



# Hornsea Project Four: Environmental Statement (ES)

**PINS Document Reference: F2.16**  
**APFP Regulation: 5(2)(a)**

## Volume F2.16: Outline Net Gain Strategy

**Prepared** Royal HaskoningDHV July 2021  
**Checked** Thomas Watts, Orsted August 2021  
**Accepted** David King, Orsted August 2021  
**Approved** Julian Carolan, Orsted September 2021

F2.16  
Version A

## Table of Contents

1	Introduction.....	6
1.1	Project Background .....	6
1.2	Purpose .....	6
1.3	Objectives and Implementation of the Outline Net Gain Strategy .....	10
2	Planning and Policy Context .....	11
3	Consultation .....	13
4	BNG Process .....	16
4.2	Hornsea Four Approach to BNG .....	20
5	Results.....	23
5.2	Outline OnSS Biodiversity Net Gain Opportunities.....	24
5.3	Summary and Next Steps .....	25
6	References .....	28

## List of Tables

Table 1:	Summary of key legislation and policy relevant to biodiversity net gain.....	12
Table 2:	Consultation responses.....	13
Table 3:	Baseline biodiversity unit calculation for habitats within the OnSS.....	23
Table 4:	Baseline biodiversity unit calculation for linear (hedgerow) habitats within the OnSS.....	24

## List of Figures

Figure 1:	Hornsea Four Document Interaction.....	9
Figure 2:	Mitigation Hierarchy (CSBI 2015).....	18
Figure 3:	Net Gain OnSS Survey Area.....	19
Figure 4:	OnSS Existing and Proposed Biodiversity Net Gain Habitats.....	22

## Glossary

Term	Definition
Attenuation feature(s)	Area within which SuDS measures are to be adopted to facilitate attenuation and/or storage of surface water drainage. Measures can be, but are not limited to, the use of filter drains, swales, attenuation and flow control structures.
Commitment	<p>A term used interchangeably with mitigation and enhancement measures. The purpose of Commitments is to reduce and/or eliminate Likely Significant Effects (LSEs), in EIA terms.</p> <p>Primary (Design) or Tertiary (Inherent) are both embedded within the assessment at the relevant point in the EIA (e.g. at Scoping, Preliminary Environmental Information Report (PEIR) or ES).</p> <p>Secondary commitments are incorporated to reduce LSE to environmentally acceptable levels following initial assessment i.e. so that residual effects are acceptable.</p>
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for one or more Nationally Significant Infrastructure Projects (NSIP).
Energy Balancing Infrastructure (EBI)	The onshore substation includes energy balancing Infrastructure. These provide valuable services to the electrical grid, such as storing energy to meet periods of peak demand and improving overall reliability.
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
Export Cable Corridor (ECC)	The specific corridor of seabed (seaward of Mean High-Water Springs (MHWS)) and land (landward of MHWS) from the Hornsea Project Four array area to the Creyke Beck National Grid substation, within which the export cables will be located.
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.
Hornsea Project Four Offshore Wind Farm	The term covers all elements of the project (i.e. both the offshore and onshore). Hornsea Four infrastructure will include offshore generating stations (wind turbines), electrical export cables to landfall, and connection to the electricity transmission network. Hereafter referred to as Hornsea Four.
Landfall	The generic term applied to the entire landfall area between Mean Low Water Spring (MLWS) tide and the Transition Joint Bay (TJB) inclusive of all construction works, including the offshore and onshore ECC, intertidal working area and landfall compound. Where the offshore cables come ashore east of Fraisthorpe.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing low voltage electrical earthing links.
National Grid Electricity	The grid connection location for Hornsea Four at Creyke Beck.

Term	Definition
Transmission (NGET) substation	
Onshore substation (OnSS)	Comprises a compound containing the electrical components for transforming the power supplied from Hornsea Project Four to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid. If a HVDC system is used the OnSS will also house equipment to convert the power from HVDC to HVAC.
Order Limits	The limits within which Hornsea Project Four (the 'authorised project') may be carried out.
Orsted Hornsea Project Four Ltd.	The Applicant for the proposed Hornsea Project Four Offshore Wind Farm Development Consent Order (DCO).
Trenchless Techniques	Also referred to as trenchless crossing techniques or trenchless methods. These techniques include Horizontal Directional Drilling (HDD), thrust boring, auger boring, and pipe ramming, which allow ducts to be installed under an obstruction without breaking open the ground and digging a trench.

## Acronyms

Acronym	Definition
BNG	Biodiversity Net Gain
DCO	Development Consent Order
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
EBI	Energy Balancing Infrastructure
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
JB	Joint Bays
LB	Link Box
MHWS	Mean High Water Springs
MLW	Mean Low Water
MLWS	Mean Low Water Springs
NGET	National Grid Energy Transmission
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
SoS	Secretary of State
TCPA	Town and Country Planning Act
TJB	Transition Joint Bays

## Units

Unit	Definition
ha	hectares
kV	kilovolt (electrical potential)
km	kilometre
m	metre

## 1 Introduction

### 1.1 Project Background

1.1.1.1 Orsted Hornsea Project Four Limited (the 'Applicant') is proposing to develop Hornsea Project Four Offshore Wind Farm (hereafter 'Hornsea Four'). Hornsea Four will be located approximately 69 km offshore the East Riding of Yorkshire in the Southern North Sea and will be the fourth project to be developed in the former Hornsea Zone. Hornsea Four will include both offshore and onshore infrastructure including an offshore generating station (wind farm), export cables to landfall, and on to an onshore substation (OnSS) with energy balancing infrastructure (EBI), and connection to the electricity transmission network.

1.1.1.2 Details of the activities and infrastructure associated with Hornsea Four are fully set out in [Volume A1, Chapter 4: Project Description](#). In summary, the onshore elements of Hornsea Four will comprise of:

- **Landfall** – including transition joint bays connecting the offshore export cable corridor (ECC) and onshore ECC, one temporary landfall compound and temporary access tracks;
- **Onshore ECC** – including the onshore export cables, eight temporary logistics compounds, joint bays and link boxes, and temporary access tracks;
- **OnSS and EBI** – including the temporary working area, temporary and permanent access tracks, the permanent working area (inclusive of the OnSS, EBI and associated landscaping and attenuation feature(s)); and
- **400 kV National Grid Electricity Transmission (NGET) connection area** – the area within which a 400 kV section of the onshore ECC will connect to the existing NGET substation at Creyke Beck.

1.1.1.3 Hornsea Four has adopted several commitments (primary design principles inherent as part of the project). These commitments (set out within [Volume A4, Annex 5.2: Commitment Register](#)) include; installation techniques and engineering designs/modifications, to avoid a number of impacts or to reduce impacts as far as possible.

### 1.2 Purpose

1.2.1.1 This Outline Net Gain Strategy sets out the biodiversity net gain (BNG) measures identified by the Applicant for the onshore OnSS only. At this time, no BNG measures are proposed in the intertidal area, at the landfall or along the onshore ECC.

1.2.1.2 In the event that Hornsea Four is granted development consent, a detailed Net Gain Strategy will be prepared and consulted with the relevant planning authority, Natural England and landowners prior to commencement of onshore construction activities at the OnSS. This will follow the principles established in this Outline Net Gain Strategy. This is secured by Requirement 6 of the draft Development Consent Order (DCO) ([Volume C1, Chapter 1](#)) which states:

**6.** (1) No stage of the connection works in Work No. 7 may commence until a net gain strategy (which must accord with the outline net gain strategy) in relation to that stage has been submitted to and approved in writing by the relevant planning authority, in consultation with the relevant SNCBs.

(2) The net gain strategy must be implemented as approved.

1.2.1.3 BNG is the result of a process applied to development so that overall, upon completion of the works, there is a net positive outcome for biodiversity. The process itself follows the mitigation hierarchy, which sets out what must be done to avoid, minimise and/or restore losses on biodiversity on site as a result of development.

