North Falls and Five Estuaries offshore wind farms

Joint Substations Design Guide

Version 01: January 2026

FIVE ESTUARIES OFFSHORE WIND FARM

NORTH FALLS Offshore Wind Farm

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Prepared For: North Falls & Five Estuaries

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1. Introduction

1 Introduction

1.1 The Joint Substations Design Guide

1.1.1 This Joint Substations Design Guide (JDG) has been prepared to support the development of detailed proposals for two co-located onshore substations (OnSSs). These OnSSs are for the North Falls and Five Estuaries offshore wind farm Projects. They are to be constructed on a site bounded by Ardleigh Road, Grange Lane and Barn Lane.

Development Consent Order

1.1.2 The two projects have been subject to a Development Consent Order (DCO) examination process. Five Estuaries Offshore Wind Farm (VEOWF) received development consent in December 2025 and North Falls Offshore Wind Farm (NFOWF) is expecting a decision in early 2026.

1.1.3 DCO proposals showed an outline level of detail only, due to the uncertainty regarding technology and construction methodology at this early stage. This 'envelope' approach is standard procedure for Nationally Significant Infrastructure Projects (NSIPs).

1.1.4 Detailed design parameters for the onshore development are stated within the draft DCOs.

- NFOWF: Part 3, Requirement 6
- VEOWF: Schedule 2, Requirement 2

1.1.5 Both Projects submitted 'design approach documents' within their DCO applications. In the absence of detailed designs, these identified a series of 'design principles' to inform the subsequent detailed design, post-consent.

- NFOWF submitted a 'Design Vision'.
- VEOWF submitted a 'Design Principles Document'.

1.1.6 Both Projects also submitted Outline Landscape and Ecological Management information;

- NFOWF submitted an Outline Landscape and Ecological Management Strategy (OLEMS);
- VEOWF submitted an Outline Landscape and Ecological Management Plan (OLEMP)

1.1.7 These documents provided an outline of the measures proposed to avoid or mitigate ecological and landscape impacts during the pre-construction, construction and operation phases, as identified through the Projects' Environmental Impact Assessments (EIA). Indicative Landscape Mitigation Plans and Cross Sections included within the OLEMS / OLEMP demonstrated how mitigation measures could be applied to an indicative site layout.

Detailed Design

1.1.8 Detailed designs for the OnSSs will be developed after the respective DCOs are awarded. The draft DCOs for NFOWF and VEOWF state that development must not commence until the following details are approved:

- Layout and scale
- Proposed levels
- External hard surfacing
- Dimensions, colour and materials for buildings
- Fencing height and colour
- Access, parking and circulation areas
- Lighting
- Services
- Drainage
- A written landscape scheme in accordance with the OLEMS / OLEMP
- Biodiversity Net Gain (BNG) Strategy

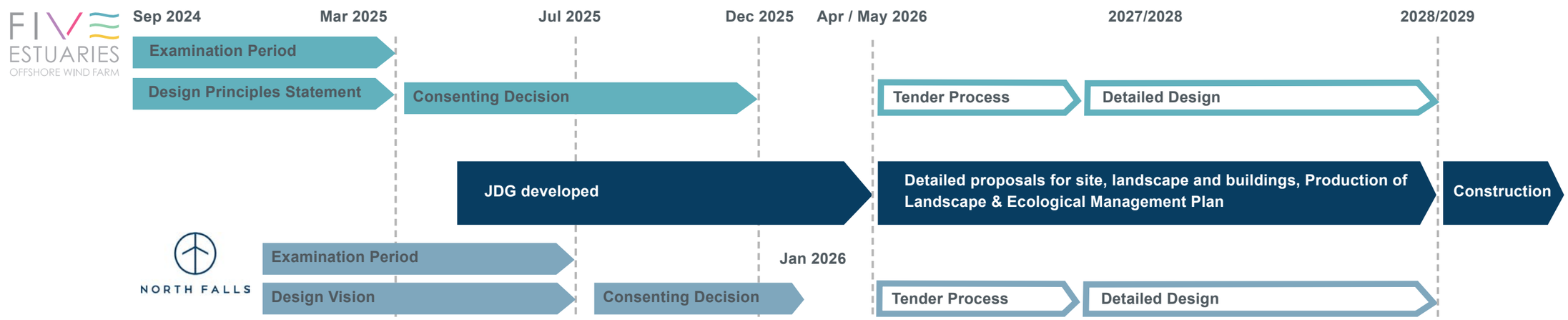


Plate 01 - Timeline for NFOWF and VEOWF, identifying the relationship of the JDG within the process

1.1.9 The draft DCOs state that the submitted details must be in accordance with the detailed design parameters and substantially in accordance with the Design Vision and Design Principles Document. North Falls DCO also requires accordance with '*any design guide*'. Compliance with the measures set out in the OLEMS / OLEMP must also be demonstrated, in order to achieve the mitigation requirements.

1.1.10 Detailed design will be undertaken by the appointed design contractor. Designs will be subject to formal approval by the discharging authority. For the purposes of these projects, the discharging authority is Essex County Council (ECC).

Purpose

1.1.11 The purpose of the JDG is to:

- Provide further information on how the detailed design will develop;
- Allow stakeholders and interested parties to contribute meaningfully to the design process, identifying where design optionality exists;
- Inform the tender process, providing a clear indication of the employer's requirements and the design expectations to the design contractor;
- Reconcile any differences between the VEOWF and NFOWF schemes and respond to any design issues raised during the examination process; and
- Ensure that 'Good Design' is maintained throughout the project lifespan, in accordance with National Planning Policy and Best Practice guidance for NSIPs.

Scope

1.1.12 The geographical extent of the JDG will only cover the co-location OnSS area for North Falls and Five Estuaries.

The JDG includes details of above-ground built development within the site boundary. This encompasses the OnSS compound buildings, structures and landscape and ecological works within the wider site areas.

Programme

1.1.13 An indicative delivery programme is provided in Plate 01, which shows how the production of the JDG aligns with the DCO Examination, consenting and detailed design processes.

1.1.14 Consultants were appointed in April 2025 to develop the guide, alongside the North Falls and Five Estuaries offshore wind farm and their technical teams. The final version of the document is anticipated for release in March 2026. A detailed timeline is shown in Plate 02.

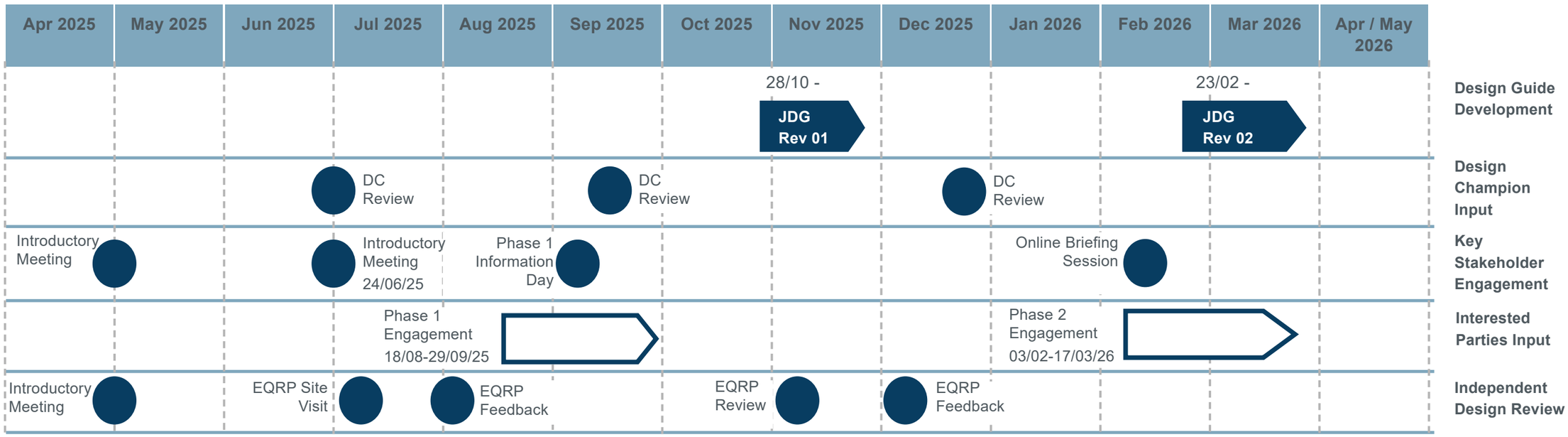


Plate 02 - Indicative timeline for the JDG

Review Process

1.1.15 An internal Design Champion will review the JDG as it progresses, supported by a design review team. The role of the internal Design Champion is identified in the National Infrastructure Strategy (2020);

- *'All Projects are required to have a board level design champion in place...at either the project, programme or organisational level, supported where appropriate by design panels'.*

1.1.16 Nationally Significant Infrastructure Projects: Advice on Good Design (2024) advises a good design process should include;

- *'Design leadership supported by an engaged design champion to ensure design governance is secured and the design principles drive a structured design process and hierarchy of design control'.*

1.1.17 The JDG will be subject to a multi-phased stakeholder review process with identified key stakeholders and local communities. This approach is set out within a joint communications and engagement strategy which has been subject to review by ECC and Tendring District Council (TDC).

1.1.18 The Essex Quality Review Panel (EQRP) will undertake an independent design review on the JDG as it progresses. A tracker recording feedback received and actions taken is included within Part 10: Consultation.

1.1.19 At draft stage, JDG Rev 00 identified aspects of the OnSS design that were subject to optionality. The Phase 1 engagement process has allowed the selection of options to be refined.

1.1.20 Rev 01 will also be subject to a similar review and development process, to refine options. A second round of engagement will follow.

1.1.21 Rev 02 will therefore include the range of preferred design options. These shall meet the technical and regulatory standards required and be considered appropriate and acceptable by the discharging authority.

Usage

1.1.22 The JDG will be included within the tender documentation as part of the Employer's Requirements.

1.1.23 Tender pricing should therefore allow for the range of options identified within the guidance, which reflect the client's expectations in terms of design quality.

1.1.24 After contract award, the successful tenderer will be expected to deliver proposals in accordance with the guidance.

1.1.25 Following appointment, a range of further surveys and assessments will be required to inform the detailed design. For example, a Tree Survey to BS:5837 will be needed to identify all existing features and their value for retention to determine the placement of site components and new planting, infiltration testing required to identify the extent of Sustainable Urban Drainage Systems (SuDS) features, etc.

1.1.26 Outline strategies developed prior to DCO submission will also be updated, as identified in Plate 4.

1.1.27 The appointed contractor(s) will be required to engage with the discharging authority throughout the development of the detailed design and reasonable timing should be allowed for the discharging authority to review the draft(s) prior to submission for discharging the relevant DCO requirements.

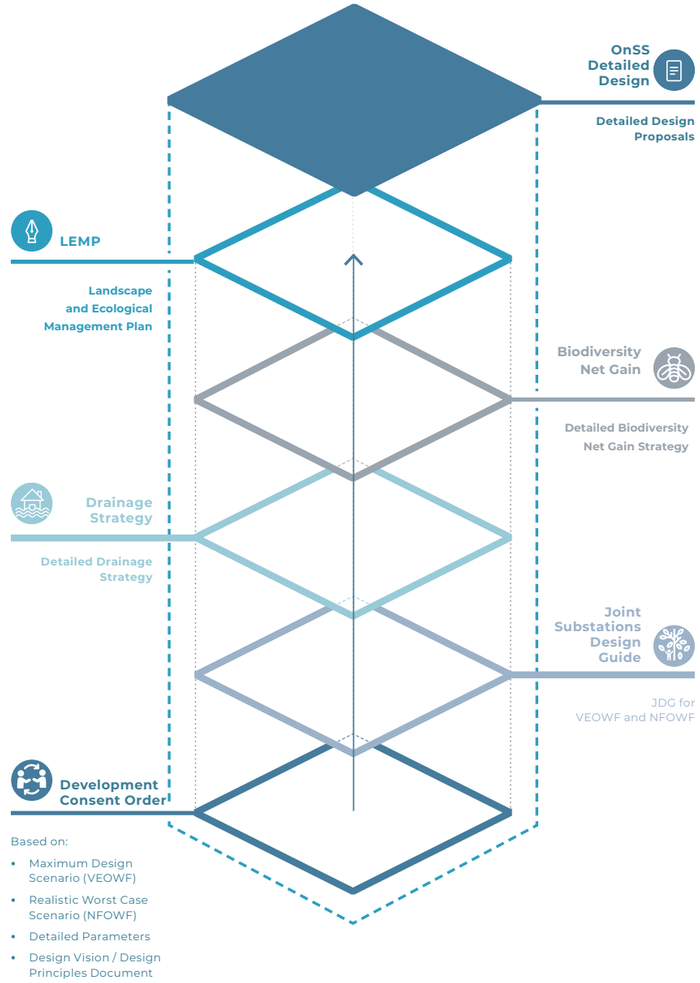


Plate 03 - OnSSs detailed design considerations

2. The Project

2 The Projects

2.1 Brief overview of the project(s)

2.1.1 The UK Government has committed to installing 50GW of offshore wind capacity by 2030, and reaching net zero carbon emissions by 2050. To help achieve the urgent need for renewable energy, in August 2019, the Crown Estate awarded an Agreement for Lease (AfL) to seven Projects, including Greater Gabbard Extension and Galloper Extension (now North Falls and Five Estuaries).

- NFOWF is a 50/50 joint venture between SSE Renewables and RWE Offshore Wind.
- VEOWF is being led by RWE Renewables UK, on behalf of project partners: RWE, a Macquarie-led consortium, ESB and Sumitomo Corporation.

2.1.2 NFOWF and VEOWF will be connected to landfall on the Essex coast via undersea cable routes, then via a coordinated underground cable route to the site identified for the co-located OnSSs, to the west of Little Bromley, near Ardleigh.

2.1.3 The function of the two OnSSs is to convert power generated from the offshore wind farms to a form suitable to feed into the national transmission system at the new National Grid Electricity Transmission (NGET) East Anglia Connection Node (EACN) substation, proposed on land to the west of Grange Road, Ardleigh. Plate 05 shows the proximity of EACN to the NFOWF and VEOWF OnSSs. EACN is part of the Norwich to Tilbury (N2T) DCO application submitted in August 2025. It does not form part of the JDG.

2.1.4 Following construction, the two OnSSs will be transferred to a Offshore Transmission Owner (OFTO), who is appointed following a competitive tender. The OFTO is responsible for operating and maintaining the electric power transmission infrastructure, under licence by OFGEM. The OFTO is also responsible for the maintenance of the wider site, including areas identified for landscape mitigation and BNG.

2.1.5 The project lifespans are predicted to be 30 years for NFOWF and 20-40 years for VEOWF.

2.2 Key components of the Projects

2.2.1 The relevant components of the project for the JDG comprise the two co-located OnSSs and their wider setting.

AIS substation compound

2.2.2 In NFOWF and VEOWF's respective DCO submissions, NFOWF utilised an Air Insulated Switchgear (AIS) and VEOWF retained optionality for either AIS or Gas Insulated Switchgear (GIS). VEOWF will now progress with AIS at the site.

2.2.3 An AIS compound will include several buildings, electrical equipment, access routes and other hard surfaces, enclosed by a secure, fenced boundary with lighting and CCTV provided. Plate 04 shows a typical AIS Substation arrangement.

2.2.4 The detailed design parameters for the OnSS, as set out within the draft DCOs for NFOWF and VEOWF state;

- The total area of the fenced compound (excluding its accesses) must not exceed 58,800m2; and
- The lightning rods within the fenced compound must not exceed a height of 18m above Ordnance Datum.

2.2.5 The detailed design parameters for the highest part of any building, any external electrical equipment or enclosure varies between the two developments;

- NFOWF states a maximum height of 13m (external electrical equipment) with a maximum building height of 7m; and
- VEOWF states a maximum height of 15m, exlcuding lightning rods

2.2.6 A maximum area of 280 x 210m is required for the OnSS compound.

Plate 04 - Typical AIS Substation - Source RWE

Plate 05 - Overlapping DCO boundaries for the three proposed substations: NFOWF shown in blue, VEOWF shown in yellow, EACN shown in red (not part of the JDG).

2.2.7 Each compound is anticipated to include the following elements:

- Control Building;
- STATCOM buildings;
- Storage / amenity building;
- Transformers (including noise enclosures);
- Reactor noise enclosures;
- Switchgear;
- Circuit breakers;
- Water tanks;
- Distribution Network Operator (DNO) packaged substation;
- DNO meter cabinet;
- Hard surfacing;
- Fencing;
- CCTV;
- Lighting;
- Signage; and
- Parking Infrastructure.

Wider site

2.2.8 The wider site for each project includes the lands between the OnSSs and the wider site boundary. This zone will include the following elements:

- Hard surfacing, including the main vehicular access;
- Operational drainage including SuDS;
- Other waterbodies, such as ditches and ponds;
- Fencing; and
- Security measures (CCTV and lighting).

2.2.9 The wider site encompasses extensive soft landscaping, with specific measures included to mitigate identified environmental impacts (ecology, visual impact, loss of landscape features etc.) and to provide other enhancements to the site, such as BNG.

2.2.10 The outline landscape proposals for the sites, as submitted at DCO application, are shown in Plates 06 and 07. Further details are provided within the OLEMS / OLEMP.

Plate 06 - VEOWF Outline Landscape and Ecological Management Plan at DCO.

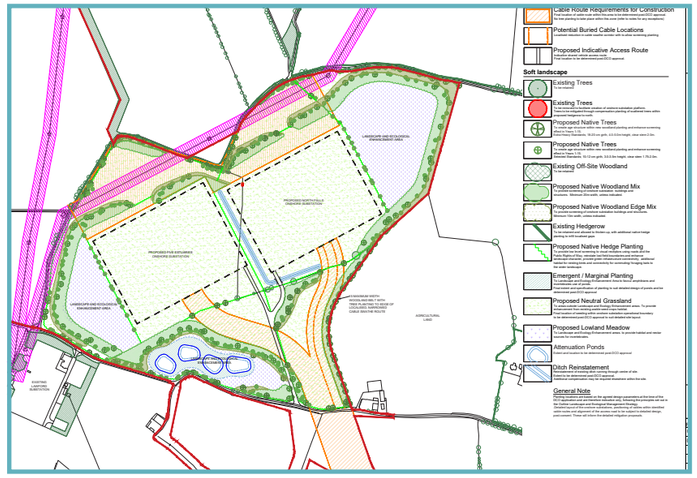


Plate 07 - NFOWF Outline Landscape and Ecological Management Plan at DCO.

2.3 Design Context - Best Practice

2.3.1 Best practice for Good Design in NSIPs is described within two key references:

- NSIPs: Advice on Good Design (Planning Inspectorate, 2024) was not published until after both VEOWF and NFOWF DCO submissions, but is highly relevant to the preparation of the JDG and subsequent detailed design. It states:
  - '*Good design is crucial for achieving excellent functionality, sustainability, positive place-making and resilience in NSIPs'.*
  - *'Achieving high quality, good design outcomes requires an effective, intentional, transparent, deliverable process to be planned, followed and secured. Success in good design comes from a combination of securing both good process and good outcomes*'.
- The four key principles set out within National Infrastructure Commissions Design Principles for National Infrastructure (2020) have shaped the design vision and principles work completed by VEOWF and NFOWF to date. They remain valid themes for the preparation of the JDG and subsequent detailed design. 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.*

2.4 Good Design Context - Policy

2.4.1 The emphasis on Good Design for NSIPs is further reinforced through policy:

- The National Infrastructure Strategy (NIS, 2020) describes how Good Design can be embedded through the use of design principles, parameters, and codes to guide the development of Projects ensuring they are well-designed, aesthetically pleasing, and fit for purpose.
- The National Planning Policy Framework (2025) acknowledges that Good Design can be achieved through clear design expectations, testing approaches and effective engagement.
- The Overarching National Policy Statement for Energy, EN-1 (2024) identifies that;
  - *'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'.*

Plate 10 - NIC four key design principles. Image source: National Infrastructure Commission

2.5 Technical Limitations for Design

2.5.1 National policy also recognises the technical and regulatory context governing the design of NSIPs and the limitations this can place on design optionality:

- The Overarching National Policy Statement for Energy, EN-1 (2024) states:
  - *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... including fitness for purpose and sustainability, is equally important'.*
  - *'It is acknowledged...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'.*
- NPS for Electricity Networks Infrastructure, EN-5 (2024) also acknowledges:
  - *'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'.*

2.6 Performance Requirements

2.6.1 This section summarises the additional performance requirements for the co-located OnSSs and their wider site proposals, which are described in details within the DCO documentation.

2.6.2 Further reference should be made to the specific documents for full details of compliance requirements.

Functionality and Operability

2.6.3 Fundamentally, the proposals must achieve the functional and operational requirements of an OnSS.

Robustness

2.6.4 Proposals shall be sufficiently robust to withstand site conditions during the operational lifetime of the projects.

2.6.5 Design details and materials specification shall consider the need to minimise unnecessary operational and maintenance requirements for the OFTO, acknowledging that maintenance within substations is less straightforward due to safety considerations and the specialised training required for those doing the work.

2.6.6 Proposals must also uphold Good Design standards.

Compliance

2.6.7 Proposals must comply with relevant statutory and technical requirements.

2.6.8 Wherever possible, proposals shall align with Best Practice standards and the criteria for Good Design.

Consent

2.6.9 Proposals must reflect the consented NFOWF and VEOWF schemes as set out in the Design Parameters, Design Vision / Design Principles Document, OLEMS / OLEMP.

2.6.10 Proposals shall take cognisance of the requirements of consenting bodies responsible for the subsequent approvals and discharge process. The JDG engagement process described within Part 1 aims to support and minimise any project risks associated with the consenting process.

2.7 Mitigation

2.7.1 Proposals shall incorporate the mitigation measures identified within the respective Environmental Statements submitted at DCO stage by VEOWF and NFOWF, in order to minimise potential environmental effects.

2.7.2 Mitigation measures of relevance to the co-located OnSS site include:

Landscape & Visual

2.7.3 Planting and habitat creation to the wider site area shall replace and/or compensate for the loss or change in existing landscape elements.

2.7.4 The design of the OnSSs shall seek to minimise visual impacts experienced by local receptors; residents, users of Public Rights of Way (PRoW) and users of the local road network.

2.7.5 Beyond the OnSS compounds, visual mitigation measures will include the planting of woodland belts, hedgerows and other forms of vegetation to filter and screen the development.

Heritage

2.7.6 The measures set out above also form part of the embedded mitigation to minimise effects on the setting of local heritage assets, St Mary's Church and Jenning's Farm.

Ecology

2.7.7 Habitat reinstatement measures include; grassland habitats, trees and woodland and arable field margins.

2.7.8 Habitat creation measures include; increasing habitat connectivity, new woodland creation and maintenance, drainage features, watercourses and ponds designed to meet wildlife needs as well as water management requirements, hibernacula for reptiles, amphibia and small mammals, wildflower meadow creation, installation of bird and bat boxes.

Drainage & Water

2.7.9 Embedded mitigation measures include:

- Reinstatement of agricultural land drainage, including the relocation of the ditch crossing the two OnSS compounds; and
- Implementation of the SuDS elements (swales, attenuation ponds) identified within the Outline Operational Drainage Plan.

Noise

2.7.10 The design of the OnSS compounds shall include measures to control operational noise levels at source, such as acoustic screens or structures.

2.8 Enhancement measures

2.8.1 Proposals for the co-located OnSSs and wider site shall include suitable enhancement measures. These will contribute to the overall sense of place, reinforce local distinctiveness and biodiversity.

2.8.2 Enhancement measures will include the statutory requirement for 10% BNG improvements.

2.8.3 Other enhancement measures contributed through the landscape and ecological interventions will include:

- Enhancements to local Green and Blue Infrastructure (GBI);
- Enhancements to landscape character in line with the landscape management recommendations set out within the OLEMP and OLEMS; and
- Potential enhancements to countryside access and PRoW.

2.9 Design Standards

2.9.1 The following national and local design standards shall inform the future detailed design stages. This is not a exhaustive list of all relevant standards.

2.9.2 General Site Planning

- Environmental Impact Assessment Regulations;
- Habitats Regulations;
- The Electricity Act 1989;
- The Planning Act 2008;
- Overarching NPS for Energy (EN-1);
- NPS for Renewable Energy Infrastructure (EN-3);
- NPS Electricity Networks Infrastructure (EN-5);
- Planning Inspectorate Advice Note Nine: Rochdale Envelope;
- Overarching NPS for Energy (EN-1) (2011);
- EIA Guide to Shaping Quality Development (IEMA) (2015);
- The Horlock Rules;
- National Grid Technical Specification 'Substations';
- NGTS 3.10 General Technical Specification for Civil Engineering Works and Electricity Substations; and
- The Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002.

2.10 Design and Local Character

- NIC Design Principles (NIC, 2020);
- National Character Area Profile 111- Northern Thames Basin;
- Tendring Landscape Character Assessment - 7A Heathland Plateaux - Bromley Heaths;
- Essex Design Guide (EDG, 2018);
- Essex Green Infrastructure Strategy (EGIS,2020); and
- Essex Green Infrastructure Standards (EGIS, 2022).

2.11 Buildings

- Building Regulations: various Approved Documents; and
- Essex Design Guide (EDG, 2018).

2.12 Hard Surfaces

- National Highways guidance on Abnormal Indivisible Loads (AiL);
- Approved Document M: Access to and use of Buildings; and
- BS8300: Design of an accessible and inclusive built environment.

2.13 Boundaries

- NG TS 2.10.02 Technical Specifications - Perimeter Security Fencing for Substations and Other Operational Compounds;
- British Standard 1722 - Fences; and
- Department for Energy and Net Zero (DESNZ) Energy Resilience Strategy.

2.14 Lighting

- Dedham Vale National Landscape Lighting Design Guide (2023); and
- 'Bats and Artificial Lighting in the UK' Guidance Note GN 08 / 23.

2.15 Drainage and Water

- Generic Electricity Substation Design Manual for Civil, Structural and Building Engineering:
  - Section 01 Oil Containment (TS 2.10.01);
  - Section 09 Site Drainage (TS 2.10.09);
  - Section 13 Flood Defences for Electricity Substations (TS 2.10.13);
- Flood and Water Management Act 2010;
- The Building Regulations 2010 Drainage and waste disposal, document H;
- National Planning Policy Framework (NPPF) 2021;
- National Planning Practice Guidance 2021;
- The SuDS Manual (C753);
- Essex County Council Local Flood Risk Management Strategy; and
- The SuDSs Design Guide for Essex.

2.16 Trees and Planting

- A Sense of Place; Design Guidelines for development near high voltage overhead lines;
- National Grid's Notes for Guidance - Tree Planting Restrictions On Pipelines;
- NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees;
- Essex Tree Palette (ETP, 2018);
- Forest Research Ecological Site Classification (ESC4). A tool to assess the suitability of a range of tree species and National Vegetation Classification (NVC) woodland communities based on precise geographical location. It incorporates future climate change projections. Found at: http://www.forestdss.org.uk/geoforestdss/; and
- NVC - Field Guide to Woodland. JNCC.

2.17 Sustainability

- Green Guide to Specification (BRE).

3. The Site

3 The Site

3.1 Site Description

3.1.1 The site occupies a rural context, approximately four miles east of Colchester. Existing land uses include farming (arable) and horticulture (glasshouses).

3.1.2 The projects' site is bounded by Ardleigh Road, Grange Road and Barn Lane. The agreed site boundary for the JDG is discussed in more detail within Part 2.

3.1.3 The landscape is generally flat and open, with far reaching views due to the removal of field boundaries and limited extent of significant woody vegetation. Further information on the site is provided in Part 2

3.1.4 NGET have selected a site immediately to the west of Grange Road for the new EACN 400kV substation. A DCO submission was made in August 2025.

3.1.5 The EACN will also offer a connection into the electricity supply grid for the proposed Tarchon UK-Germany power link. The site for the Tarchon substation is yet to be confirmed. The Tarchon project is not related to either Five Estuaries or North Falls.

3.1.6 The co-located OnSS site is located to the north-east of the existing UK Power Networks (UKPN) substation (Lawford Substation), on Ardleigh Road. The site is located approximately 2km to the south-west of the settlement of Little Bromley, in Tendring.

3.1.7 The site is approximately 35m Above Ordnance Datum (AOD), with a generally flat land form across the site. The land cover is characterised by arable farmland with large-scale field patterns.

3.1.8 Field boundaries across the onshore substation works area are generally open in character, with some hedgerow boundaries with occasional hedgerow trees. The ecological survey has identified sections of existing species poor hedgerow on the northern boundary of the substation site. This offers scope for enhancement with new infill hedge planting providing greater habitat and Green Infrastructure (GI) connectivity.

3.1.9 Historic mapping indicates a line of trees located within the middle of the site, which formed part of a field boundary system that subdivided the larger agricultural fields. The hedgerow itself has become lost over time.

3.1.10 There is a higher degree of tree cover along the boundary with Barn Lane and Grange Road, to the north and west, and around the existing substation on Ardleigh Road, to the south-west of the onshore substation working area. These filter views across the site from the northeast.

3.1.11 Shelter belts, around 20m in width, are a common feature in the wider landscape, where they form boundaries to horticultural uses and farms. Elsewhere, small copses of trees are clustered in the corners of fields and at the junctions of field boundaries, near to isolated residential properties.

3.1.12 A drainage ditch runs through the centre of the site, with others located close to the boundary of the wider onshore substation working area.

3.1.13 The UKPN substation opposite the site is surrounded by a woodland belt varying in depth between 12-40 metres. Two 132kV overhead electricity transmission lines run northwards from the substation, one of which crosses the western boundary of the site.

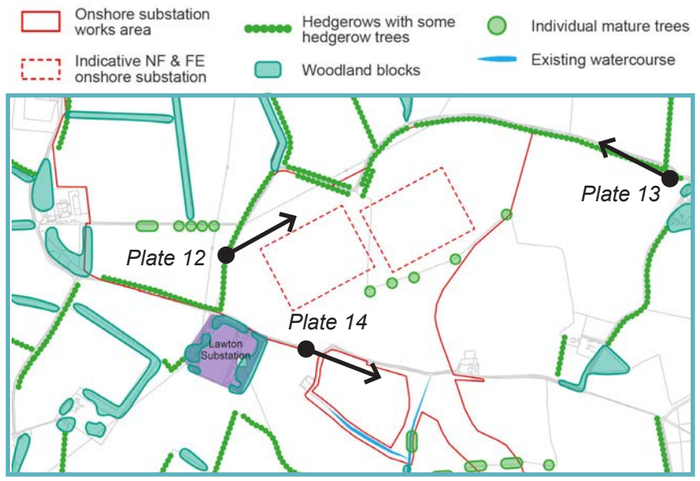


Plate 11 - Existing vegetation and watercourses at the site. Source: NFOWF

Plate 12 - Grange Road, facing north east. Source: LUC.

Plate 13 - Barn Lane, facing west. Source: LUC

3.2 Landscape Character

3.2.1 The site is located within the broad scale National Character Area (NCA) 111 Thames Basin and the local scale Landscape Character Area (LCA) 7A Bromley Heaths, as defined within the Tendring Landscape Character Assessment.

3.2.2 The landscape condition is described as being 'in decline'. Long term management aims to 'Conserve and Enhance' the landscape character include:

- *Conserve shelter belts of native species;*
- *Enhance woodland cover and the wooded character;*
- *Maintain historic lanes with ancient Oaks and unimproved roadside verges;*
- *Manage, enhance and expand hedgerows and grass strips as field boundaries to agricultural areas (to help bind soil, reduce erosion, provide habitats and wildlife* corridors); and
- *Improving biodiversity by creating semi-natural habitats such as wildflower meadows and grasslands.*

3.3 Visual Amenity

3.3.1 The surrounding landscape is generally flat with some long-range views.

3.3.2 Lawford substation is located south of the OnSS site. Pylons are visible in the landscape, however electrical equipment within the compound is largely screened from local receptors by mature clusters of trees.

3.3.3 Ardleigh Road passes through the onshore substation works area, running northwest to southeast. An existing PRoW runs to the south connecting Ardleigh Road to Lilley's Lane.

3.3.4 A small number of properties and farmsteads lie to east and south-east of site. These include Normans Farm, Jenning's Farm and Mulberry Court. Views from properties on the western edge of Little Bromley are typically filtered by intervening vegetation.

3.4 Heritage Setting

3.4.1 An assessment of the impacts of the OnSSs on the heritage settings of listed buildings was submitted by both parties.

3.4.2 Heritage assets within the co-located OnSS site include:

- Church of St Mary (NHLE 1337175 – Grade II* Listed Building); and
- Jenning's Farmhouse (NHLE 1111459 – Grade II Listed Building).

3.4.3 Minor adverse impacts are identified for both assets due to the change in their setting. These are not considered Significant in EIA terms.

Plate 14 - Ardleigh Road, facing east. Source: LUC

Plate 15 - Jenning's Farmhouse. Source: NFOWF.

Plate 16 - Vegetation to rear of Jenning's Farmhouse. Source: NFOWF

3.5 Public Rights of Way

3.5.1 Plate 17 identifies the PRoW in the vicinity of the OnSSs. There are no PRoW through the site itself.

3.5.2 An existing byway, Barn Lane, runs along the northern boundary of the site, connecting Bromley Road and Grange Road. It is lined with existing gappy hedgerows and hedgerow trees. These include Ash, which are visibly suffering from die-back.

3.5.3 Other PRoW in the vicinity of the site include;

- FP170-25, FP170-21, FP170-22 to the north of the site;
- FP170-23, FP170-57, FP170-19, FP172-12, FP172-14 to the east of the site; and
- FP172-15 to the south of the site.

3.6 Ecology

3.6.1 The onshore project area is dominated by arable fields interspersed with field margin drains, rivers and areas of scattered and dense scrub. Field boundaries are typically species-poor hedgerows.

3.6.2 Other small areas of habitat present include semi-improved grassland, marshy grassland, woodland (broadleaved and mixed semi-natural and plantation) and woodland/scrub successional habitats.

3.6.3 Fauna such as common pipistrelle, hazel dormice and common nesting birds are associated with hedgerows. Trees and woodland are also valuable to badgers, bats and hazel dormice for nesting and foraging resources. Terrestrial habitats such as grassland support notable species including reptiles.

3.7 Drainage

3.7.1 The co-located OnSSs are situated to the northern end of the Tenpenny Brook Water Framework Directive (WFD) Surface Water Operational Catchment. Mapping indicates that there are two Ordinary Watercourses comprising ditches along field boundaries to the south of Ardleigh Road

3.7.2 The site is situated wholly within Flood Zone 1. None of the onshore substation works area is situated within a historical flood extent.

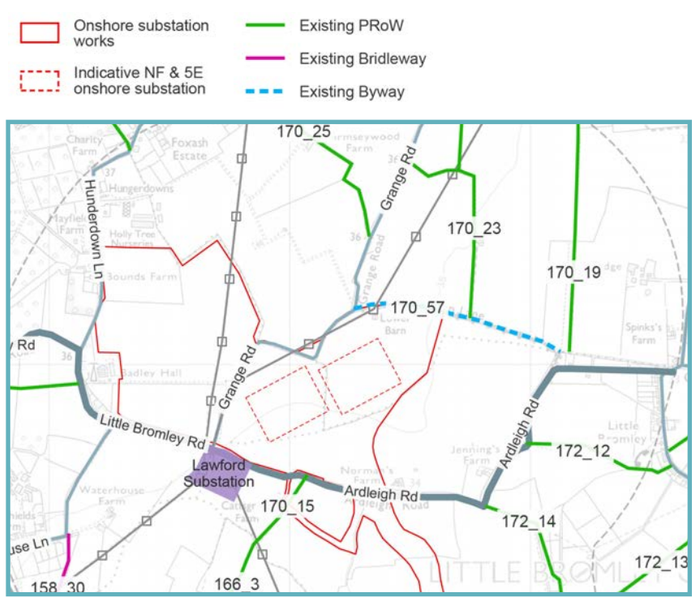


Plate 17 - Existing PRoW at the site. Source: NFOWF

Plate 18 - Barn Lane. Source: LUC

Plate 19 - Drainage ditch to south of Ardleigh Road . Source: LUC.

4: Layout

4 Layout Guidance

4.1 Introduction

Layouts at Development Consent Order Stage

4.1.1 Indicative site layouts were included within the Outline Landscape and Ecological Management Plan (OLEMP) submitted by VEOWF and the Outline Landscape and Ecological Management Strategy (OLEMS) submitted by NFOWF.

4.1.2 Prior to DCO submission, guiding principles for these layouts were established and concept layouts were subject to extensive technical scrutiny and assessment.

4.1.3 The indicative layout for the co-located OnSSs was selected for two significant reasons;

- It provides maximum opportunity to co-ordinate the infrastructure, therefore minimising visual impacts though alignment and reducing the overall net impact.
- Whilst the temporary construction compounds are not within the OnSS site, the layout offers the opportunity for a more optimum temporary construction compound (TCC) arrangement.

4.1.4 For this reason, significant changes to the layout will not be proposed as part of the JDG process.

Detailed Site Layouts

4.1.5 The detailed site layouts will be influenced by the following factors:

- The extent of the overall site boundary for the co-located substations;
- The size and shape of the OnSS compounds;
- Technical requirements concerning electrical transmission and safety, which may determine the exact configuration of electrical equipment within the compound and the entry and exit points for cabling;
- Other functional requirements (access routes, security surveillance, drainage etc.);
- Site constraints, such as ground conditions, flood zones, protected habitats etc. Additional survey work will be undertaken to determine the locations affected and identify and specific design or construction methodologies to be employed.
- Wayleaves or easements that must be maintained. These may constrain the land available for development or place restrictions on the design i.e. the location of underground cables will restrict the extent of planting;
- Construction phasing and the location of temporary compounds, haul roads, lay down areas and temporary attenuation ponds may influence the location of specific features. Areas unaffected by these requirements may be suitable for i.e. advance planting;
- The requirement for suitable mitigation measures; and
- The requirement for suitable enhancement requirements e.g. BNG.

Plate 20 - NFOWF OnSS site boundary at DCO.

Plate 21 - VEOWF OnSS site boundary at DCO.

4.2 JDG Boundary

Site boundaries for the Development Consent Order

4.2.1 The red line site boundaries submitted for the Development Consent Order (DCO) were different for NFOWF and VEOWF.

4.2.2 The VEOWF red line boundary (Plate 21) included agricultural lands to the north and east of Normans Farm, extending eastwards up to the rear of Jenning's Farm.

4.2.3 The NFOWF red line boundary (Plate 20) was drawn more closely to the onshore substation compounds, following the line of an existing field boundary leading from Barn Lane, then finishing to the west of Normans Farm.

Site boundary for the Joint Substations Design Guide

4.2.4 North Falls and Five Estuaries have now agreed a common boundary for the site to define the extent of the JDG (Plate 22). This includes the wider VEOWF site area, to the east of Normans Farm.

4.2.5 Following Phase 1 engagement the boundary was adjusted to omit the ditch to the west of Jenning's Farm. The boundary now follows the western top of ditch.

