around the perimeter of the Projects will comply with National Grid Technical Standard 2.22, and as a minimum, be a Category 2 'Standard' fence system. This is defined as a 2.4m high fence that can be either physical mesh or palisade barrier with electric pulse fence.

Plate 4-30 Indicative fencing locations



183. Whilst palisade fence has traditionally been the preferred choice for large infrastructure projects, additional fencing options should be considered during the detail design stage such as steel mesh panelling. The use of alternate fencing may only be viable in specific locations around the Onshore Substation Zone and may not be relevant to the whole site.

184. Boundary treatments should, where feasible, reflect their setting in the landscape. This can be implemented through the use of colour on Category 2 fences or through the implementation of natural screening to screen receptors and integrate the site into the landscape.

185. Planted boundary treatments should reflect local species composition and avoid the use of single species and non-native planting. Broad hedgerows with a variety of species provide the best habitat opportunities. **Table 4-4** and **Table 4-5** provide a list of typical native species likely to be included.

186. Planted boundaries would provide additional biodiversity, habitat creation and ecological mitigation, whilst also providing visual mitigation through the scale, structure and colour of vegetation set within the landscape. Species selection would need to consider local provenance, existing site conditions and technical constraints such as existing overhead powerlines or underground cables.

4.3.3.11 Noise

187. As noted in **Volume 7, Chapter 25 Noise (application ref: 7.25)**, operational impacts due to Onshore Converter Stations noise are predicted to be negligible for residential receptors. This represents negligible effects during daytime and a minor adverse (not significant) effects during night-time. No additional mitigation measures are therefore proposed.

4.3.3.12 Earthworks

188. Earthwork bunds will be explored to provide visual mitigation for adjacent settlements or users of the PRoW system. Bunds may or may not be an appropriate approach due to space requirements, availability of spoil, technical requirements, and likely effectiveness of screening. The bunds presented in this section are for illustrative purposes and the viability, location and scale of any proposed earthworks would be subject to survey and primary site requirements such as cable routing and use of excess spoil.

189. The wider landform character area consists of a flat, low lying plain with little topographical variation, however the Onshore Substation Zone is located on raised ground which falls slightly towards Bentley. Any proposed earthwork bunds should therefore take an organic, sinuous form with soft edges that create a subtle feature within the landscape, as opposed to a hard-edged engineered form. The bunds should be created from site-won soil from cut and fill levelling if available.

190. Planting such as wildflower, grasses and shrubs could be introduced atop any bunding to provide additional visual mitigation as well as increasing biodiversity, as shown in **Plate 4-31**. The form, scale and positioning of plants would be key to integrating proposed earthwork bunds into the landscape.