1.2.1.4 Hornsea Four is committed to reducing any net loss to biodiversity as a result of the onshore development of the OnSS. The production of an Outline Net Gain Strategy fulfils project commitment Co199 (**Volume A4, Annex 5.2: Commitment Register**) which requires a Net Gain Strategy to be developed in accordance with the Outline Net Gain Strategy. The Outline Net Gain Strategy includes proposed measures to provide biodiversity net gain at the OnSS (as shown in **Figure 3**). The production of an Outline Net Gain Strategy identifies biodiversity net gain opportunities over and above primary, secondary and tertiary mitigation measures required to neutralise potential impacts of the project on environmental receptors identified through the Environmental Impact Assessment (EIA) process, as set out in **Volume A3: Onshore Environmental Assessment** and **Volume A4, Annex 5.2: Commitment Register**.

1.2.1.5 This Outline Design Plan sits within a wider suite of documents (as shown in **Figure 1**, which utilises the same colour scheme to denote levels) which comprise the following:

#### **DCO Parameters and Maximum Design Scenario**

**Volume C1.1: Hornsea Four Draft Development Consent Order** – Consents the overarching maximum parameters associated with Hornsea Four infrastructure.

**Volume A1, Chapter 4: Project Description** – Further refines the maximum design scenario (MDS) for the Hornsea Four infrastructure providing additional parameters not outlined in the draft DCO.

#### **Detailed Design**

**Volume F2, Chapter 13: Outline Design Plan** – Provides the outline approach and key embedded design mitigations of the OnSS and EBI which will inform the detailed design to be approved under Requirement 7 of the draft DCO.

## Mitigation Measures

**Volume A3, Chapter 1-10: Onshore Environmental Assessment** – Comprises ten environmental topic areas subject to Environmental Impact Assessment (EIA), setting out primary, tertiary and secondary mitigation measures (secured through various DCO provisions as identified in **Volume A4, Annex 5.2: Commitments Register**) to avoid or reduce environmental effects.

**Volume F2, Chapter 8: Outline Landscape Management Plan** - Sets out the outline approach to landscaping works which will inform the detailed landscaping to be approved under Requirement 8 of the draft DCO. The indicative landscape masterplan also includes some embedded enhancement measures.

Further mitigation measures associated with Hornsea Four are secured in the Outline Ecological Management Plan (**Volume F2, Chapter 3**), Outline Onshore Infrastructure Drainage Strategy (**Volume F2, Chapter 6**), Outline Onshore Written Scheme of Investigation (**Volume F2, Chapter 10**), Outline Code of Construction Practice (**Volume F2, Chapter 2**).

## Biodiversity Net Gain

**Volume F2, Chapter 15: Outline Net Gain Strategy** – Covering only matters that are measurable, linked to biodiversity net gain. The outline measures will be developed further post-consent of Hornsea Four and approved under Requirement 6 of the draft DCO.

## Enhancement Measures

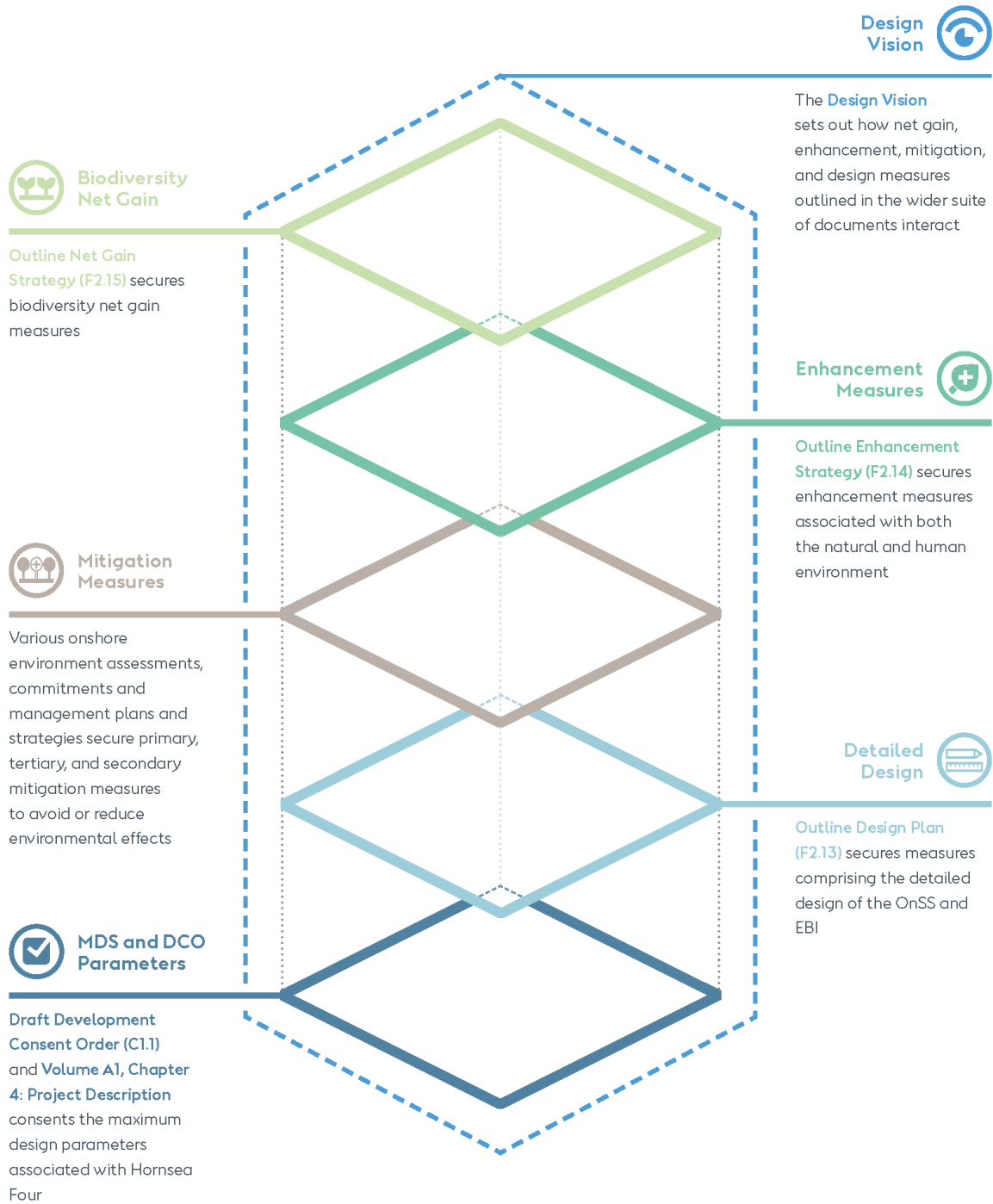
**Volume F2, Chapter 14: Outline Enhancement Strategy** – Sets out outline enhancement measures (measures identified over and above mitigation measures) associated with both the natural and human environment. The outline measures will be developed further post-consent of Hornsea Four and approved under Requirement 22 of the draft DCO.

## Design Vision

The core principals of each of the documents outlined above are combined in **Volume A4, Annex 4.6: Design Vision Statement**. This document presents the 'vision' of Hornsea Four, setting out how the project design, mitigation, enhancement and net gain measures interact. This interaction is further illustrated in **Figure 1**. The core elements of the Design Vision Statement including the relevant project mitigations are secured via respective elements of the draft DCO (**Volume C1.1**) (the most relevant of which are outlined in the above boxes). The Design Vision Statement is therefore provided as a visual aid only.

1.2.1.6 If Hornsea Four is granted development consent, a detailed Net Gain Strategy will be prepared and consulted with the relevant planning authority and landowners prior to construction of the connection works, in accordance with the principles established in this Outline Net Gain Strategy.