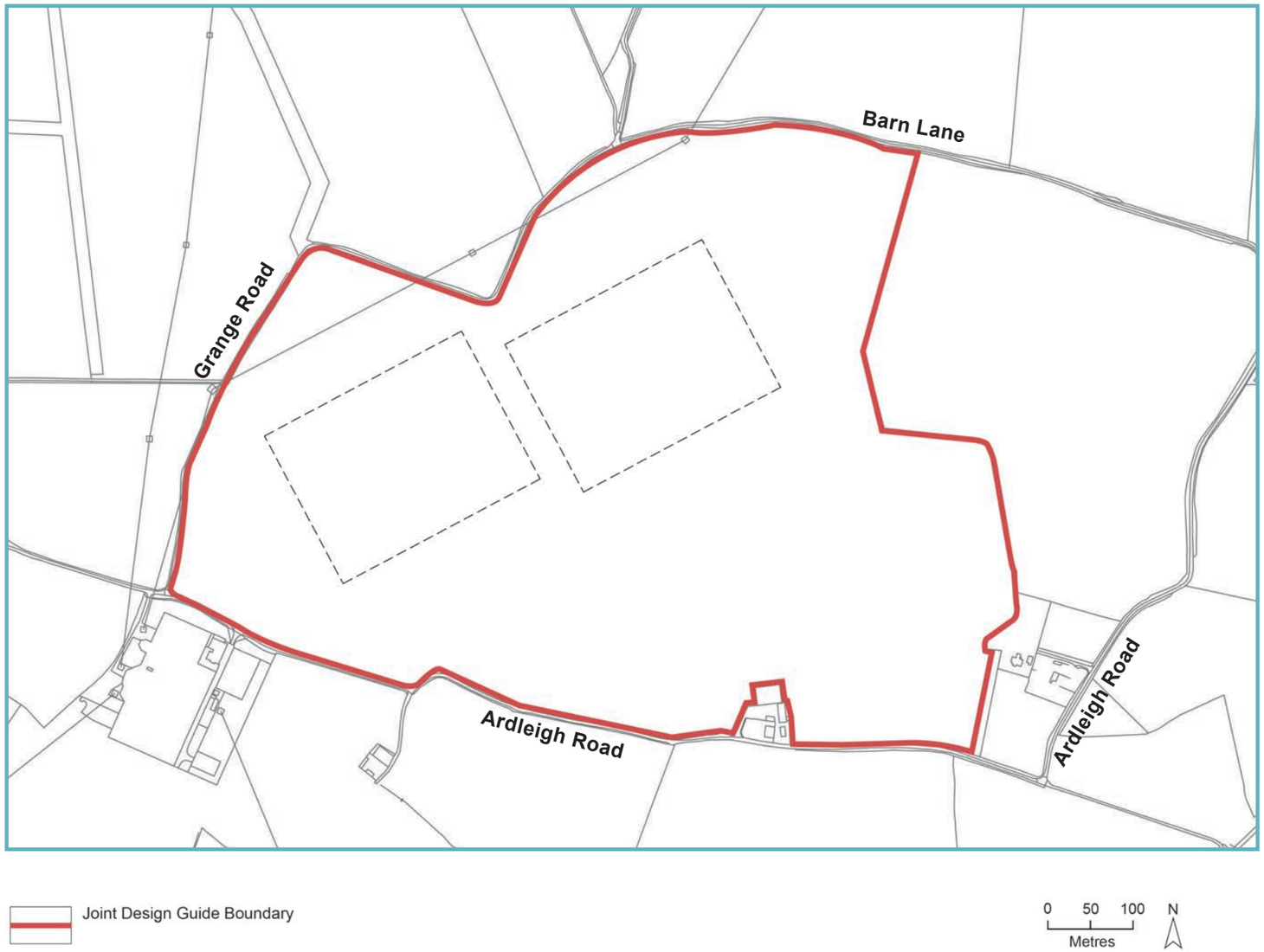


Plate 22 - Joint Design Guide Boundary

4.3 Fencing locations

4.3.1 A full security assessment is being undertaken for NFOWF and VEOWF. This will include recommendations on fencing. Further details and design guidance are provided within Section 5.

Secure boundary

4.3.2 Secure fencing is installed to the perimeter of the compound area to prevent unauthorised access to the critical national infrastructure. Fencing is typically installed in straight lines..

Other boundary treatments to the wider site

4.3.3 There is no technical or statutory requirement for fencing to the wider site. Feedback from key stakeholders during Phase 1 engagement expressed a wish to minimise fencing to reduce visual clutter within the rural setting.

4.3.4 The boundary layout reflects the following;

- The need for a physical barrier to protect establishing vegetation from potential damage due to farming operations on adjacent agricultural land; and
- The need for a physical barrier to restrict access.

Protection at edge of agricultural land

4.3.5 Fencing is required in the following locations:

- The boundary with Ardleigh Road that abuts Normans Farm, where fence lines shall be positioned to maintain safe access for farm machinery;
- The boundary with agricultural land to the north east; and
- At a suitable offset from Barn Lane to maintain farm machinery access.

Potential Internal Boundary

4.3.6 A potential internal boundary may be required, should the opportunity to develop a PRoW through the site be pursued.

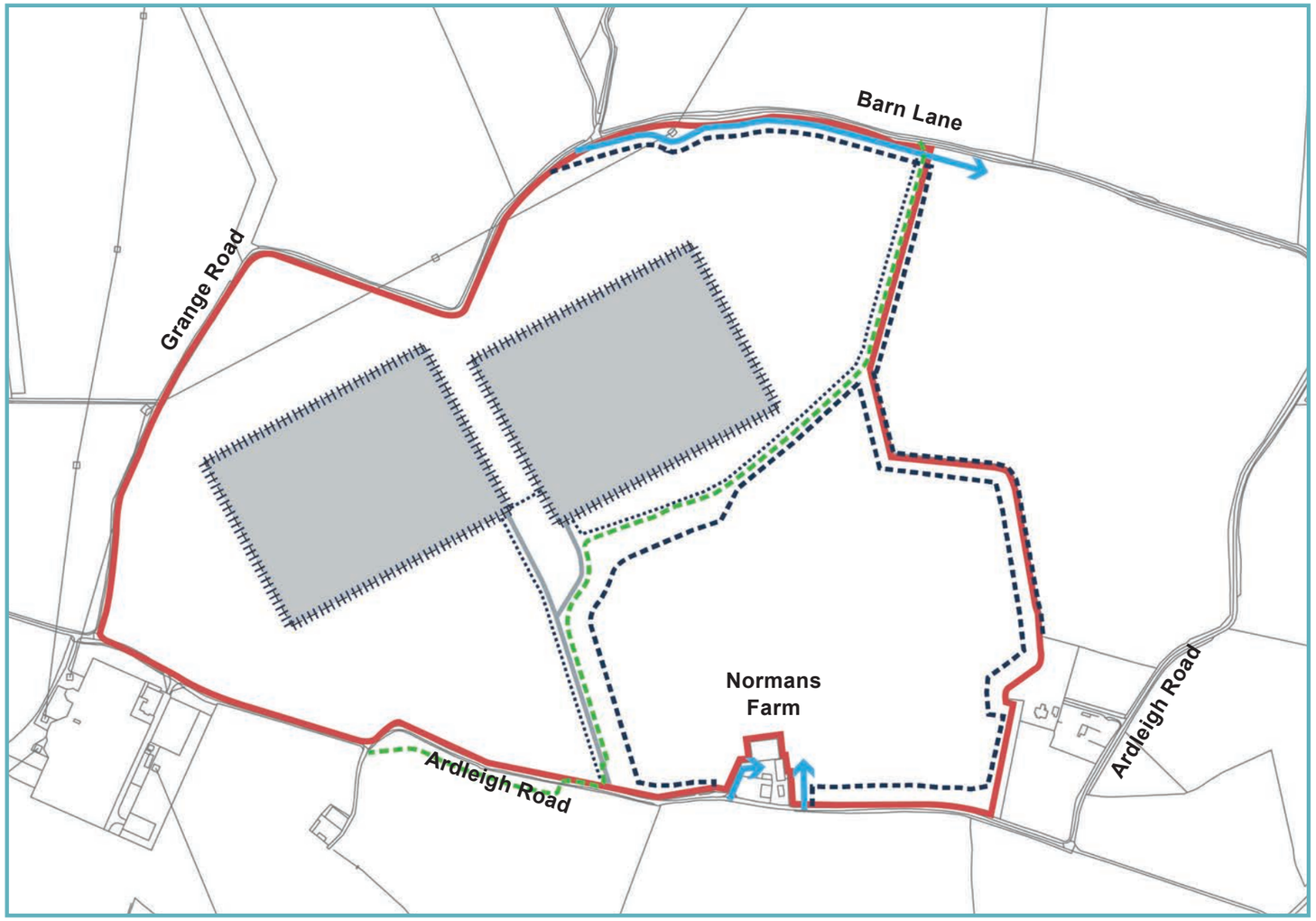


Plate 23 - Fencing

4.4 Recreation

4.4.1 Feedback from the first EQRP review urged NFOWF and VEOWF to consider ways in which the wider community could meaningfully benefit from the development. Further feedback was gathered from the local community during the Phase 1 engagement, to better understand how the area is used for recreation and the ways in which the development might align with these uses.

4.4.2 The Projects are currently considering whether parts of the site could be used by the community, with managed access. Further input is required from potential OFTO operators to understand the implications arising from this.

4.4.3 An additional consideration is whether a new footpath route could be created within the site, which could enhance PRoW connectivity within the area. Other improvements to the local PRoW will be considered. These are all subject to future discussions with ECC and TDC's PRoW and Planning teams and local Parish Councils.

4.4.4 Plate 24 shows a potential route through the site, which is under consideration. This seeks to replace a 'lost' footpath, shown on OS mapping from the late 19th century.

- 1. Existing Lawford 57 Byway
- 2. New connection to Lawford 57 (requires new opening in existing hedge and construction of ditch crossing)
- 3. Route follows western edge of agricultural field boundary
- 4. Route follows western edge of existing ditch
- 5. Route follows western edge of diverted ditch
- 6. Route follows eastern edge of access road
- 7. Route follows new PRoW to south of Ardleigh Road
- 8. Route connects to Little Bromley 15 Footpath

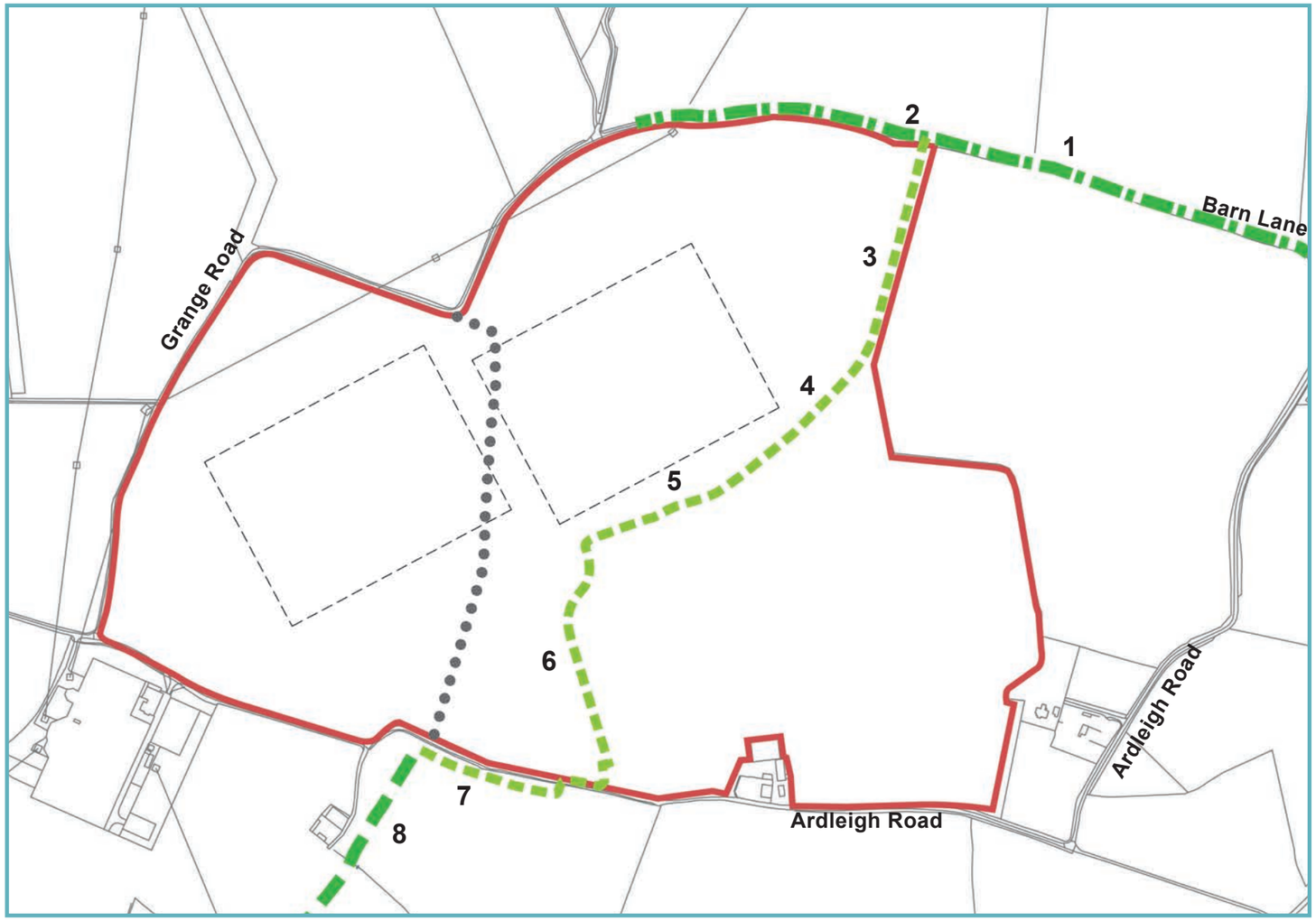


Plate 24 - Potential footpath route through the OnSSs site

4.5 Security

CCTV

4.5.1 An unmanned substation will require a CCTV system appropriately designed in accordance with risk assessment and linked to Supervisory Control and Data Acquisition (SCADA) system requirements for online monitoring/alarms & security.

4.5.2 This will include CCTV surveillance of the OnSS compound and the shared access route.

Lighting

4.5.3 Permanent light fittings will only be installed around and within the substation. Under normal operating conditions the substation will not be illuminated at night. Lighting will be used only when required for maintenance outages or emergency repairs at night.

4.5.4 Light fittings will typically be mounted on columns or buildings.

4.5.5 Where possible, the following principles should be adhered to:

- Use the minimum possible number of light fittings required to adhere to relevant standards.
- Light should be directed to where it is needed and not spill into neighbouring spaces.
- All light above the horizontal should be avoided.
- Lamps should be 3000K or less and ideally 2700K. These are sometimes described as ‘warm white’.

Plate 25 - Lighting

4.6 Wayleaves and Easements

4.6.1 Easements may limit the placement of features or restrict certain activities within the site.

132kV Overhead Transmission Line

4.6.2 A 132kV overhead transmission line skirts the northwest with a tower located close to the junction with Grange Road and Barn Lane. No operational equipment will be installed beneath the overhead line.

4.6.3 Fences will observe minimum clearances to overhead conductors (approximately 5m).

4.6.4 Tree planting restrictions will limit planting of tall, forest-scale species (Beech, Horse Chestnut, Lime, Oak).

Onshore Export Cable Corridor

4.6.5 Incoming cables from landfall will enter the site to the west of Normans Farm.

4.6.6 Tree planting restrictions apply near all Extra High Voltage (EHV) cables. No planting of small-medium trees shall take place within 6m of the easement centre (10m for larger species).

Outgoing Cable Corridor

4.6.7 Outgoing cables exit to the north west of the OnSS before entering the EACN Substation. Route options are not subject to external influence.

4.6.8 Tree planting restrictions must also be followed.

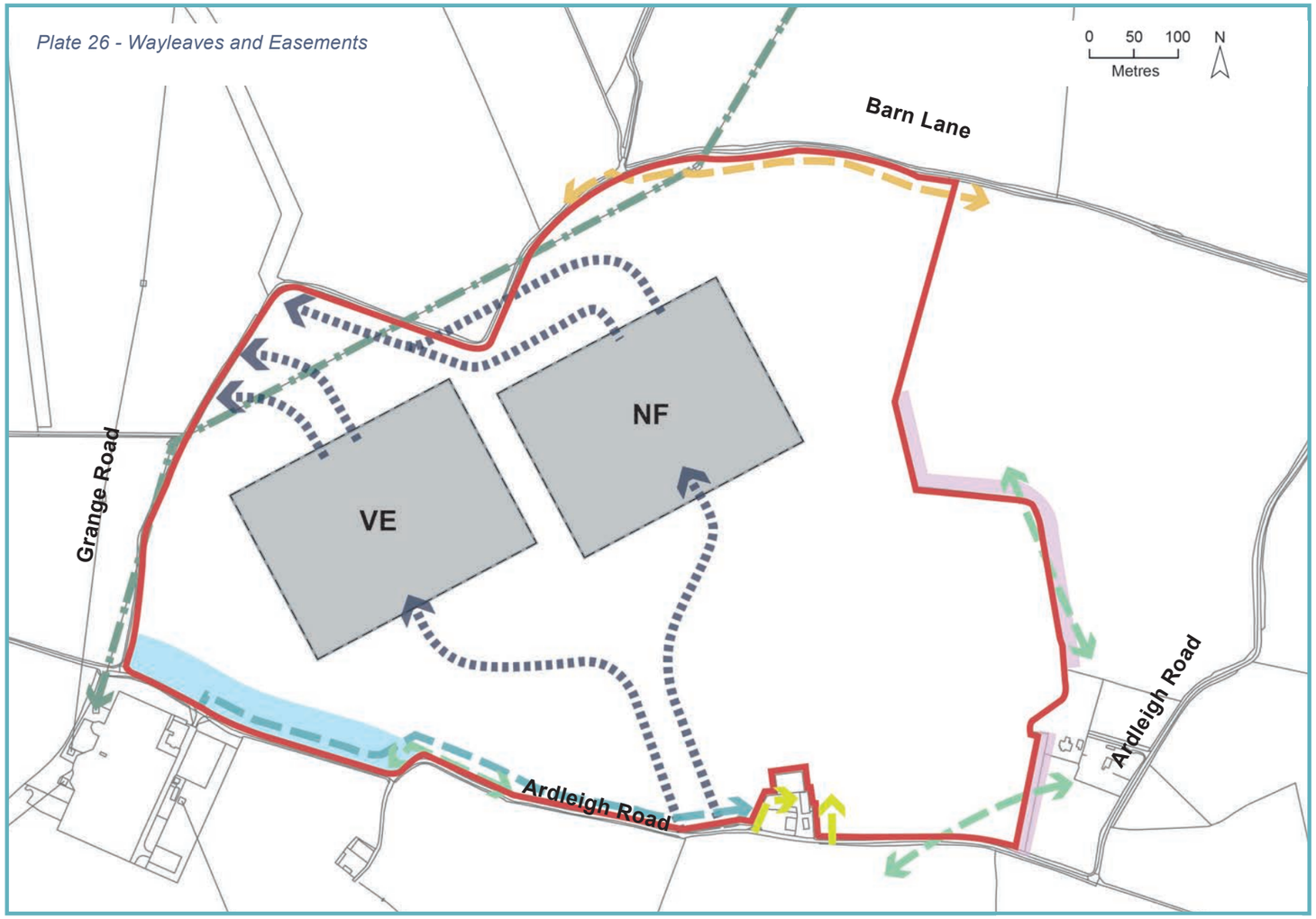
NGET Infrastructure Requirements

4.6.9 The layout shall accommodate minor infrastructure requirements associated with the proposed EACN. Further liaison will be undertaken with NGET to establish any requirements.

Low Voltage Overhead Distribution Line

4.6.10 Existing low voltage (LV) overhead distribution line cross the south eastern edge of the site, connecting to Jenning's Farm and Mulberry Lodge. This will limit the extent of planting that can be introduced along the northern boundary to Ardleigh Road and the rear of the two properties.

Plate 26 - Wayleaves and Easements



Private Water Supply

4.6.11 An existing private water supply runs within the northern verge of Ardleigh Road. The exact location of the supply shall be determined and the extent of planting and fencing adjusted to allow suitable access to maintain the supply.

4.6.12 Further discussion will be required with landowners.

4.7 Substation Compounds

Technical Requirements

4.7.1 An AIS relies on the surrounding air to provide the insulation between pieces of equipment, resulting in fewer buildings at a lower height.

4.7.2 Detailed design parameters state that the total area of the compound (excluding its accesses) must not exceed 58,800m2, with a maximum area of 280 x 210m stated.

4.7.3 The configuration of the electrical infrastructure is constrained by operational, constructional and technical requirements. Relevant building regulations, internal requirements and National Grid technical specifications for electrical substations shall be followed.

4.7.4 The following aspects must be considered:

- Magnetic clearance from the air core reactors;
- Limitation of fire risk and water supplies for fire fighting purposes;
- Site lighting and security systems;
- Access requirements to equipment/building; and
- Lightning protection.

4.7.5 An orthogonal, side by side compound arrangement, as shown within the DCO application, provides maximum opportunity to co-ordinate infrastructure, and an optimum temporary construction compound (TCC).

4.7.6 At the detailed design stage a reduction in the compound area may be possible, through site efficiencies and considered placement of infrastructure. Plates 27-30 explore the potential options, which were reviewed within the Phase 1 engagement period.

Optionality

- Should a reduction in the AIS footprint be possible, the preferred approach is to reduce the width, allowing for additional planting along the immediate southern boundary. This will provide enhanced screening to views from Norman's Farm, Jenning's Farm and Ardleigh Road.

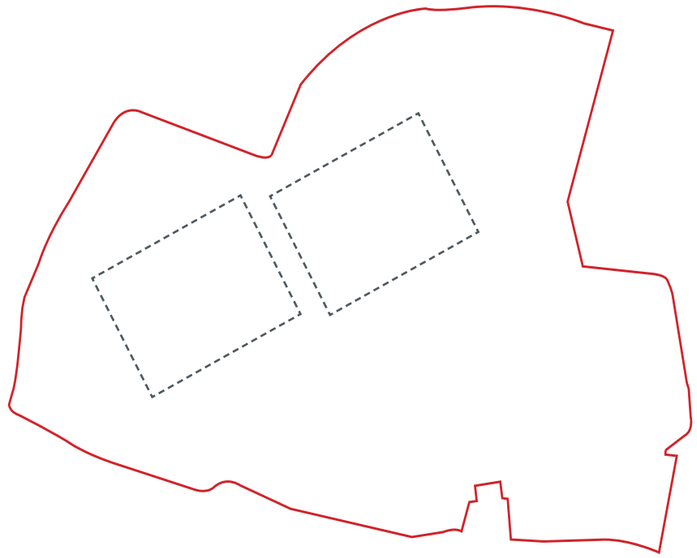


Plate 27 - Current compound arrangement

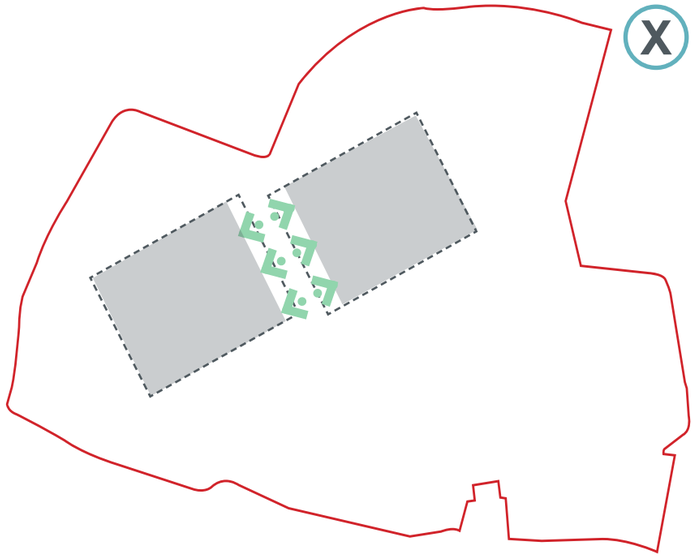


Plate 28 - Shortened length, allowing widened central planting

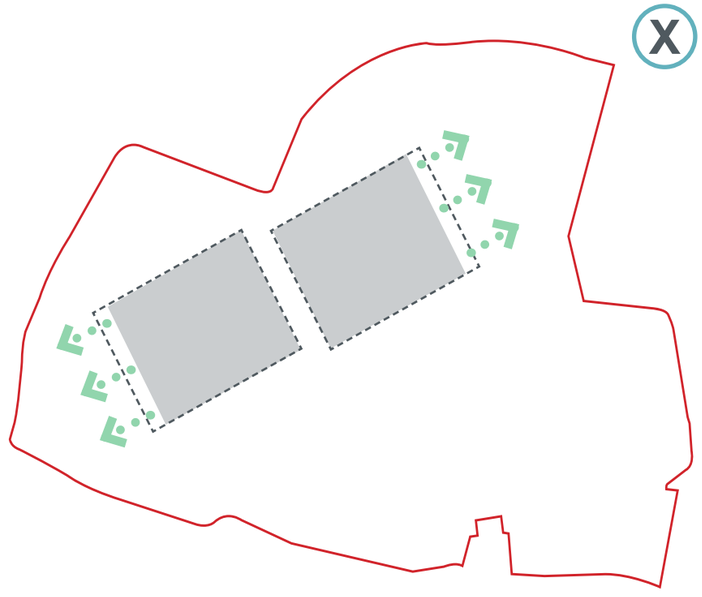


Plate 29 - Shortened length, allowing widened edge planting to south west and north east

Plate 30 - Shortened width, allowing widened edge planting to south east

4.8 Water and Drainage

Drainage Strategy

4.8.1 A joint Outline Operational Drainage Strategy (OODS) was developed by VEOWF and NFOWF prior to both projects' DCO applications, ensuring the designs can co-locate and do not cause any adverse effects on each other and/or the local environment. A detailed Operational Drainage Strategy in accordance with this strategy will be produced following DCO award and will be discharged to the local authority by both projects.

4.8.2 The project drainage will follow sustainable drainage systems (SuDS) principles which will aim to attenuate any surface water runoff to an equivalent greenfield runoff rate therefore replicating natural processes as well as improving water quality, amenity, and biodiversity objectives..

4.8.3 The following above-ground elements will be accommodated within the site layout. These are shown on Plate 31:

- Existing ditch
- Relocated ditch
- Filter drains
- Swales
- Permanent attenuation ponds
- Temporary attenuation ponds

Existing Ditches

4.8.4 A network of existing ditches run within the site. These convey field runoff to a watercourse south of Ardleigh Road and will be retained. The detailed location of planting and boundaries will ensure that adequate access to the ditches is provided for inspection and maintenance.

Relocated Ditch

4.8.5 The construction of the OnSS compounds will required the relocation of an existing ditch.

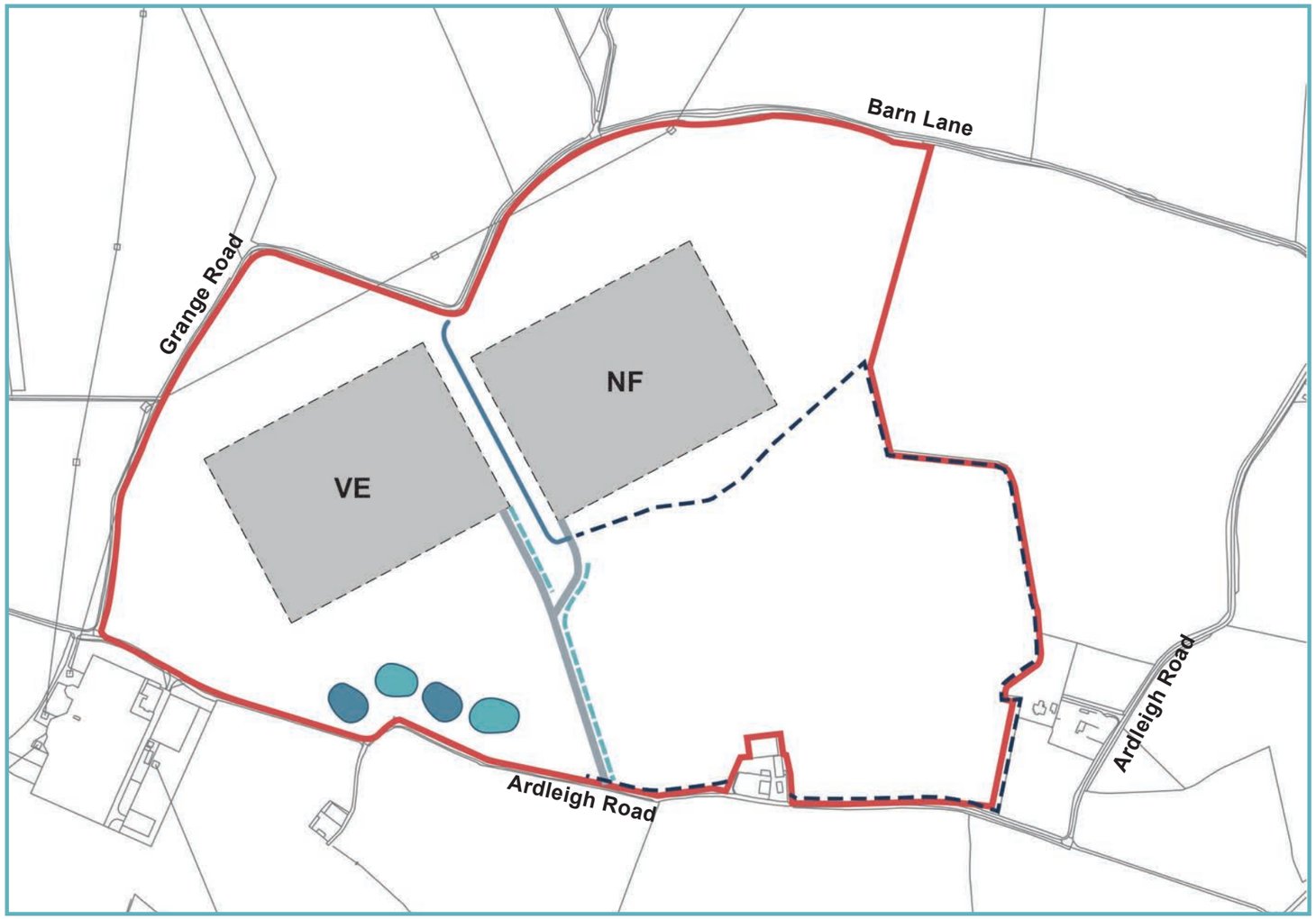


Plate 31 - Water & Drainage

Filter Drains

4.8.6 Runoff from the internal access roads within the substation site will be captured by filter drains and conveyed to swales at the boundary.

Swales

4.8.7 Runoff from the access road will be channelled into swales, which will convey flow to the attenuation storage.

Attenuation Ponds

4.8.8 Both projects are likely to require attenuation ponds. The number and size of the ponds is dependent on the results from infiltration testing. The OODS indicated two permanent ponds and two temporary ponds.

4.8.9 The permanent ponds will be retained throughout the OnSSs operational lifespan; one serving VEOWF compound and one serving the NFOWF compound.

4.8.10 Once construction has been completed and the land returned to its former state, the attenuation volumes within the temporary ponds are likely to reduce. Where possible, these ponds will be retained in order to deliver long term ecological enhancements at the site.

Design

4.8.11 The ponds at the OnSS will be designed so as to be of high ecological value, with varying depths, scalloped margins and areas with a wide draw down zone. They will be potentially suitable for use by a wide range of species including invertebrates, amphibians, reptiles, mammals and birds.

4.8.12 Design guidance relating to drainage and water is described within Section 5.

Plate 32 - Drainage swale. Source: LUC

Plate 33 - SuDS pond. Source: Edward Mcmaihin. https://creativecommons.org/licenses/by-sa/2.0/

Plate 34 - Ditch. Source: Roger Jones. https://creativecommons.org/licenses/by-sa/2.0/

5: Design and Materials

5 Design

5.1 Introduction

5.1.1 The draft DCOs require the OnSSs to be in accordance with the detailed design parameters and substantially in accordance with the Design Vision and Design Principles Document. Both draft DCOs also require accordance with '*any design guide*'. Compliance with the measures set out in the OLEMS / OLEMP must also be demonstrated, in order to achieve the mitigation requirements.

5.2 Guidance Content

5.2.1 The content of this Section encompasses the range of built components that will remain visible within OnSS compounds and wider site, on completion of construction. It does not include aspects of the soft landscape or ecology, which are covered in Part 8.

5.2.2 The function of each component is described, identifying any technical or performance requirements that must be met. Other design requirements are then outlined.

5.2.3 The range of design options considered suitable for each component is then outlined, with typical specifications identified for ease of comparison. For some components there may be no optionality, and if so this is clearly stated.

5.3 Building Typologies

5.3.1 An AIS substation will contain buildings, of different shapes and sizes. Typical massing of the three main types of buildings is shown in Plate 35;

- STATCOM buildings, shown 55 x 15 x 7m high (see Plate 36);
- Control Buildings, shown 50 x 20 x 5m high (see Plate 37); and
- Storage and Amenity buildings, shown 20 x 9 x 4m high (see Plate 38).

5.3.2 Other structures within the compound may be perceived as buildings, due to their height and massing in comparison to the substation buildings. This includes water tanks, acoustic fencing, packaged substations and generators.

5.4 Building Functionality

5.4.1 Fundamentally, the buildings on the OnSS site do not function as traditional 'buildings'. Their primary purpose is to house the sensitive electrical equipment, with minimal human activity. The safety and security of the electrical processes is paramount to building functionality.

5.4.2 There is no or limited requirement for fenestration and buildings have discrete access points, in keeping with the minimal operational requirements.

5.5 Building Layout

5.5.1 Building layout within the compounds will be determined by the most efficient layout and functionality of the various equipment.

5.5.2 Should there be any flexibility in the layout, buildings will be oriented using the following principles:

- Avoid a continuous building line, with long, monotonous elevations;
- Create a clear spatial relationship with other compound structures of similar sizes; and
- Orientate to provide solar shading;

5.6 Building Design & Materiality

5.6.1 OnSS buildings will typically have blank elevations with no or limited fenestration and simple access points, allowing for occasional inspection and maintenance. Adequate ventilation and emergency systems may also require incorporation within building elevations or periphery.

STATCOM and Control Buildings

5.6.2 The larger OnSS buildings, such as the STATCOM and Control Buildings, will typically be of a modular construction, for speed and ease of construction and maintenance. This utilises cladding systems, such as corrugated metal sheeting, over a simple steel frame to maximise internal volumetric requirements.

5.6.3 The steel frame is typically fabricated off-site, then brought to site, erected, and the cladding fitted in place.

5.6.4 There is no specific colour required for cladding. Typically, they are painted grey, where no requirement exists for them to blend into their surroundings. The Design Approach for Site Specific Infrastructure (DASSI) submitted with the N2T DCO application idetnifies Brown Grey and Olive Green as potential colours for the EACN substation buildings.

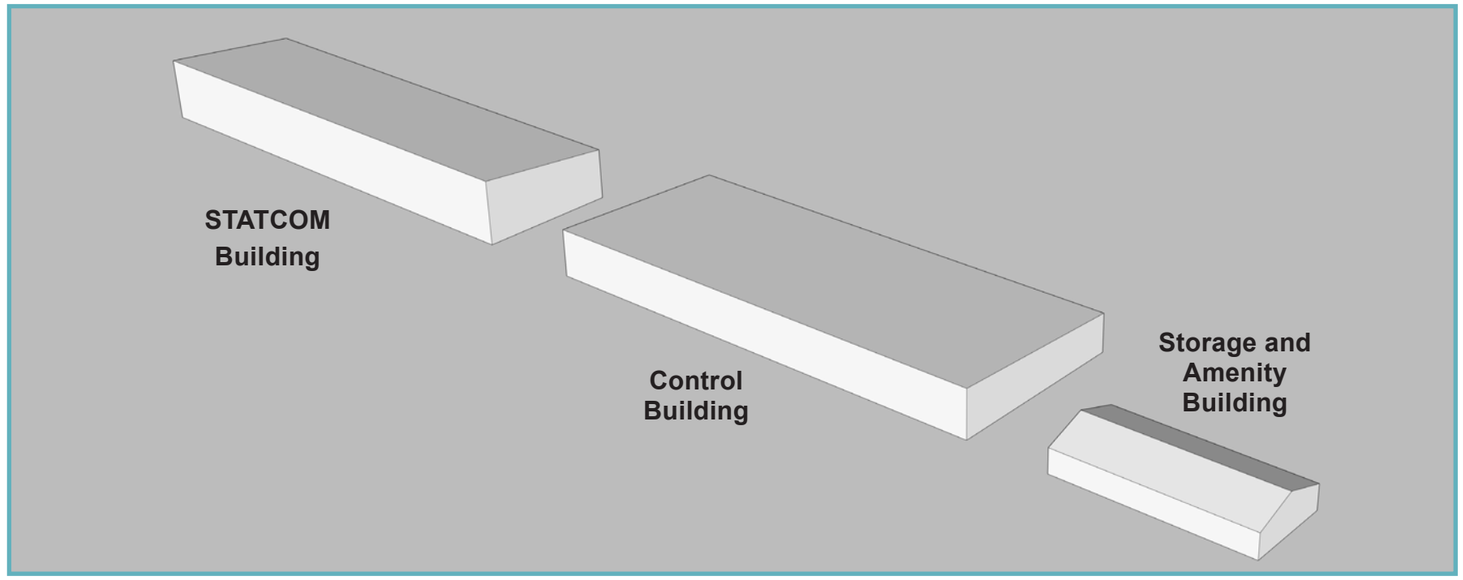
5.6.5 Roofs to OnSS buildings will typically have a shallow, dual or mono pitch, allowing water to shed easily and limit water ingress that could damage internal electrical equipment. Sloped roofs will also minimise maintenance, given the ONSS is an unmanned facility.

5.6.6 Roof heights are also kept as low as possible to minimise visual intrusion, whilst meeting the ventilation and insulation requirements for electrical equipment.

Storage and Amenity buildings

5.6.7 These buildings do not house the complex electrical processes, therefore there is typically more flexibility in their design and specification.

5.6.8 Plates 36-38 provide typical examples of substation buildings showing the relationship with external equipment and access routes.