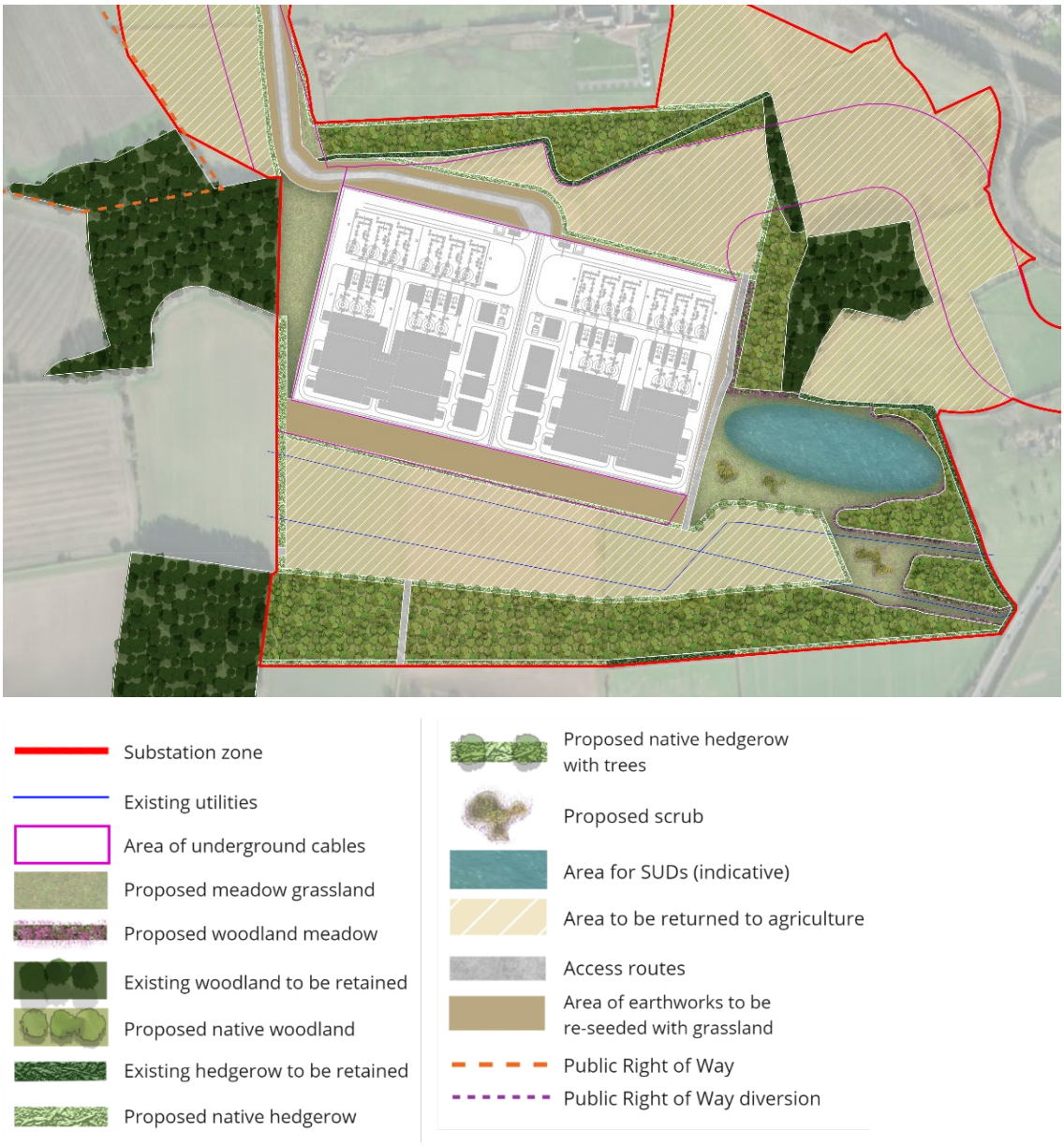
Plate 4-31 Example of earthwork bund

4.4 Outline Landscape Mitigation Plan

191. The following general principles were applied in developing illustrative landscape proposals, as shown in **Plate 4-32**:

- Landscape planting will provide visual mitigation around the periphery of the Onshore Substation Zone; Minimum clearance distances from fence lines, overhead power lines, and buried cables have been applied in accordance with relevant technical guidance;
- Where feasible, land will be returned to agricultural use to maintain the predominantly farmland character of the landscape;
- Native woodland planting will follow an organic layout, incorporating a mix of herb, shrub and tree species to form canopy layers and woodland edge;
- The landscape proposals and planting mixes are informed by the trees and vegetation already present in the local area;
- Evergreen tree species will be minimised and kept to the outer edges of woodland blocks, with the rest of the woodland a mix of locally native species; and
- Hedgerows will comprise a species-rich mix of native plants.

Plate 4-32 Indicative landscape mitigation plan



192. Planting of trees has been avoided within the indicative areas for the Onshore Export Cables and 400kV connection. Planting of trees within 6m of high-pressure gas pipelines located to the south of the Onshore Converter Stations, has also been avoided. It is assumed that planting hedges over these features will be acceptable, subject to consultation with the owners of these assets.

193. Other areas within the Onshore Substation Zone where no planting is proposed will be seeded with species-rich grassland mixes or will be retained under agricultural use with appropriate access provided.

194. The landscape plan also seeks to integrate landscape treatment with the proposed drainage attenuation basin to the south-east of the substation. The detail of the landscape treatment in this area will be developed in the final LMP based on the final design of the drainage works.