**Figure 1: Hornsea Four Document Interaction.**

## 1.3 Objectives and Implementation of the Outline Net Gain Strategy

- 1.3.1.1 This document presents the draft outline net gain strategy (i.e. net gain opportunities) that have been identified at this time for increasing the biodiversity value at the OnSS. Using professional judgement and information obtained from surveys undertaken to date, the project has identified a number of potential opportunities which are considered to provide positive outcomes for biodiversity, as presented in [Section 4.2](#). Hornsea Four will adopt a staged approach to the approval of DCO requirements enabling requirements to be approved in part or in whole prior to the commencement of the relevant stage of works according to whether a staged approach is to be taken to construction of the works in question. This approach will be governed by the inclusion of Requirement 27 within the draft DCO which requires a written scheme setting out the stages of construction to be approved prior to the commencement of the authorised development. The Construction Staging Scheme must be approved by the relevant Planning Authority in respect of the onshore connection works and by the MMO in relation to authorised works seaward of MHWS.
- 1.3.1.2 The Construction Staging Scheme will detail the stages of construction and the timing of approval of relevant DCO requirements with respect to the relevant construction stages identified within the scheme.

*(1) The authorised development may not be commenced until a written scheme setting out the stages of construction of the authorised development has been submitted to and approved by the relevant planning authority, in relation to the connection works, or the MMO, in relation to works seaward of MHWS.*

*(2) The stages of construction referred to in sub-paragraph (1) shall not permit the authorised development to be constructed in more than one overall phase.*

*(3) The scheme must be implemented as approved.*

## 2 Planning and Policy Context

- 2.1.1.1 The Government's 25 Year Environment Plan describes an ambition to leave the environment in a better state than that which it inherited for the next generation. This ambition is supported by the National Planning Policy Framework (NPPF), which makes general provisions for the delivery of BNG.
- 2.1.1.2 In the March 2019 budget, the Government acknowledged that BNG has not been delivered effectively through the NPPF and confirmed its intention to make BNG mandatory for Town and Country Planning Act 1990 (TCPA) development through the Environment Bill. This presents a challenge for developers, given the current variety in local authority approaches to embedding BNG and to counter this there has been a push to help achieve consistency, transparency and standardisation. This is to be delivered through a new national legislative mechanism, the Environment Bill. A mandatory BNG approach is intended to create a level playing field for developers and consistency in application. In June 2021 it was announced that the Environment Bill will be amended to apply to Nationally Significant Infrastructure Projects (NSIP).
- 2.1.1.3 The draft Environment Bill in review contains measures for BNG on projects consented through the TCPA and NSIP. Under the Environment Bill developers are mandated to ensure biodiversity sites are enhanced by a factor of at least 10% and maintain these enhancements for 30 years. Marine developments are, at least in the near-term, excluded from the scope of mandatory BNG.
- 2.1.1.4 Hornsea Four recognises commitments within the draft Environment Bill, NPPF, BS 8683 Process for designing and implementing Biodiversity Net Gain – Specification and Policy ENV4 of the East Riding of Yorkshire Council Local Plan, to conserve and enhance the environment by minimising impacts on and providing net gains for biodiversity. These commitments are supported by the Overarching National Policy Statement for Energy (EN-1), which states an applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity conservation interests.
- 2.1.1.5 Hornsea Four is committed to conserving and enhancing biodiversity through the implementation of a number of measures. By applying the mitigation hierarchy, Hornsea Four aims to prioritise avoidance of biodiversity loss before attempting to provide net gains which contribute toward onsite, local and strategic environmental priorities in consultation with local stakeholders.
- 2.1.1.6 Through the development of a Design Vision Statement, Hornsea Four aims to present development proposals which are both sensitive to the local landscape and offer enhancement to local biodiversity. This Design Vision Statement considers the existing landscape context and explores a series of interventions and best practice solutions to best integrate the development into the local area, minimising visual impact where possible, whilst enhancing the amenity and ecological potential of the project.
- 2.1.1.7 **Table 1** provides details of the key legislation and policy relevant to biodiversity net gain.

**Table 1: Summary of key legislation and policy relevant to biodiversity net gain.**

Plan/Policy Document	Summary
National Policy Statement (NPS) for Energy (EN-1)	<p>The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests. (EN-1, paragraph 5.3.4).</p> <p>Development proposals provide many opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, the Secretary of State should maximise such opportunities in and around developments, using requirements or planning obligations where appropriate. (EN-1, paragraph 5.3.15).</p>
National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, updated 2019)	<p>Whilst noting that the NPPF is not directly applicable to Hornsea Four as it is a NSIP, consideration of its requirements has been undertaken, where Paragraph 8 of the NPPF states that there are three dimensions to sustainable development: economic, social and environmental, and that all three are mutually dependent and gains for all should be sought jointly and simultaneously through the planning system.</p> <p>The environmental dimension is defined as <i>"an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."</i></p>
East Riding of Yorkshire Council Local Plan	<p>Policy ENV4 of the East Riding of Yorkshire Council Local Plan states proposals should consider information from the ERYBAP, Local Sites in the East Riding of Yorkshire, Biodiversity Priority Areas, Humberhead Levels Partnership covering the NIA, LNPs covering habitat networks and green infrastructure, and other landscape scale biodiversity initiatives, such as the Royal Society for the Protection of Birds' Humberhead Levels Futurescapes Project.</p> <p>Section 8 of the East Riding of Yorkshire Council Local Plan states that mitigation measures should deliver no net loss of biodiversity when developments are implemented, and a net gain in biodiversity should be achieved wherever possible.</p>

## 3 Consultation

3.1.1.1 Consultation is a key part of the DCO application process. Consultation regarding net gain has been conducted through informal meetings with stakeholders through the Evidence Plan process. An overview of the project consultation process is presented within **Volume A1, Chapter 6: Consultation**. Agreements made with consultees within the Evidence Plan process are set out in the topic specific Evidence Plan Logs which are appendices to the Hornsea Four Evidence Plan (**Volume B1, Annex 1.1: Evidence Plan**), an annex of the Hornsea Four Consultation Report (**Volume B1, Chapter 1: Consultation Report**). All agreements within the Evidence Plan Logs have unique identifier codes which have been used throughout this document to signpost to the specific agreements made (e.g. ON-ECO-1.1).

3.1.1.2 A summary of the key comments raised during consultation specific to net gain is outlined in **Table 2**, together with how these issues have been considered by the Applicant.

**Table 2: Consultation responses.**

Consultee	Date, Document, Forum	Issues raised	Response to issue and where addressed in the ES
Environment Agency	Section 42 response	<p>We also propose that a commitment should be added to the Commitment Register to ensure that environmental/biodiversity net gains (enhancements) are delivered as part of the proposed development. The details of the proposed enhancement should be provided as the detailed design of the scheme is finalised and should be agreed with us prior to construction.</p> <p>Our comments are supported by paragraphs 170 and 175 of the National Planning Policy Framework (NPPF) and Policy ENV4 of the East Riding of Yorkshire Council Local Plan, which recognise that the planning system should conserve and enhance the environment by minimising impacts on and providing net gains for biodiversity. It is also supported by paragraph 5.3.4 of the Overarching National Policy Statement for Energy (EN-1), which states that the applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity conservation interests.</p>	<p>The Applicant has actively engaged with ERYC, the local community, and through bodies such as The Wildlife Trust, The Yorkshire Wildlife Trust, the Environment Agency and Natural England, although no significant biodiversity net gain opportunities have been identified at this time. Hornsea Four will continue to explore any opportunities which may arise.</p>