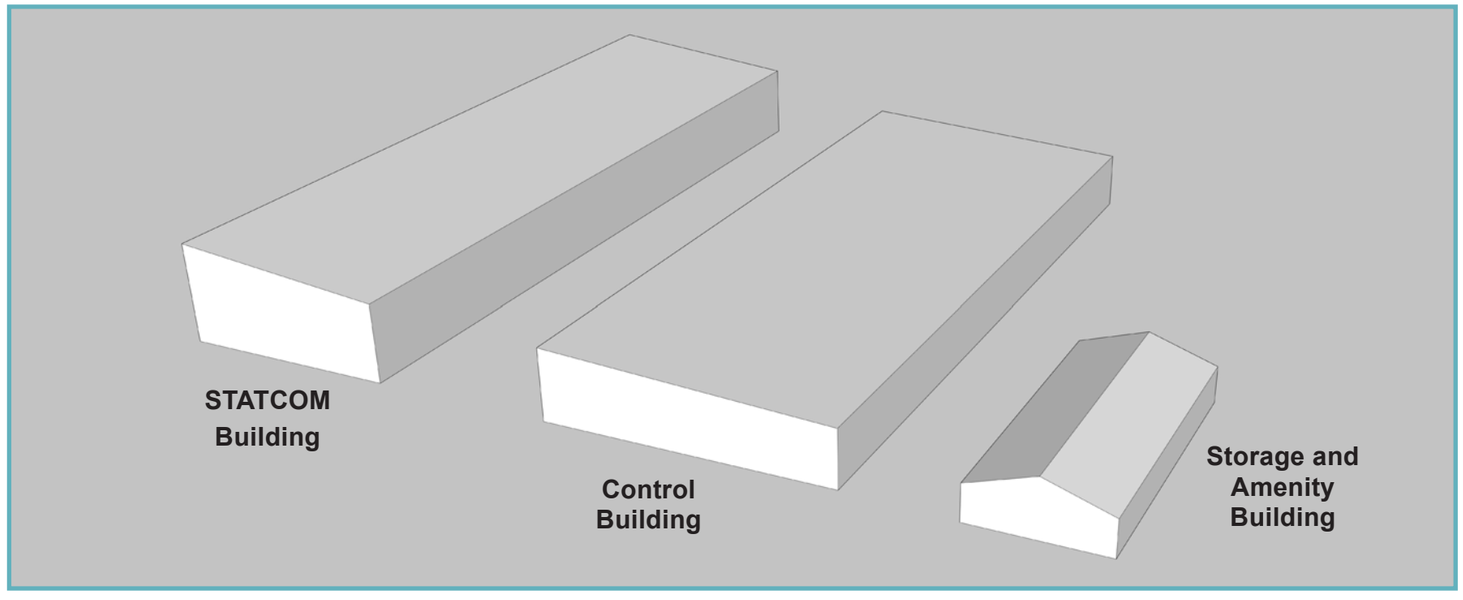


Plate 35 - 3D massing of the three main types of substation buildings, based on the indicative dimensions provided at DCO submission.

Plate 36 - Typical STATCOM building. Source: https://www.entsoe.eu/technopedia/techsheets/static-synchronous-compensator-statcom/

Plate 37 - Typical AIS Control Building (source - RWE)

5.6.9 Design Considerations

DCO Parameters

5.6.10 The detailed design parameters for the highest part of any building, any external electrical equipment or enclosure varies between the two developments;

- NFOWF states a maximum height of 13m (external electrical quipment) with a maximum building height of 7m.
- VEOWF states a maximum height of 15m, exlcuding lightning rods. This was based on a scenario which allowed use of either AIS or GIS, with 15m the typical height of a GIS substation.

Infrastructure Precedents

5.6.11 Precedent examples representing 'Good Design' in infrastructure are illustrated overleaf. In each example, considered analysis of the local vernacular; form, materials, colour etc. has informed the design process; resulting in sensitive built forms that contribute to the wider sense of place.

5.6.12 Plates 38 & 39 illustrate the proposed design of ventilation shafts, an essential above ground element to the underground HS2 tunnelling through the Chilterns National Landscape.

5.6.13 Designs cues are taken from the local vernacular;

"Pitched roofs wrap around the buildings, creating simple agricultural barn forms. Buildings are orientated to reduce their perceived scale from key viewpoints. The zinc, painted steel and engineering brick will be durable and designed to age gracefully over time without losing robustness and quality. Dark, neutral colours will ensure the buildings visually recessive".

5.6.14 The proposed onshore development at Codling Wind Farm includes a STATCOM building and two smaller GIS buildings. These will be constructed within the prominent setting of Dublin Port (Plate 40), in proximity to several protected buildings.

Plate 38 - HS2 ventilation shaft, Chalfont St Peters (source - HS2)

Plate 39 - HS2 ventilation shaft, Little Missenden (source - HS2)

5.6.15 Proposals were informed by detailed analysis of the setting, surrounding buildings and the nature of views and potential visual impact. The design was developed using proportional studies (Plate 41) and a considered appraisal of materials (Plate 42).

5.6.16 The final design sees a stepped approach to the massing of buildings, in keeping with the surrounding built form. A subdued colour palette was used to minimise the visual impact within the urban environment, in harmony with the blue-grey tones of the Dublin sky and water frontage.

Plate 40 - Artist's impression of Codling Wind Farm (Dublin Onshore Substation) within its urban setting; (source - Faulkner Brown)

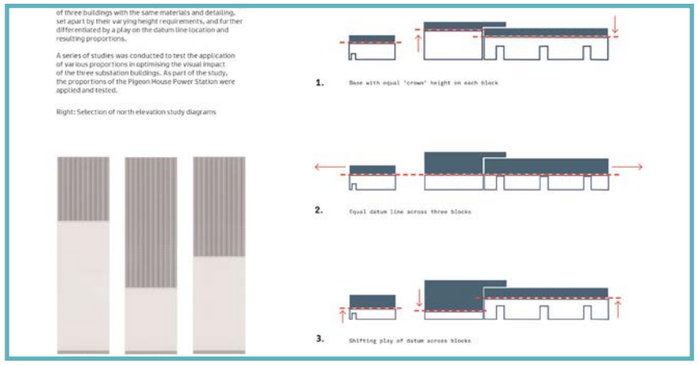


Plate 41 - Codling Wind Farm; Dublin Onshore Substation, Proportional studies (source - Faulkner Brown)

Plate 42 - Codling Wind Farm; Dublin Onshore Substation, materiality studies (source - Faulkner Brown)

Local Precedents

5.6.17 A review of local architectural precedents has been undertaken to assess their relevance as design cues, as suggested within the Essex Design Guide, prepared by Essex County Council.

5.6.18 It should be noted that the successful reinterpretation of local vernacular within contemporary design relies upon a subtle interplay of building forms, their spatial relationship to each other and the other built elements within their curtilage, such a boundary treatments and planting.

5.6.19 In this instance, the scale of the buildings and their immediate proximity to significant electrical infrastructure will dispel any perception of the OnSSs as traditional settlements or farmsteads.

5.6.20 Notwithstanding this, the surrounding buildings can provide a useful reference in terms of form, scale, materiality and colour.

Local Precedent - Glasshouses

5.6.21 Within the surrounding area, the main precedent for large industrial structures with a simple form and elevation are the horticultural glasshouses between Ardleigh and Lawford (Plate 43). These are typically a maximum of 6m high, comparable to the STATCOM buildings.

5.6.22 The materiality of the glasshouses is clearly not appropriate for the STATCOM buildings, however the facade treatments could consider the interplay of light and the weather on the reflective glasshouse elevations. This visual effect could be reinterpreted in a contemporary cladding system to create a harmonious transition to the horizon. Part 7 considers this in more detail.

Local Precedent - Barns

5.6.23 Ensuring resemblance to local agricultural structures will allow the proposal's built form to better integrate into the local area. With surrounding buildings being predominantly steel-framed barns with metal cladding, a similar form and construction type would be ideal.

5.6.24 Lower structures with simple forms and facade treatments include agricultural barns. The height of these buildings cover a range; recently constructed barns at Holly Lodge Farm have a roof height of around 9m.

5.6.25 Within the local area, the positioning of agricultural barns is typically in close proximity to the farmhouse, but usually separated by an open yard. Barns may appear as individual structures or within small groups of two or three (Plates 44, 46,47, 51, 52).

5.6.26 Local barns are considered to be an appropriate precedent for the buildings within the site, such as the Control Building and Storage and Amenity Building due to their simple form, scattered positioning and small clusters. The materiality and colour of the barns can also be considered an appropriate visual reference.

5.6.27 Traditional Essex barns are constructed from horizontal weatherboarding, painted black (which may appear a dark brown).

5.6.28 More recent barns are a mix of brick (lower level) with vertical timber or corrugated steel (upper level),large, painted steel doors and corrugated steel roofs.

5.6.29 EQRP Design Review #1, included a discussion on the relevance of local precedents. The panel expressed a strong preference for the use of agricultural barns as design precedents, these being the most prevalent structures within the immediate setting and of a comparable scale to the OnSSs buildings.

Plate 43 - Industrial glasshouses, Hungerdown Lane. Source: LUC

Plate 44 - Derelict traditional barn in nearby fields. Source: LUC.

Plate 45 - Normans Farm (water tower at Horsley Cross in the background). Source: LUC

Case Study #1 - Little Bromley Hall Farm

5.6.30 Little Bromley Hall Farm (Plate 46) lies to the immediate north of St Mary's Church, approximately 1km to the southeast of the JDG site boundary.

5.6.31 The farm is present on OS mapping from the 1830s. The low brick wall wrapping the farmyard can be discerned, although agricultural buildings on site date from the twentieth century.

5.6.32 There are several clusters of buildings within the farm yard, creating a variation in colour, form and roof-line when viewed from the south (Plate 46). The low brick wall visually links the barns to the brick farmhouse and white render on the farm house is continued along the side elevation of one of the barns.

5.6.33 The elevations and three dimensional study have been created using planning drawings from 1991. These represent a grouping of three barns at the eastern edge of the site. The overall height of the group is around 7.7m, with the length varying 32-41m. The width of the group is c. 25m.

5.6.34 The ratio of roof:wall varies between 1:1 and 1:2. The grouping of buildings incorporates two dual-pitched roofs and one truncated dual-pitch roof.

5.6.35 The elevational treatment is broken into three elements (Plate 48);

- Red brick plinth
- Horizontal timber weatherboarding, stained black but now faded to a dark brown
- Fibre cement roof (grey, non-reflective)

5.6.36 Doorways are articulated distinctly with a deep setback within the elevation and a strong contrast between the aged weatherboarding and the contemporary steel shutter in a standard RAL green. Windows have been inserted more modestly within the elevation.

Plate 46 - Little Bromley Hall Farm,taken from Barlon Road. Source: SLR

Plate 47 - Barns at Little Bromley Hall Farm. Source: SLR

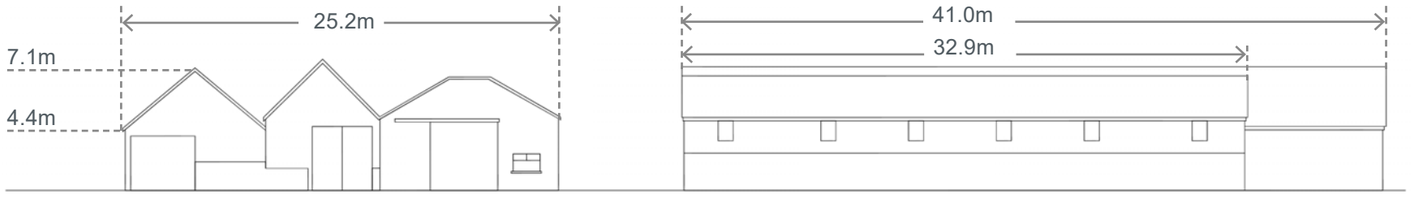


Plate 48 - Elevational study of barns at Little Bromley Hall Farm

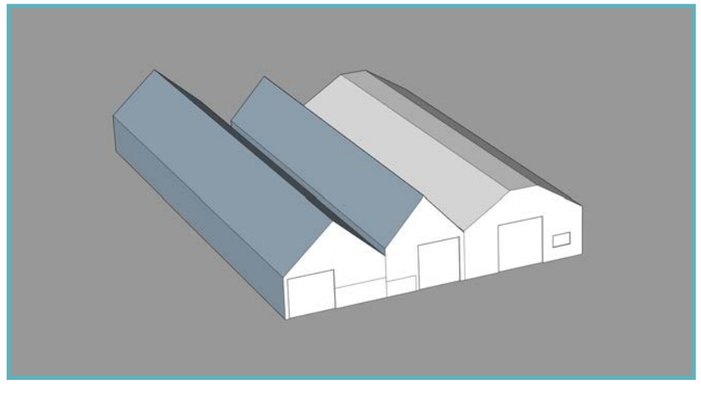


Plate 49 - 3D massing of barns at Little Bromley Hall Farm

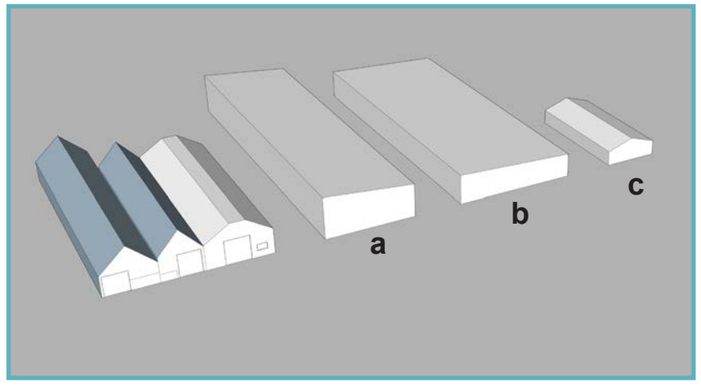


Plate 50 - Little Bromley Hall Farm 3D massing in comparison to a) STATCOM building, b) Control Building and c) Storage and amenity buildings

Case Study #2 - Holly Lodge Farm

5.6.37 Holly Lodge Farm (Plate 51) lies approximately 780m to the northeast of the JDG site boundary.

5.6.38 The farm is present on OS mapping from the 1830s, although all buildings, save the original farmhouse, appear to have been replaced with contemporary structures.

5.6.39 The three large modern barns create a homogenous appearance when viewed in conjunction with boundary planting (Plate 52). Glimpses of the farmhouse and other farmyard structures can be discerned.

5.6.40 The elevations and three dimensional study have been created using recent planning drawings for the new barns. At 18m wide, these are a similar width to the STATCOM and Control Buildings, although shorter in length at 30.2m.

5.6.41 The height of the barns is 9m, taller than the anticipated height of the STATCOM and Control Buildings. The ratio of roof:wall is 1:4. All barns have a dual pitch roof.

5.6.42 The elevational treatment is broken into three elements (Plate 53);

- Concrete panels to base
- UPC coated box section steel cladding; Olive Green
- Fibre cement roof (grey, non-reflective)

5.6.43 Large doorways with roller shutters are inserted into one of the shorter elevations, with exhausts and fans placed within housing on the opposite side. There is no fenestration.

Plate 51 - Holly Lodge Farm, from Barn Lane PRoW. Source: LUC

Plate 52 - Holly Lodge Farm, from Barn Lane PRoW. Source: LUC

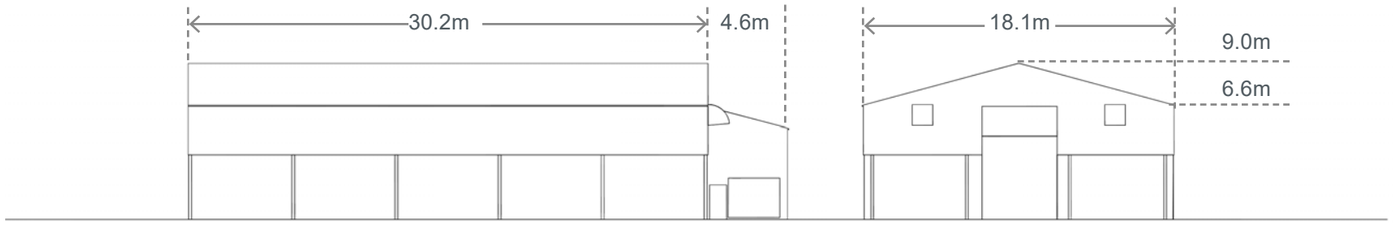


Plate 53 - Elevational study of barns at Holly Lodge Farm

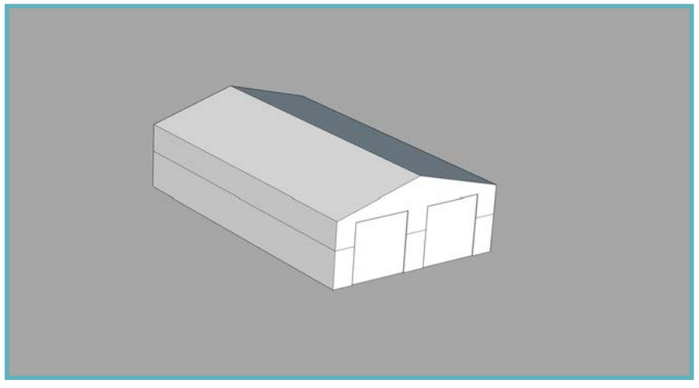


Plate 54 - 3D massing of barns at Holly Lodge Farm

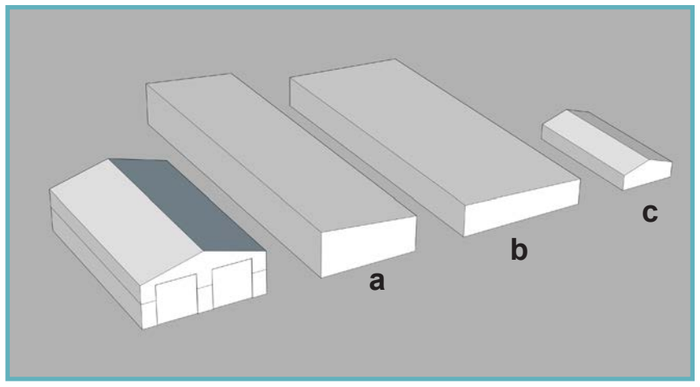


Plate 55 - Holly Lodge Farm 3D massing in comparison to a) STATCOM building, b) Control Building and c) Storage and amenity buildings

Case Study #3 - Grange Farm

5.6.44 Grange Farm (Plate 56) lies approximately 1km to the north of the JDG site boundary.

5.6.45 The farm is present on OS mapping from the 1830s, but has extended further to the north in recent years.

5.6.46 This new development, comprising large barns and a lower level office block, is prominent in views from the south of Lawford (Plate 57)

5.6.47 The elevations and three dimensional study have been created using recent planning drawings for the new barns. At 18m wide, these are a similar width to the STATCOM and Control Buildings, although shorter in length at 24m.

5.6.48 The height of the barns is 6.9m, similar to the anticipated height of the STATCOM and Control Buildings. The ratio of roof:wall is 1:2. All barns have a dual pitch roof.

5.6.49 The elevational treatment is broken into three elements (Plate 58);

- Concrete panels to base
- Profile metal sheet cladding; Juniper green
- Profile metal sheet roof material; Goosewing grey

5.6.50 Large doorways with roller shutters are inserted into one of the shorter elevations, with doors alongside.

Plate 56 - Grange Farm, from Grange Road. Source: LUC

Plate 57 - Grange Farm, from Grange Road at the edge of Lawford. Source: LUC

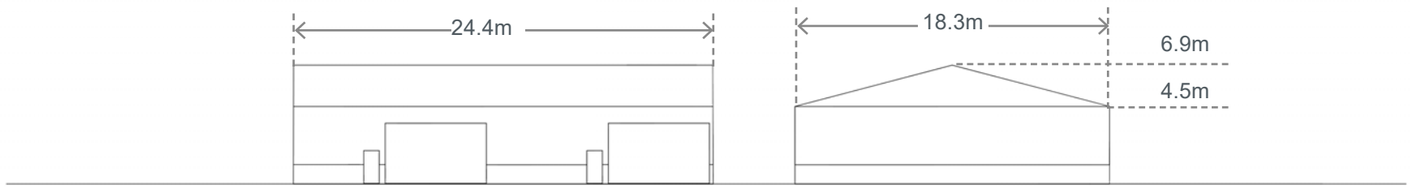


Plate 58 - Elevational study of barns at Grange Farm

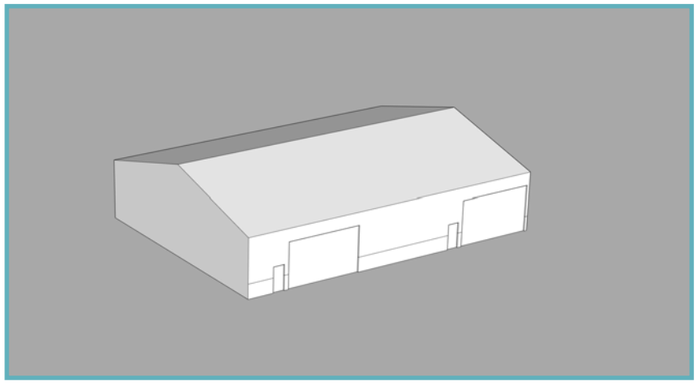


Plate 59 - 3D massing of barn at Grange Farm

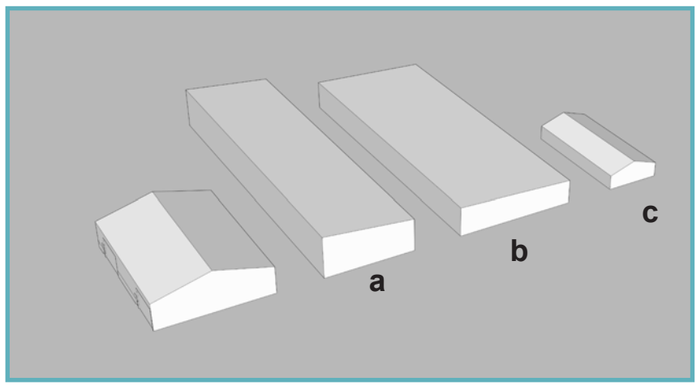


Plate 60 - Grange Farm 3D massing in comparison to a) STATCOM building, b) Control Building and c) Storage and amenity buildings

5.7 Building Optionality

5.7.1 Plates 61-70 illustrate a range of potential adaptions to the typical built form, using the Control Building as an example. A summary of the optionality by building type is provided in Section 5.8.

Massing

5.7.2 Plates 50, 55 and 60 illustrate that the indicative massing of the STATCOM and Control Buildings is much longer than local agricultural barns.

5.7.3 There are no defined parameters that determine the placement of built form on site. Initial layouts prepared prior to DCO stage suggested that both STATCOM and Control Buildings could be placed next to each other, with the longest elevations running continuously along the shorter edge of the compound.

5.7.4 Detailed design development of the built form should consider how longer elevations can be visually 'broken up' to reduce the monotony of lengthy elevations and echo the massing of local barns. Plates 62-65 illustrate a variety of techniques.

5.7.5 Splitting the built form into two separate halves (Plate 61) is not possible due to the internal configuration of electrical equipment.

5.7.6 Articulation of the elevation with recesses (Plate 62) can introduce variation and shading to the elevation, reducing the appearance of built form massing. Any change in the footprint must maintain minimum internal volumes and electrical configurations. The introduction of recesses or offsets will also require additional structural support, impacting on costs and ability to construct in a modular manner.

5.7.7 The use of colour, to break up the expanse of elevation is illustrated in Plate 63. Plate 64 considers how colour could also be used at the edges of the form, to emphasise the edges of the built form. The use of colour is explored further within Section 7.

Optionality - Massing

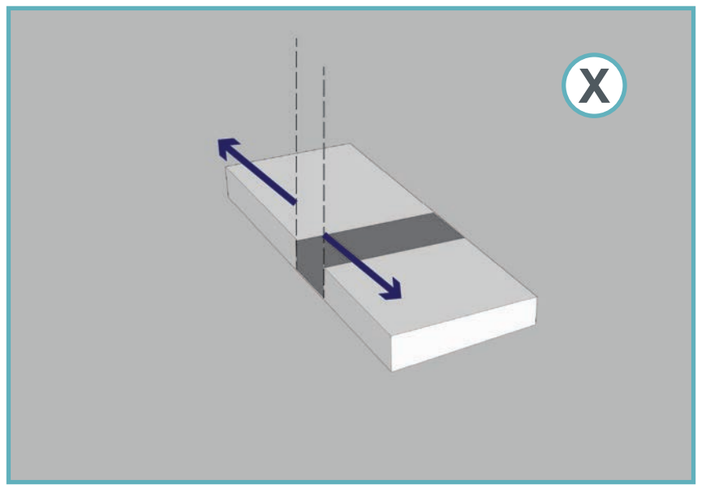


Plate 61 - Splitting the built form into two separate halves to reflect agricultural massing

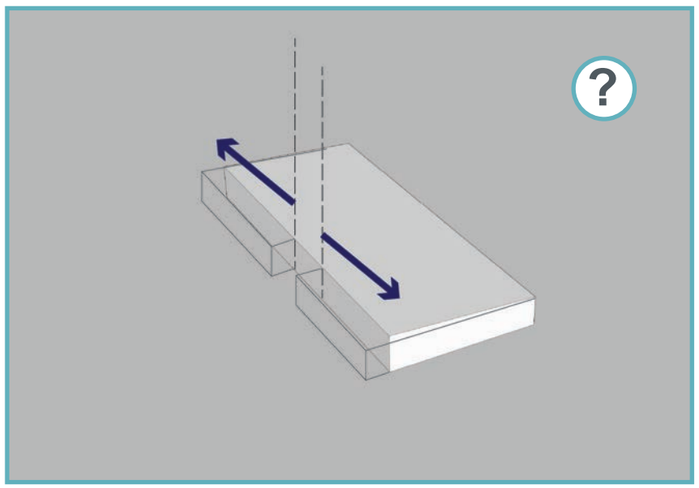


Plate 62 - Articulating separate forms through a step in elevational profile

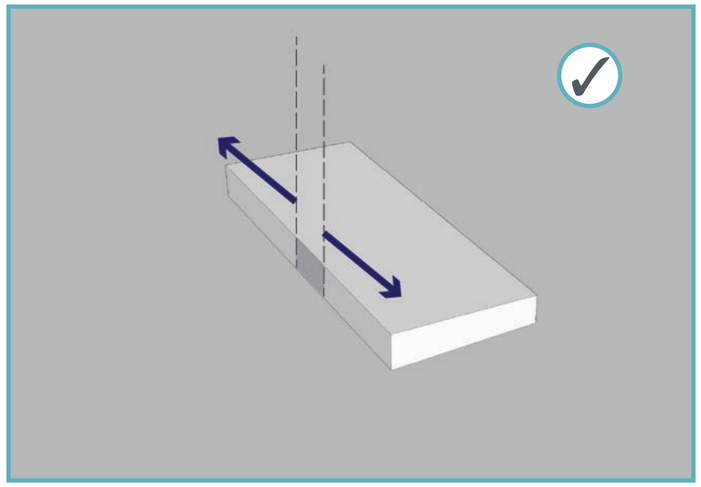


Plate 63 - Articulating separate forms through a change in colour within the centre of the elevation

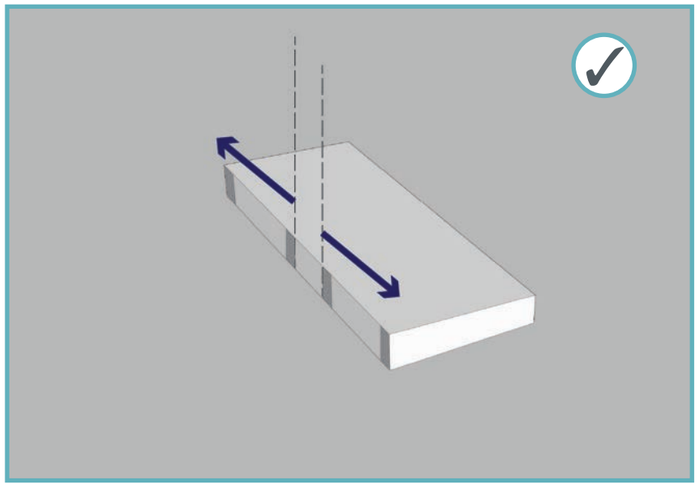


Plate 64 - Defining separate forms through a change in colour at the centre and edges of the elevation

Roof

5.7.8 Options for either a mono or dual pitch roof were presented during the Phase 1 Engagement. A clear preference was not determined, although other feedback expressed a desire for the OnSSs buildings to have as low profile as possible and for them to reflect local agricultural character.

5.7.9 Use of a flat roof (Plate 65) will slow drainage runoff rates. The risk of damage from ponding and water ingress is too high to consider for OnSSs buildings.

5.7.10 Barns at Little Bromley Hall Farm display multiple pitches (Plate 68). Introducing similar forms will create several low-points along the centre of the building. Similar to flat roofs, the risk of damage resulting from water ingress is too high to consider for the OnSSs.

5.7.11 Indicative massing for the larger OnSSs buildings identifies a shallow mono-pitch of around 3° degrees, whereas agricultural precedents have dual-pitch roofs, varying between 15-44°. Increasing the pitch (Plate 66) will increase the proportion of roof visible in building elevations and better emulate agricultural precedent.

5.7.12 Optionality for either a mono or dual pitch roof will be maintained at detailed design stage. Introducing a dual pitch roof (Plate 65) will provide a truer reflection of local agricultural vernacular and provides more flexibility in the siting of OnSS buildings. Should a mono pitch roof be proposed, this will require careful consideration of the positioning and orientation of buildings within the compound, to ensure that the mono pitch is angled towards the outer edges of the site.

5.7.13 The roof pitch must maintain the minimum height required for internal operations, whilst complying with the maximum height parameter of 7m. The impact on external maintenance requirements must also be fully appraised.

5.7.14 Local agricultural roofs are formed from fibre cement panels or profile steel sheet. Use of a recessive colour and non-reflective surface finish will minimise visual intrusion within the wider setting.

Optionality - Roof

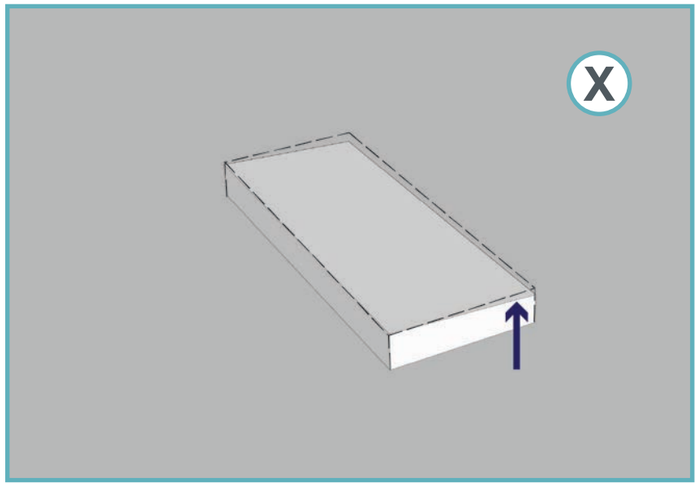


Plate 65 - Flat roof

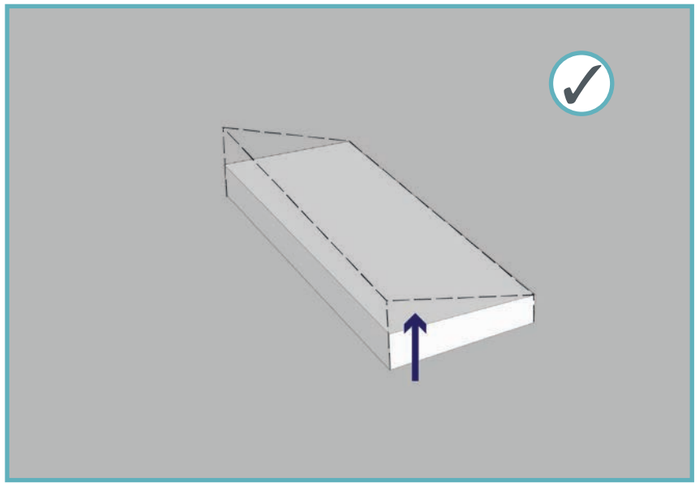


Plate 66 - Increased gradient to mono pitch

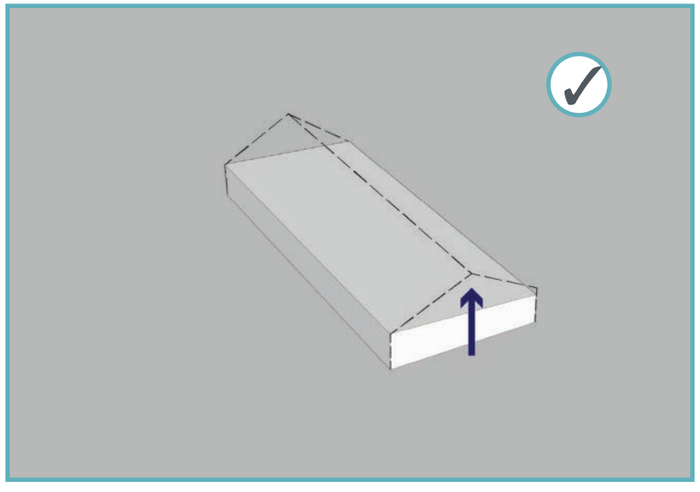


Plate 67 - Dual pitch

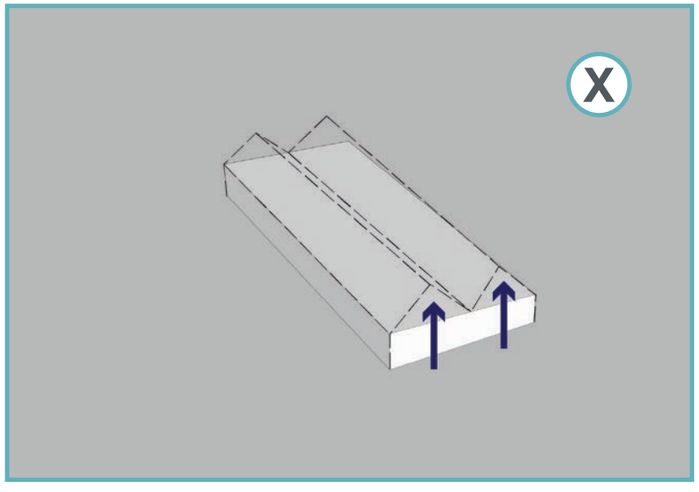


Plate 68 - Multiple pitches

Elevations

5.7.15 Feedback from the Phase 1 engagement expressed a clear desire for OnSSs buildings to embrace the local vernacular, wherever possible.

5.7.16 Local agricultural precedents utilise a variety of materials and colours within their elevations. Typically, they incorporate a robust 'plinth' at ground level, the height varying between a third to a half of the overall elevation. Local brick or concrete panel boards are typical materials. On more recent barns this change in verticality is sometimes suggested by a change in colour. Above the plinth, horizontal weatherboarding or a vertical profile steel cladding is typically used.

5.7.17 Due to the modular approach taken for substation buildings and need for a secure, watertight and non-flammable environment, the use of timber cladding cannot be considered.

5.7.18 A change in sheet material (e.g. fibre cement / steel cladding), change in the orientation of panels (horizontal / vertical) or change in colour can be considered to emphasise verticality within the elevations.

Optionality - Elevations

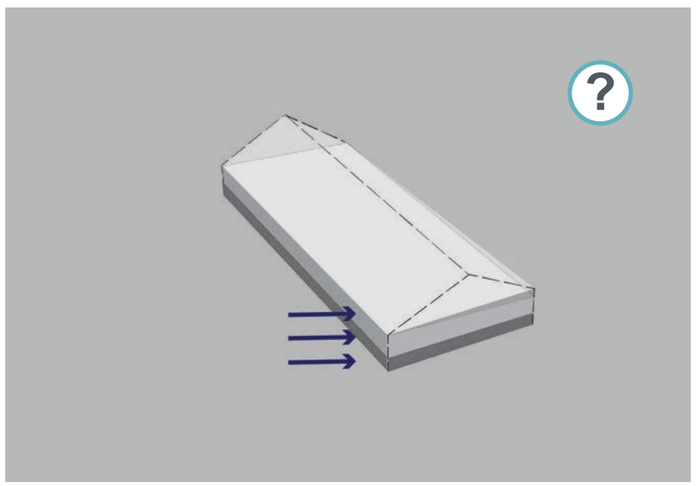


Plate 69 - Emphasis of verticality on a dual-pitch roof

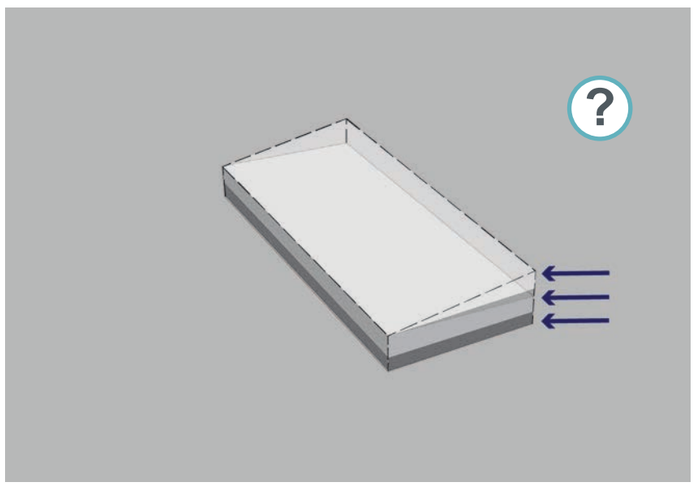


Plate 70 - Emphasis of verticality on a mono-pitch roof

5.8 Summary of Building Optionality

STATCOM buildings

5.8.1 Due to the complex internal electrical processes taking place within the building, there is limited optionality in comparison to other building types.

Layout

- The location will largely be determined by the electrical layout and space availability within the compound.

Massing

- Optionality to adjust aspects of building form, whilst maintaining a simple structural, modular form.

Roof

- Optionality for dual or mono pitch roof.
- Maximum roof height of 7m to be maintained.

Elevations

- Optionality to vary facade treatment, whilst maintaining a simple elevational treatment with minimal fenestration / access.

Materials

- Steel frame and cladding is the preferred facade material as it allows modular construction.

Colour

- The Environmental Colour Assessment (ECA) (Part 7) identifies a suitable range of colours for the cladding.

Sustainability

- 'Lean' construction, minimisation of embodied carbon and reuse/recycle of material to be prioritised within design.

Control Buildings

5.8.2 The Control Building also houses complex electrical processes, there is optionality in comparison to other building types.

Layout

- The location will largely be determined by the electrical layout and space availability within the compound.

Massing

- Optionality to adjust aspects of building form, whilst maintaining a simple structural , modular form.

Roof

- Optionality for roof dual or mono pitch.
- Maximum roof height of 7m to be maintained.

Elevations

- Optionality to vary facade treatment, whilst maintaining a simple elevational treatment with minimal fenestration / access.

Materials

- Steel frame and cladding is the preferred facade material as it allows modular construction.

Colour

- The ECA (Part 7) identifies a suitable range of colours for the cladding.

Sustainability

- 'Lean' construction, minimisation of embodied carbon and reuse/recycle of material to be prioritised within design.

Storage and amenity building

5.8.3 The building provide storage, and amenity for operation and maintenance staff using it on an occasional basis.

Layout

- There is a greater degree of optionality for the storage and amenity building.

Massing

- Optionality to adjust aspects of building form, maintaining a simple structural form.
- Prefabricated options will be considered.

Roof

- Optionality for roof dual or mono pitch.
- Wherever possible, the roof pitch should be minimised to constrain the building height.