195. Maintenance activities will be undertaken in accordance with the following, subject to any updates:

- BS4428: 1989 Code of practice for general landscape operations (excluding hard landscapes); and
- BS8545: 2014 Trees: from Nursery to independence in the landscape – Recommendations.

196. Further detail in regards to the landscape proposals and maintenance recommendations is available in **Volume 8, Outline Landscape Management Plan (application ref: 8.11)**.

5 Design Review Process

198. This section sets out the design review process that the Applicants would undertake post-consent.

199. The design of the Onshore Substation Zone would benefit from independent advisors and internal design champions undertaking a design review process. This would ensure that the development and the design proposals are high-quality, provides appropriate mitigation to adverse impacts and enhance the overall outcomes.

5.1 Project Design Champion

200. A Project Design Champion would be appointed to the Projects. They would ensure that the Onshore Development is designed and built to the highest possible standard. The Design Champion would be someone with a broad range of experiences.

201. The Institution of Civil Engineers notes that a Design Champion '*would help to set the right brief and develop a project-specific vision and principles*' and would also '*ensure that the vision and principles inform decision-making, and that there is adequate reporting on design progress and value*'.

202. NPS EN-1 section 4.7.5 notes 'A project board level design champion could be appointed, and a representative design panel used to maximise the value provided by the infrastructure'.

203. The NIS 2020, also includes an aim for '*all infrastructure projects to have a board level design champion in place by the end of 2021 at either the project, programme or organisational level, supported where appropriate by design panels*'.

204. The Design Champion, would likely be the representative engaging with the Design Review Panel. The Design Champion and Design Review Panel will include person(s) not directly involved in the design development and person(s) with the authority to influence the Projects design within the Applicants organisation. They will be selected based on design experience, commitment to the design principles and seniority to hold the project team to account and challenge decisions when appropriate.

5.2 Design Review Panel

205. The Design Review Panel is a multi-disciplinary team of professionals with experience working in the built environment. The Panel provides independent and impartial expert advice to applicants and local authorities in relation to important or large scale developments.

206. NPS EN-1 section 4.7.8 notes '*Applicants should consider taking independent professional advice on the design aspects of a proposal. In particular, the Design Council can be asked to provide design review for nationally significant infrastructure projects and applicants are encouraged to use this service*'.

207. The NPPF 2023, also notes '*The Design Review Panel's feedback is a material consideration for local authorities and the planning inspectorate when determining planning applications*'.

208. Seeking multi-disciplinary advice and guidance from the Panel would feed into the detailed design process and provide varied and alternative design approaches to achieving good design of the Onshore Developments.

209. It should be noted that some elements of the design approach are fixed due to technical guidance and the Panel would not be able to advise on these. This includes elements such as the site layout and dimensions of the equipment. The Panel would be able to advise on elements such as material finishes, colour, soft landscape, etc.

6 Summary

210. This Design and Access Statement supports the DCO application for the Projects. It sets out the various approaches that will be implemented to achieve good design in accordance with national policy and guidance.

211. The Applicants have stated their understanding of good design in section 1.3 and outlined their approach to delivering this in section 4. This includes committed design principles which will ensure that all elements of the Projects are designed and delivered in a way that minimises impacts while securing long-term enhancement.

212. The Projects will achieve good design, whilst at the same time balancing operational requirements, through application of these principles:

- Coordinated development;
- Responsive construction;
- Avoiding sensitive features;
- Landscape restoration;
- Ecological enhancement;
- Visual mitigation and
- Stakeholder consultation.

213. The approach to design has been informed by extensive statutory and informal consultation with stakeholders to ensure that the context is understood. The Applicants have explored design flexibility and design rationale in an open and transparent manner. A summary of the key onshore design decisions that have been made by the Applicant as a result of the consultation process is provided in section 1.3.4.

214. The final design of the Projects will depend on the final development scenario, which will be confirmed through detailed engineering design studies that will be undertaken post-consent. The Applicants are committed to achieving good design throughout this process and for the duration of the construction, operation and decommissioning of the Projects. The Design and Access Statement contains the measures and principles that will ensure that this happens.

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