Consultee	Date, Document, Forum	Issues raised	Response to issue and where addressed in the ES
Natural England	Section 42 response	Without a sufficient baseline, it is not clear how the project will prevent no net loss. It is not clear that the measures included in this document will lead to a biodiversity enhancement. There is no mention of how the project will attempt to achieve a biodiversity net gain.	<p>Baseline habitat data has been collected during the Hornsea Four Extended Phase 1 Habitat Survey effort undertaken by Royal HaskoningDHV in February and September 2019 (<a href="#">Volume A6, Annex 3.1: Extended Phase 1 Habitat Survey Report</a> and <a href="#">Volume A6, Annex 3.2: Extended Phase 1 Target Note Tables</a>). The findings of these surveys have been used to inform the baseline biodiversity calculations presented in <a href="#">Section 4.2.2</a>. This approach has been presented and agreed with Natural England as part of the Hornsea Four onshore Ecology Evidence Plan Technical Panel meeting held on the 8th April 2019 (ON-ECO-1.8). Agreement was subsequently obtained from Natural England via the Hornsea Four onshore ecology Evidence Plan Technical Panel meeting held on the 1st April 2020 (ON-ECO-1.18).</p> <p>The Applicant has actively engaged with ERYC, the local community, and through bodies such as The Wildlife Trust, The Yorkshire Wildlife Trust, the Environment Agency and Natural England, although no significant opportunities have been identified at this time. Hornsea Four will continue to explore any opportunities which may arise. The Applicant is in consultation with stakeholders on enhancement opportunities.</p> <p><a href="#">Volume A4, Annex 4.6 Design Vision Statement</a> also presents Hornsea Four's development</p>

Consultee	Date, Document, Forum	Issues raised	Response to issue and where addressed in the ES
			<p>aspirations which are both sensitive to the local landscape setting and which have the potential to offer enhancement to local biodiversity. Proposals include woodland planting, an integrated attenuation pond and potential hedgerow enhancements at the OnSS.</p> <p><b>Volume F2, Chapter 3: Outline Ecological Management Plan</b> (oEMP) presents information on ecological mitigation and management to be provided by Hornsea Four for the pre-construction, construction, and post-construction phases of the project. Should any further mitigation and/or management be identified, the oEMP will be updated, as required.</p>
Natural England	2 <sup>nd</sup> September 2021 – Onshore Ecology Position Paper	The Applicant requested clarification from Natural England whether the Hornsea Four Outline Net Gain Strategy can be submitted using the Defra 2.0 Metric, or whether the document needed to be updated accounting for the recent release of the new Defra 3.0 Metric.	Natural England confirmed that the Defra 2.0 Metric currently presented in the Outline Net Gain Strategy is acceptable (ON-ECO-5.3).

## 4 BNG Process

### Overview

- 4.1.1.1 Royal HaskoningDHV has been appointed to assess the biodiversity impacts resulting from Hornsea Four and set out what may be required to achieve net gain for biodiversity at the OnSS.
- 4.1.1.2 In July 2021, Natural England released the updated Biodiversity Metric, version 3.0. Agreement was obtained from Natural England in September 2021 (ON-ECO-5.3) which confirmed the Defra 2.0 Metric currently used and presented in this document is acceptable.
- 4.1.1.3 Based on the onshore ecological baseline (as outlined in [Section 4.2](#)) data, the Defra metric 2.0 toolkit has been used to calculate the baseline biodiversity units of the OnSS, as shown on [Figure 3](#). This information can be used to follow the mitigation hierarchy (avoid, mitigate, restore, offset) and inform the post development proposals relating to BNG.
- 4.1.1.4 At this time, no calculation of the post development proposals has been undertaken as the proposed BNG opportunities detailed in this document are subject to ongoing landowner discussions and obtaining their subsequent agreement, along with further engagement with ERYC and Natural England. In addition, up-to-date habitat and species findings from the pre-construction surveys will be required to inform the post development calculations. However, the calculated baseline biodiversity units presented in [Section 5](#) enable the loss, no net loss or net gain of biodiversity to identified post development.
- 4.1.1.5 It should be noted that using the metric to calculate biodiversity units is just one indicator of biodiversity. This measure should be considered in combination with an understanding of specific species, species composition (animals and plants), habitat structure, ecological functionality and people's use of each area.

### Biodiversity Unit Calculations

- 4.1.1.6 The metric for calculating the biodiversity units follows the Defra 2.0 metric (<https://www.gov.uk/government/collections/biodiversity-offsetting>). This metric has been used to enable the assessment of biodiversity losses and gains. This approach, and the use of the Defra 2.0 metric, was agreed with Natural England (ON-ECO-5.3).
- 4.1.1.7 The calculation of the baseline biodiversity units using the biodiversity metric takes account of all the habitats within the OnSS as identified using Phase 1 habitat categories. This calculation is in accordance with Defra's technical paper, guidance for developers and guidance for offset providers (Defra, 2019). This is the standard metric used for calculating biodiversity units. Where data is not available assumptions have been made based on the best available evidence.



4.1.1.8 Biodiversity baseline calculations for each habitat category follow the formula:

$$\begin{aligned} &(\text{Habitat}) \text{ Distinctiveness} \times \text{Condition} \times \text{Area (ha)} = \text{Biodiversity Units} \\ &\text{Or} \\ &(\text{Habitat}) \text{ Condition} \times \text{Length} = \text{Linear Biodiversity Units} \end{aligned}$$

4.1.1.9 Calculations of biodiversity units using the biodiversity metric takes account of habitat that is lost due to development, habitat retained post development, any retained and enhanced habitats, and any habitats created due to the development. The assessment is based upon the target state (size and condition) for the habitats that are being enhanced or created:

$$\begin{aligned} &(\text{Habitat}) \text{ Distinctiveness} \times \text{Condition} \times \text{Area (ha)} \times \\ &\quad \text{Spatial Risk} \times \text{Temporal Risk} \times \text{Delivery Risk} \\ &\quad = \text{Post-Development Biodiversity Units} \\ &\text{Or} \\ &(\text{Habitat}) \text{ Condition} \times \text{Length (m)} \times \text{Risk Factor} \\ &\quad = \text{Post-Development Linear Biodiversity Units} \end{aligned}$$

Applying the mitigation hierarchy

4.1.1.10 The information from the biodiversity unit calculations enables the identification of the habitat types and the areas needed for ecological mitigation in line with the mitigation hierarchy. This maximises the onsite compensation, which in turn minimises the offsite compensation that would be needed to deliver no net loss or net gain for biodiversity. This is the most efficient and cost-effective way of delivering no net loss or net gain for biodiversity.

4.1.1.11 Post consent and following completion of the pre-construction surveys, the biodiversity units will need to be updated to reflect any changes and in turn presented in the Net Gain Strategy that will be consulted with the relevant planning authority and landowners.

4.1.1.12 The difference between the baseline biodiversity units and those calculated for the post-development phase indicate the number of units that would be needed to deliver no net loss or net gain for biodiversity. Using this information, the habitat types and the size that would be needed off site to deliver no net loss or net gain would be identified. This in turn can be used to provide a rough cost estimate for the potential offset requirements.