Elevations

- Optionality to vary facade treatment.

Materials

- Use of alternative cladding systems and render will be considered.
- The use of an alternative material (e.g. brick) for lower levels will also be considered.

Colour

- The ECA (Part 7) identifies a suitable range of colours for the cladding.

Sustainability

- Limited optionality for PV panels or green roof.
- 'Lean' construction, minimisation of embodied carbon and reuse/recycle of material to be prioritised within design.

5.9 Compound structures

5.9.1 AIS compounds will contain a range of electrical equipment, along with other structures required to support the operational requirements. These include:

- Circuit breakers and busbars
- Transformers
- Reactors
- Auxiliary transformers
- Harmonic Filters
- Transformer noise enclosures
- Reactor noise enclosures
- Lightning masts
- Septic tank
- Water tank

Circuit breakers and busbars

5.9.2 Electrical busbars connect the various pieces of electrical equipment within the substation together. Circuit breakers are placed at strategic points within the busbar system to allow sections of the wind farm electrical network to be switched out with minimum disruption to the wind farm operation. Electrical equipment will be a maximum of 13m in height.

Transformers

5.9.3 Transformers step up the offshore wind farm export cable voltage to the 400kV voltage of the National Electricity Transmission System. The indicative size of each of the units is 6m by 16m by 12.5m high (to the top of the bushings). Transformers are typically grey.

Reactors

5.9.4 Reactive compensation equipment will condition the wind farm power prior to export to the transmission system, to ensure it complies with the requirements set out by the transmission system operator. Typically, one set of reactive compensation equipment is required for each wind farm export circuit.

5.9.5 Reactive compensation equipment will typically consist of a STATCOM unit and separate reactors. The indicative size of the reactive compensation control unit is 4m by 7.5m by 7.1m high. The level of reactive power required from the reactors (and therefore their size) cannot be determined at this early stage.

Auxiliary Transformers

5.9.6 In addition to the main transformers the substation will also have a set of smaller auxiliary transformers to provide a LV supply to substation buildings and auxiliary systems.

Harmonic Filters

5.9.7 Harmonic filters ensure that the power exported to the grid complies with the quality of supply requirements set out by the transmission system operator. Typically, one set of harmonic filtering is required for each export circuit and a 400kV harmonic filter may be required for the circuit connecting to the transmission system. It has been assumed that each harmonic filter compound will be of dimensions approximately 22.5m by 20m with an expected height of the filters to be from 10m to 12.5m.

Noise Enclosures

5.9.8 Noise enclosures provide suitable acoustic treatment to the transformer and reactors. The choice of enclosure is dependent on the level of acoustic reduction required. They are typically up to 10m in height. Enclosures may include bespoke structures or use of an acoustic screen. A typical noise enclosure is shown in Plate 71.

Lightning Masts

5.9.9 Slender lightning masts up to 18m high will be required to provide protection to electrical equipment.

Septic Tank

5.9.10 An underground septic tank will treat waste arising from the on site welfare facilities, in the absence of a connection to the public sewer. The size of the tank will be confirmed during detailed design.

Water Tank

5.9.11 A water tank, connected to a main water supply, stores water for use in the event of a substation fire. The indicative dimensions for a tank are 6.5m wide by 6m high.

Optionality

5.9.12 Due to the functional nature of these components there is no optionality to alter their position within the overall layout.

5.9.13 Changes in layout i.e. to mitigate visual impact, will be considered where technically and logistically possible at detailed design stage.

Colour

- There is no optionality in colour for electrical equipment. The standard colour is light grey.
- Due to the scale of the water tank and noise enclosures, they may be perceived as buildings. Wherever possible, the preferred colour scheme should be applied to these structures to create visual harmony within the scene.

Plate 71 - Transformer with noise enclosure (source - RWE)

5.10 Boundary Typologies

5.10.1 The boundary requirements at the OnSSs site include:

- Secure boundary to the OnSS compounds
- Other boundary treatments to the wider site

5.11 Secure boundary to the OnSS compounds

Performance Requirements

5.11.1 Perimeter fencing, in combination with closed circuit television systems (CCTV), will form the secure boundary. This will prevent unauthorised access to the OnSS compound. Fencing will typically be installed in straight lines, for ease of surveillance by CCTV system.

5.11.2 Due to the requirement for clear sightlines and high level of security, it is not possible to use building lines to form the secure boundary, as suggested in a recent EDRP review.

5.11.3 Since the publication of JDG Rev 00, the Department for Energy Security and Net Zero (DESNZ) has drafted an Energy Resilience Strategy, due for publication in 2026. It will include guidance on design standards for Critical National Infrastructure (CNI). A full security assessment will be undertaken prior to detailed design to determine if the project is deemed to be CNI.

Typical Specification

5.11.4 A typical secure boundary must comply with NG TS 2.10.02 Technical Specifications - Perimeter Security Fencing for Substations, which stipulates three categories of fencing;

- 3 – Reduced. ‘Standard’ but without electric fence;
- 2 – Standard. A physical mesh or palisade barrier to 2.4m height with electric pulse fence;
- Enhanced. 'Standard' with enhanced features.

5.11.5 There is no standard colour. Fencing will sometimes be left with a galvanised (grey) finish.

5.11.6 Based on similar, recent security reviews, it is expected that the secure boundary should be of a palisade construction due to the security critical nature of the site. The fencing category and height will be determined by the security requirements at the site, determined through review.

Design Considerations

5.11.7 Palisade provides a more solid appearance to the fence panel, due to the width of the pales in comparison to small diameter wire used in weld mesh panels. Palisade fencing will provide a greater degree of screening to any built form or structures within the compound, but will be more visually prominent feature than weld mesh within foreground views.

5.11.8 Mitigation planting will largely screen the secure boundary from visual receptors during summer months.

5.11.9 During Phase 1 engagement, a preference was expressed for the security fencing to be in keeping with surroundings, with no clear preference expressed for either weldmesh or palisade.

5.11.10 NGET have proposed a hot-dipped galvanized steel palisade fence as the secure boundary to the EACN substation, on the opposite side of Grange Road.

5.11.11 The use of 'standard' green fencing (RAL 6005, Moss Green) shall be avoided as the blue tones contrast with the yellow-green hues of natural vegetation.

Optionality

- The extent of fencing will be minimised, whilst meeting the security needs for the site.
- There is no optionality for fence type and height.

Colour

- The colour selected for the fencing must complement the agreed scheme for compound buildings and structures.
- RAL 6013 (Reed Green) is the preferred choice for the fence colour, as this is the closest match to baseline colour 6020-G70Y.
- RAL 6003 (Olive Green) is the closest match that is readily available from known fencing suppliers.

Plate 72 - Palisade fencing. The use of 'standard' green (RAL 6005) contrasts with natural vegetation colours / Source: Oakdale

Plate 73 - Palisade fencing example, showing close tonal and colour relationship to the Winter landscape backdrop (RAL 100 30 20 Olive Green used in this example) / Source: LUC

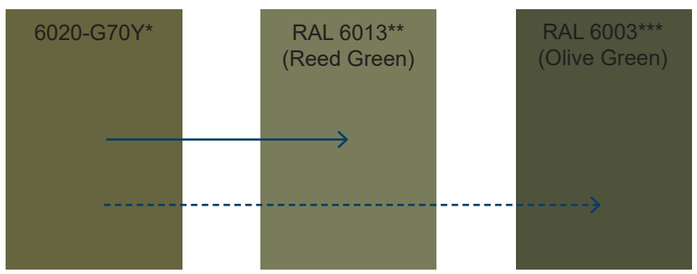


*Plate 74 - *Surveyed baseline colour 6020-G70Y, **closest RAL match RAL 6013 Reed Green and ***closest standard fencing shade RAL 6003 Olive Green*

5.12 Other boundary treatments to the wider site

Performance Requirements

5.12.1 There is no technical or statutory requirement for boundary fencing within the wider site.

5.12.2 As described in Section 4.3, the layout and extent of boundaries will consider the following aspects;

- Provision of a physical barrier to protect establishing vegetation from potential damage from farming operations on adjacent agricultural land.
- Provision of a physical barrier to restrict access by vehicles or members of the public.

5.12.3 The future security assessment may identify further requirements for fencing or other security measures.

Design Considerations

5.12.4 The primary consideration is to minimise clutter and limit adverse visual effects for receptors. Fencing materials and design shall align with the local vernacular. The lowest fence height shall be used, where possible.

5.12.5 Feedback received during the Phase 1 engagement expressed a wish to minimise the use of boundary fencing, to minimise visual clutter within a rural location.

5.12.6 An overall preference was expressed that fencing should have a rural character and sustainable construction. Timber is the preferred material.

5.12.7 Concerns were raised regarding controlling the spread of agricultural pests, such as rabbits. Use of impermeable fencing was requested.

5.12.8 Following the publication of the JDG Rev 00, the Department of Environment, Food and Rural Affairs (Defra) issued a requirement that all permanent fencing installed is designed in such a way as to allow the movement of animals (where appropriate) across the landscape. This must include access points installed at strategic locations along fence lines to allow badgers and other animals to pass through

Optionality

- Three types of fencing were suggested within JDG Rev 00 prior to Phase 1 engagement. Optionality in fencing type has since reduced due to the Defra requirement and the need to establish a distinct physical boundary at specific locations. Two options for fence type remain:

Materials

- A timber post and rail (Plate 75) is in keeping with local vernacular and allows free movement for all wildlife. Where this option is selected, the LEMP shall stipulate how new planting is to be adequately protected from Grey Squirrel, Rabbit and Deer.
- A timber post and wire mesh fence (Plate 76) is in keeping with local vernacular but limits movement for larger mammals, such as Badgers. Where this option is selected, the detailed design shall incorporate badger gates (Plate 77) at suitable intervals, as stipulated by a qualified Ecologist. Minimum mesh sizes may also apply.

Height

- Fence heights should be minimised, wherever possible.
- A maximum height of 1.2m is recommended. This is subject to an assessment of the risk to planting from grazing wildlife and adequate plant protection measures being put in place.

Plate 75 - Timber post and rail fence. The spacing of rails allows free passage for all wildlife. Source: Jacksons Fencing.

Plate 76 - Timber post and wire fence. The wire mesh could hinder the passage of wildlife. Source: Suregreen.

Plate 77 - Badger gate example for use within wire mesh fence. Source: Jim Barton https://creativecommons.org/licenses/by-sa/2.0/

5.13 Hard Surfaces

5.13.1 There will be a range of hard surfaces within the OnSS compound. This will include:

- Vehicle Access Road
- Car Parking
- Pedestrian Access
- Equipment Hardstanding
- Cable Trench Cover
- General Compound

5.13.2 Plate 78 identifies an indicative arrangement of these hard surfaces within an AIS substation compound.

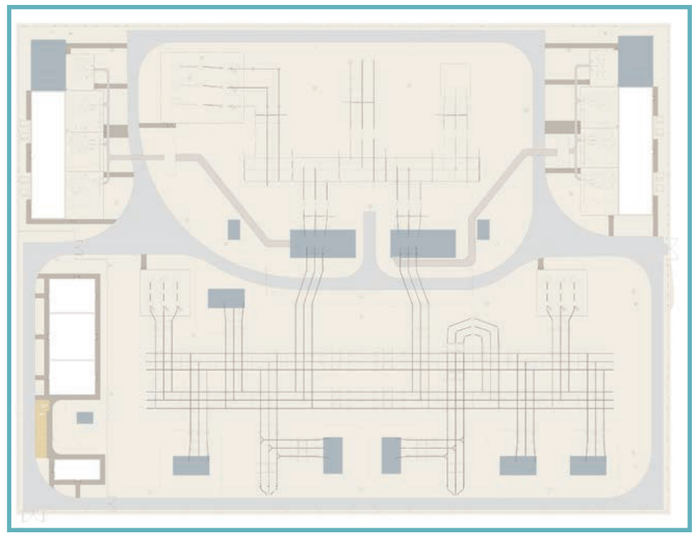


Plate 78 - Indicative location of hard surfaces within OnSS compound

General Guidance

5.13.3 Surfacing specifications shall meet all technical and operational requirements required for an OnSS.

5.13.4 The extent of impermeable surfacing should be minimised, where possible, in line with the National Planning Policy Guidance (NPPG) Hierarchy of Drainage and the Sustainable design measures identified within Section 6.

5.13.5 The specification shall consider the application of the waste hierarchy principles:

- Reduce: limit the extent of materials used overall
- Reuse: consider how materials can be reused
- Recycle: consider the use of recycled materials

Plate 79 - Stone chippings

Plate 80 - Permeable parking

Plate 81 - Concrete pads to base of electrical equipment

Plate 82 - Pedestrian access routes to buildings

Vehicle Access Road

5.13.6 A circulatory vehicle access route is required within the compound to provide adequate vehicle access for installation of equipment, operational and maintenance requirements and fire fighting purposes.

5.13.7 A shared access road will provide vehicle access to the OnSS compounds from the entrance on Ardleigh Road.

5.13.8 The design and specification of the vehicle routes shall meet the National Highways guidance on Abnormal Indivisible Loads (AIL). These apply where a vehicle has any of the following:

- a weight of more than 44,000kg;
- an axle load of more than 10,000kg for a single non-driving axle and 11,500kg for a single driving axle;
- a width of more than 2.9m; and
- a rigid length of more than 18.65m.

5.13.9 The Outline Drainage Strategy assumes an impermeable construction for all vehicular access roads, with a SuDS system required to attenuate and treat surface water run-off from impermeable surfaces. At detailed design stage, options to increase the extent of permeable construction will be explored. These must be compliant with the overarching loading requirements.

Car Parking

5.13.10 Car parking spaces will be provided in close proximity to the OnSS compound entrance and Control Building.

5.13.11 Accessible parking spaces will be provided at an agreed ratio. The design and layout will be generally aligned with the principles set out in Approved Document M: Access to and use of Buildings (Other Than Dwellings), and BS8300: Design of an accessible and inclusive built environment.

5.13.12 Permeable surfacing will be used for all parking areas, where loading requirements and other restrictions allow.

Pedestrian Access

5.13.13 The layout of pedestrian access routes within the OnSS compound will employ a functional approach to access. Pedestrian routes will include:

- Access to buildings from car and cycle parking areas
- Access between buildings
- Perimeter access for building maintenance
- Access to electrical equipment, where requiring regular inspection

5.13.14 All pedestrian access routes will be designed in accordance with Approved Document M: Access to and use of Buildings, and BS8300: Design of an accessible and inclusive built environment. This will ensure that all pedestrian routes meet minimum width requirements and provide a firm and robust surface, free from trips and other hazards.

5.13.15 Circuitous routes will be avoided, where possible, to minimise travel distances for disabled users.

Equipment Hardstanding

5.13.16 Hardstanding to electrical equipment must provide a robust and stable surface, capable of meeting heavy loading requirements. Typically concrete will be used in these circumstances.

Cable Trench Cover

5.13.17 Cable trench covers will be required to provide suitable access for inspection, maintenance and repair.

General Compound

- General compound areas between the structures on site will be specified as permeable surfaces.
- Stone chippings are typically used due to their high electrical resistance. Where possible, chippings will be recycled from other applications (such as railway ballast) and/or sourced locally.

5.14 Ancillary Structures

5.14.1 The extent of ancillary structures within the OnSS compound will be limited to those necessary for the functional operation of the site. These include:

- Cycle parking
- Signage
- CCTV
- Lighting

Cycle Parking

5.14.2 OnSSs are uncrewed facilities and the requirement for cycle access is very unlikely due to the equipment required for operations and maintenance works. A small-number of spaces will meet the limited quantum requirements.

5.14.3 Where space allows, cycle parking shall be located internally within buildings. Where located externally, it should be positioned in close proximity to buildings and car parking areas for ease of access.

Signage

5.14.4 Signage will be required to the main entrance gate adjacent Ardleigh Road. This will typically be low-key but provide essential information, such as the risks associated with entering areas with high voltage electrical equipment.

5.14.5 Signage in accordance with the Electricity Supply Regulations will be located in conspicuous positions along the secure OnSS compound boundary.

Plate 84 - Secure external cycle parking with green roof

Plate 85 - 'Dark Sky' approved bollard lighting

CCTV

5.14.6 CCTV coverage will be required to the OnSS compound and shared access road to a recognised security standard. There is no optionality for this element.

5.14.7 Typical details of a 'redwall' system are shown in Plate 82. This specifies the positioning of CCTV columns away from the secure compound boundary, allowing suitable clearance for column tilting.

5.14.8 Clearance distances shall be established prior to the design of soft landscape and planting areas. Proposed planting shall be designed in such a way to avoid the overhanging of tree canopies within this zone.

Lighting

5.14.9 Lighting to the secure compound will be governed by technical criteria, specifying the level of illumination required in the event of maintenance outages or emergency repairs. The lights will be directed downward, and shielded to reduce glare.

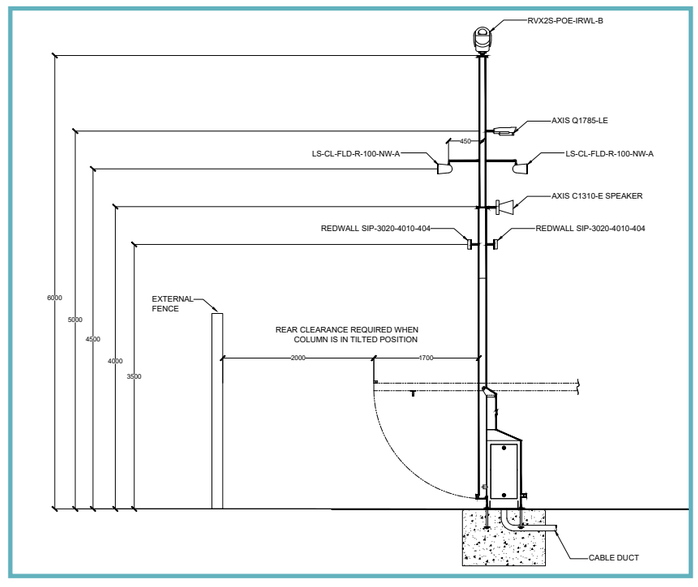


Plate 83 - Typical CCTV installation at an OnSS compound (source: National Grid)

5.15 Drainage

5.15.1 The following features will be included within the site layout:

- Filter drains
- Swales
- Attenuation Ponds

5.15.2 Whilst these elements play a functional role as part of the Operational Drainage Strategy, wherever possible they will be designed to contribute to the wider site aims, such as enhancing biodiversity and provision of GBI. The indicative sections in Plates 86-88 show how they can be designed to maximise these opportunities. Further details are provided within Part 8: Landscape and Ecology.

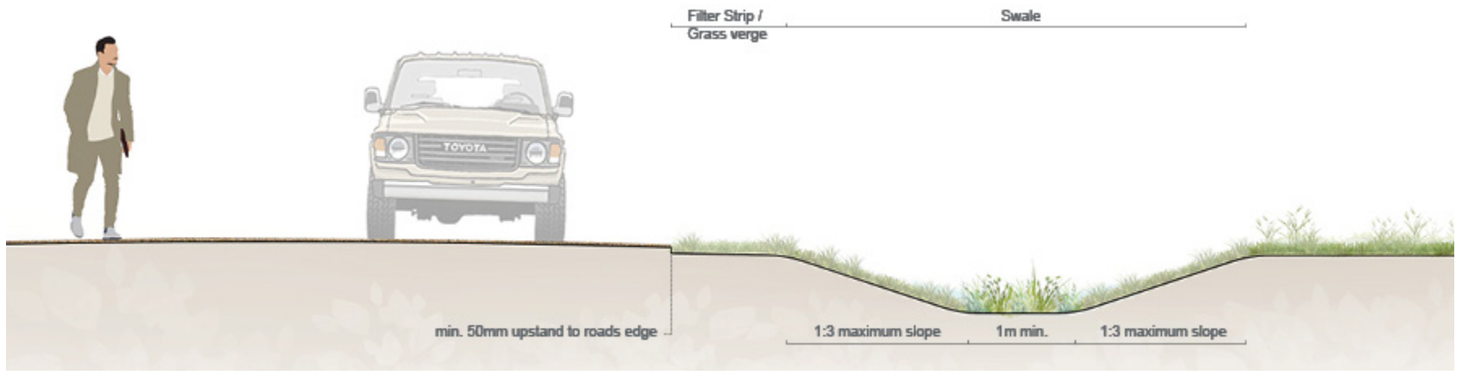


Plate 86 - Typical cross section through drainage swale

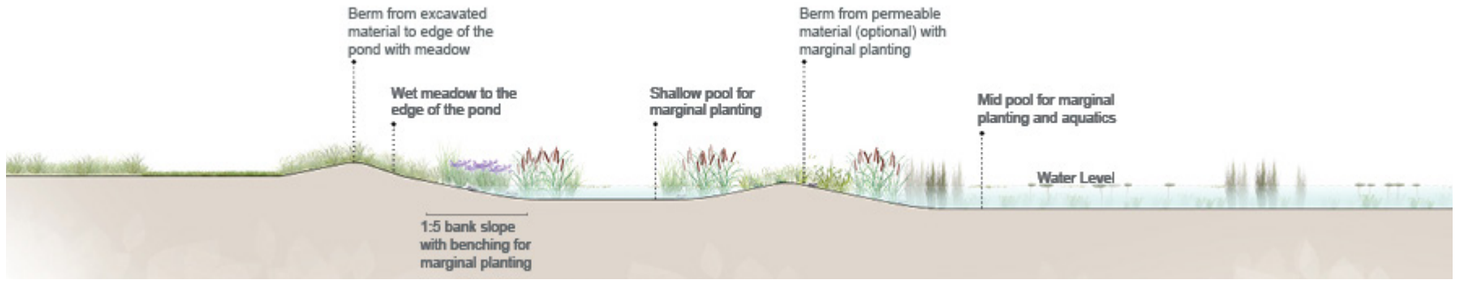


Plate 87 - Typical cross section through attenuation pond, designed for wildlife #1

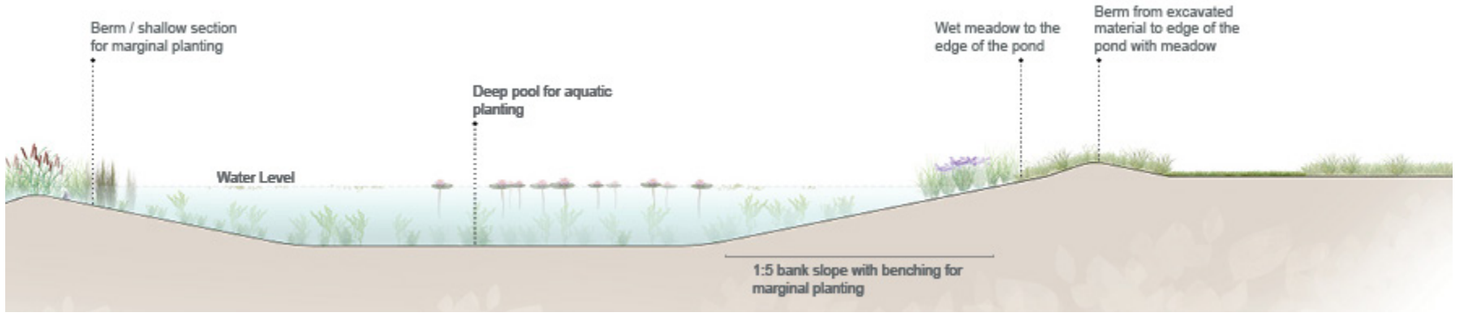


Plate 88 - Typical cross section through attenuation pond, designed for wildlife #2

6: Sustainability

6 Sustainability

6.1 Sustainable Design and Construction Principles

6.1.1 Sustainable design and construction principles shall be followed when developing the detailed design of the co-located OnSSs and their wider setting. This ensures alignment with NFOWF and VEOWF sustainability commitments.

6.1.2 Key areas of consideration and optionality include;

- Carbon reduction;
- Climate resilience;
- Biodiversity; and
- Inclusion of specific sustainable design features.

North Falls

6.1.3 NFOWF's DCO submission included the following relevant documentation;

- Environmental Statement Chapter 33 Climate Change;
- Environmental Statement Appendix 33.1 Greenhouse Gas Assessment Methodology; and
- Appendix 19.3 Waste Assessment Onshore.

6.1.4 The Design Vision stated the following ambition for the OnSS:

- *To develop a holistic and unified approach to the design of Nationally Significant Infrastructure, through a scheme which aims to be an exemplar of green design and good practice in sustainability.*

6.1.5 Multi-criteria analysis was undertaken for each Design Principle. This identified where they aligned with the NIC Design Principles of Climate, People, Place and Value.

6.1.6 Climate criteria included a general assessment of potential benefits in relation to Carbon and Water usage, and overall Climate Resilience. For hard landscape and building materials this included ratings for embodied carbon, using the Green Guide to Specification, along with broader design considerations.

6.1.7 Place criteria included an assessment of potential biodiversity benefits, whilst Value criteria considered the contribution made to green and blue infrastructure (water usage, climate resilience and biodiversity).

Five Estuaries

6.1.8 VEOWF's DCO submission included the following relevant documentation;

- Environmental Statement Chapter 6.4.1 Climate Change; and
- 6.4.1.1 Greenhouse Gas Assessment.

6.1.9 The Design Principles Document includes a section on Low Impact Design and states:

- *Approaches to minimize the carbon footprint of the buildings will be evaluated such as the use of solar panels, layout to benefit from solar gain & shading, rainwater harvesting, selection of materials. These choices will be evaluated on a Life Cycle Assessment (LCA) basis to understand the overall impact they will have.*
- *These choices will be balanced with the competing impacts to ensure balanced decision making process.*

6.2 Design Considerations

Carbon Reduction

6.2.1 Assessments were undertaken at DCO stage to determine the 'payback' period; the time taken for carbon emissions associated with the construction of the project to be counteracted by the lower carbon emissions from the renewable electricity generated.

6.2.2 Greenhouse Gas Assessments (GGA) and Life Cycle Assessments (LCA) considered the impacts for the entire project across six key stages of the life cycle:

- Raw Materials;
- Manufacturing;
- Installation;
- Operation;
- Freight; and
- End of Life.

6.2.3 For the onshore area, assessments of Raw Materials were based on the typical construction components of an onshore substation, as set out in the Project Description;

- *An onshore substation platform constructed from a layer of imported stone fill with a concrete pour;*
- *Substation buildings constructed from a steel frame with cladding panels. The steel frame would be fabricated off site and then erected on site;*
- *Electrical equipment fabricated from copper and other metals;*
- *A permanent security fence of steel construction;*
- *A bituminous road construction for the operational access; and*
- *A layer of stone chippings as surfacing around the electrical equipment.*

6.2.4 The findings of the assessments indicated that VEOWF would be expected to achieve payback in about 2 years and NFOWF in around 2.5 years (from Operation).

6.2.5 At the detailed design stage there is an opportunity for designers to reduce the impact of raw materials, through 'lean' design and considered specification.

6.2.6 The site layout shall be designed for efficiency, where possible. Aspects to consider include:

- Minimising the extent of secure perimeter fencing;
- Minimising the extent of hard surfacing;
- Minimising the extent of other infrastructure, such as lighting, CCTV, barriers, signage etc.

6.2.7 A reduction in raw materials usage and the ability to readily re-use and recycle built components at the end of the decommissioning period should also be considered early on in the detailed design stage. For example:

- Minimising use of virgin materials, i.e. using recycled aggregates in concrete mixes and road sub-bases, designing an efficient built form that reduces the volume of structural steel;
- Specifying materials with lower embodied carbon, as determined within the Green Guide for Specification, or other industry guidance;
- Careful detailing to minimise wastage;
- Designing structures so that they may be easily disassembled;
- Specifying finishes and construction techniques that allow materials to be recycled in future; and
- Ensuring that there is an onward market for recycled materials prior to specification.

6.2.8 Designers and contractors should also consider how construction and manufacturing processes can contribute to an overall reduction in carbon consumption. Areas for consideration include;

- Use of pre-fabrication techniques, such as modular, off-site construction. This can reduce overall construction time, minimise materials wastage, improve build quality and reduce the margin for errors;
- Specifying readily and locally available materials and finishes, to minimise freight distances; and
- Minimising the number of different manufacturing processes required.

Climate Resilience

6.2.9 Climate Change Resilience Assessments (CRA) were undertaken at DCO stage to consider the direct impacts of climate change on the Projects. This predicted a low vulnerability to climate change in each project phase.

6.2.10 At detailed design stage, designers shall look for opportunities to mitigate the impact of various climate change scenarios when developing the detailed design. This will include;

- Response to increased flooding; and
- Response to increased temperatures.

6.2.11 The site layout shall be designed to minimise the extent of impermeable surfaces requiring drainage.

6.2.12 The OODS prepared for DCO submission stipulates the use of SuDS wherever possible. Permeable surfaces, filter strips, swales and attenuation ponds are identified within the outline site layout. These will reduce the volume and runoff rates of drainage waters discharged from the site. The Detailed Operational Drainage Strategy will incorporate any further measures identified to mitigate any future climate change scenario.

6.2.13 A design response to the likelihood of increased temperatures shall consider the following aspects:

- Minimising the extent of hard surfacing, reducing large areas of dark-coloured surfaces, which will increase localised air temperatures;
- Minimising solar gain, by positioning buildings to maximise shading of hard surfaces;
- A reduction in hard surfaces overall, thus allowing a corresponding increase in green infrastructure. This can locally reduce the indoor and outdoor temperature, reducing the Urban Heat Island effect; and
- Ensuring planting specification include species that are tolerant of increased temperature and drought conditions.

Plate 89 - Minimise raw materials usage and allow for future recycling. Source: LUC.

Plate 90 - Permeable surfaces. Source: LUC.

Plate 91 - SuDS swale. Source: LUC.

Biodiversity

6.2.14 NFOWF and VEOWF submitted BNG Strategies in support of their respective DCO applications. Whilst the requirements for BNG for NSIPs does not come into effect until May 2026, both projects have committed to a 10% net gain.

- NFOWF's BNG assessment identified an anticipated gain far in excess of 10% in both habitat and hedgerow credits, within the DCO limits; and
- VEOWF's BNG assessment identified an anticipated gain far in excess of 10% in hedgerow credits, within the DCO limits. Off site compensation is identified to achieve the 10% uplift in habitat credits.

6.2.15 At the detailed design stage a joint BNG strategy shall be undertaken encompassing the shared OnSSs site.

6.3 Sustainable Design Features

6.3.1 During the Phase 1 engagement process, a high level of support was garnered for the inclusion of sustainable design features. The inclusion of each feature has been carefully assessed by the design and engineering teams.

Electric vehicle charging points

6.3.2 Electric vehicle (EV) charging points are now routinely installed within car parking facilities, catering to the high uptake in electric vehicles. Provision of EV charging points will reduce consumption of fossil fuels, a source of carbon dioxide and other negative emissions.

Whilst the OnSS will be an uncrewed facility, the high uptake of private electrical vehicles and likelihood of future changes to company fleet vehicles suggest it would be prudent to include EV charging points within the compound parking areas.

Photovoltaic panels

6.3.3 Photovoltaic (PV) panels allow large roof expanses to be utilised to harness a renewable source of energy.

6.3.4 PV panels can be installed to flat roof or pitched roofs. A roof pitch of between 15-50° works best. On flat roofs the PV panels are mounted to a frame to achieve the correct angle. The optimum orientation is a southerly direction, although east and west facing panels will work, though less efficiently.

6.3.5 PV panels are not suitable for any buildings within the OnSS site:

- Whilst the ability to generate additional power would be beneficial in terms of meeting energy demands for the site, the primary reason that the use of PV panels cannot be pursued is because of legal and regulatory requirements. The OnSS will ultimately be owned by a transmission company (OFTO) and the “Unbundling Regulations” restrict transmission companies from both owning/operating and generating/supplying energy.

Plate 94 - Enhancements to biodiversity. Source: LUC.

Plate 92 - Electric vehicle charging. Source: https://creativecommons.org/licenses/by-sa/4.0/

Plate 93 - PV panels. Source: RWE

Green Roofs

6.3.6 Green roofs control surface water run off and reduce the extent of hard surfaces.

6.3.7 'Extensive' roofs use shallow-rooting plants, whilst 'Intensive' incorporate a more diverse range of species, but require a deeper substrate.

6.3.8 Green roofs are not suitable for the larger substation buildings (STATCOM and Control Building):

- The typical construction over a flat roof (to maximise water retention) will limit the extent to which the built form can echo local agricultural precedents.
- Even lightweight systems have a saturated density of 250kg/m2, therefore additional steel structure will be required to withstand the loading.
- Unless installed and maintained correctly, there is a risk of leaks. Water penetration can cause significant damage to internal electrical equipment.
- Should vegetation dry out, this would constitute an unacceptable fire risk for OFTO operators.
- Roof access and working from height will require perimeter guardrails. These will ultimately increase the height of the building.

Green walls

6.3.9 Green walls can help to cool building façades and counteract the Urban Heat Island effect . They may also provide visual interest within the elevations.

6.3.10 Green walls are typically installed as a 'system' in which planting modules are integrated within the building facade. They require adequate and consistent irrigation to ensure planting continues to thrive through the lifespan of the project. Regular maintenance is required to remove dead plants, replant bare patches etc.

6.3.11 Green walls are not suitable for the larger substation buildings (STATCOM and Control Building):

- Green walls require adequate and consistent irrigation. Should vegetation dry out, this would constitute an unacceptable fire risk for OFTO operators.
- Similar to green roofs, irrigation and additional support systems for the modules will increase the loading requirements on the building structure, leading to an increase in steel and other raw materials.

Rainwater harvesting

6.3.12 Rainwater harvesting collects water that falls on roofs and hard surfaces, stores it, and then re-uses it for water-dependent activities e.g. toilet flushing or irrigation. Rainwater harvesting is suitable for use in residential and/or regularly occupied commercial buildings, with a moderate to high water demand.

6.3.13 Rainwater harvesting is not suitable ofr buildings within the OnSS site:

- The OnSS site is largely unmanned, therefore the domestic water demands will be typically very low.
- The maintenance requirements of such a system must also be balanced against the likelihood of suitably-trained operatives being available on site.
- The OODS stipulates that all surface water run off within the OnSS compound (including roof surfaces) will be directed into the site SuDS system; slowed by permeable surfaces, filter strips and swales, prior to its eventually discharge via the attenuation ponds.

Plate 95 - Green roof. Source: LUC

Plate 96 - Green wall. Source: LUC.

Plate 97 - Rainwater harvesting. Source: Stormwater Ltd.

Optionality

- A holistic approach to sustainable design shall be adopted, ensuring that sustainability is fully integrated into all aspects of the detailed design process.

Layout

- There is limited flexibility regarding the placement of buildings and equipment within the OnSSs compounds. Efficiencies in layout shall seek to reduce the extent of hard landscape, where possible.

Materials

- Designers and contractors shall identify further measures to minimise consumption of raw materials, across the project lifecycle.

Resilience

- Species selection, stock maturity, provenance and long term maintenance requirements to be carefully considered when developing planting plans and specifications to ensure long-term survival of planting required for mitigation and ecological enhancement measures.

7: Colour

7 Colour

7.1 Requirements of the DCO

7.1.1 This part of the JDG provides design guidance in respect of the colour of the OnSSs, addressing the requirement under Schedule 2 (Part 1) 5(1)(e) of both the VEOWF draft DCO and the North Falls draft DCO, which require that construction of the OnSS must not commence until details of 'the dimensions, external colour and materials used for the buildings' have been submitted to and approved by the discharging authority.

7.1.2 The JDG does not provide final design details or a final confirmed colour for the substations, which will be subject to the detailed design process and be approved by the discharging authority post-consent. The design guide does however provide informed guidance based on an Environmental Colour Assessment (ECA) and facilitates the continued review of the external colour, with recommendations informed by the ongoing consultations with ECC, the EQRP and Interested Parties (IPs). The comments received from this engagement have fed into the design guidance contained in Section 7.4 - 7.8.

7.2 Environmental Colour Assessment

7.2.1 An ECA has been undertaken, which involves a detailed survey of baseline colours in order to inform the development of colour palettes to be applied to the substation buildings and other structures.

7.2.2 The approach to the ECA accords with the Landscape Institute's Technical Information Note 04/2018 Environmental Colour Assessment (hereafter the 'LI ECA Note'). This has included desk study and site specific photography in the locality to record perceived colours using the Natural Colour System (NCS).

7.2.3 The ECA records the baseline of the locality around the Five Estuaries and North Falls OnSSs and develops colour palettes for the detailed design of the substations and associated components of these developments.

7.2.4 This approach ensures that colour palettes are developed in response to the colour context of the OnSS and surrounding area.

7.2.5 The baseline colour ranges recorded on site are presented in Sections 7.15 - 7.21. Colours selected in the proposed colour palette (Section 7.6 - 7.7) were then converted from the NCS colour to the closest 'RAL Classic' colour - the main colour reference used by manufacturers of cladding materials used for substation buildings.

7.2.6 The colour palette takes into account the landscape context around the OnSS and how this will change with the introduction of tree and hedgerow planting proposed. The colour selections respond to the OnSS becoming increasingly screened and seen in the context of emerging and verdant planting (see Section 4).

7.3 Project Scope

AIS and GIS

7.3.1 AIS has been selected as the preferred technology for the OnSS for Five Estuaries and North Falls. The electrical infrastructure will consist of buildings and structures, organised across the OnSS footprint in response to technical requirements.

7.3.2 Layout, design and materials guidance is provided in Part 2 of the JDG. An indicative layout of a typical AIS substation is illustrated in Plate 98 (however the electrical design is not complete and is subject to changes in layout and dimensions). The recommended colours set out in this JDG (section 7.5 - 7.6) will be applied to the substation buildings within the AIS layout as follows (with their maximum parameters noted):

- 2 x STATCOM (Control & Valve) buildings: 55 x 15 x 7m
- 1 x Control building (possibly several adjacent containerised buildings): 50 x 20 x 5m
- 1 x Storage/Amenity building: 20 x 9 x 4m

7.3.3 The substation buildings will be set amongst other electrical infrastructure including transformers (and transformer noise enclosures), reactors (and reactor noise enclosures), harmonic filters, circuit breakers, busbars and lightning masts. While there is potential that the transformer and reactor noise enclosures could be coloured, the other external electrical structures present no optionality and are a standard grey/metallic or do not take colour on top of the base material.

7.3.4 The OnSSs compound will be secured with steel palisade inner security fence, with the potential to be coloured using the colour palette shown in Section 2.

7.4 Landscape Context

7.4.1 The Landscape and Visual Impact Assessments (LVIA) prepared for the DCO submissions for both Five Estuaries and North Falls assess and illustrate how the OnSSs will appear in the landscape and the mitigation planting designed to create a landscape framework that will provide effective screening of the OnSSs.

7.4.2 The OnSSs will be seen in a flat and low-lying agricultural landscape where open views occur across open fields, but where trees and hedgerows along field boundaries also create a sense of depth and enclosure. The horizon line is typically defined by a trim of tree and hedgerow cover, marking the transition form the flat landform and the open sky. It is in this context that the OnSSs will be seen, grounded in a largely open landscape and set against an open sky.

7.4.3 The extent of mitigation planting proposed (see Section 8 of the JDG) will extend the existing influence of woodland and hedgerows to create a more enclosed, green and permanent landscape. While the planting will ultimately screen the OnSSs, in the intervening years the OnSSs will be seen at the centre of this emerging planting in the landscape. The concepts for the selected colours and patterns, therefore, relate to the colours of this rural landscape through creating a backdrop for the new vegetation, reflecting the transition in colours through earth, vegetation and sky or making reference to cultural colours evident in the architecture of the local area.

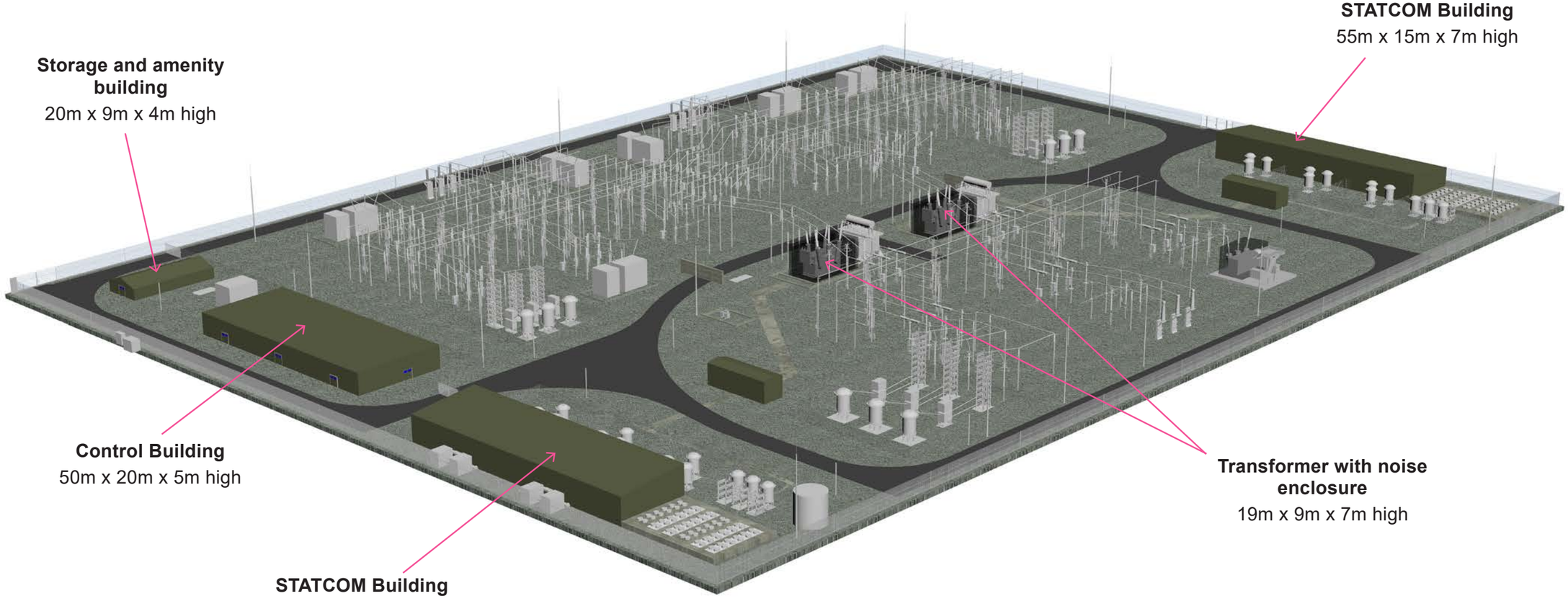


Plate 98 - Typical indicative layout of AIS substation (colours not representative of those proposed)

7.5 Design Guide Recommendations

Introduction

7.5.1 The recommendations of the JDG with respect to the colour of the substation buildings are set out in the following sections 7.6 - 7.10.

7.5.2 An ECA has been carried out that included a site based survey of baseline colours in the landscape, in order to inform the choice of colour palettes to be applied to the OnSS buildings.

7.5.3 The colour range of the landscape in summer and winter has been identified, together with the prevailing colours of local architecture, in order to establish the colour palettes that are most common and representative in the local landscape context.

7.5.4 Landscape and architectural colour palettes have been identified, including bold and subtle colours drawing from the landscape and local architecture. These colours have been used to review the advantages and disadvantages of six different concepts for the substation buildings.

7.5.5 Design reviews and engagement were undertaken with the EQRP, local authorities and the public and the feedback has informed the subsequent design development, choice of colour palette and articulation of colour on the substation buildings set out in this JDG.

7.5.6 The refined design taken forward in the JDG draws on aspects of the initial concepts and feedback received. The focus of the design is on visual integration with subtle landscape and architectural colours, drawing on aspects of the 'visual integration', 'accents' and 'foils' concepts presented previously, with blocks of colour used against a neutral baseline to break up the massing of the substation buildings and relate to existing and proposed vegetation in the landscape.

7.5.7 The colour palette to be used for the substation buildings is shown Section 7.6 - 7.10. The colour palette for the substation buildings is drawn from a selection of greys from the architectural palette (see Section 7.21) with subtle accent colours drawn from both local agricultural barns (in the architectural palette) and subtle landscape colours from the landscape colour range (see Section 7.18).

7.5.8 Coloured cladding panels with these colours should be used on the substation buildings to create a visually engaging design that integrates with the local landscape context.

7.5.9 The structure of the design uses 'grey' colours sampled from local farm buildings as baseline colours for the wall panels of the substation buildings, with subtle accent colours from the landscape and architectural colour palettes used to break up the massing and horizontality of the substation building forms, and relate to the colour and form of blocks of vegetation in the rural landscape.

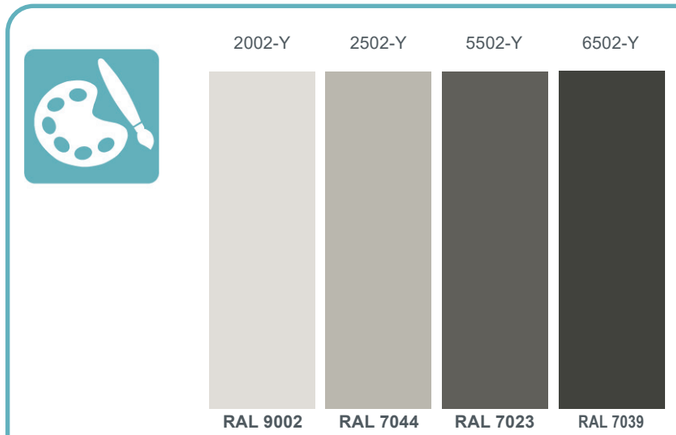
7.5.10 Groups of horizontal and vertical wall panels are to be used vertically to break up the horizontality of the substation building, with blocks of darker colour coloured wall panels along the length/lower elevation, and generally lighter colours used for accents for the wall panels on the upper parts of the substation building elevations.

7.5.11 Three worked examples showing optionality for the articulation of coloured wall panels for the substation buildings are set out in Section 7.8 - 7.10, as follows, which allow for some design optionality depending on the choice of wall cladding system:

- **Irregular groups of horizontal panels (worked example 1)**. Horizontal wall panels with accent colours to be arranged in an irregular pattern against grey base colours.
- **Regular blocks of horizontal panels (worked example 2)**. Horizontal wall panels with accent colours arranged in more regular blocks with groups of consistent colour against grey base colours.
- **Irregular groups of vertical panels (worked example 3)**. Vertical wall panels with accent colours arranged in an irregular pattern against grey base colours, with optionality for full wall length panels or shortened panels to allow a change in colour vertically on the walls.

7.5.12 A colour articulation guide is provided for each worked example in Section 7.8 - 7.10 to guide how colours from the selected colour palette should be applied to wall panels used in the construction of the substation buildings to achieve the design.

7.6 Colour Palette - Grey Base Colours



Colour

- Baseline grey colours sampled from local farm buildings to be used as the 'base' colours of the wall panels for the substation buildings.
- 1-2 neutral greys should form the 'base' colour, with optionality to select lighter and darker shades and the accent colours (see palette in 7.6 above).
- A darker grey should be used on the lower part of the substation buildings to provide grounding and integration with landscape.

Colour Palette for Substation Buildings

7.7 Colour Palette - Accent Colours

Colour

- Landscape and architectural 'accent' colours from this palette should be used as accent wall panels amongst a grey base (Section 7.6) to break up the massing and horizontality of the substation buildings in patterns that accord with the colour articulation guidance in the worked examples in Sections7.9-7.10.

6010-Y10R	5040-Y	4040-G90Y	6020-G70Y	5020-G30Y	1505-Y	7010-R90B	8505-Y80B
RAL 7006	RAL 7008	RAL 1020	RAL 6013	RAL 6011	RAL 1013	RAL 7015	RAL 7021

Worked Example 1 - Irregular Horizontal Panels

7.8 Colour Articulation Guide - Worked Example 1 - Irregular Groups of Horizontal Panels

Design Guidance:

7.8.1 Wall panels to be laid horizontally and in tiered sequence directly above each other.

7.8.2 Wall panels to be of the same length, between a minimum 4m and maximum 6m. Worked examples presented are based on 6m wall panel length.

7.8.3 Wall panels to be of the same width of approximately 1000mm (examples based on standard panel cover width of 1000mm).

7.8.4 Baseline colours (greys) and landscape accent colours (greens/browns) to be used for the substation buildings wall panels are identified in the colour palettes in Section 7.6 and 7.7.

7.8.5 1-2 neutral greys (palette in Section 7.6) should form the 'base' colour, with optionality to select lighter and darker shades and the accent colours from the palette in 7.7. A darker grey should be used on the lower part of the substation buildings to provide grounding and integration with landscape.

7.8.6 3-4 'accent' colours from the palette in Section 7.7 to be used on each substation building, with horizontal panels arranged vertically in groups of mixed accent colours in an irregular pattern, in accordance with this design guidance and the worked example illustrated in Plates 99-102.

7.8.7 Accent coloured wall panels to be arranged in an irregular pattern against grey base colours to break up the horizontality of the substation buildings, to achieve the type of effect illustrated in the worked example in 99-102.

7.8.8 Optionality to vary building facade treatment by adjusting pattern and position of accent colours. Neutral grey base colours should be used to integrate with the backdrop and sky. Accent colours should be used to add visual interest to the substation buildings and a visual link to the local architecture and landscape.

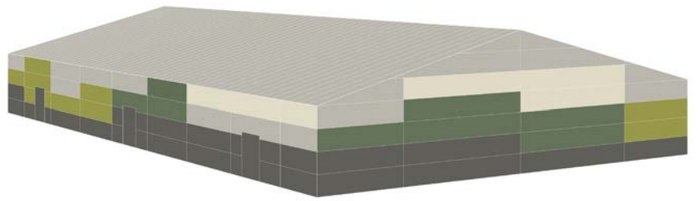
7.8.9 The design intention is to break up the horizontal massing of the substation buildings with green accent colours to integrate with existing vegetation and provide a foil to 'set-off' the proposed mitigation planting that will grow and mature around the substations over time.

7.8.10 There is optionality to vary the pattern of grey base colour and accent colours on each individual substation building provided that the structure accords with this design guidance and the worked example illustrated in Plates 99-102.

7.8.11 Wall panels should however be laid in the same direction (horizontally or vertically) on each substation building, avoiding a mix of horizontal and vertical wall cladding within the same substation site.

7.8.12 Roof panel colours should be selected from the grey baseline colour palette and match the colour of the upper wall panels.

Illustrative 3D view dual-pitch roof



Illustrative 3D view mono-pitch roof

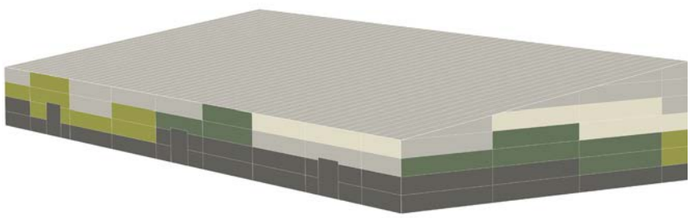
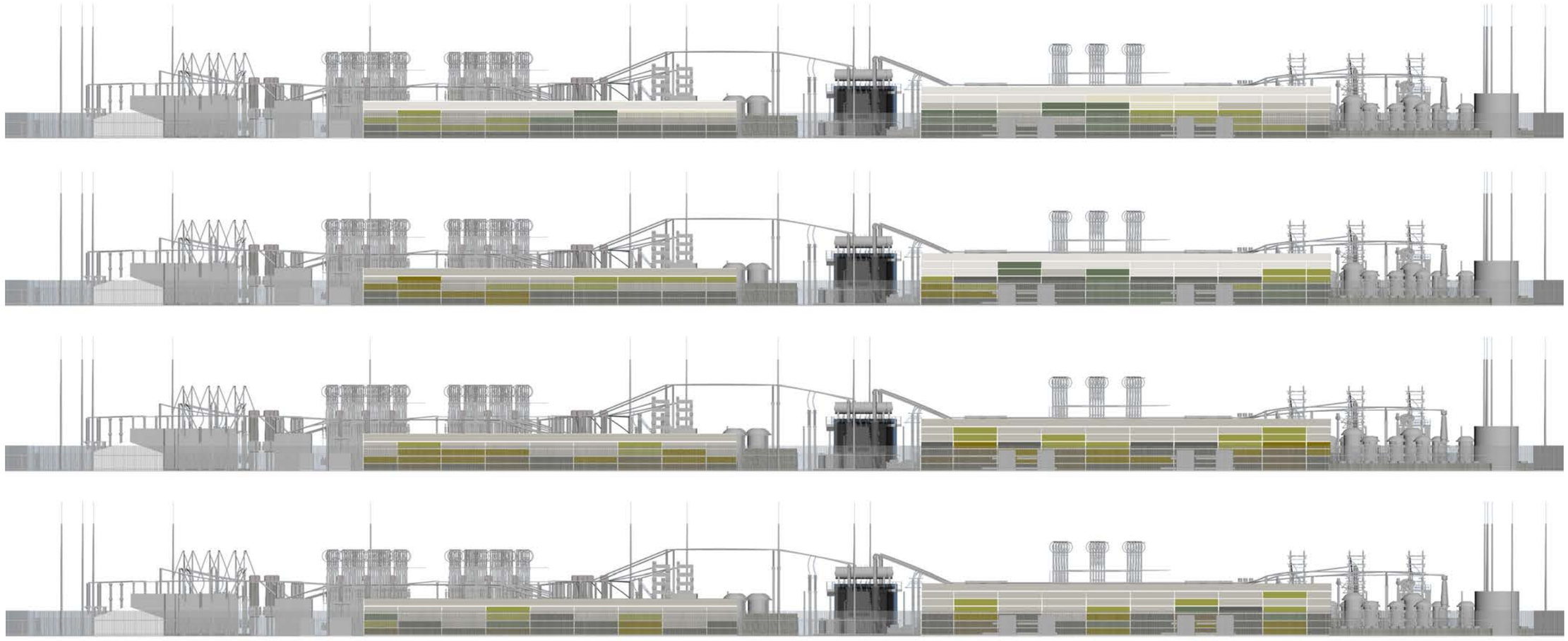


Plate 99 - Colour Articulation - Worked Example 1 - 3D Views

Colour Articulation Guide - Worked Example 1 - Irregular Groups of Horizontal Panels

Illustrative cross section elevations



Illustrative landscape cross section

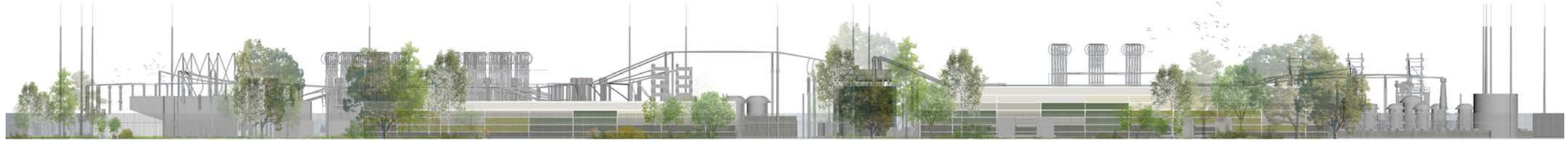


Plate 100 - Colour Articulation - Worked Example 1 - Elevations

Colour Articulation Guide - Worked Example 1 - Irregular Groups of Horizontal Panels

Illustrative Rendered 3D Views - Dual-pitch roof

Plate 101 - Colour Articulation - Worked Example 1 - Illustrative 3D Render

Colour Articulation Guide - Worked Example 1 - Irregular Groups of Horizontal Panels

Illustrative Rendered 3D Views - Mono-pitch roof

Plate 102 - Colour Articulation Worked Example 1 - Photomontage View

Worked Example 2 - Regular Horizontal Panels

7.9 Colour Articulation Guide - Worked Example 2 - Regular Blocks of Horizontal Panels

Design Guidance:

7.9.1 Similar to worked example 1 but with coloured wall panels arranged in more regular blocks with groups of consistent colour in a regular pattern.

7.9.2 Wall panels laid horizontally and in tiered sequence directly above each other.

7.9.3 Wall panels to be of the same length, between a minimum 4m and maximum 6m. Worked examples presented are based on 6m wall panel length.

7.9.4 Wall panels to be of the same width of approximately 1000mm (examples based on standard panel cover width of 1000mm).

7.9.5 Baseline colours (greys) and landscape accent colours (greens/browns) to be used for the substation buildings wall panels are identified in the colour palettes in Section 7.6 and 7.7.

7.9.6 1-2 neutral greys (palette in Section 7.6) should form the 'base' colour, with optionality to select lighter and darker shades and the accent colours from the palette in 7.7. A darker grey should be used on the lower part of the substation buildings to provide grounding and integration with landscape.

7.9.7 3-4 'accent' colours from the palette in Section 7.7 to be used on each substation building, with horizontal panels arranged vertically in groups of mixed accent colours in a regular block pattern, in accordance with this design guidance and the worked example illustrated in Plates 103-106.

7.9.8 Accent coloured wall panels to be arranged in a regular pattern against grey base colours to break up the horizontality of the substation buildings, to achieve the type of effect illustrated in the worked example in Plates 103-106.

7.9.9 Accent colour wall panels to be structured in simple groups of consistent colour in a regular block pattern to articulate separate forms through a change in colour within the building elevation.

7.9.10 Optionality to vary building facade treatment by adjusting pattern and position of accent colours. Neutral grey base colours should be used to integrate with the backdrop and sky. Accent colours should be used to add visual interest to the substation buildings and a visual link to the local architecture and landscape.

7.9.11 The design intention is to break up the horizontal massing of the substation buildings with green accent colours to integrate with existing vegetation and provide a foil to 'set-off' the proposed mitigation planting that will grow and mature around the substations over time.

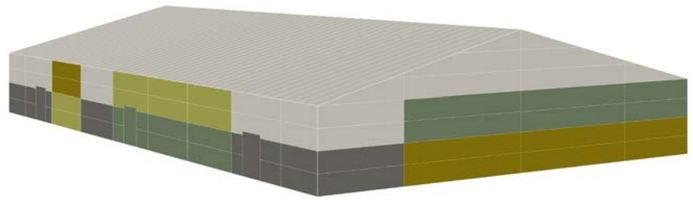
7.9.12 There is optionality to vary the pattern of grey base colour and accent colours on each individual substation building provided that the structure accords with this design guidance and the worked example illustrated in Plates 103-106.

7.9.13 Wall panels should however be laid in the same direction (horizontally or vertically) on each substation building, avoiding a mix of horizontal and vertical wall cladding within the same substation site.

7.9.14 Roof panel colours should be selected from the grey baseline colour palette and match the colour of the upper wall panels.

7.9.15 Landscape accent colours can be different on each substation building.

Illustrative 3D view dual-pitch roof



Illustrative 3D view mono-pitch roof

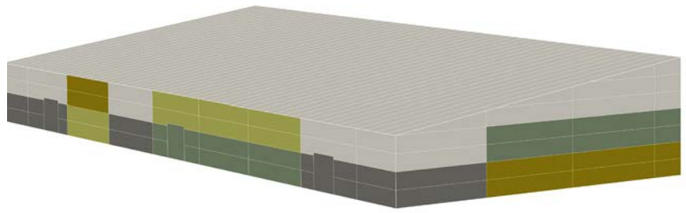


Plate 103 - Colour Articulation - Worked Example 2 - 3D Views

Colour Articulation Guide - Worked Example 2 - Regular Blocks of Horizontal Panels

Illustrative cross section elevations

Illustrative landscape cross section

Plate 104 - Colour Articulation - Worked Example 2 - Elevations

Colour Articulation Guide - Worked Example 2 - Regular Blocks of Horizontal Panels

Illustrative Rendered 3D Views - Dual-pitch roof

Plate 105 - Colour Articulation - Worked Example 2 - Illustrative 3D Render

Colour Articulation Guide - Worked Example 2 - Regular Blocks of Horizontal Panels

Illustrative Rendered 3D Views - Mono-pitch roof

Plate 106 - Colour Articulation Worked Example 2 - Photomontage View

Worked Example 3 - Irregular Vertical Panels

7.10 Colour Articulation Guide - Worked Example 3 - Irregular Groups of Vertical Panels

Design Guidance:

7.10.1 Wall panels to be laid vertically and in sequence directly next to each other.

7.10.2 Wall panels to be of the same width of approximately 1000mm (examples based on standard panel cover width of 1000mm).

7.10.3 Wall panels to be of minimum 1.8m length, but with length to be varied (up to the maximum wall height length) to achieve the pattern illustrated in the worked examples in Plate 100 - 103. These include optionality of full wall length panels and optionality for designs with shortened panels to allow a change in colour vertically part of the way up the wall.

7.10.4 Baseline colours (greys) and landscape accent colours (greens/browns) to be used for the substation buildings wall panels are identified in the colour palettes in Section 7.6 and 7.7.

7.10.5 1-2 neutral greys (palette in Section 7.6) should form the 'base' colour, with optionality to select lighter and darker shades and the accent colours from the palette in 7.7. A darker grey should be used on the lower part of the substation buildings to provide grounding and integration with landscape.

7.10.6 3-4 'accent' colours from the palette in Section 7.7 to be used on each substation building, with vertical panels arranged in groups of mixed accent colours in an irregular pattern, in accordance with this design guidance and the worked example illustrated in Plates 107-110.

7.10.7 Accent coloured wall panels to be arranged in an irregular pattern against grey base colours to break up the horizontality of the substation buildings, to achieve the type of effect illustrated in the worked example in Plates 107-110.

7.10.8 Optionality to vary building facade treatment by adjusting pattern and position of accent colours. Neutral grey base colours should be used to integrate with the backdrop and sky. Accent colours should be used to add visual interest to the substation buildings and a visual link to the local architecture and landscape.

7.10.9 The design intention is to break up the horizontal massing of the substation buildings with green accent colours to integrate with existing vegetation and provide a foil to 'set-off' the proposed mitigation planting that will grow and mature around the substations over time.

7.10.10 There is optionality to vary the pattern of grey base colour and accent colours on each individual substation building provided that the structure accords with this design guidance and the worked example illustrated in Plates 107-110.

7.10.11 Wall panels should however be laid in the same direction (horizontally or vertically) on each substation building, avoiding a mix of horizontal and vertical wall cladding within the same substation site.

7.10.12 Roof panel colours should be selected from the grey baseline colour palette and match the colour of the upper wall panels.

Illustrative 3D view dual-pitch roof

Illustrative 3D view mono-pitch roof

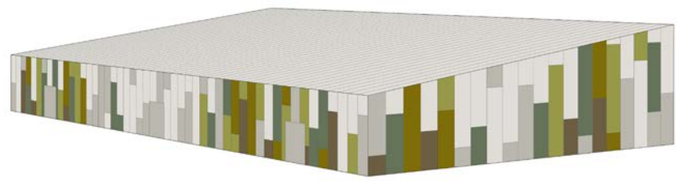
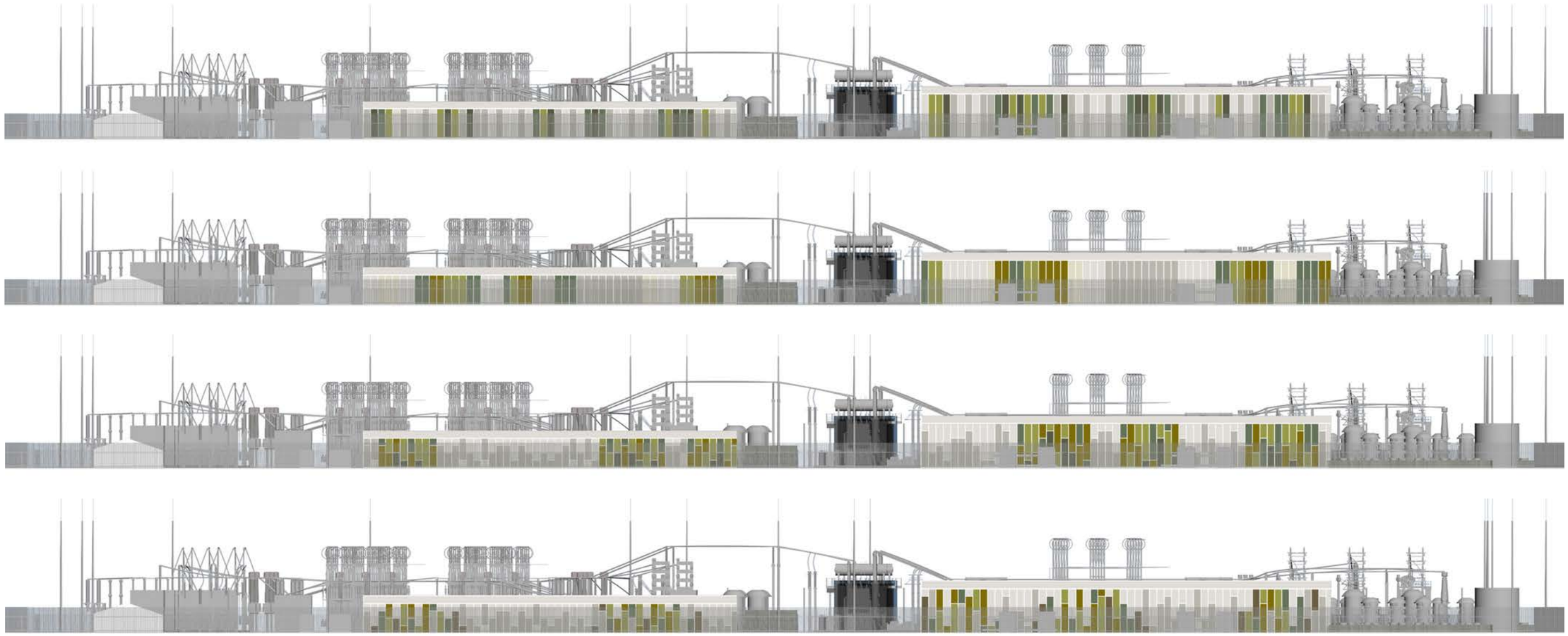


Plate 107 - Colour Articulation - Worked Example 3 - 3D Views

Colour Articulation Guide - Worked Example 3 - Irregular Groups of Vertical Panels

Illustrative cross section elevations



Illustrative landscape cross section

Plate 108 - Colour Articulation - Worked Example 3 - Elevations

Colour Articulation Guide - Worked Example 3 - Irregular Groups of Vertical Panels

Illustrative Rendered 3D Views - Dual-pitch roof

Plate 109 - Colour Articulation - Worked Example 3 - Illustrative 3D Render

Colour Articulation Guide - Worked Example 3 - Irregular Groups of Vertical Panels

Illustrative Rendered 3D Views - Mono-pitch roof

Plate 110 - Colour Articulation Worked Example 3 - Photomontage View

ECA - Methodology

7.11 Introduction

7.11.1 The remaining paragraphs of Section 7 of the JDG describe the methodology for the ECA, the landscape and architectural baseline colours identified and the initial concept designs used to explore the potential colour of the substation buildings. Design reviews and engagement that informed the subsequent design development, choice of colour palette and articulation of colour on the substation buildings are also described.

7.11.2 An Environmental Colour Assessment (ECA) involves carrying out a detailed survey of baseline colours in order to inform the development of colour palettes to be applied on structures and associated hard and soft components in that environment. Guidance on ECA is presented in the Landscape Institute's Technical Information Note 04/2018 Environmental Colour Assessment (hereafter the 'LI ECA Note'), which sets out the objectives, principles and process that should be followed in the production of an ECA. The method set out in the LI ECA Note provides an objective approach to colour selection and highlights the notable landscape and visual improvements that an ECA can deliver.

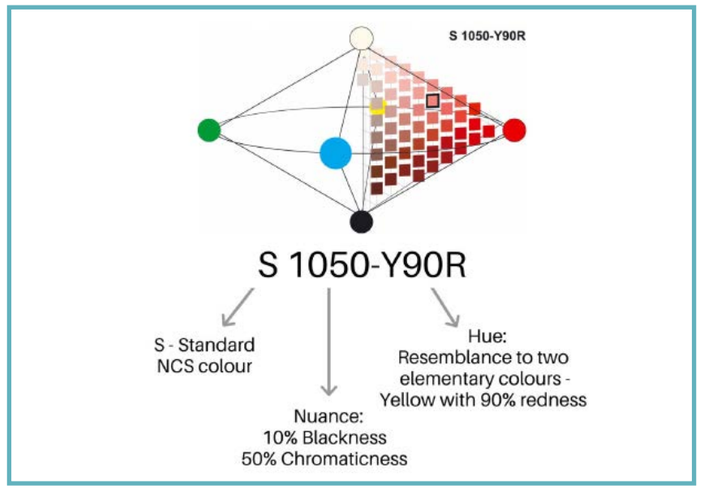


Plate 111 - NCS Colour Triangle

7.11.3 An ECA has been undertaken in accordance with the LI ECA Note, including desk study and site specific photography in the locality to record perceived colours using the Natural Colour System (NCS). The ECA records the baseline of the locality around the Five Estuaries and North Falls OnSSs and develops colour palettes for the detailed design of the substations and associated components of these developments. This approach ensures that colour palettes are developed in response to the colour context of the sites and surrounding area. This ECA provided the basis for consultation undertaken with ECC, TDC, the EQRP and other interested parties, presenting options for colour concepts and palettes for further discussion and feedback. The comments received from this engagement have fed into the design guidance contained in Section 7.5 - 7.10.

7.11.4 The LI ECA Note sets out the following steps for undertaking an ECA, which are followed in this ECA.

- **Background** - setting out the overarching aims, objectives, scope and intention of the ECA in alignment with the broader aims of the project;
- **Desktop Study** - developing an understanding of 'the landscape's natural, cultural and visual baseline' drawing on previous site work and assessment and developing an understanding of guidance and theory on colour;
- **Site Survey** – undertaking site visits to identify and record the baseline colours and dominant tonalities within the local landscapes and settlements of the study area;
- **Colour Palettes** – establishing the various colour ranges and main tonalities using the NCS and organising into palettes representative of the local context; and
- **Developed Palettes** – developing concepts regarding colour selection and patterns with consideration of the design objectives, the relationship between colours, pattern and the local landscape context.

7.12 Natural Colour System

7.12.1 The NCS is a global colour system used by designers and manufacturers to standardise the definition of colour. It is a system that has been developed by the Swedish Colour Foundation since 1964 and is different from other colour systems, such as CMYK and RGB, as it is based on human perception and the visual appearance of colours, rather than the physical mixing of colours. The Landscape Institute ECA Note states, 'Most ECA practitioners work with the Natural Colour System throughout the ECA process, as it is globally recognised and applied across many different industries and sectors.'

7.12.2 The NCS Colour Circle sets out the four chromatic elementary colours of yellow, red, blue and green at the north, east, south and west points, respectively. The circumference between two of the chromatic elementary colours is occupied by the nine different hues which are made by mixing specific amounts of the two chromatic elementary colours. For example, between yellow and red there are nine hues that range from a predominance of yellow over red to red over yellow. The nomenclature for each hue denotes the percentage of each chromatic elementary colour used to create the hue (for example Y10R denotes 90% yellow and 10% red).

7.12.3 The NCS Colour Triangle then uses each of the four chromatic elementary colours and 36 hues as the apexes from which nuances of each colour or hue are developed, as shown in Plate 67. This is done by adding specific amounts of black and / or white. The nomenclature for each nuance denotes the percentage of black, colour or hue, and white, for example 1040 denotes 10% blackness, 40% colour or hue, and 50% whiteness (although only the percentage of blackness and colour or hue are specified).

7.12.4 The NCS Colour Space is formed by the amalgamation of all the NCS Colour Triangles set out around the colour wheel with the black apex extending in one 3D direction and the white apex extending in the opposite

3D direction, as shown in Plate 111. The colour space presents a total of 2,052 colours, although can be used to describe all 10 million colours detectable by humans. NCS is the system favoured by colour experts undertaking ECAs as it presents globally recognised system with a broad range of colours that relate well to the colours found in both the natural and built environment.

7.12.5 An important part of undertaking the site work involved matching colours, hues and nuances observed in the local context with the colours, hues and nuances on the NCS swatches. The NCS was also used to develop the colour palette through the testing of different colours, hues and nuances and the relationship between them, compared to other colour systems available. NCS has proved to be practical and beneficial in simplifying the communication, specification, and notation of the appearance of colours, hues and nuances relevant to this ECA. RAL classic numbers for the colour palette proposed for the substations (Section 7.6 - 7.7) are also provided, as the main colour reference used by manufacturers of metal sheet cladding materials typically used for substation construction. RAL is a widely recognized standard colour matching system which defines colours for paint, coatings and plastics.

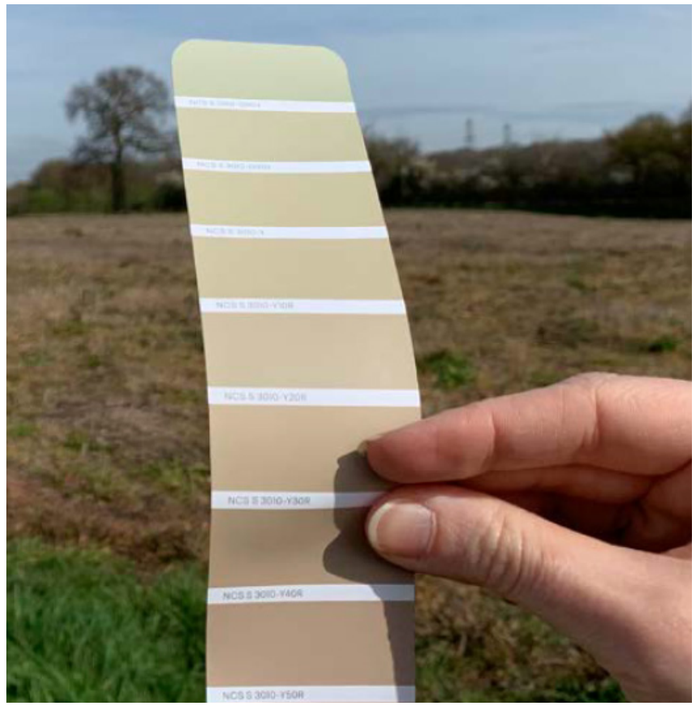


Plate 112 - Site surveys using NCS colour charts

7.13 Colour Principles

7.13.1 There are a broad range of theories on the perception and use of colour in the built and natural environment, from which the LI ECA Note has drawn out the key principles that have been researched by the relevant colour experts. These principles are set out in the following pages, with reference to their origins and an outline of their relevance to this specific ECA.

Natural Lighting

7.13.2 The LI ECA Note highlights the importance of light, ‘since this has a profound effect on our perception of colour and how it ‘behaves’. Colour and light should always be considered together, as they are essentially inseparable elements.’

7.13.3 Visibility of the OnSSs will generally be limited to the local area and the most common view will be from Ardleigh Road to the south and south-east, looking towards the southern facade. In the northern hemisphere, south facing façades will be perceived as lighter because of the increased light level. Colours on the north facing facade cause a greater chromatic increase in bluish, greenish, and pinkish colours. The north facing direction causes most reddish-blue objects to shift towards increased reddish content, yellowish objects decrease in chromaticness and shift towards green and red attributes, while greenish objects tend to shift more towards green. Conversely, south facing objects will increase in chromaticness because of the direct sunlight. Yellowish, greenish, and pinkish hues move towards yellow hues, blue shifts towards green and red towards blue (Lancaster, M (1996)).

Inherent and perceived colour

7.13.4 The LI ECA Note 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. A colour sample which may look slightly dull in the studio as a swatch will look more colourful and lighter on a facade or surface. The existing colour palettes may need to be adjusted in the developed palettes to take account of this phenomenon, reducing chromaticness, and increasing the amount of black.’

7.13.5 It is important to make the distinction between inherent colour, which is ‘the constant chromatic quality of the facade’ and perceived colour, which is ‘the colour seen in a specific situation by a specific observer’ (Fridell Anter, K (1996)). In the case of perceived colour, this will, therefore, vary depending on factors such as changing lighting through the seasons and the day, as well as distance. As Fridell Anter states ‘the problem is that the perceived colour of a building will differ from the inherent colour - and we do not always know how’ (Fridell Anter, K (1996)).

7.13.6 There are, however, some general conclusions that can be drawn from the extensive observational research carried out by Fridell Anter. Firstly, perceived colours will typically comprise less blackness and more chromaticness and whiteness, giving a slightly brighter and lighter appearance than the inherent colour. This is referred to as a ‘nuance shift’. Secondly, a ‘hue shift’ typically occurs which means the perceived colour appears more bluish and/or less yellowish compared to the inherent colour. Explanations for nuance and hue shifts relate to the difference of seeing large blocks of colour in the natural light and against a landscape background, rather than small samples seen in artificial light and against a white page. It is recognised that

natural landscapes tend towards yellowness and this can lead to colours being placed in the landscape tending towards an increased perception of blueness.

Target and Background

7.13.7 Structures are often seen as 'visual targets' especially when seen against the background of a largely undeveloped landscape context. Colourscape (Lancaster, M (1996)) states, if the building is 'more reflective or more colourful than the background it is likely to catch the eye'. Of the four 'visual objectives' cited in Colourscape; namely suppression, integration, distraction and creative expression; integration is likely to be the most appropriate for this project, owing to the size of the buildings and their scale relative to the landscape context, as well as the visual sensitivity of the landscape context in which baseline development is typically sparse and small in scale. Colours that are bright and contrasting are likely to increase the prominence of the buildings and emphasise their large scale relative to the receiving landscape, making the buildings a 'target' that may diminish the importance of the 'background' landscape. In respect of the issue of scale, Michael Lancaster (1996) states 'It is almost always a mistake to use highly saturated bright colours over large areas.

Colour and distance

7.13.8 There is a common understanding amongst colour theorists that with distance, colours lose their distinction and gradually merge (Lancaster, M (1996)). Distance also introduces a change in perceived colour with a gradual reduction in chromaticness and increase in blackness and whiteness leading to a dulled grey effect, although some colours, such as white and yellow maintain their chromaticness over longer distances.