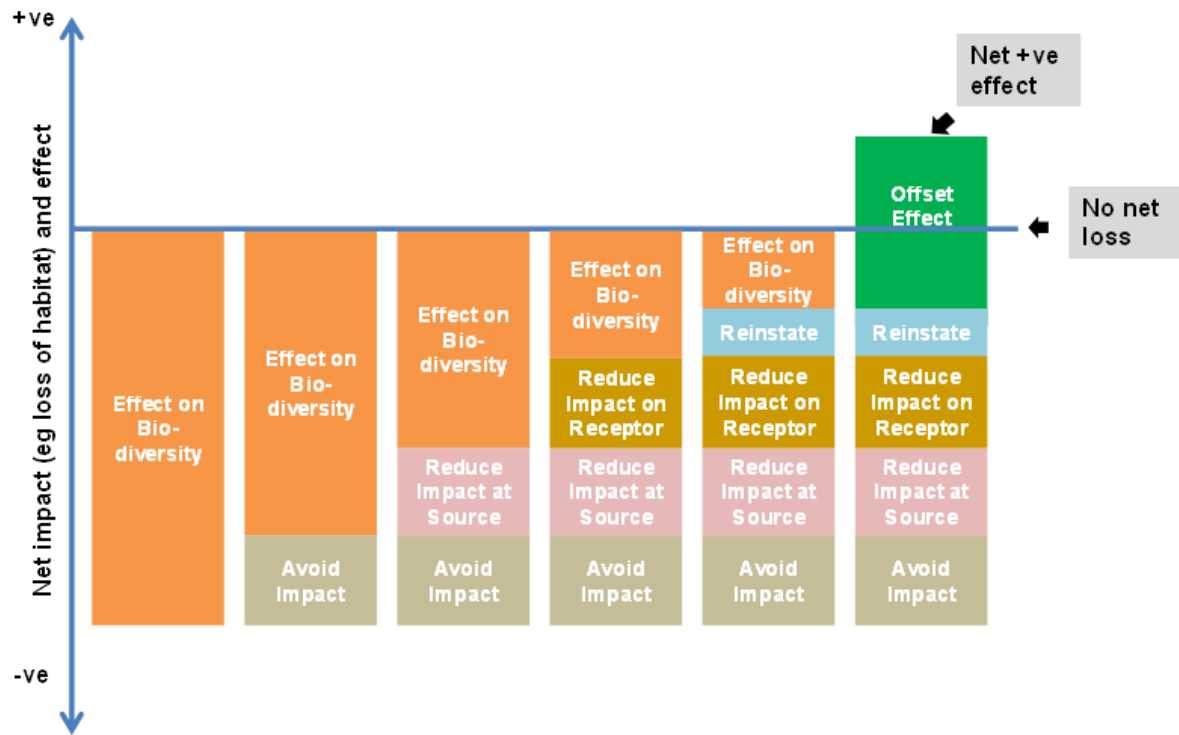


Figure 2: Mitigation Hierarchy (CSBI 2015).

500000

520000

460000

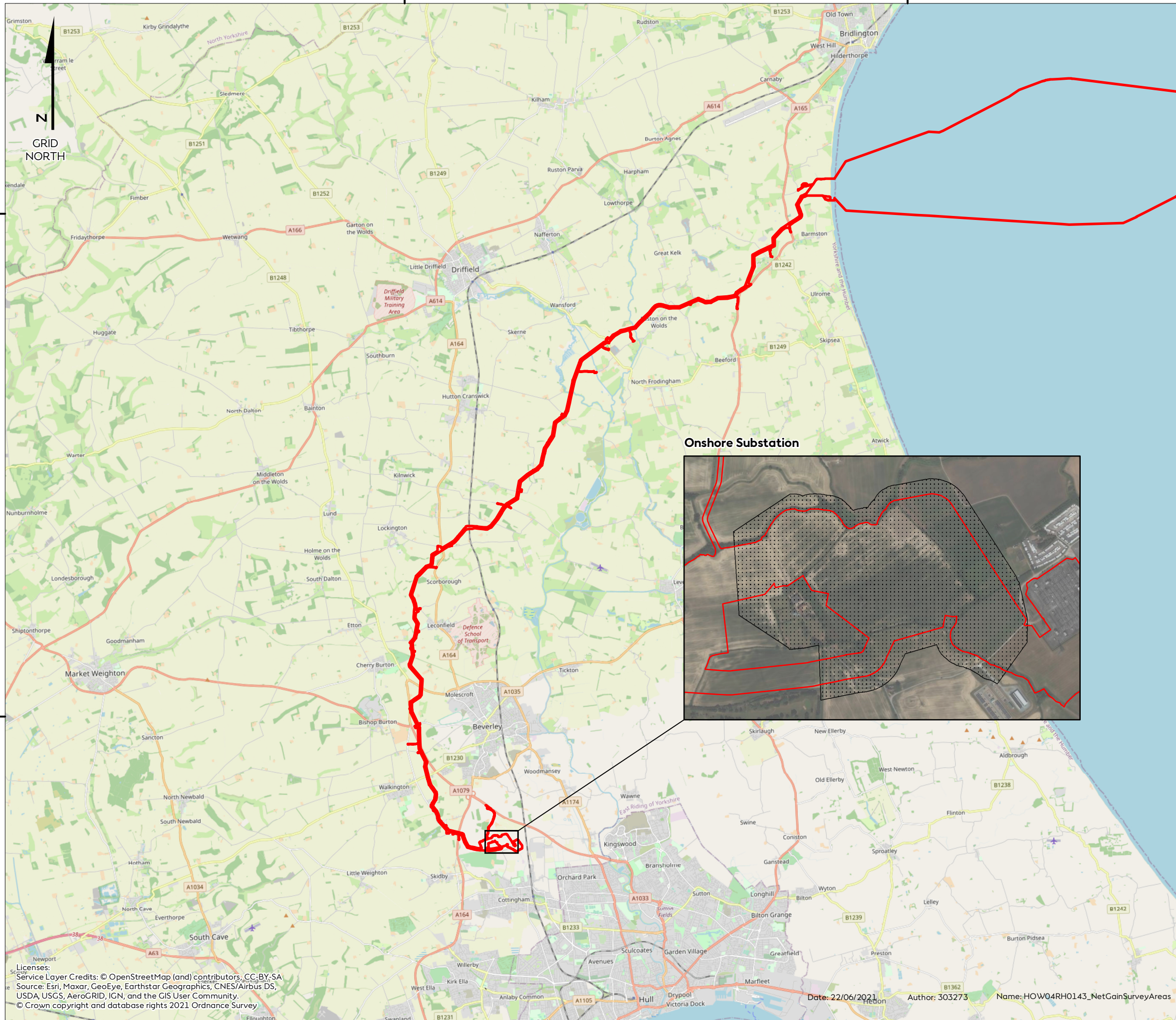
460000

440000

440000

500000

520000



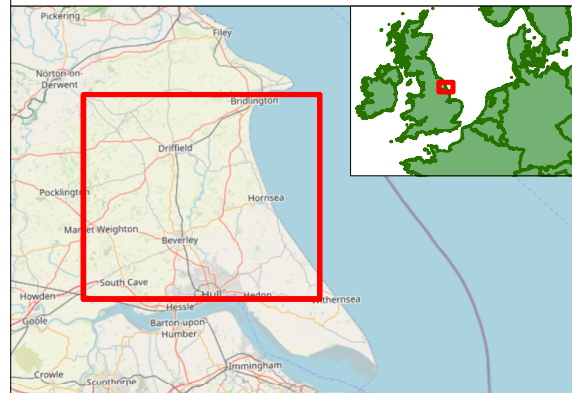
Onshore Substation



# Hornsea Four

## Figure 3 OnSS Net Gain Survey Area

- Order Limits
- Survey Area



Coordinate system: British National Grid  
 Scale@A3: 1:150,000

REV	REMARK	DATE
	First Issue for DCO	22/06/2021

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA  
 Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS,  
 USDA, USGS, AeroGRID, IGN, and the GIS User Community.  
 © Crown copyright and database rights 2021 Ordnance Survey

## 4.2 Hornsea Four Approach to BNG

### 4.2.1 BNG Site Selection

4.2.1.1 Subject to landowner agreement, the OnSS has been identified by Hornsea Four for BNG opportunities, as shown on [Figure 3](#). This site has been identified for BNG opportunities using information obtained from the existing ecological baseline surveys, as well as feedback received from stakeholders through the onshore Technical Panel Meetings.