7.13.9 It is observed that urban buildings are typically seen at close range and rural buildings are typically seen at middle or distant range, with this observation reflected by the fact that the OnSSs will typically be observed from a range between 0.6 and 1.2km. A Swedish example referred to in the LI ECA Note revealed how green close up became darker blue green at 2km and lilac grey at 20km. While there are many other variables to consider, such as the effects of light and surfaces, this research suggests that while the perceived colours will be seen lighter and brighter than the inherent colours at 50m, from a range of 2km there will be a hue shift towards blue and a nuance shift towards black. The colour selection for the OnSSs, which will mostly be observed from around the 1km range, should, therefore, look to counter the blueness by moving more towards yellow and counter the darkness by moving more towards whiteness.

7.14 Site Surveys

7.14.1 Site surveys were carried out over the winter and spring months of 2025. This involved visiting the site and the surrounding area and identifying suitable locations from which a range of colours representative of the rural landscape and settlements could be experienced. At these locations, the NCS colour charts were used to find the closest match with the predominant colours present in the locality, by holding the chart up so that the swatches could be seen adjacent to the baseline colours. A record of the NCS references and photography were taken on site, along with consideration of the date, time of day, weather conditions, lighting conditions, landscape character, textures and depth of relief. It was also important to identify and record the tonal range evident in the local landscape in order to establish an understanding of the baseline tonality.

7.14.2 The aim of the site surveys was to make an accurate record of the most prevalent and/ or representative colours and tonalities in the local landscape and settlements. These baseline colour ranges identified during the site surveys are presented in Sections 7.15 - 7.21. An accurate record of the baseline colours of the local context informed subsequent decisions on colour selection. This approach aligned with the design intention that the OnSSs would need to integrate with the local landscape in order to reduce the prominence of the buildings in the OnSS and to establish a clear and strong association with the local context.

7.15 Baseline Colour Ranges

7.15.1 As the OnSS buildings will typically be viewed from a minimum separation distance of approximately 0.6km to 1.2km the colours, hues and tonalities may change slightly with distance, although the relative tonality between the different colours, hues and tonalities will remain relatively constant.

7.15.2 Being able to identify the range of tones present in the baseline landscape was, therefore, important to understand how to 'pitch' the tone of any new colours/ hues being introduced. While the general theory is that an increase in blackness will darken the tone and make the buildings more recessive in the landscape and an increase in whiteness will lighten the tone and make the buildings more prominent in the landscape, there are a number of other factors to also consider including the level of chromaticness, light, distance and the colours of the baseline landscape, as well as the scale of the buildings and the influence form the surrounding electrical infrastructure and fencing.

7.15.3 From the baseline colours identified through the Site Survey, a shortlist was identified by applying considerations around creating a palette that would be representative of the characteristic colours of the local landscape, as well as fulfilling the requirements of the design concepts. Whilst the recording of baseline colours followed an essentially objective approach, the shortlist selection inevitably introduced a degree of subjectivity as judgements were required with regard to the selection of specific colours and omission of other colours.

7.15.4 The baseline colour ranges recorded on site are presented in the following Sections 7.15 - 7.21. Colours selected in the proposed colour palette (Section 7.6 - 7.7) were converted from the NCS colour to the closest RAL classic colour by matching using colour charts.

7.16 Colour Range - Spring/Summer Landscape

Plate 113 - Colour range summer landscape

7.17 Colour Range - Winter Landscape

Plate 114 - Colour range winter landscape

7.18 Landscape Palette

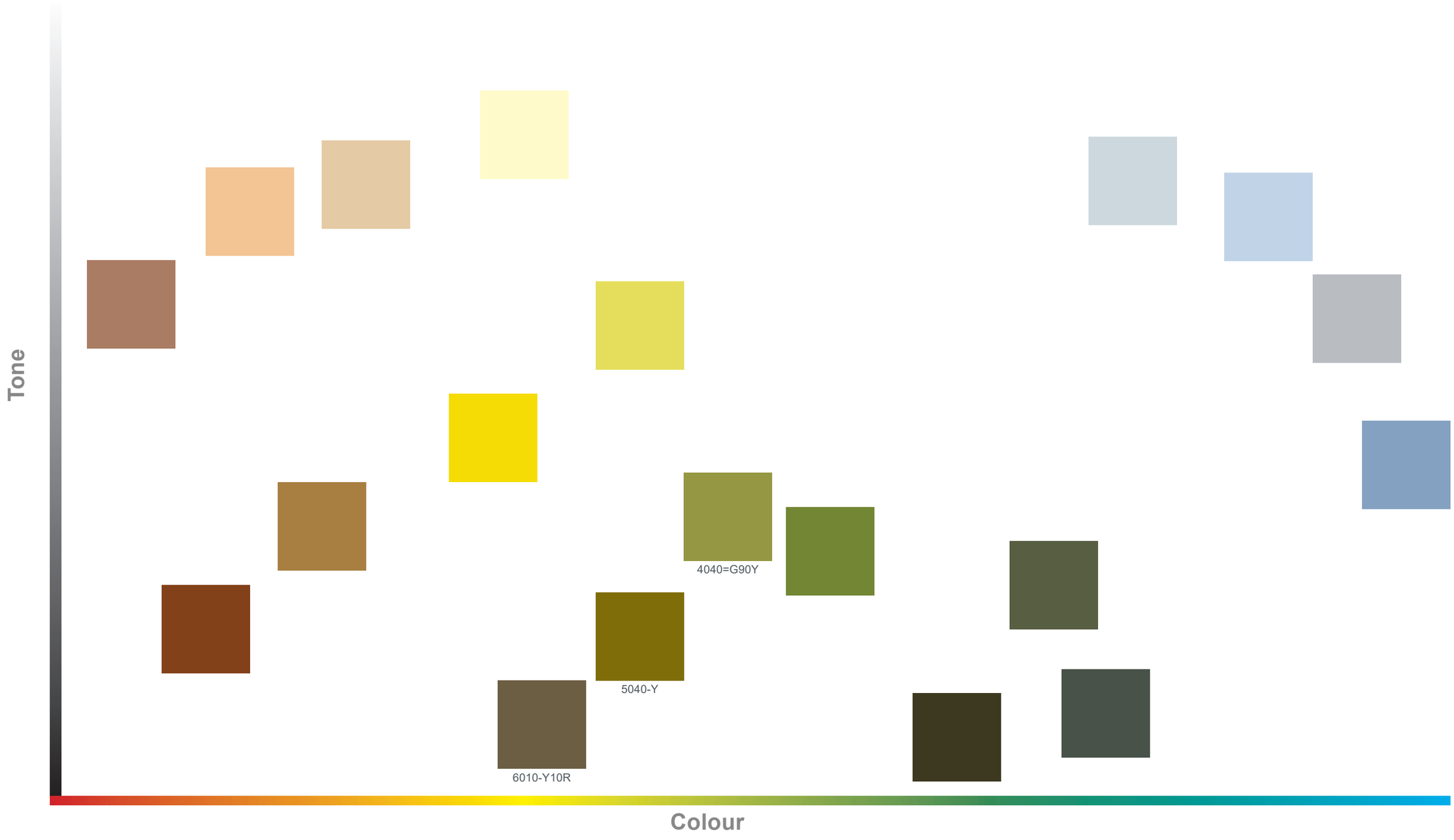


Plate 115 - Landscape colour palette

7.19 Colour Range - Local Architecture

Plate 116 - Local architecture colour palette. Photographs taken during colour study site visit show buildings in the local area around the Five Estuaries and North Falls substations. Colour is applied both vertically and horizontally.

7.20 Colour Range - Architecture Schematic

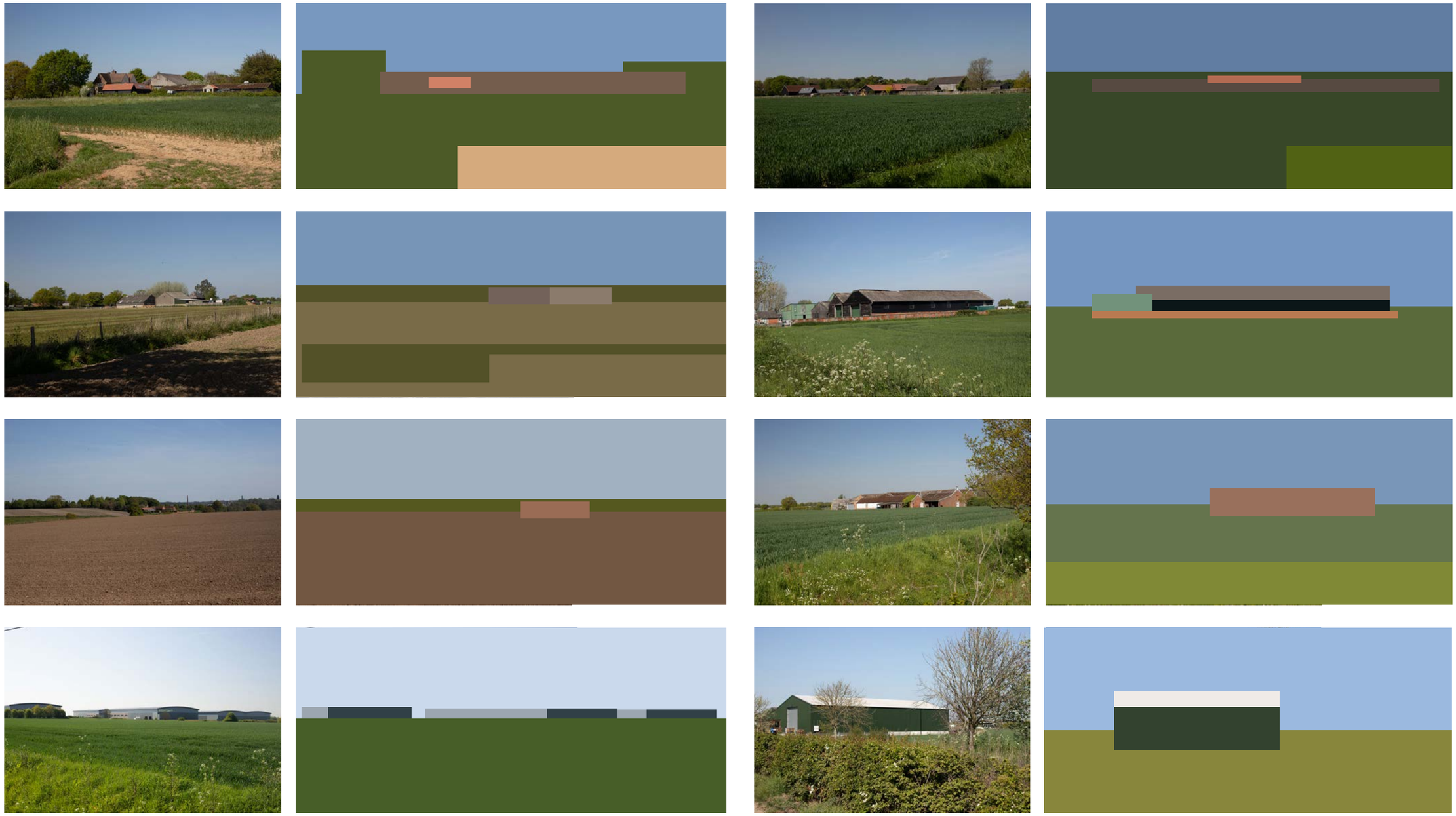


Plate 117 - Colour range architecture schematic. Photographs taken during colour study site visit show farm buildings in the local area around the Five Estuaries and North Falls substations

7.21 Architectural Palette

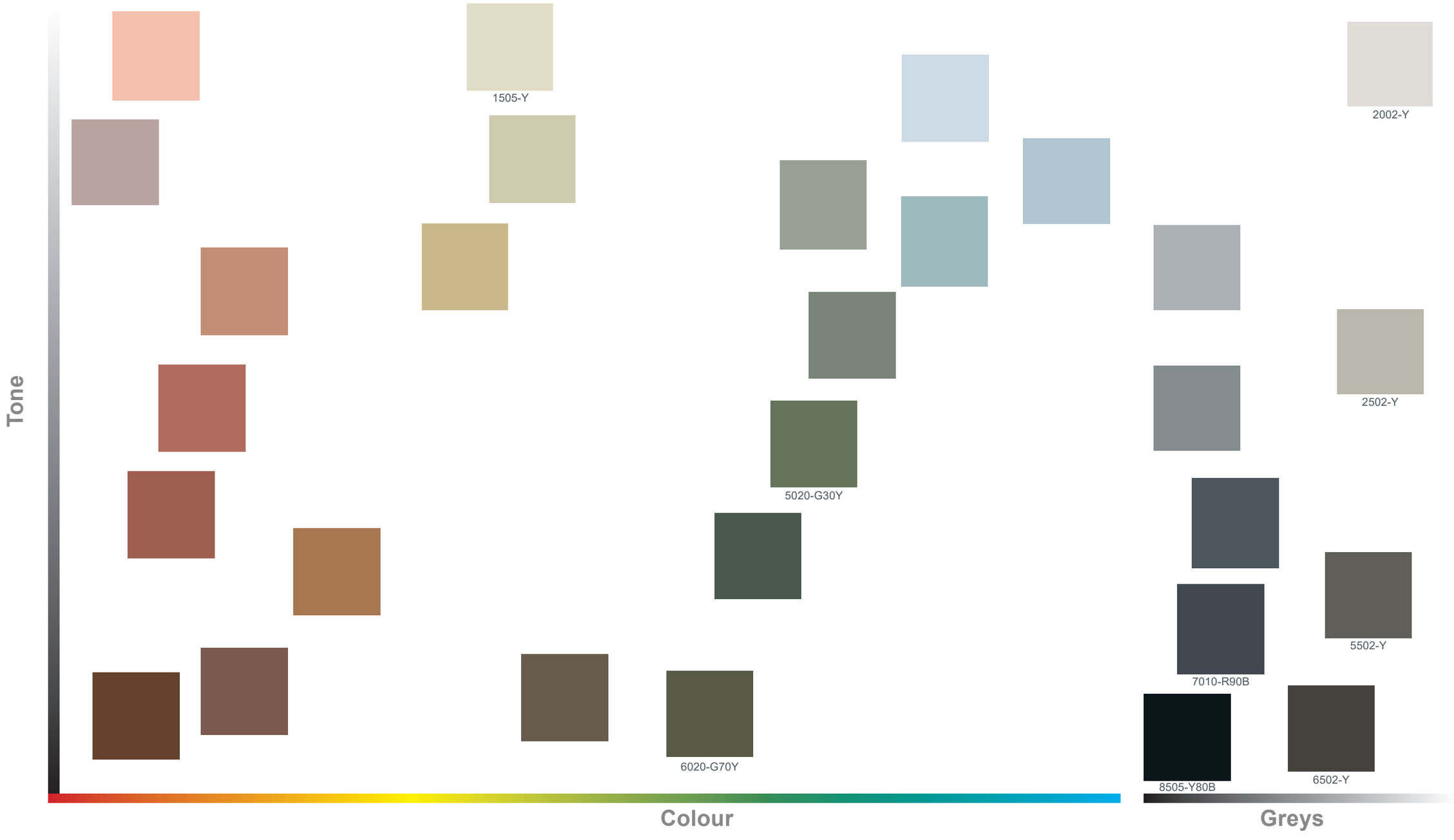


Plate 118 - Architectural palette

Core Colours

7.22 Core Colours and Concepts

7.22.1 Landscape and architecture core colour palettes were derived from the colour study, representing a summary of the most representative colours found within the local landscape context and architecture, as identified in the colour analysis in Section 7.15-7.21.

7.22.2 Landscape core colours include a range drawn from exiting landscape features, including trees/woodland, crops, grasses, soils and sky. These colours are found within the surrounding landscape elements and are most likely to assist with integrating the substation buildings within their landscape context. The core landscape palette includes both bold and subtle landscape colours for integration or emphasis.

7.22.3 Architecture core colours include a range drawn from the local architectural context, particularly local farm buildings/barns, farmhouses and local villages. These colours include bold and recessive tones, which can be combined to create façades that allow the substation buildings to either blend or stand out in the landscape, while maintaining harmony due to these colours being present in the existing environment. Local farm buildings also include a range of greys that may be an appropriate base colour for the substation buildings.

Landscape Core Palette

Architecture Core Palette

Plate 119 - Core colour palettes for concept development

Initial Concepts

7.22.4 These landscape and architecture core colours were used to develop initial concept designs to explore the potential colour of the substation buildings and ways that colour could be used to integrate or emphasise aspects of the substations.

7.22.5 These initial concepts consisted of 'Visual Integration', 'Transition', 'Architectural Blocks', 'Accents', 'Foils' and 'Electricity' which are illustrated in the following Sections 7.23 to 7.28.

7.22.6 These initial concepts were presented in the Rev 00 of the JDG for the Phase 1 engagement, which sought opinions from local authorities and the public on the colour and design of the substation buildings. The feedback informed the subsequent design and colours recommended in Sections 7.5 - 7.10 of the JDG.

7.22.7 The initial concepts are presented in the following pages to illustrate the design development but are superseded by the guidance and worked examples presented in Sections 7.5 - 7.10 of this JDG.

7.23 Concept 1 - Visual Integration

7.23.1 "Visual Integration" aims to camouflage the building within the landscape. Colours which align with or are slightly darker than the background are used to help buildings blend in when viewed from a distance. This concept does not use bold patterns like some of the others, instead the façades are generally a single colour, or a subtle gradient which gets lighter towards the top, where more light would naturally hit the building. Subtle patterns can be employed to further break up the facade of the building, mimicking the variety of seasonal colours present within the trees in the landscape. As mitigation planting matures, the building will become even more effectively camouflaged within its surroundings.

AIS elevations

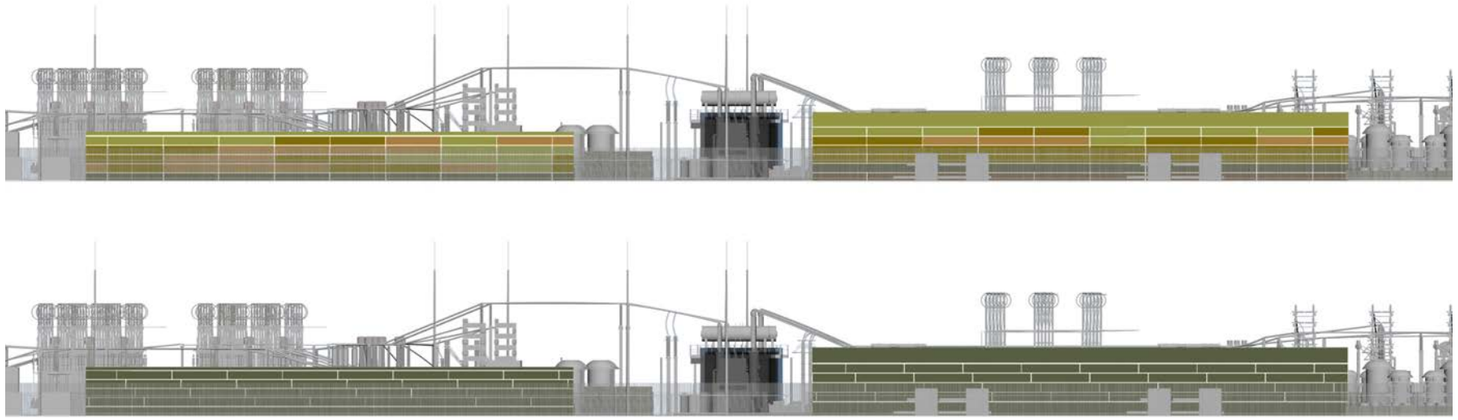


Plate 120 - Visual integration colour concept elevations

Advantages:

- Recessive colour on lower elements of GIS and AIS buildings integrate and align with surrounding woodland heights and colours/background.
- Façades of lower AIS buildings consisting single colour have simple relationship with external electrical components.
- Simple to implement if non-patterned variant used.

Disadvantages:

- Upper elements of GIS buildings contrast with the sky, emphasising their height and massing.
- Bold colours and strong patterns may contrast with electrical infrastructure and fencing at lower levels.
- Reads as one large block if single colour variant used - no fragmentation through pattern.

Plate 121 - Indicative photomontage showing both North Falls AIS substation and Five Estuaries GIS substation with visual integration colour concept - from Ardleigh Road / Jenning's Farm (ES Viewpoint 4)

7.24 Concept 2 - Transition

7.24.1 'Transition' reflects the range of colours that occur through a typical vertical section of the local rural landscape - from soils at the base, layers of crops and vegetation form the fore to background, and the skies above the landscape. Use of colours from the baseline will reduce the prominence of the substation buildings, the stylised pattern defines it as an interpretation of the existing landscape rather than a complete reflection. This concept has potential to merge with the surrounding context across seasons and with the mitigation planting as it matures.

AIS elevations

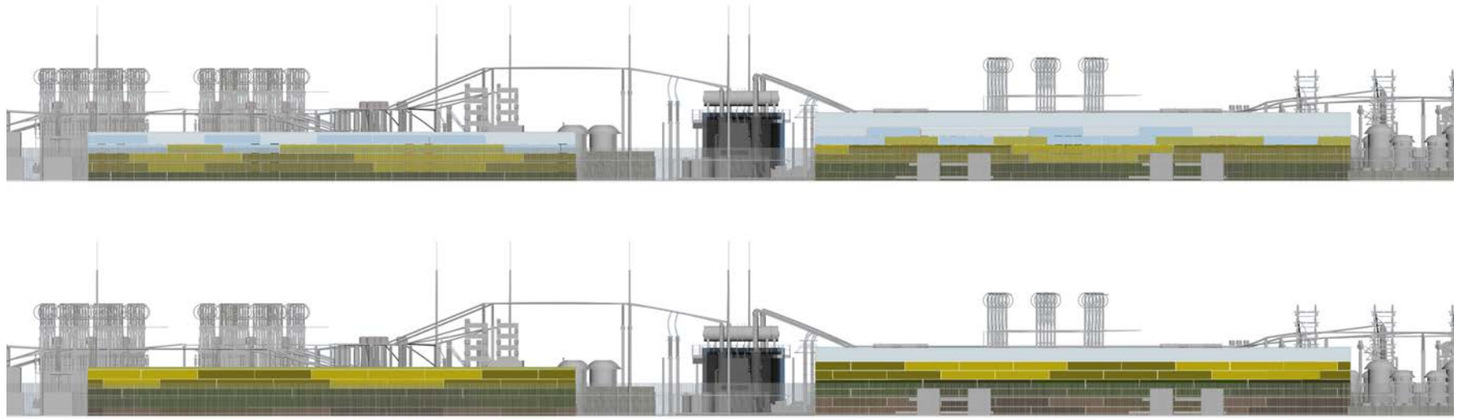


Plate 123 - Transition colour concept elevations

Advantages:

- Subtle lighter colours on upper parts of GIS buildings integrate with sky, minimising their apparent height.
- Darker recessive base course on lower part of buildings provides grounding and potential to integrate with the landscape.
- Interesting and novel to look at when views of the building are unavoidable, particularly as mitigation planting establishes.

Disadvantages:

- Potential for lighter colours in the transition to contrast with darker background and woodlands.
- Careful selection of colour transition/gradation needed informed by key views.
- More complex.

Plate 122 - Indicative photomontage showing both North Falls AIS substation and Five Estuaries GIS substation with transition colour concept - from Ardleigh Road / Jenning's Farm (ES Viewpoint 4)

7.25 Concept 3 - Architectural Blocks

7.25.1 Architecture is a common feature in the rural landscape and this study has illustrated how the blocks created by agricultural sheds create a contrasting feature through their colour and shape. Traditional local materials present a predominance of reds, browns and oranges, often set against more neutral greys and dark browns and blacks. With reference to these traditional colours and patterns, designs were developed that break up the mass of the buildings through contrasting horizontal and vertical alignments. While the reds and oranges present a direct contrast to the greens of the landscape, the tones and hues have been tempered and offset against more neutral browns, greys and blacks.

AIS elevations

Plate 125 - Architectural blocks colour concept elevations

Advantages:

- Darker base course grounds the buildings and integrates well with ploughed fields/agricultural land.
- Architectural colours relate to local vernacular of other farm buildings in the landscape.
- Architectural blocks colours do not blend in, but provide a distinct element which stands out in the landscape, similar to local fam buildings.
- Warm tones relate not only to the local architecture, but also to the earth tones of the agricultural landscape.

Disadvantages:

- Bold architectural colours emphasise the GIS building form against the horizon/landscape and may emphasise presence of AIS buildings within the electrical layout.
- Upper elements of GIS buildings contrast with the sky, emphasising their height and massing.
- Surrounding external electrical infrastructure within substation layout means that buildings are not seen alone as an architectural feature.

Plate 124 - Indicative photomontage showing both North Falls AIS substation and Five Estuaries GIS substation with architectural blocks colour concept - from Ardleigh Road / Jenning's Farm (ES Viewpoint 4)

7.26 Concept 4 - Accents

7.26.1 The traditional architecture of the local area uses a broad range of colours, with bright or contrasting colours often used to emphasise specific architectural features, such as doors and windows. In respect of the OnSSs, bright or contrasting colours may not be appropriate for the substation buildings as it would make them appear overly prominent in the landscape. This concept however, uses bright or contrasting accent colours in small amounts to a predominantly neutral background. The accent colours would add visual interest and individuality to each of the buildings and could be used to symbolise the flow of electricity or other flows of movement in the landscape.

AIS elevations

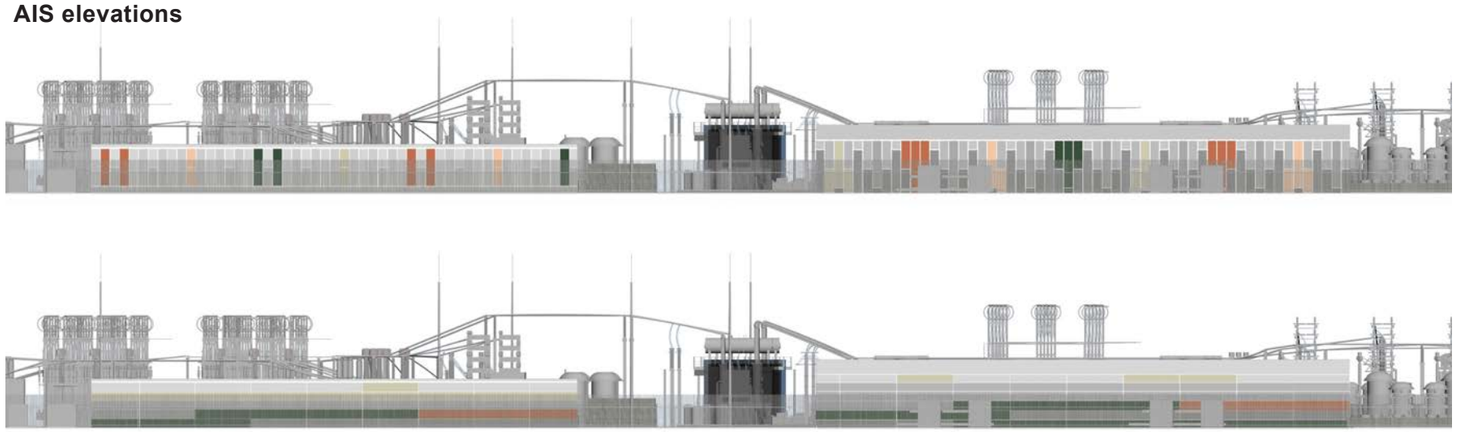


Plate 127 - Accents colour concept elevations

Advantages:

- Colour accents add visual interest to buildings, may symbolise 'flow' of electricity and offer a common design language between different substation buildings.
- Darker 'landscape' accent colours on lower parts of buildings integrate with landscape/woodlands, while lighter subtle accents on upper part of buildings integrate with sky.
- Neutral grey offers integration with backdrop and sky.

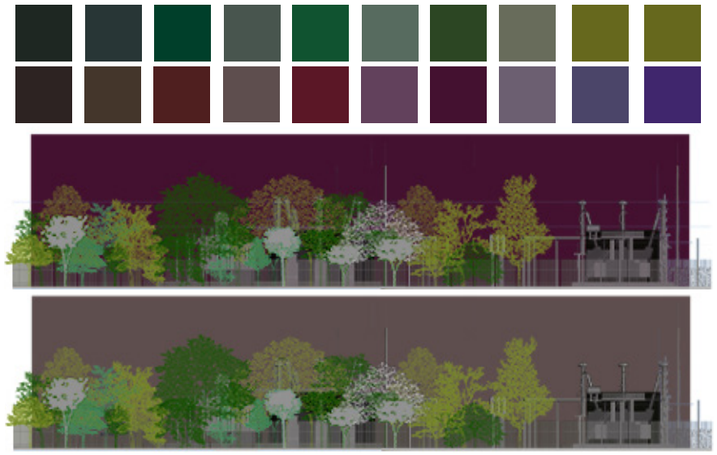
Disadvantages:

- Bright or contrasting colours may appear overly prominent in the landscape and draw attention. Careful selection of accent colours and their positioning on buildings needed.
- Potential for visual complexity with combination of accents and external electrical infrastructure.

Plate 126 - Indicative photomontage showing both North Falls AIS substation and Five Estuaries GIS substation with accents colour concept - from Ardleigh Road / Jenning's Farm (ES Viewpoint 4)

7.27 Concept 5 - Foils

7.27.1 The ‘foils’ concept uses colours for the substation buildings that contrast with the colours of the mitigation planting vegetation, which will occupy the foreground. The buildings are coloured to ‘set-off’ the predominant greens, yellows and browns of the vegetation, by using contrasting colours on the opposite of the colour wheel and darker tones. The colour samples along the top show the colours of the vegetation with the colours below reflecting contrasting colours and tones. These are then tested against the foreground feature of the vegetation, as well as the electrical infrastructure seen to the fore. Green accent colours could also be used to break up the horizontal form of the buildings and read within the blocks of the vegetation.



AIS elevations

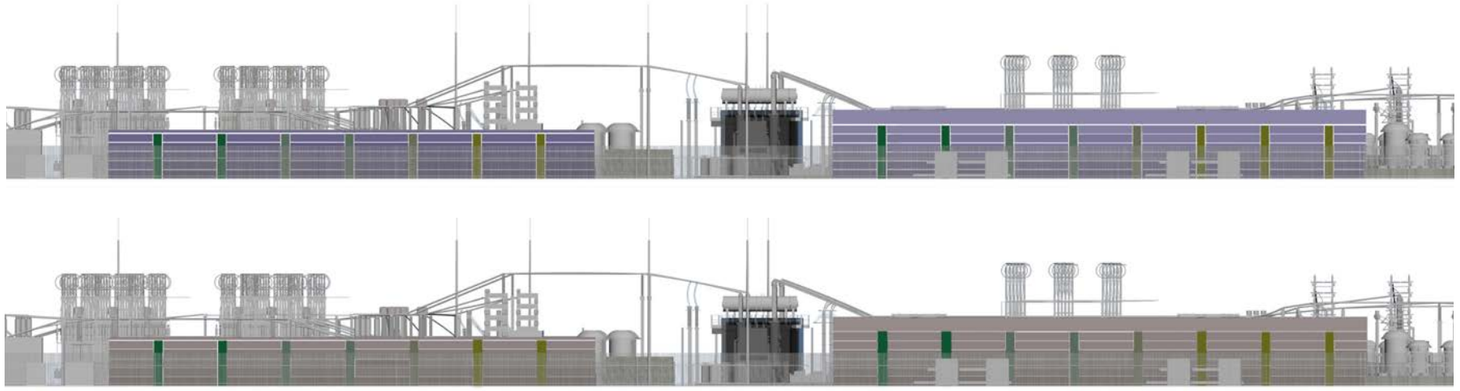


Plate 129 - Foils colour concept elevations

Advantages:

- Potential for subtle colour options (e.g. S7502-B grey in photomontage) to integrate with background while also providing a foil to ‘set-off’ the proposed (green) planting.
- Introduction of green ‘accents’ within the building façades has potential to provide visual link to proposed planting.
- Darker and warmer colours create the effect of a shadow, contrasting with the greens and yellows in the landscape and allowing the building to appear recessive, particularly once planting establishes.

Disadvantages:

- Foils could place bold, dark colours of taller GIS buildings above the skyline and draw attention to the substations.
- Bold, dark colours on smaller AIS buildings likely to stand out amongst electrical components.
- ‘Foil’ to planting likely to only be realised after a long-time period, when tree planting matures.

Plate 128 - Indicative photomontage showing both North Falls AIS substation and Five Estuaries GIS substation with foils colour concept - from Ardleigh Road / Jenning's Farm (ES Viewpoint 4)

7.28 Concept 6 - Electricity

7.28.1 The 'Electricity' concept makes direct reference to the purpose of the substation, making a bold and honest statement. It takes the opportunity to celebrate and highlight the renewable energy that will be generated by the offshore wind farms. Natural occurrences such as lightning, aurora borealis or sparks help to visualise electricity. Cues towards a colour that symbolises electricity can also be taken from societal perception and signage, which generally portray electrical risk as a bright yellow colour. The colours representing this concept have not been selected from the ECA palette in order to achieve contrast, with colours selected to refer to the perceived colour of electricity and to allow the buildings to stand out in the landscape.

AIS elevations

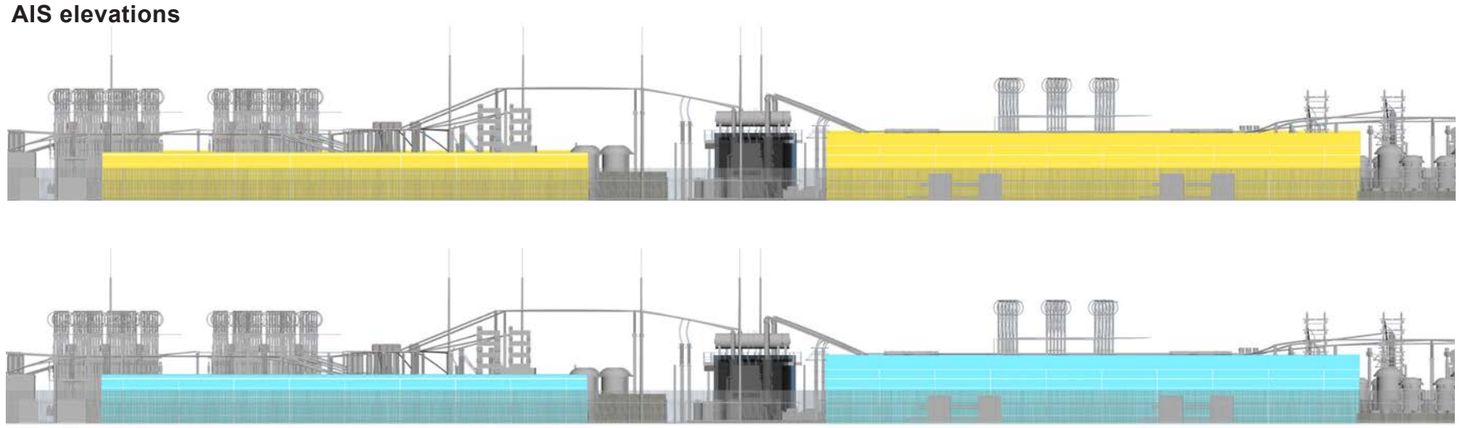


Plate 130 - Electricity colour concept elevations

Advantages:

- The concept makes a direct link to the electricity generated from the offshore wind farm in the design.
- The colour of the substation conveys its function and would provide a bold landmark in the landscape.
- One bold colour is simple in design and easy to install.

Disadvantages:

- Bold colours are likely to draw attention to the substation, which contradicts with other preferences to screen and blend the building into the landscape.
- The colours do not draw from the surrounding landscape and could clash with the prevailing colour of the landscape.

Plate 131 - Indicative photomontage showing both North Falls AIS substation and Five Estuaries GIS substation with electricity colour concept - from Ardleigh Road / Jenning's Farm (ES Viewpoint 4)

7.29 Phase 1 Engagement

7.29.1 Phase 1 engagement was undertaken in September 2025 with local authorities, stakeholder and communities, which included requests for feedback about the colour of the substation building and the initial design concepts (Plate 132). Stakeholders and the public were asked if they had a preference on the colours being considered for the buildings located within the substation compounds and the colour application concepts being considered (Visual Integration; Transition; Architectural Blocks; Accents; Foils; and Electricity).

7.29.2 ECC provided feedback on the colour range for summer landscapes and that the colour palette should have more representation of wheat, barley and corn crops prevalent throughout the summer months. The summer landscape colour range and palette were subsequently updated to address these comments (plate 113 and 115), so that both spring and summer landscapes were represented.

7.29.3 Feedback from both ECC and Ardleigh Parish Council recommended that the colour range for local architecture should better reflect buildings from Tendring, Ardleigh, Little Bromley and surrounding farms and hamlets. Further surveys were undertaken and the architectural colour range (Plate 116) and palette (Plate 118) were updated to better capture the local vernacular, with more focus on the colours of farm buildings / barns in the local landscape.

7.29.4 A consistent theme across the feedback received from Local Authorities, Parish Councils and the public was that an approach that visually integrates the substations buildings in the landscape would offer the least impact on local residents. There was a general consensus that the approach should be to use colour and design to reduce the visual prominence of the substation buildings in the landscape, in line with the with mitigation discussed during Examination of both projects.

7.29.5 Feedback suggested that colours could be guided by neighbouring agricultural barns, and that vivid, bright, or conceptual colourways should be avoided.

7.29.6 Although the reasons for investigating bold colours/ designs suggested by the EQRP were understood (see Section 7.30), subsequent feedback from other stakeholders and the public consistently identified that bold and bright colours were inappropriate in this landscape and that the colours used should help the substations blend into the landscape as far as is possible.

7.29.7 Feedback was also provided that the visual integration and transition concepts included the most suitable colour choices; and that subtle landscape colours are likely to be the least visually intrusive and most likely to harmonise with the rural setting.

7.29.8 Specific feedback was also provided that the use of the subtle landscape colours in the palette is more appropriate and that groups of verticals are needed to break up the horizontality of the substation buildings, potentially in irregular pattern (such as how blocks of vegetation appear in the rural landscape), rather than a regular form. ECC indicated preference for vegetation accents/highlight colours arranged in irregular blocks to reflect how vegetation appears in the rural landscape. Comments were also expressed that blocks of earthy colour along the lower length could help 'ground' the buildings.

7.29.9 The Phase 1 engagement feedback informed the subsequent design development and refinement of the colour and design concept recommended in the design guide, which is set out in Section 7.5 - 7.10.

Plate 132 - Phase 1 Consultation Boards

7.30 Design Reviews (Essex Quality Review Panel)

Summary

7.30.1 The EQRP were appointed to undertake a review of the draft JDG. The Panel commended the projects for exploring the potential design options through an ECA within the JDG, noting that the design and colour palette options were based on the landscape context and local vernacular. The EQRP questioned whether it may be more meaningful to develop a design which reflects the purpose of generating power offshore.

7.30.2 From a heritage perspective, the EQRP endorsed a colour palette derived from the surrounding landscape or the local architectural context, and commented that it was important to use colour, material, and texture to break up the massing of the development in views.

7.30.3 The EQRP highlighted the challenge of the changing landscape through the different seasons, as the colour palette of the landscape will differ throughout the year and highlighted that winter colours are more likely to be present throughout the year. It also noted that as the substation buildings are surrounded by a grid of other equipment, the arrangement of the colour palette could be used to introduce some verticality into the horizontal forms of the buildings.

7.30.4 The EQRP noted that the incidence, proportions and visibility of colour will vary throughout the year, day, and in different weathers, which could make it difficult to develop a design which blends into the surroundings. It is questioned whether it would be more appropriate to accept the visual impact of the substations and create a more iconic design which reflects the function of the OnSSs and the wider offshore wind farms.

7.30.5 This alternative approach to 'celebrate' the development and shape it into a local landmark, was generally encouraged by the Panel, and if it were to be explored, the Panel encouraged that the focus should be on incorporating elements of a palette which reflects the function of the OnSS, clean energy and colours that relate to electricity.

7.30.6 The Panel suggested exploring precedents with an agricultural typology with pitched roofs, and highlighted the Welding Institute in Cambridge, designed by Eric Parry Architects, as a scheme with an engaging design that balances the horizontal nature of the buildings with verticality created by the cladding and pitched roof forms (Plate 133). A number of other precedents (also shown in Plate 133) were highlighted by the EQRP as exemplars of 'good design' in energy projects.

7.30.7 The projects explored the potential to celebrate the function of the OnSS with bolder colours relating to electricity (Section 7.28), however the preferred approach of this JDG is to use colours from the local landscape context to reduce the visual prominence of the substation buildings, in line with the mitigation discussed during Examination and in accordance with the feedback provided by local authorities and the public.

7.30.8 The EQRP and Phase 1 engagement feedback informed the subsequent design development and refinement of the colour and design concept recommended in the design guide, set out in Section 7.5 - 7.10. The design builds on precedents and feedback provided, with a colour palette derived from the surrounding landscape and architectural context, using colour to break up the massing and structured to introduce some verticality into the horizontal forms of the substation buildings.

The Welding Institute, Cambridge *(c) Dirk Lindner 2015*

HS2, Chiltern Barn *(c) HS2*

Edgware Road Substation *(c) Barry Carruth 2013 (Creative Commons)*

Plate 133 - Precedents suggested by EQRP

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8: Landscape and Ecology

8 Landscape and Ecology Guidance

8.1 Introduction

Requirements of the DCO

8.1.1 In accordance with the requirements set out in the NFOWF draft DCO and the VEOWF draft DCO, this Section 8 of the design guide provides recommendations to support the development of a written landscaping scheme to be submitted to and approved by the discharging authority. The design guide aligns with both the Outline Landscape and Ecological Management Plan (OLEMP) for the VEOWF and the Outline Landscape and Ecological Management Strategy (OLEMS) for NFOWF.

8.1.2 This design guide does not form the Landscape and Ecology Management Plan (LEMP) for Five Estuaries or the Written Landscape Scheme (WLS) or Ecological Management Plan (EMP) for North Falls, which will be subject to a detailed design process and be approved by the discharging authority post-consent. The design guide sets out the principles that the Five Estuaries LEMP and North Falls WLS/EMP will follow, building upon and refining the indicative proposals in the OLEMP and OLEMS, offering further detail on the spatial arrangement and composition of proposed planting areas and habitats proposed. The design guide facilitates the continued review of the landscape scheme informed by the ongoing consultations with ECC, TDC and IPs.

Purpose

8.1.3 The Landscape and Ecology section of the Joint Design Guide informs the detailed design of each project's documents—the Five Estuaries LEMP and the North Falls EMP/WLS. This document is therefore necessarily less detailed than the LEMP and EMP/WLS will be. By combining the projects' indicative layouts and setting shared aims and objectives, the Guide provides coordinated advice for the landscape scheme. This ensures a consistent, harmonised landscape strategy and supports aligned detailed design within each project's LEMP/EMP/WLS. It also provides assurance that these documents will remain coordinated as they progress, reflecting the co-location of the two OnSSs on a single site and the need for aligned plans and documentation. The information and recommendations held in this document serve as a guide. The landscape and ecological plans will be updated at the detailed design stage, in liaison with the discharging authority to ensure that the extent and location of landscape elements, screening mitigation (particularly the isolated stands), habitats and other enhancement measures remain appropriate.

Aims

8.1.4 The aim of the landscape and ecological design is to use the site surrounding the Five Estuaries and North Falls onshore substations to deliver multiple functions, including the deliverance of:

- Commitments made through the DCO process (principally about the screening of the onshore substations and the provision of biodiversity)
- Enhancement of local landscape character
- Improvement of soil health
- Attenuation of storm water
- Amelioration of the micro-climate.

8.1.5 This landscape and ecology chapter of the JDG explores options for the development of the detailed landscape and ecological design for the projects respective LEMP and EMP/WLS. The current design remains indicative while considering general establishment and maintenance practices; however, the establishment and maintenance details will be addressed in the respective LEMP and EMP/WLS.

8.1.6 A further aim of the landscape and ecological design proposals set out in this design guide is to support greater integration with the surrounding green infrastructure network by identifying opportunities to connect with existing vegetation patterns at a broader scale. The proposals set out in the Landscape and Ecology Masterplan (Section 8.16) illustrate potential linkages that should be considered to enable landscape proposals associated with other projects to integrate and form a wider network.

Process

8.1.7 Indicative layouts have been developed for the DCOs of both Five Estuaries and North Falls, accompanied by the OLEMP/ OLEMS. Their outline status reflects the lack of certainty prior to a final layout and design being fixed at the post examination stage of the process. Comments made during the examination stage by the Examining Authority, ECC, TDC, and other interested parties have and will influence refinements to all aspects of the design presented in this Design Guide. The differences in the indicative layouts for Five Estuaries and North Falls have been resolved to create a single outline plan layout covering both sites.

8.1.8 This process has involved identifying and responding to opportunities and regulations related to local and national guidance, while also aiming to deliver ecological connection and improvements. These objectives include delivering enhancements in keeping with the NCA statements of opportunity, and landscape management principals of the receiving LCA.

8.1.9 The intent of the landscape and ecological design plan set out in the design guide is similar to other successful landscape projects with a focus on nature recovery of areas of arable farmland, including Boothby Wildland Nature Reserve and Knepp Wildland. Users of this design guide may refer to projects such as Boothby Wildland Nature Reserve and Knepp Wildland, as relevant precedents for the type of landscape proposals intended, with a focus on nature recovery of areas of arable farmland, that are intended.

Objectives

8.1.10 The Landscape and Ecology Masterplan has been designed to fulfil the following objectives:

- Organise the site layout to retain key valued landscape, heritage, GBI, considering the role that existing vegetation can play in integration new development within its surroundings.
- Form an effective screen of planting around the onshore substations which will mitigate landscape and visual impacts in the local area.
- Create a mosaic of habitats that maximises the biodiversity of the site and connects with the wider green infrastructure.
- Retain farm fields where practicable to ensure quality farmland is kept in production.
- Seek opportunities to retain water on site, with an aim to create water features, regulate water levels, and enhance landscape character and biodiversity.
- Reintroduce the woodlands, scrublands, grasslands and wetlands that would have characterised the indigenous landscape of this area.
- Inbuild climate resilience by selecting climate resilient species and creating microclimates to ameliorate extremes.

Plate 134 - Five Estuaries Offshore Wind Farm OLEMP

8.2 Approach to Biodiversity Net Gain

8.2.1 North Falls and Five Estuaries are committed to delivering measurable BNG at the OnSSs. While each project followed slightly different approaches during the consenting stages, this Design Guide aligns them into a consistent, landscape-led, and policy-compliant framework for ecological enhancement and long-term habitat resilience.

8.2.2 North Falls committed to a minimum 10% BNG through habitat creation—such as lowland meadow, species-rich grassland, SuDS ponds, and hibernacula—supported by a 30-year monitoring and management plan. Its OLEMS sets out a structured strategy aligned with the Essex Green Infrastructure Strategy and local priorities.

Plate 135 - North Falls Offshore Wind Farm OLEMS

8.2.3 Five Estuaries took a landscape-led approach, creating priority habitats including lowland meadow, traditional orchards, neutral grassland, woodland, and ponds. Although not driven by a specific BNG unit target, the statutory metric was applied retrospectively to demonstrate compliance and maximise ecological value. All habitats will be managed for 30 years, with a five-year aftercare period, formalised in the final LEMP.

8.2.4 Together, the projects aim to deliver a cohesive ecological network through coordinated planting, shared monitoring protocols, and integrated design enhancing biodiversity, connectivity, and resilience. Commitments in respect of BNG for each project are set out in the following documents:

- Five Estuaries Offshore Wind Farm – Onshore Biodiversity Net Gain Indicative Design Stage Report (March 2024) (Five Estuaries Offshore Wind Farm ES, Volume 6, Part 6, Annex 4.18).
- North Falls Offshore Wind Farm – Biodiversity Net Gain Strategy (July 2024) Doc Ref 7.22).

8.2.5 The methodology for the joint design guide has been primarily landscape-led, with the requirement to deliver ecological mitigation, compensation and enhancements measures in line with current policy and legislation, regardless of the Statutory Biodiversity Metric. While not based on a specific BNG unit target, the scheme has been carefully optimised to deliver biodiversity benefits, and in line with consultee requests, to explore opportunities to provide a minimum of 10% increase in biodiversity. Similarly, the landscape-led approach has prioritised the integration of green and blue infrastructure (GBI) to deliver broader environmental benefits.

Plate 137 - Landscape Baseline Photographs

8.3 Landscape Baseline

8.3.1 The development of the Landscape and Ecological Design has been influenced by consideration of the baseline context, in terms of the evolution of the landscape, the present landscape character and existing habitats at the site and surrounding area.

Landscape and Ecological Evolution

8.3.2 The design has been informed by the historical evolution of the landscape. The 'Tendring District Landscape Character Assessment' (TDLCA) (November 2021) states; 'little more than a century ago, a large portion of the land was covered with woodland and full of swampy ground but is now well drained and intensively cultivated.' In addition to naturally occurring woodland and marsh, descriptions in the TDLCA also refer to woodland, heathland and grassland. The distribution of these habitats would have been influenced by the glacial drift of sands and gravels deposited over the underlying London clays with heathland on thinner soils and woodland on deeper soils. The Enclosure Act of 1750, initiated the gradual removal of vegetation, accelerated further by the mechanisation and intensification of farming practices over the last century, and leading to our current situation in which there is no natural and very little semi-natural vegetation remaining in Tendring District. The objective, to reintroduce the habitats of the indigenous landscape, will create a link with the past, reintroduce land cover that is native to this area and restore the historic character of the landscape.

Landscape Baseline

8.3.3 The site occupies a lowland plateau at an elevation of approximately 34 to 35m, with a gentle fall from north to south causing the land to drain slowly to the south. The general flatness of the plateau means enclosure is created mainly by vegetation and where trees and hedgerows do occur, they make a valuable contribution to the aesthetic of the rural landscape. The soils are described as 'lightly acid loamy and clayey soils with impeded drainage'. Their fertility is considered to be moderate to high and can support a range of woodland and grassland habitats, making them suitable to support the habitat mosaic being proposed. The extensive field drainage system ensures excess water is drained away, such that there is very little surface water. A SuDS system is proposed to attenuate surface water associated with the onshore substations. These ponds and other habitat ponds proposed are considered to be positive features that will enhance landscape character and biodiversity potential.

Plate 136 - View towards site from Ardleigh Rd near Jenning's Farm

8.3.4 Agriculture is the predominant land use in the area (much of the land is Grade 1 agricultural land) and the land cover comprises the seasonal production of cereals. This creates a generally open character, albeit with important enclosure from intermittent hedgerows and tree cover. The Landscape and Ecological Design presents an interface between the existing agricultural landscape and the proposed ecological habitats. The agricultural land uses and associated rural character are respected through the retention of farm fields to the south-east and the creation of traditional hedgerows and shelterbelts around the periphery of the site. The creation of species-rich habitats will present a more lush and naturalistic character that will contrast with and complement the rural farmland. The landscape proposal will be carefully coordinated to allow for necessary access and maintenance by neighbouring landowners and will be in accordance with ongoing landowner agreements.

Visibility

8.3.5 The generally flat and low-lying landform coupled with the screening effect of existing dispersed vegetation produces a landscape in which there are few long-range views. This has led to visibility of the onshore substations being contained within the local landscape around the site. A key objective, from the outset of the projects, was to mitigate the effects of the onshore substations on local landscape character and visual amenity with extensive shelterbelt, woodland and orchard planting presenting the effective means to deliver this objective. The Landscape and Ecological Design addresses the commitment to screening made through the DCOs by designing the areas of tree planting to be multi-layered, so that there is a density of foliage at each vertical stratum. While effects will be mitigated gradually over time through years of plant growth, the visual effect of the onshore substations will also be enhanced by the application of colour on specific structures in the AIS substations as explored in Section 7: Colour

Climate Resilience

8.3.6 The Met Office publishes data predicting how the UK climate will change during the 21st Century, based on a range of different scenarios and highlights how the climate in the south-east of England is likely to get hotter and drier in the summer months, and warmer and wetter in the winter months, also with an increase in storm events. The Landscape and Ecological Design can ameliorate these effects of climate change through creating woodlands, scrub, grasslands and ponds that will attenuate water, provide shade, shelter and moisture and support a web of wildlife that will support the continuation of natural processes such as pollination, seed dispersal and natural regeneration. Plant species will be selected, layouts designed, and management organised to ensure inbuilt climate resilience. This will include careful selection of locally native and climate resilient plant species (with reference to Essex Tree Palette and Forestry England), selecting a diverse range of locally appropriate species to minimise potential losses, considering the appropriate stock size and timing of planting to avoid placing additional stresses on plant material, and ensuring proper ongoing maintenance and access to landscape implementations.

Essex Local Nature Recovery Strategy

8.3.7 The leading principals of the North Falls and Five Estuaries Joint Design Guide are closely alignment with the Essex Local Nature Recovery Strategy Document (LNRS). The essence of the Landscape and Ecological Design for the Joint Design Guide inherently aims to achieve the same goals outlined by the LNRS, including the aims of creating “bigger, better, and more connected” habitats into its landscape and ecological proposals. It promotes biodiversity through habitat mosaics of woodland, grassland, hedgerows, wetlands, and traditional orchards, while integrating green and blue infrastructure to enhance connectivity with the wider landscape. The guide commits to measurable Biodiversity Net Gain (BNG) and long-term management, incorporates climate-resilient planting and sustainable drainage systems, and reinstates historic landscape features—all consistent with LNRS priorities for nature recovery, climate adaptation, and ecological resilience.

8.4 Ecological Baseline

8.4.1 The OnSS site is located on an expansive lowland plateau where arable crops form the predominant land cover and where surface water is limited to drainage ditches along field boundaries. As a result of the limited range of habitat types present and relative lack of semi-natural habitats, there is great scope to increase the biodiversity value of the site. The richness of local biodiversity can be considerably enhanced through creating a range of habitats comprising native species.

8.4.2 Oak is the dominant tree species in this area and historically, along with ash, would have formed the canopy of woodlands. Other common species include hazel, sycamore, hornbeam and lime, with the coppicing of hazel and sweet chestnut a key feature of ancient woodlands.

8.4.3 There are no landscape or nature designations in the local area and green infrastructure is limited to hedgerows, shelterbelts and small woodland blocks. It is in this nature- depleted context that the site presents the opportunity to create an important resource for local wildlife. It is also important that vegetation on the site connects with vegetation in the surrounding landscape to maximise the potential connectivity with other habitats that the site has to offer. This approach reflects both Essex County Council ECC’s ‘Green Infrastructure Strategy’ and ‘Essex Green Infrastructure Standards’ which require new developments to contribute positively to strengthening and expanding existing green networks across the county.

8.5 Design Concept

Bringing together the outline plans

8.5.1 The Design Guide landscape and ecology masterplan, shown in Section 8.16 (General Arrangement) and 8.18 (Illustrative), devlops and combines the landscape strategy set out in the North Falls Design Vision Document and North Falls OLEMS with the Five Estuaries OLEMP.

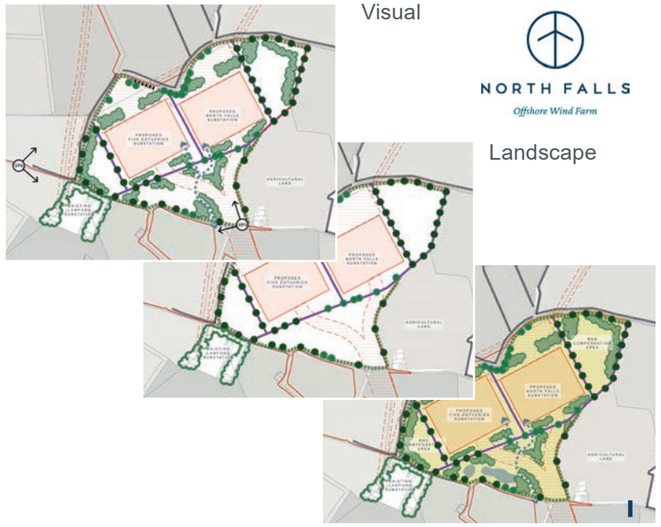
8.5.2 The projects have shared a similar design approach through these outline strategies (Plate 138), based on the layering of information around the development requirements, constraints and existing landscape context, with proposals for visual screening, landscape enhancements and ecological mitigation, compensation and enhancements.

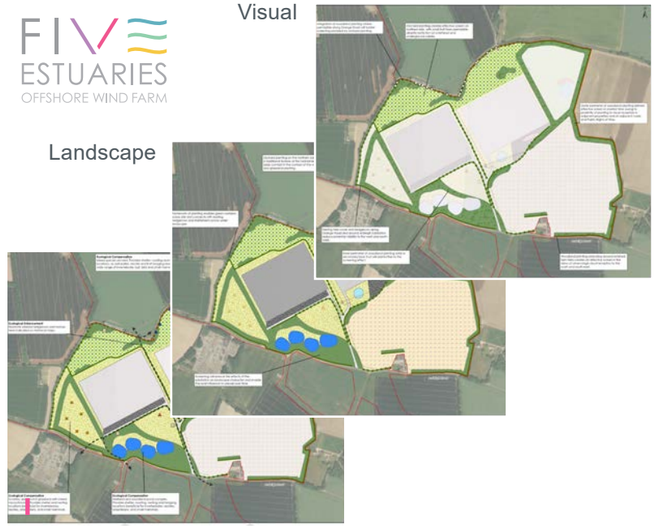
8.5.3 The Design Guide and its Landscape and Ecology Masterplan (Section 8.16 General Arrangement and 8.18 Illustrative) incorporate several updates made during the Examination of both projects and draw together the outline plans, with merging of the North Falls and Five Estuaries landscape plans, to provide an updated and coherent overall masterplan to take forward towards the detailed design stage.

8.5.4 In particular, two key aspects have been incorporated into the plan:

- Woodland shelterbelt along Ardleigh Road to the west of Normans Farm and around field boundary to the west of Jenning's Farm. This provides for a greater and earlier level of visual screening due to its closer proximity to receptors, as well as a larger area of land retained for agricultural use.
- Creation of a traditional orchard (i.e. not intensive) on the northern side of the substations (as per the Five Estuaries OLEMP), to restore a traditional feature and provide habitat enhancement, interspersed with higher landscape screening planting in this area (as per the North Falls OLEMS).

8.5.5 In addition to these two key areas, the Design Guide provides further definition and illustration of the proposed habitat mosaics (Section 8.6) within the masterplan, including for example, differentiating boundary shelterbelts for screening and locally native broadleaf woodlands, areas of lowland meadow, and proposals for tree copses and wetland areas within the landscape and ecological enhancement areas.





Design Guide Landscape and Ecology Masterplan
(Section 8.16 General Arrangement and 8.18 Illustrative)

Plate 138 - North Falls and Five Estuaries landscape plan development

8.6 Proposed Habitat Mosaics

8.6.1 The Landscape and Ecological Design proposes a range of different habitats, as shown in the illustrative cross sections in Plate 139. These include:

- Shelterbelts
- Hedgerows
- Woodland
- Traditional orchards
- Grassland
- Scrub
- Ponds

8.6.2 Each of these proposed habitats is described further in sections 8.9-8.14 of this design guide and microhabitats are also described in 8.15.

8.6.3 The indicative spatial arrangement of these habitats and proposed landscape planting areas are shown in the Landscape and Ecology Masterplan in Section 8.16 and Section 8.18. Together with the habitat descriptions, this Landscape and Ecology Masterplan (Section 8.16 and 8.18) refines the indicative proposals in the OLEMP, providing additional information on spatial layout and composition of planting areas and habitats proposed.

8.6.4 The ecological gain delivered through the Landscape and Ecological Design comes from combining a range of habitats and microhabitats on one site, creating a whole that is greater than the sum of its parts. The diversity and presence of habitat mosaics will provide year-round habitat and food sources, supporting existing species and encouraging the return of those that are lost or declining.

8.6.5 A key element of these mosaics is recognising that the listed specifications are designed to meet multiple, sometimes competing requirements—for example, planting locally appropriate species while also including climate-resilient or screening species.

8.6.6 This design guide provides an indicative plan that meets the overall objectives for the site, with detailed interventions to be reviewed and refined on a case-by-case basis.

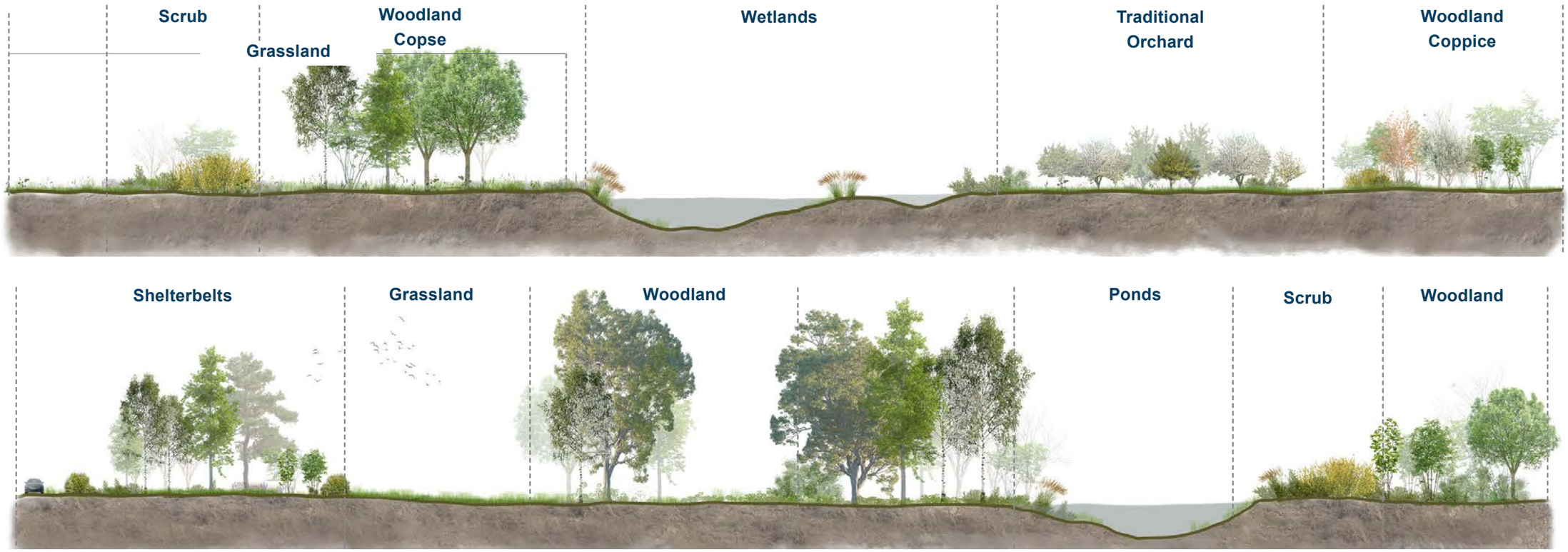


Plate 139 - Habitat mosaics illustrative cross sections

8.6.7 It is anticipated that earthworks will need to occur to enable the constructions of the OnSS platforms/ compounds. The topsoil generated from this activity could be utilised in several ways on site, potentially including the creation of bunds. Sensitive land profiling of topsoil could deliver the following benefits for the landscape scheme:

- Assist with landscape screening;
- follow the waste hierarchy, avoiding removal and disposal vehicle movements and associated costs; and
- Provide further landscape variety, helping to achieve the goal of varied habitat mosaics

8.6.8 Any specifics on this would follow the detailed design and be brought forward within the projects LEMPs or part of the design requirement sign offs.

8.7 Planting Procurement and Implementation

Design Guidance:

8.7.1 The following points should be carefully considered when selecting, procuring, and establishing plant material.

8.7.2 Species selection should consider the following aims;

- Locally appropriate and informed by local authority guidance (Essex Tree Pallet, Essex Design Guide);
- Climate resilient;
- Maximise screening, where appropriate; and
- Diverse selection to promote resiliency and biodiversity

8.7.3 Planting material/stock selection should prioritise:

- Locally grown (South East England/ East Anglian) plant stock to ensure climate resiliency
- Sourcing a range of plant sizes including larger stock to be implemented in appropriate locations, enabling faster, higher impact screening

8.7.4 Planting implementation should consider:

- Advance planting in appropriate locations through the scheme for enabling faster, higher impact screening (see section 8.7.1)
- Carefully located to allow adequate access for maintenance of planting and additional site features, such as drainage ditches, field margins, etc.
- Protective fencing or tree guards should be installed where required an appropriate, around areas of new planting to complete boundaries and protect new hedging and woodland.

8.8 Planting Progression

8.8.1 The design guide presents an indicative framework, with the understanding that specific interventions will be assessed and refined individually across the site as the project progresses. The proposed habitat mosaics will continue to grow and develop over time, and maintenance interventions will be made where appropriate to best support and compliment the development of healthy and appropriately located habitats. As detailed in the OLEMS/OLEMP, planting should create an effective visual screen within 5 to 15 years as it grows and matures over time after establishment. Opportunities for advanced planting will be identified and implemented to accelerate early growth, intending to significantly reduce the time needed to achieve effective screening. Potential opportunities include advance woodland shelterbelt planting around all appropriate perimeters of the landscape plan boundary, including the eastern and southern boundaries along Ardleigh Road. Plates 140-142 show illustrative cross sections of proposed habitats at Year 1, Year 5, Year 15 and Year 30 to show what the planting is trying to achieve over time.

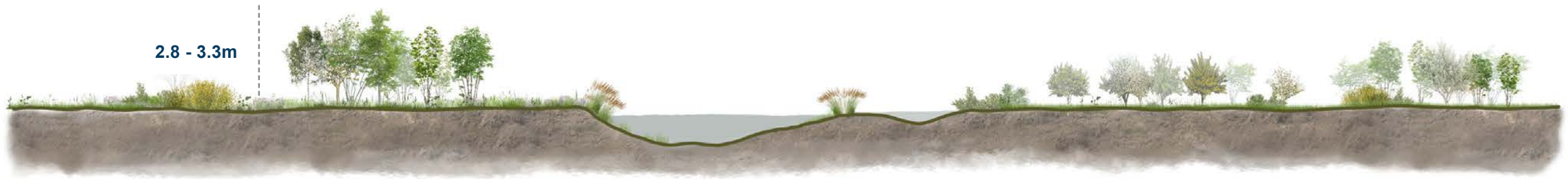


Plate 140 - 5 year planting diagram

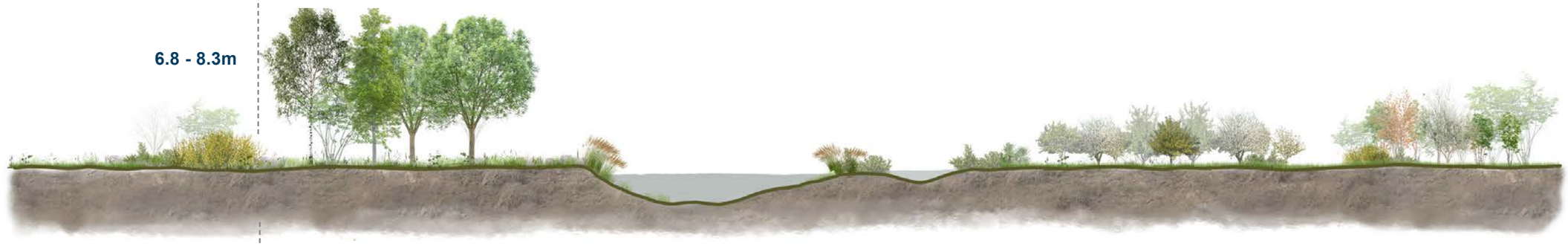


Plate 141 - 15 year planting diagram

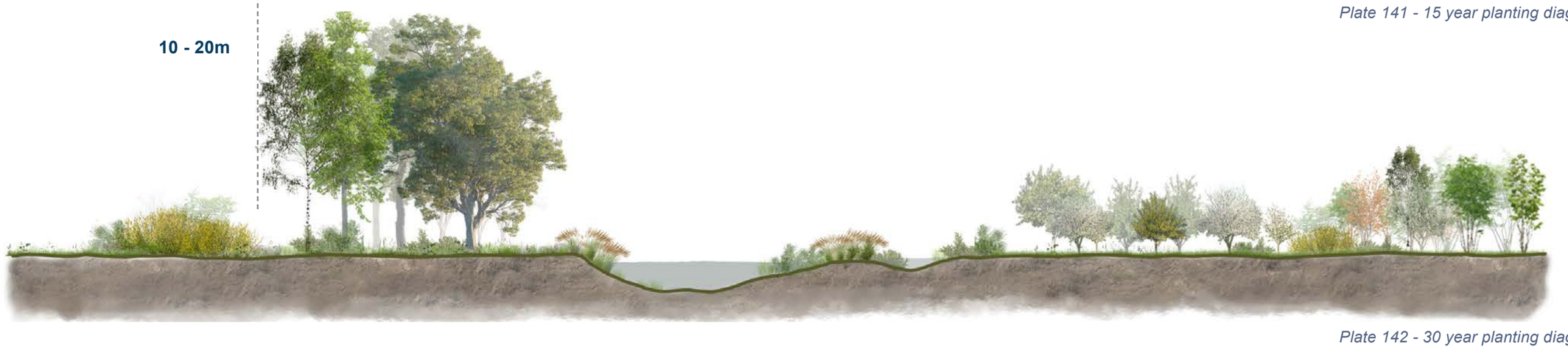


Plate 142 - 30 year planting diagram

Plate 143 - Shelterbelt and hedgerow habitat illustrative plan and cross section; 1:200

8.9 Woodland Shelterbelts

8.9.1 Woodland shelterbelt planting will extend around the western, southern and eastern peripheries of the site. Woodland shelterbelts has been designed to create a visual screen of the onshore substations and will typically be 20m in width and will reach a height of approximately 6 to 8m after 15 years growth.

8.9.2 The woodland shelterbelt includes hedgerows along one or both outer edges, enclosing a mix of canopy trees, understorey trees and ground cover between to create a layered profile and effective screen. The woodland mix will be planted as whips with canopy trees and associated nurse species located close to the roadside edge to provide immediate height. The shelterbelt profile is intended to taper down through smaller trees, and understorey towards the hedgerow on the field side, to avoid excessive shading of crops. The trees will be thinned to ensure the strongest specimens have space to grow.

Proposed Species

8.9.3 Proposed species for shelterbelts should be carefully selected (see Planting Procurement and Implementation Box) and informed by the following sources:

- Essex Tree Palette (Essex County Council, 2018)
- Essex Design Guide (Essex County Council, 2018)

8.9.4 The final species list will be agreed with the discharging authority as part of the respective LEMP/EMP/WLS for each project.

A guide to the potential species anticipated to form this habitat typology are set out as follows:

Canopy Trees: Quercus robur (English Oak)

Understorey Trees: Corylus avellana (Hazel), Acer campestre (Field Maple), Carpinus betulus (Hornbeam), Sorbus aucuparia (Mountain Ash), Prunus avium (Wild Cherry), Alnus glutinosa (Alder), Betula pendula (Silver Birch)

Understorey and Hedgerows: Crateagus monogyna (Hawthorn), Prunus spinosa (Blackthorn), Corylus avellana (Hazel), Ilex aquifolium (Holly), Carpinus betulus (Hornbeam), Rosa canina (Dog Rose), Quercus robur (English Oak).

Ground Cover: (Wood Sage) (Bugle) (Wood Speedwell) (Honeysuckle)(Hairy Woodrush) (Wood Sorrell) (Greater Stitchwort) (Creeping Soft-Grass)

8.10 Hedgerows

Species-Rich Native Hedgerows with Hedgerow Trees

8.10.1 Hedgerows will be planted around the majority of the boundary of the site both independently and in accompaniment of the shelterbelt habitat profile. The hedgerows should provide screening, restore any gaps in existing hedgerow, and maintain, extend, and connect the overall existing network of hedgerows. Hedgerows provide connective habitat between different sections of the site, acting as a physical link between areas.

8.10.2 Hedgerows will be planted in a double staggered row, with whips spaced at 50cm and rows 30cm apart. Hedgerows that are planted alongside and /as part of the shelterbelt matrix will be maintained at approximately 1.5-2m wide. Stand-alone sections of hedgerows should be allowed to grow wider, up to a maximum of 5m wide maximum.

8.10.3 Traditional hedge-laying and sensitive management will ensure a tall, dense hedgerow with a wide base and few gaps. The hedge will comprise alternate groupings of native hedge species. Hedgerow trees will be planted along certain hedgerows, spaced with variation every 10-20m to allow the canopy to grow over time. Strong saplings can also be left to grow into hedge trees.

8.10.4 Once established, rotational hedge cutting will occur for each section every two or three years, ensuring year-round availability of habitats and food sources.

Proposed Species

8.10.5 Proposed species for hedgrows should be carefully selected (see Planting Procurement and Implementation Box) and informed by the following sources:

- Essex Tree Palette (Essex County Council, 2018)
- Essex Design Guide (Essex County Council, 2018)

8.10.6 The final species list will be agreed with the discharging authority as part of the respective LEMP/EMP/WLS for each project.

A guide to the potential species anticipated to form this habitat typology are set out as follows:

Hedgerows: Crateagus monogyna (Hawthorn), Prunus spinosa (Blackthorn), Corylus avellana (Hazel), Ilex aquifolium (Holly), Carpinus betulus (Hornbeam), Rosa canina (Dog Rose), Quercus robur (English Oak)

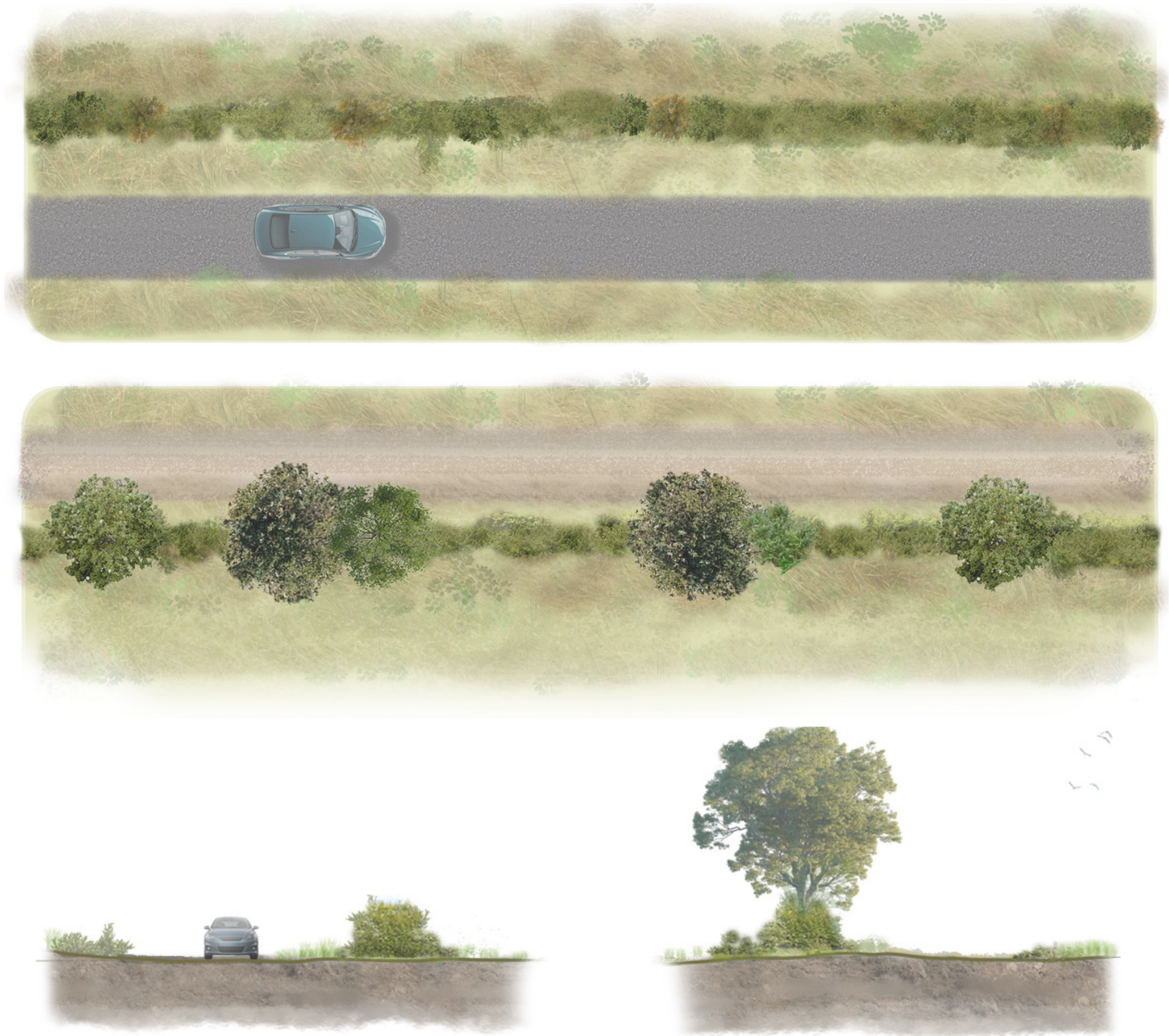


Plate 144 - Hedgerow illustrative plan and cross section

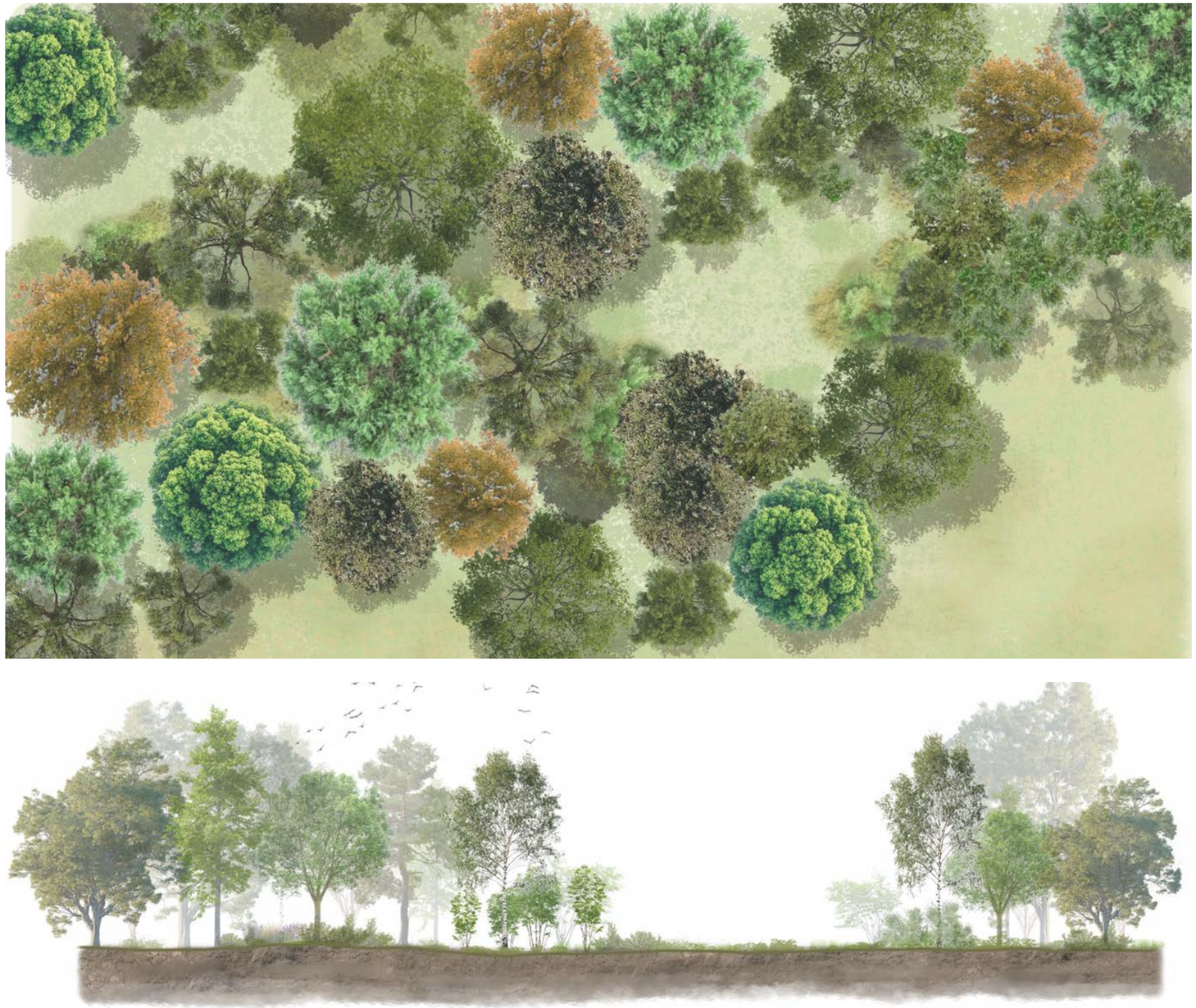


Plate 145 - Woodland habitat illustrative plan and cross section; 1:200

8.11 Woodland

Locally Native Broadleaf Woodland

8.11.1 The selection of woodland species should be informed by the presence of native trees in the nearby Weely Hall Wood, Bullock Wood and Riddles Wood SSSIs. While the native woodland of this lowland region comprises oak and ash with hazel and sweet chestnut coppice, the risks of ash dieback disease means the alternative species such as (but not limited to) sweet chestnut, and small-leaved lime should be selected. A good mix of species is essential in building resilience to climate change, pests and disease. Protective fencing and/ or tree guards will likely be installed, where required, around areas of new planting to complete boundaries and protect new hedging and woodland.