### 4.2.2 Baseline Biodiversity Unit Calculations

#### Extent and Sources of Baseline Habitat Data

- 4.2.2.1 A baseline biodiversity net gain assessment has been undertaken as part of this Outline Net Gain Strategy (see [Section 5](#)). It is based on habitat data collected during the Hornsea Four Extended Phase 1 Habitat Survey effort undertaken by Royal HaskoningDHV in February and September 2019 (full details of which are presented in [Volume A6, Annex 3.1: Extended Phase 1 Habitat Survey Report](#) and [Volume A6, Annex 3.2: Extended Phase 1 Target Note Tables](#)). The survey followed JNCC (2010) and CIEEM (2017) best practice guidance.
- 4.2.2.2 In addition to the Extended Phase 1 Habitat Survey, a hedgerow and arboricultural survey (full details of which are presented in [Volume A6, Annex 3.14: Hedgerow and Arboricultural Survey Report](#)) was undertaken which are considered the primary data source for hedgerows. Hedgerow surveys were undertaken in accordance with the Hedgerow Regulations best practice methodology (The Hedgerow Regulations 1997).
- 4.2.2.3 For area-based habitats, hectares are reported to two decimal places. For linear habitats, length is reported to the nearest half metre.
- 4.2.2.4 As agreed with Natural England (ON-ECO-5.3), habitat condition assessment surveys (in conjunction with botanical surveys) will be undertaken pre-construction. The methodology of which will be in accordance with industry guidance.

#### Baseline Biodiversity Unit Calculation

- 4.2.2.5 A baseline biodiversity unit calculation has been completed for all habitats within the OnSS using the Defra 2.0 metric, as recorded during the Extended Phase 1 Habitat Survey and shown on [Figure 3](#).
- 4.2.2.6 The baseline calculations firstly present the total units for the OnSS (i.e. its ecological baseline) and where the habitat is being retained, enhanced or selected for accelerated succession, this is shown as the total units lost. A desired outcome as a result of the biodiversity calculations would be few to no units lost in the first instance when calculating the baseline, and should biodiversity units be lost, habitat creation, enhancement and accelerated succession on-site, post development, will ensure a net gain for biodiversity.

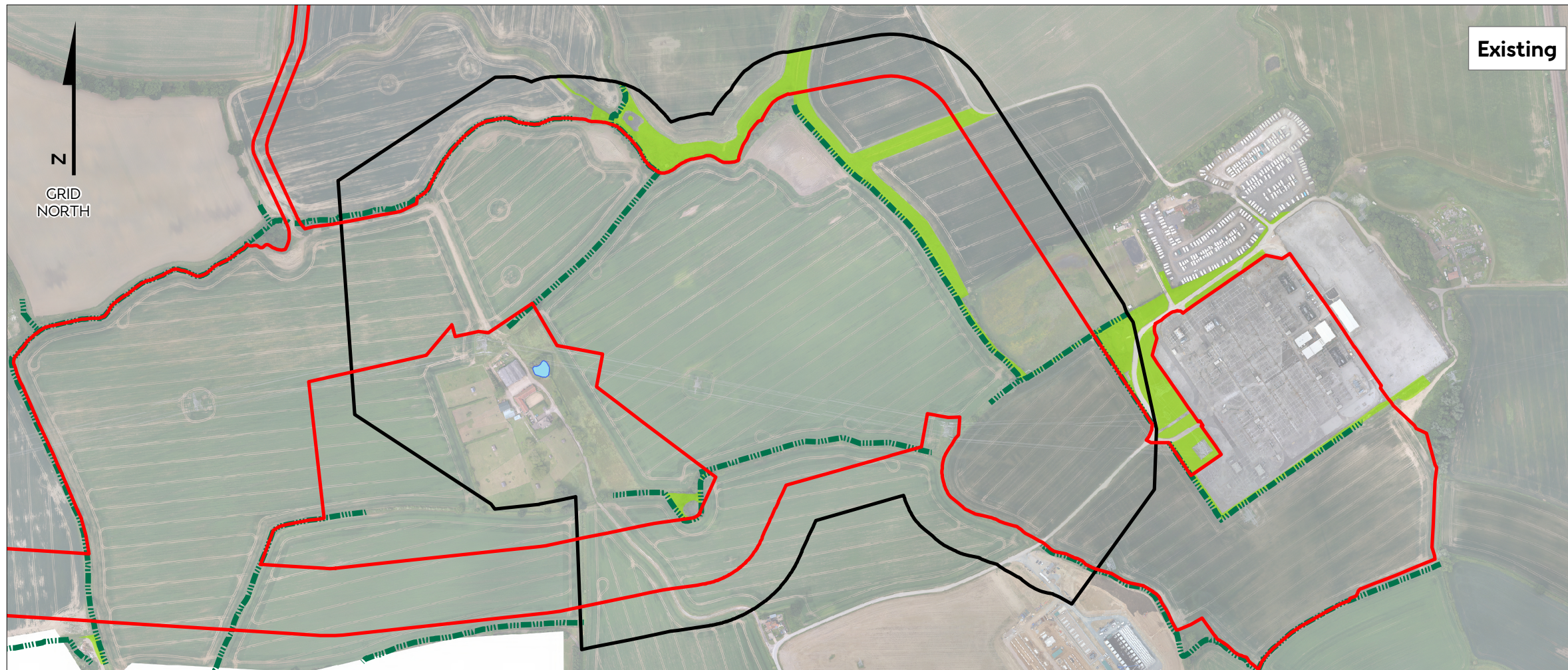
4.2.2.7 Habitat management and monitoring will be required and will be secured through the Net Gain Strategy. The Net Gain Strategy will detail a programme of inspection, reporting and management activities such as periodic hedgerow management. The habitat management and monitoring requirements will be adaptive and will include the processes for agreeing any required changes to the identified management measures as a result of the monitoring results.

4.2.2.8 Objectives for management will be set based on achieving target conditions for each habitat type and may include a period of maintenance such as strimming, pruning and replacing failed planting such as whips.

### Assumptions

4.2.2.9 The information presented in [Section 5](#) has made the following assumptions:

- The existing condition and extent of the habitats is based on existing baseline data and professional opinion;
- The average time to create the habitats has been reduced due to the fact some proposed opportunities are not being created from scratch, but existing habitats enhanced; and
- The hedgerow calculation includes a condition score. Although this differs from the Defra metric, it is considered an appropriate approach to reflect the importance of more diverse hedges.



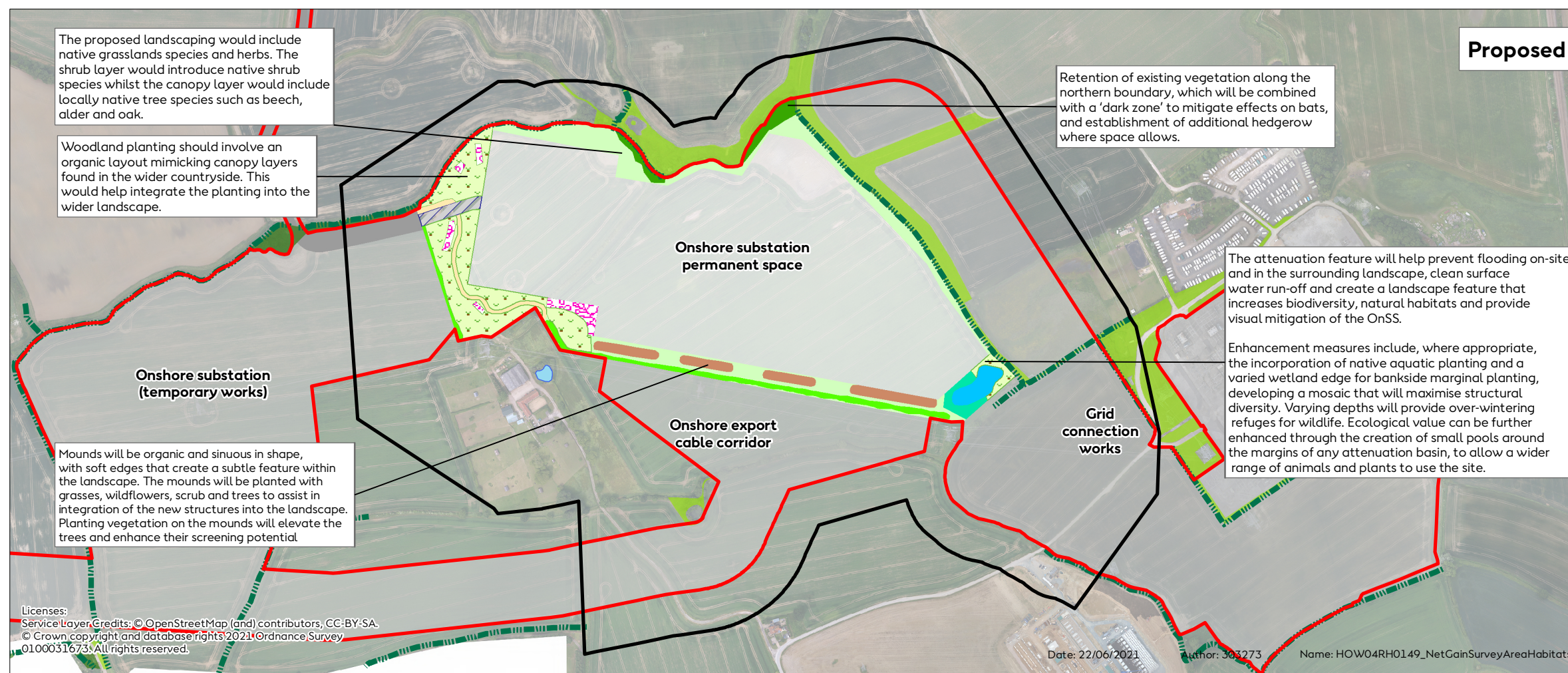
Existing

# Hornsea Four

## Figure 4

Onshore Substation Existing and Proposed Biodiversity Net Gain Habitats

- Order Limits
- Survey Area
- Existing Onshore Substation Habitats**
- Existing Hedgerow
- Dense / Continuous Scrub
- Permanent Access Track
- Works Layers
- Pond Location
- Biodiversity Net Gain Measures**
- Existing landscaping
- Proposed landscaping
- Proposed attenuation feature
- Proposed hedgerow
- Proposed landscape bund
- Proposed riparian scrub
- Proposed trees and scrub
- Proposed wildflower planting
- Landscape Features**
- Potential vehicular entrance to site
- Proposed footpath



Proposed

The proposed landscaping would include native grasslands species and herbs. The shrub layer would introduce native shrub species whilst the canopy layer would include locally native tree species such as beech, alder and oak.

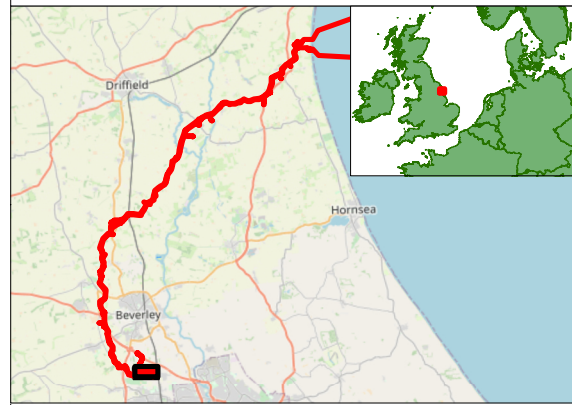
Woodland planting should involve an organic layout mimicking canopy layers found in the wider countryside. This would help integrate the planting into the wider landscape.

Mounds will be organic and sinuous in shape, with soft edges that create a subtle feature within the landscape. The mounds will be planted with grasses, wildflowers, scrub and trees to assist in integration of the new structures into the landscape. Planting vegetation on the mounds will elevate the trees and enhance their screening potential.

Retention of existing vegetation along the northern boundary, which will be combined with a 'dark zone' to mitigate effects on bats, and establishment of additional hedgerow where space allows.

The attenuation feature will help prevent flooding on-site and in the surrounding landscape, clean surface water run-off and create a landscape feature that increases biodiversity, natural habitats and provide visual mitigation of the OnSS.

Enhancement measures include, where appropriate, the incorporation of native aquatic planting and a varied wetland edge for bankside marginal planting, developing a mosaic that will maximise structural diversity. Varying depths will provide over-wintering refuges for wildlife. Ecological value can be further enhanced through the creation of small pools around the margins of any attenuation basin, to allow a wider range of animals and plants to use the site.



Coordinate system: British National Grid  
Scale@A3: 1:6,000

0 150 300 Metres

0 150 300 Yards

REV	REMARK	DATE
	First Issue for biodiversity net gain strategy	22/06/2021

Licenses:  
Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA.  
© Crown copyright and database rights 2021 Ordnance Survey  
0100031673. All rights reserved.

## 5 Results

5.1.1.1 Using the methodology described in [Section 4](#), [Table 3](#) and [Table 4](#) present the results of the OnSS baseline BNG unit calculations.

**Table 3: Baseline biodiversity unit calculation for habitats within the OnSS.**

Location	Baseline biodiversity units					Biodiversity Units permanently lost (to be replaced / net gain sought)
	Habitat Type	Condition	Area (ha)	Total Habitat Units	Biodiversity Units temporarily lost	
OnSS	Woodland and forest - Lowland mixed deciduous woodland	Good	0.1	2.28	2.28	N/A
	Heathland and shrub - Mixed scrub	Moderate	1.17	10.76	10.76	N/A
	Heathland and shrub - Mixed scrub	Moderate	0.86	7.91	7.91	N/A
	Grassland - Modified grassland	Fairly Good	1.3	7.48	7.48	N/A
	Grassland - Modified grassland	Fairly Good	1.2	6.90	N/A	6.90
	Cropland - Cereal crops	N/A Agricultural	16.92	38.92	38.92	N/A
	Cropland - Cereal crops	N/A Agricultural	23.78	54.69	N/A	54.69
	Lakes - Ponds (Non- Priority Habitat)	Moderate	0.31	4.71	4.71	N/A
	Urban - Developed land; sealed surface	N/A Other	0.07	0.00	N/A	0.00
	Urban - Developed land; sealed surface	N/A Other	0.7	0.00	0.00	0.00

**Table 4: Baseline biodiversity unit calculation for linear (hedgerow) habitats within the OnSS.**

Location	Baseline biodiversity units			Biodiversity Units permanently lost
	Habitat Type	Length (km)	Total Hedgerow Units	
OnSS	Native Hedgerow	0.61	2.95	2.81
	Native Species Rich Hedgerow with trees	0.004	0.04	0
	Native Hedgerow with trees	1.82	8.80	8.28

Note: The Defra metric simply requires 2 m of hedgerow to be created for each 1 m that is lost.

## 5.2 Outline OnSS Biodiversity Net Gain Opportunities

5.2.1.1 This section provides an overview of the proposed outline biodiversity net gain opportunities, as shown on [Figure 4](#), that have been identified at the OnSS.

5.2.1.2 Full details of site-specific measures (and associated management requirements) to be implemented will be described in the Net Gain Strategy submitted post-consent (as secured by Requirement 6 of the draft Development Consent Order (DCO) ([Volume C1, Chapter 1](#))).

### OnSS ecologically diverse landscape planting

5.2.1.3 An ecologically diverse planting scheme will be designed to replace and where possible improve the existing ecological connections around the infrastructure within the OnSS. This has been identified to comprise a mix of nurse woodland and core woodland based on indigenous woodland species. It is anticipated the woodland bands would be set along the boundaries and enclose a broad band of species rich grassland.

5.2.1.4 Within the landscaped area, grassland may be seeded with a wildflower seed mix, pollen and nectar strips and clover leys. Diverse mixtures of short turf, tall herbs, scrub and woodland may be created, providing varying heights and a mosaic habitat for native invertebrates, reptiles and mammals. Retention of brash as deadwood, for the creation of hibernacula and inclusion of bird (i.e. barn owl) and bat (and other small mammal) boxes may be considered. Planting will be of a quantity and ecological quality beyond visual screening for impact mitigation purposes and tie in with any local biodiversity targets.

5.2.1.5 The locations for landscape planting will be selected to ensure that ecological connections across the site, between larger blocks of habitat are maintained and improved where possible, to enhance overall ecological connectivity of habitat surrounding the OnSS. Examples of the proposed planting that has been incorporated into the project design is presented in the Outline Landscape management Plan ([Volume F2, Chapter 8](#)) and the Design Vision Statement ([Volume A4, Annex 4.6](#)).



- 5.2.1.6 To control the area of scrub within the OnSS, works to maintain and/or reduce its existing extent to prevent encroachment will be undertaken as part of the landscape planting works.

#### OnSS creation of a water attenuation features

- 5.2.1.7 An integrated sustainable drainage system within the OnSS, including a natural attenuation feature integrated into a biodiverse landscaped design will provide ecological benefit through a variety of both covered and open water habitats, favouring different flora and fauna. Planting may consist of native aquatic planting and a varied wetland edge for bankside marginal planting, developing a mosaic which maximises structural diversity. Ecological value may be further obtained through the creation of small pools around the margins of any attenuation basin, to allow a wider range of animals and plants to use the site. Examples of an attenuation area incorporated into the project design is presented in the Design Vision Statement ([Volume A4, Annex 4.6](#)). It is noted that natural attenuation features are anticipated to be located outside of the security fencing at the OnSS, with the potential for engineered solutions within the security fencing. Further information regarding planting is included in the Outline Landscape management Plan ([Volume F2, Chapter 8](#)), with drainage methodology presented in the Outline Onshore Infrastructure Drainage Strategy ([Volume F2, Chapter 6](#)).

#### 5.2.1.8 OnSS hedgerow creation and planting

- 5.2.1.9 As shown on [Figure 4](#), a length of new hedgerow will be planted within the OnSS. Species will include native woody species such as spindle, hawthorn, rowan and hazel as well as including other species which bear nectar, berries, fruit and nuts that will in turn provide foraging opportunities for local fauna and provide benefits for nesting birds, invertebrates and bats. Planting will be of a quantity and ecological quality beyond that required for mitigation purposes.
- 5.2.1.10 Replanted or replaced hedgerows will include species that are in accordance with local guidance of hedgerow planting i.e. the East Riding of Yorkshire hedgerow Biodiversity Action Plan (BAP) strategy. Hedgerows within and surrounding the OnSS will be double planted with 2 m grassland strips on both sides so there is always a leeward side to forage. Hedgerow planting schemes will be subject to landowner approval prior to construction of the relevant connection works. Examples of planting incorporated into the project design is presented in the Design Vision Statement ([Volume A4, Annex 4.6](#)). Ecological management measures are presented in the Outline Ecological Management Plan ([Volume F2, Chapter 3](#)).

### **5.3 Summary and Next Steps**

- 5.3.1.1 The calculations presented in [Section 5](#) provide robust information on the baseline biodiversity units for Hornsea Four that can be used to deliver net gain for biodiversity in accordance with Defra's best practice guidelines for the OnSS.

- 5.3.1.2 The baseline biodiversity metric (and the associated calculations) is a live tool to record biodiversity losses and gains and therefore further calculations will be required once the findings from the pre-construction surveys are available to quantify the impacts of habitat creation, enhancement and accelerated succession on mitigating the loss of biodiversity units and linear biodiversity units to contribute towards achieving a net gain for biodiversity. These updated calculations will be presented in the Net Gain Strategy.
- 5.3.1.3 It should be noted that there is a temporal risk associated with reinstating hedgerows and replanting of grassland and scrub due to these not reaching their target condition immediately therefore this needs to be considered when selecting species compositions and planting regimes. When replacing this habitat, there may be a mismatch in the timing of the impact and its creation, i.e. the difference in time between the negative impact on biodiversity and the area of habitat reaching the required quality. This results in lower levels of biodiversity for that period.
- 5.3.1.4 The time to achieve target condition will be calculated in the next stage of biodiversity calculations and once the findings from the pre-construction surveys are available. For example, to achieve a moderate condition, a newly planted hedge will take five years to establish, whereas a restored or enhanced hedgerow will take three years to achieve moderate condition. These updated calculations will be presented in the Net Gain Strategy.
- 5.3.1.5 The issue of temporal risk can be managed by creating habitat ahead of habitat loss, however this would only be possible in areas not directly impacted by Hornsea Four and the appropriate risk multiplier from the Defra metric, would still be applied (time to target condition multiplier). It is important to recognise that it is impossible to exactly replicate habitat losses, however habitats that require minimal or no ongoing management can be considered quicker to restore. With effective 'like for like' replanting, reinstatement, monitoring and management, an overall 'no net loss' for biodiversity could be achieved.
- 5.3.1.6 It should be noted that agreements with landowners, where required, will be sought prior to submission of the Net Gain Strategy document and implementation of BNG initiatives during construction.

## 5.3.2 Monitoring and Future Management

- 5.3.2.1 There are a number of factors that influence the time taken for a habitat to develop from the point of creation or restoration to the desired final condition. These factors are often site dependent but may include the following:
- Soil type and pH;
  - Climate variants / extreme weather;
  - Site preparation;
  - Soil nutrient status;
  - Wider landscape connectivity;
  - Irrigation; and
  - Species matrix available.

- 5.3.2.2 The timeframe should also be considered; most habitats can be recreated rapidly as long as the above factors are carefully considered, and sufficient time is allowed.
- 5.3.2.3 Periodic monitoring of reinstated habitats and management practices (for the duration of the Net Gain Strategy, i.e. up to 35 years) to ensure the success of planting will help to achieve an overall no net loss for biodiversity. For example, it is recommended that more mature, native, woody species are selected when reinstating hedgerows to reduce the time taken to achieve target condition. When reinstating habitats, there is also an opportunity to improve condition, connectivity and quality through the selection of species mixes, and therefore achieve an eventual net gain for biodiversity.
- 5.3.2.4 In the absence of the post-development calculations and agreeing the proposed BNG opportunities with landowners, a detailed monitoring plan is unable to be provided at this time. However, a detailed monitoring plan will be presented within the final Net Gain Strategy post-consent and will cover the net gain opportunities that will be delivered at the OnSS along with their specific management and monitoring requirements. However, it should be noted that Requirement 9 of the draft DCO ([Volume C1, Chapter 1](#)) requires that the success of planting (including those associated with the outline biodiversity net gain opportunities detailed in this document) will be monitored for five years after planting. During this period any plants which die, are removed, or become seriously damaged or diseased, in the opinion of ERYC, shall be replaced in the first available planting season with a specimen of the same species and size as that originally planted. Unless otherwise approved in writing by ERYC. This is secured in Requirement 9(2), Schedule 1, Part 3, [Volume C1, Chapter 1](#).

## 6 References

Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) Biodiversity Net Gain: Good practice principles for development.

CIRIA (2019) Biodiversity net gain. Good practice principles for development. A practical guide.

CSBI (2015). A cross-sector guide for implementing the Mitigation Hierarchy. Prepared by the Biodiversity Consultancy on behalf of IPIECA, ICMM and the Equator Principles Association. Cambridge, UK.

Defra (2019) The Biodiversity Metric 2.0.