Proposed Species

8.11.2 Proposed species for woodland should be carefully selected (see Planting Procurement and Implementation Box) and informed by the following sources:

- Essex Tree Palette (Essex County Council, 2018)
- Essex Design Guide (Essex County Council, 2018)
- Local SSSIs

8.11.3 The final species list will be agreed with the discharging authority as part of the respective LEMP/EMP/WLS for each project.

A guide to the potential species anticipated to form this habitat typology are set out as follows:

Canopy Trees: Quercus robur (English Oak), Castanea Sativa (Sweet Chestnut), Tilia Cordata (Small-leaved Lime).

Understorey: Corylus avellana (Hazel), Acer campestre (Field Maple), Carpinus betulus (Hornbeam), Sorbus aucuparia (Mountain Ash), Prunus Avium (Wild Cherry), Alnus glutinosa (Alder), Betula pendula (Silver Birch), Crateagus monogyna (Hawthorn), Prunus spinosa (Blackthorn), Corylus avellana (Hazel), Ilex aquifolium (Holly), Carpinus betulus (Hornbeam), Rosa canina (Dog Rose), Quercus robur (English Oak), (Honeysuckle).

Ground Cover: Teucrium scorodonia (Wood Sage), Ajuga reptans (Bugle), Veronica montana (Wood Speedwell), Luzula pilosa (Hairy Woodrush), Oxalis acetosella (Wood Sorrell), Stellaria holostea (Greater Stitchwort), Holcus mollis (Creeping Soft-Grass).

8.12 Traditional Orchards

8.12.1 Traditional orchards are a a Habitat of Principal Importance under Section 41 (S41) of the Natural Environment and Rural Communities (NERC) Act 2006. They are defined for priority habitat purposes as orchards managed in a low intensity way, in contrast with orchards managed intensively for fruit production. Traditional orchards are proposed in areas to the north of the onshore substations (Landscape and Ecology Masterplan, Section 8.16).

8.12.2 Traditional orchards are an historic feature of the Essex landscape. East of England Apples and Orchards Project (EEAOP) is a registered charity that promotes the preservation and creation of traditional orchards and local varieties grown by EEAOP that are unique to the local area, are being proposed for planting in the traditional orchard area.

8.12.3 The design guide specifies areas of traditional orchard for the following key benefits provided:

- Priority habitat with greater return on biodiversity provided to the site.
- The range of available tree varieties are adaptable to the constraints on the areas of the site to the north of the onshore substations (dwarf varieties can be planted underneath overhead cables and shallow-rooted varieties being planted above buried cables).
- Ability for habitat to establish more quickly than wood-pasture or parkland due to the shorter lifespan of proposed tree species.

8.12.4 Fruit trees will be planted as half standard rootstocks between 3 and 4.6m in height. A traditional Quincunx pattern will be used, with trees spaced on a 10m grid with an additional tree planted in the centre of each square. The additional tree will be a faster growing pollinator tree which will bring the fruit trees on, enable pollination to set the fruit, add to the overall density of the traditional orchard and eventually removed once the other trees become well established.

8.12.5 The traditional orchard will be underplanted with a species rich neutral grassland. Trees are best planted in early spring and watered regularly over the first three weeks. They will need to be staked and guarded with a1m radius around the base of the fruit trees kept mown to reduce competition during the first three years of establishment. The intention is that the fruit form the trees will provide an important food source for local wildlife.

"Traditional orchards are structurally and ecologically similar to wood-pasture and parkland, with open-grown trees set in herbaceous vegetation.. Traditional orchards are defined for priority habitat purposes as orchards managed in a low intensity way, in contrast with orchards managed intensively for fruit production"- Joint Nature Conservation Committee

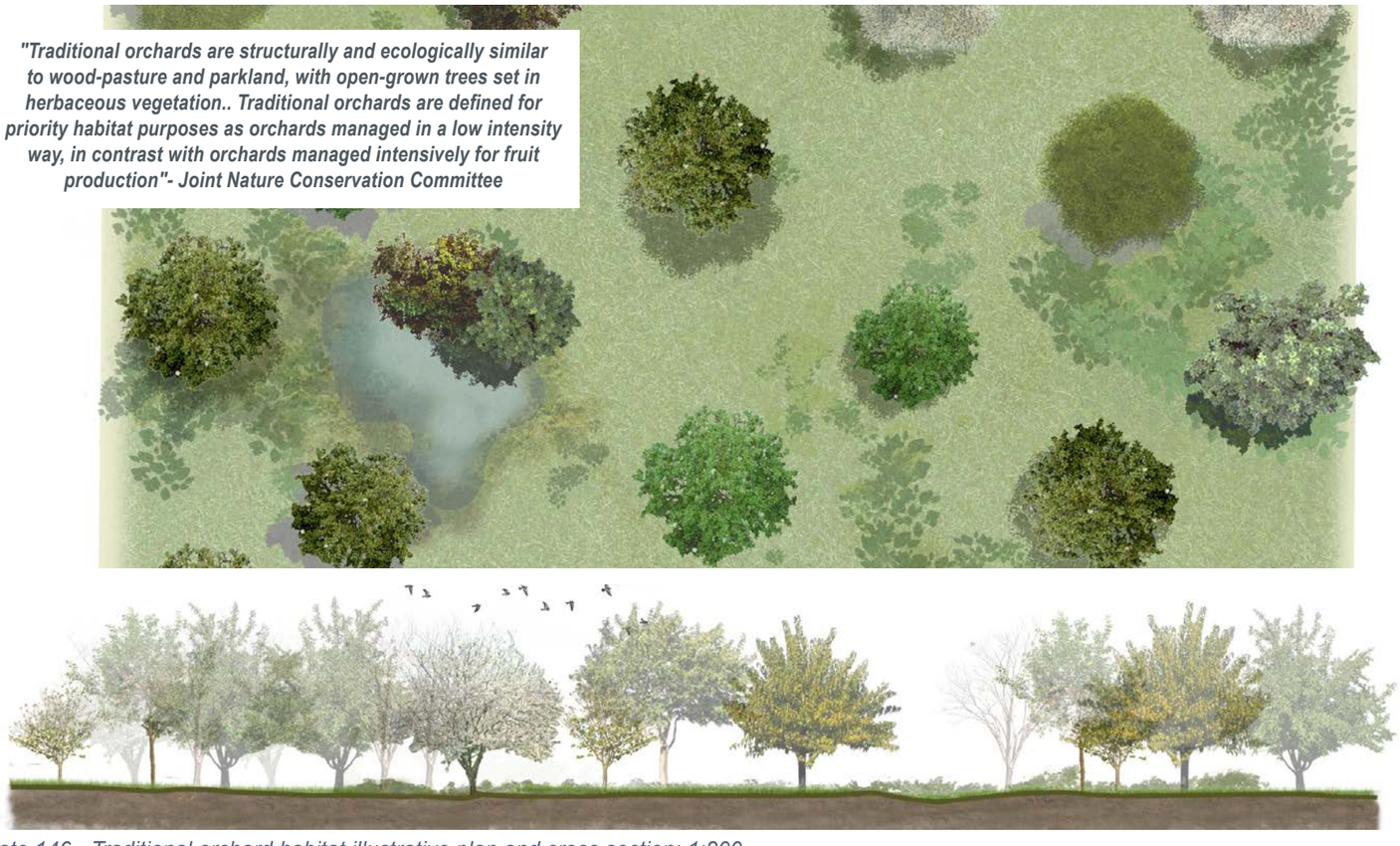


Plate 146 - Traditional orchard habitat illustrative plan and cross section; 1:200

Proposed Species

8.12.6 Proposed species for Traditional Orchards should be carefully selected (see Planting Procurement and Implementation Box) and informed by the following sources:

- Essex Tree Palette (Essex County Council, 2018)
- Essex Design Guide (Essex County Council, 2018)
- East of England Apples and Orchards Project (EEAOP)

8.12.7 The final species list will be agreed with the discharging authority as part of the respective LEMP/ EMP/WLS for each project.

A guide to the potential species anticipated to form this habitat typology are set out as follows:

Fruit Trees: Traditional Apple Trees – Nolan's Pippin and Stanway Seedling. Traditional Pear Trees – Gansel's Bergamot and Johnny Mount Pear. Traditional Plum Tree – Burrell's Red Myrobalan.Coppice Trees: Corylus avellana (Hazel), Carpinus betulus (Hornbeam), Castanea Sativa (Sweet Chestnut).

Species-Rich Neutral Grassland: Centaurea nigra (common knapweed), Leucanthemum vulgare (ox-eye daisy), Lotus corniculatus (bird's-foot trefoil), Galium verum (lady's bedstraw), Rumex acetosa (common sorrel), Lathyrus pratensis (yellow meadow).

8.13 Scrub and Grassland

8.13.1 The Landscape and Ecological Design includes large areas of grassland with smaller patches of scrub. Whilst the soil type across the site does not vary much from a slightly acid loam, there is scope for variability in response to water levels in proximity to ponds and ditches, degree of shading from buildings and other vegetation and depth of soil. Therefore grassland that experiences shade will be sown with a woodland edge or hedge mixture of grasses, parts of the site will be sown with tussocky mixtures, and most parts sown with a mix that broadly accords with NVC community MG5 Cynosurus cristatus - Centaurea nigra grassland - which could be from a green hay cut on a nearby site, or seed gathered from existing meadows. Patches of scrub interspersed across the grassland, will provide additional habitat and food sources but will need to be managed to prevent succession.

8.13.2 The management regime will also vary depending on the locations and grassland type: the bulk being subject to a haycut and either removed from site or a proportion retained as compost heaps for use by sheltering reptile and mammal species. Margins and portions will be left intentionally unmanaged for 2 to 3 years, with the exception of the removal of invasive species or encroaching scrub – this will provide shelter and overwintering for a range of animals on site.

8.13.3 A range of proposed species mixes should be sown in appropriate locations based upon further examination of the site conditions at later stages in the design process. These mixes could include:

- Lowland Meadow Grasses
- Grassland herbs
- Tussocky Grassland
- Shady Grassland
- Scrub

8.13.4 Their terminology refers to ecologically recognized terms rather than s41 habitat typologies, and are not prescriptive for the final design, as other mixtures could be chosen to achieve the same design intention. Species should be selected to intentionally promote species diversity (in structure, height, supported habitat, etc.) and climate resiliency across a variety of possible grassland types.

Plate 147 - Grassland and scrub habitat illustrative plan and cross section

Proposed Species

8.13.5 Proposed species for scrub and grassland should be carefully selected (see Planting Procurement and Implementation Box) and informed by the following sources:

- Essex Tree Palette (Essex County Council, 2018)
- Essex Design Guide (Essex County Council, 2018)

8.13.6 The final species list will be agreed with the discharging authority as part of the respective LEMP/EMP/WLS for each project.

A guide to the potential species anticipated to form this habitat typology are set out as follows:

Lowland Meadow Grasses: Centaurea nigra (common knapweed), Leucanthemum vulgare (ox-eye daisy), Lotus corniculatus (bird's-foot trefoil), Galium verum (lady's bedstraw), Rumex acetosa (common sorrel), Lathyrus pratensis (yellow meadow vetchling), Ranunculus acris (meadow buttercup), Plantago lanceolata (ribwort plantain), Primula veris (cowslip), Hypochaeris radicata.

Grassland herbs: Cynosurus cristatus (crested dog's-tail), Briza media (quaking grass), Anthoxanthum odoratum (sweet vernal grass), Trisetum flavescens (yellow oat-grass), Festuca rubra (red fescue), Agrostis capillaris.

Tussocky Grassland: Agrostis capillaris (Common Bent), Alopecurus pratensis (Meadow Foxtail), Carex divulsa ssp divulsa (Grey Sedge), Cynosurus cristatus (Crested Dogstail), Dactylis glomerata (Cocksfoot), Festuca ovina (Sheep's-fescue), Festuca rubra ssp rubra (Slender-creeping Red Fescue), Phleum bertolonii (Smaller Cat's-tail), Schedonorus arundinaceus (Tall Fescue).

Shady Grassland: Agrostis capillaris (Common Bent), Anthoxanthum odoratum (Sweet Vernal-grass), Brachypodium sylvaticum (False Brome), Cynosurus cristatus (Crested Dogstail), Deschampsia cespitosa (Tufted Hair-grass), Festuca rubra (Red Fescue), Poa nemoralis (Wood Meadow-grass), Alliaria petiolata (Garlic Mustard), Arctium minus (Lesser Burdock), Centaurea nigra (Common Knapweed), Dipsacus fullonum (Wild Teasel), Galium album (Hedge Bedstraw), Lathyrus sylvestris (Narrow-leaved Everlasting-pea), Leucanthemum vulgare (Moon Daisy), Malva moschata (Musk Mallow), Silene dioica (Red Campion).

Scrub: Crateagus monogyna (Hawthorn), Prunus spinosa (Blackthorn), Rubus fruticosus (Brambles), Ulex europaeus (Gorse), Viburnum opulus (Guelder-rose), Rosa canina (Dog rose).

8.14 Wetlands

Wetlands and SuDs

8.14.1 There are two types of ponds proposed for the site; SuDS ponds, which will provide water management and wildlife habitat; and wetland area ponds, which will provide wildlife habitat. The SuDS ponds will be located to the south of the Five Estuaries substation and although they will be designed to regulate water levels across the site, will also be designed to maximise biodiversity. This will be achieved through creating a wide draw down at the shallow ends, albeit with greater potential depths across the ponds to enable attenuation during storm events.

8.14.2 Meanwhile, the wetland area ponds should employ the following design principals to create a successful pond complex:

- Generally be shallower
- Support a mix of larger and smaller ponds (including scrapes and puddles)
- Include both permanent and temporary pools
- Aim for a preferred slope of 1:20, with a maximum of 1:5; design for varying depths
- Support scalloped edges and embayments

8.14.3 All of these elements help to create a readily habitable pond and provide a variety of conditions for wildlife

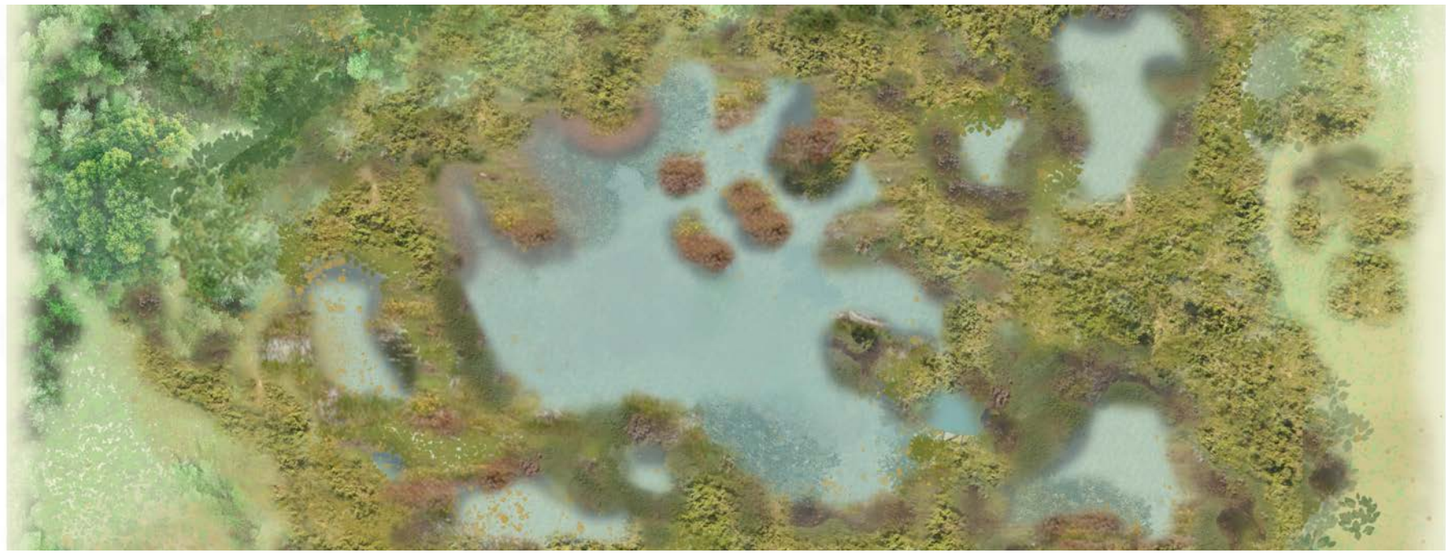


Plate 148 - Wetland habitat illustrative plan and cross section; 1:200

8.14.4 Important aspects of SuDS pond management will include management of water levels, vegetation, trees and silt to ensure the ponds are able to perform their water management function. The wetland area ponds will largely be self-managing with a fluctuation in water levels and the seasonal drying out of smaller ponds forming an important aspect of the natural water system to which species have adapted. Similarly, if ponds silt up then future management may look to create new ponds rather than excavating existing ponds. Management may be needed to address non-native, invasive species or dense tree growth leading to reduced light levels/ reducing biodiversity.

8.14.5 Despite summer dryness, the site being winter-wet indicates that areas will be suitable for establishing wetland areas. Permanent standing water is not essential - temporary pools, scrapes, and wetted areas can support wetland habitat. Wetlands should be located anywhere on-site where surface or high groundwater can be retained, with placement guided by a detailed water management plan (see Sections 4 and 5 for further information on anticipated drainage information and strategy) Wetlands can exist even with water at or just below the surface.

8.14.6 Wetland areas are currently shown indicatively in the Landscape and Ecology Masterplan (Section 8.16-8.19). These will be refined once more detail on the ground conditions is known, to understand the potential volumes and details of the potential water retention. The intention is for all ecological wetland features to be unlined. Given the rarity of this habitat type in Essex, its creation would be ecologically valuable.

Proposed Species

8.14.7 Planting up of ponds with locally appropriate species is not initially proposed, as wetland habitats typically vegetate naturally within a relatively short period of time; this also represents the most bio secure method, minimising the risk of importing non-native species or disease. The final species list will be agreed with the discharging authority as part of the respective LEMP/ EMP/WLS for each project.

8.15 Microhabitats

8.15.1 Microhabitats are localised areas that offer specific conditions favourable for particular species. They can range in size from a patch of moss to a hedgerow and vary in soil type, moisture, light, and vegetation, supporting insects, birds, amphibians, and mammals. Because each species has unique habitat needs, creating a diversity of microhabitats helps build a richer, more resilient ecosystem. This design guide landscape masterplan proposes the inclusion of microhabitats in appropriate locations across the habitat mosaic, with indicative locations shown in the Landscape and Ecology Masterplan in Section 8.16 (General Arrangement) and 8.18 (Illustrative).

Protected and Notable Species: Special Considerations

8.15.2 The landscape and ecology masterplan (Section 8.16-8.19) aims to expand upon the measures and commitments addressing potential impacts on protected and notable species set forth in the North Falls OLEMS (Section 2.2.3) and the Five Estuaries OLEMP (Section 7) in regard to local species habitats and protection. The described microhabitats will provide a variety of additional habitat support for the key species described. As described in these documents, the aim is to minimise impacts to ground-nesting birds, providing some provision for grey partridge and nesting skylark by incorporating hedgerows and tree planting, alongside low banks with dense grassy cover for nesting, and areas of semi-improved grassland to support chick-rearing.

8.15.3 Additional food sources will be available through provisional habitats supporting invertebrate species, and the establishment of wetland habitats will be helpful for species utilizing mud in their nesting. For further measures and commitments addressing potential impacts on protected and notable species, please refer to Five Estuaries OLEMP (Section 7) and North Falls OLEMS (Section 2.2.3).

Log Piles

Many woodland species rely on dead wood. Even a small log pile can support fungi, insects, and provide refuge, hunting areas, and winter shelter for small mammals, reptiles, and amphibians.

Rock Piles

Rock piles create a range of conditions including stable temperature and humidity within their gaps, giving reptiles, amphibians, insects, and small mammals safe refuge. Sun warmed surfaces provide basking sites and hunting grounds. They work best near ponds, scrub, hedgerows, or log piles.

Hibernaculum

A hibernaculum is an underground chamber loosely filled with logs, branches, bricks, and stones, then covered with soil and planting. It provides reptiles and amphibians with warm, sheltered overwintering habitat.

Temporary Pools

Temporary pools are valuable declining habitats used by many species, including rare plants and insects adapted to periodic flooding and drying. Predator free conditions support tadpoles and aquatic insects, and they often provide drinking water for wildlife in arable landscapes.

Invertebrate Bank

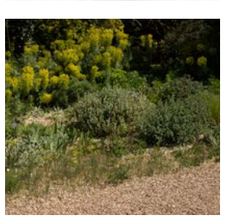
An invertebrate bank is a permanent grassy mound (about 0.4 m high, 3–5 m wide) seeded with tussocky and fine grasses plus flowers. It offers winter shelter for bees, beetles, and spiders, and benefits ground nesting birds and small mammals. Exposed earth faces can be incorporated.

Nest Boxes

Where natural habitats are lacking, bird and bat boxes provide essential nesting and roosting sites. Different box types can support barn owls, kestrels, passerines, and both summer and winter roosting bats.

Compost Heaps

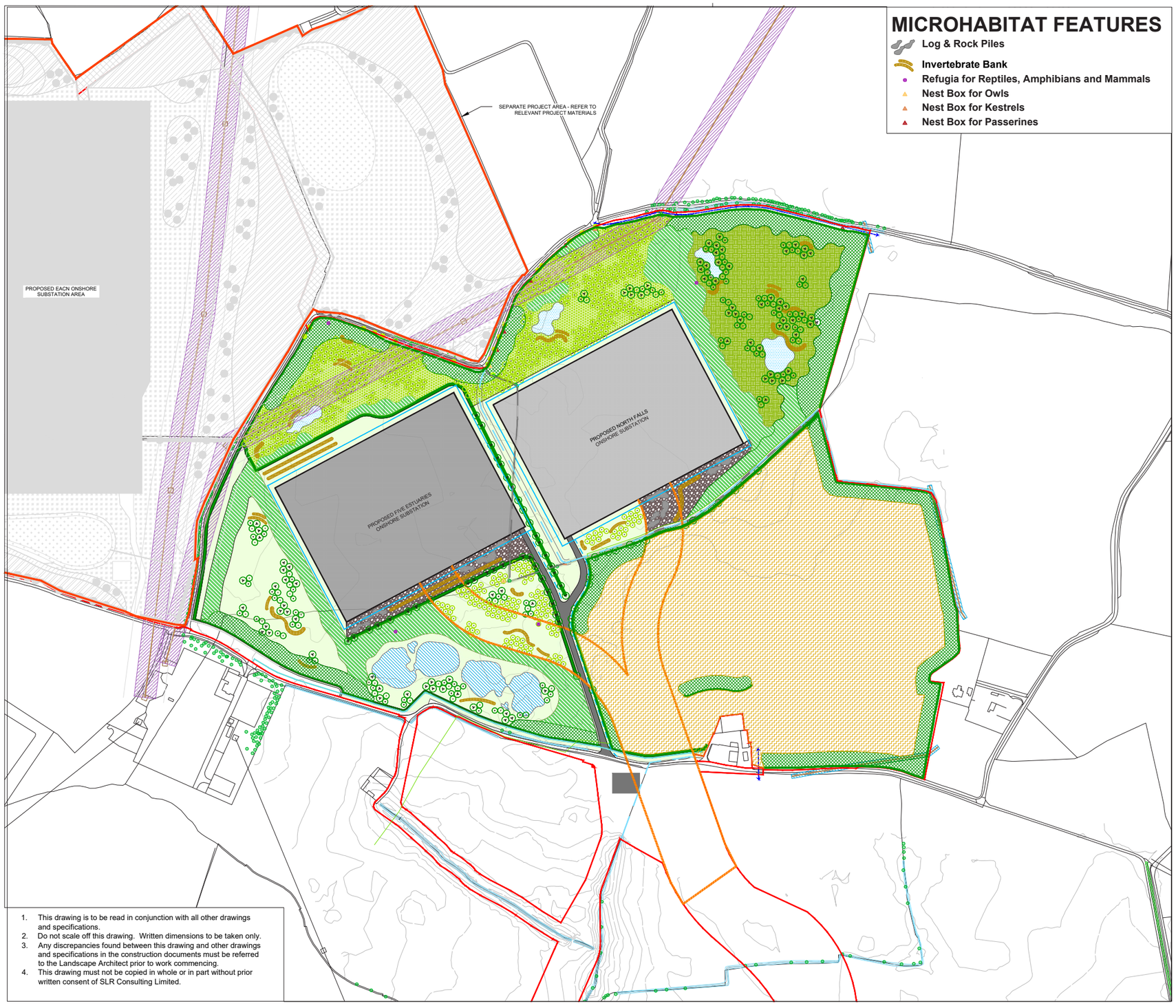
Compost heaps made from site generated organic debris (e.g., cut grass and hedgerow material) create warm, decomposing habitat used by fungi, insects, amphibians, reptiles, and small mammals, especially valuable during winter.



Exposed Earth Faces

Steep, vegetation free earth faces provide nesting habitat for miner bees, solitary wasps, and beetles. South facing slopes warm quickly, creating ideal conditions for these burrowing insects.

8.16 Landscape and Ecology Masterplan - General Arrangement



MICROHABITAT FEATURES

- Log & Rock Piles
- Invertebrate Bank
- Refugia for Reptiles, Amphibians and Mammals
- Nest Box for Owls
- Nest Box for Kestrels
- Nest Box for Passerines

HARD LANDSCAPE

- Onshore Order Limits
- Onshore Substation Operational Boundary
- Onshore Substation (OnSS, Developed Land: Sealed Surface)
- Onshore Substation (OnSS, Artificial Unvegetated: Unsealed Surface)
- Indicative Substation Access Route
- Existing Overhead Line
- Overhead Line Easement (30m to be maintained clear of tall planting)
- Overhead Line Easement (6m to be maintained clear of tall planting)
- Cable Route Requirement for Construction

SOFT LANDSCAPE

- Existing Trees To Be Retained
- Locally Native Broadleaved Woodland
- Woodland Shelterbelts
- Traditional Orchard w/ Species-Rich Grassland
- Traditional Orchard Trees (Planted in traditional Quincunx pattern on 10m grid with additional central tree)
- Copse (Indicative Groupings)
- Species-Rich Neutral Grassland
- Lowland Meadow Grasslands
- Dry Stony Area For Invertebrates (with Species-Rich Grassland)
- Agricultural Use
- Species Rich Native Hedgerow
- Species Rich Native Hedgerow with Trees
- Wetland Area (Grassland)
- SUDs/Pond
- Existing Ditch To Be Filled
- Existing Ditch To Remain
- Indicative Ditch Diversion
- Indicative Swale/Infiltration Ditch
- Indicative Private Water Pipe Location
- Indicative Farm Access Routes
- EACN Indicative Landscape Boundary

1. This drawing is to be read in conjunction with all other drawings and specifications.
2. Do not scale off this drawing. Written dimensions to be taken only.
3. Any discrepancies found between this drawing and other drawings and specifications in the construction documents must be referred to the Landscape Architect prior to work commencing.
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Client
Five Estuaries Offshore Wind Farm Ltd.
North Falls Offshore Wind Farm Ltd.

Project
Five Estuaries Offshore Wind Farm Ltd.
North Falls Offshore Wind Farm Ltd.

Drawing Title
Design Guide Landscape and Ecology Masterplan

50m 100m 150m 200m 250m

Scale:	**1:5000@A3**	Date:	**DEC 2025**
By:	**SB**	Status:	**INFORMATION**
Checked:	**SM**	Approved:	**XX**

Drawing Number	Rev
201463_SLR_Design Guide Landscape and Ecology Masterplan	**03**

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8.17 Landscape and Ecology Masterplan - Integration with Future Projects

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HARD LANDSCAPE

- Onshore Order Limits
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- Onshore Substation (OnSS, Developed Land: Sealed Surface)
- Onshore Substation (OnSS, Artificial Unvegetated: Unsealed Surface)
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- Existing Overhead Line
- Overhead Line Easement (30m to be maintained clear of tall planting)
- Overhead Line Easement (6m to be maintained clear of tall planting)
- Cable Route Requirement for Construction

SOFT LANDSCAPE

- Existing Trees To Be Retained
- Locally Native Broadleaved Woodland
- Woodland Shelterbelts
- Traditional Orchard w/ Species-Rich Grassland
- Traditional Orchard Trees (Planted in traditional Quincunx pattern on 10m grid with additional central tree)
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North Falls Offshore Wind Farm Ltd.

Project
Five Estuaries Offshore Wind Farm Ltd.
North Falls Offshore Wind Farm Ltd.

Drawing Title
Design Guide Landscape and Ecology Masterplan & EACN Indicative Design

50m 100m 150m 200m 250m

Scale:	**1:5000@A3**	Date:	**DEC 2025**
By:	**SB**	Status:	**INFORMATION**
Checked:	**SM**	Approved:	**XX**

Drawing Number	Rev
201463_SLR_Design Guide LEMP EACN	**00**

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8.18 Landscape and Ecology Masterplan - Illustrative

8.19 Landscape and Ecology Masterplan - Illustrative Integration with Future Projects

9: Engagement

9 Engagement

9.1 General approach to Engagement

9.1.1 The production of the Design Guide will be an iterative process, informed by input from internal Design Champions, an independent design review panel (Essex Quality Review Panel) and feedback provided by:

- Representatives from Essex County Council, who will be responsible for approving the detailed proposals for the OnSSs;
- Representatives from Tendring District Council;
- Parish Councils intersecting the proposed co-located onshore substations: Ardleigh, Lawford, Little Bromley, Great Bromley;
- Landowners intersecting the proposed co-located onshore substations;
- Local residents; and
- Other interested parties within the parishes intersecting the proposed co-located onshore substations.

9.1.2 The role of the Independent Design Panel is defined in the Overarching National Policy Statement for Energy, EN-1 (2024);

- *'Applicants should also consider taking independent professional advice on the design. In particular, the Design Council can be asked to provide design review for NSIPs'.*

9.1.3 This role has been undertaken by the Essex Quality Review Panel (EQRP). The EQRP were established by the Essex Planning Officers Association in partnership with Place Services to ensure the delivery and promotion of high quality new developments through the creation of good design, sustainability and improved quality, creating better places and environments to work and live in the County.

9.2 Approach

Internal Design Champion

9.2.1 In 2018, the NIC's first National Infrastructure Assessment recommended the creation of the Design Champion role. NFOWF and VEOWF have appointed RWE's Head of Electrical, Control and Instrumentation, who has over 17 years of substation development and construction experience across multiple offshore wind farms. The Design Champion will oversee the internal design review process, retaining overarching responsibility for design quality, assisted by an internal design review team

Stakeholder Engagement

9.2.2 VEOWF and NFOWF are engaging with the local authorities, Parish Councils, landowners and communities that intersect and immediately neighbour the projects' proposed substation sites. Early engagement in the process allows adequate time to respond to the information. The engagement programme has been designed with this in mind while adhering to safety and technical constraints.

9.2.3 Through the engagement, as well as providing clear information on what aspects of the substations' designs are open to further influence, the following will also be set out:

- The purpose of the Design Guide;
- What has informed it to date; and
- What is not open to influence and why, for example due to safety and technical constraints.

9.2.4 It is noted that this is highly focused engagement on key aspects of a single document. It is not a further round of public consultation. This engagement follows over six years of project development, including three and four rounds of public consultation for Five Estuaries and North Falls, respectively.

Initial Briefing (2025)	
June	Online Parish Council and district councillor briefing session hosted by North Falls and Five Estuaries offshore wind farms, in collaboration with representatives from Essex County Council and Tendring District Council to introduce the Design Guide, engagement approach and how we would like them to engage in the process.
	Landowner letters issued introducing the design guide and upcoming engagement with offer of a briefing facilitated by the projects' appointed land agent, Dalcour Maclaren.
Phase 1 of Engagement (2025)	
18th August	Design Guide first draft issued, triggering start of a six-week engagement period. Landowner briefings to take place facilitated by the projects' appointed land agent, Dalcour Maclaren.
2nd September	Drop-in public information day at Lawford Venture Centre
29th September	Six-week review period on Design Guide first draft concludes.
Phase 2 of Engagement (2026)	
3rd February	Design Guide second draft issued, triggering the start of a six-week engagement period. Online Parish Council and district councillor briefing session to outline the updates made to the Design Guide and what we are looking for feedback on
17th March	Six-week review period on Design Guide second draft concludes.
Publication of Joint Design Guide (2026)	
April / May	Final Joint Design Guide is published.

Plate 149 - Design Guide engagement and review timetable

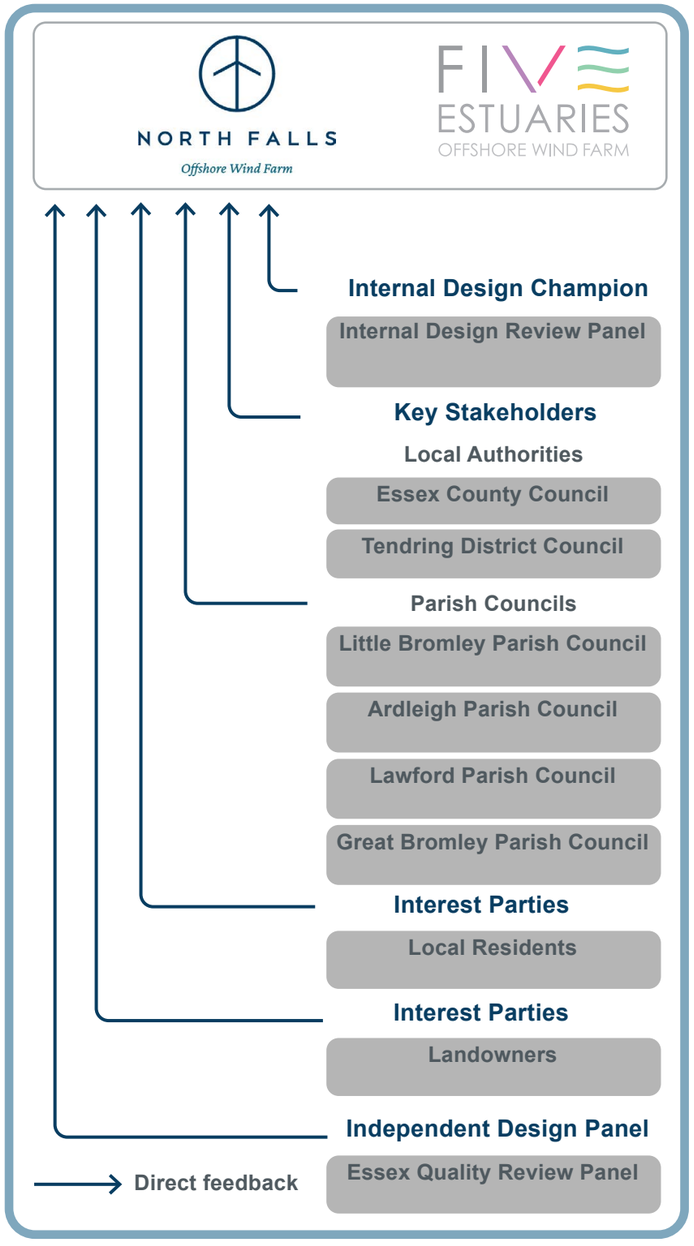

Plate 150 - JDG feedback process

Independent Design Review Panel

9.2.5 The Essex Quality Review Panel (EQRP) were appointed by VEOWF and NFOWF in May 2025. Two independent design reviews have now taken place.

9.3 Timetable and Feedback Process

9.4 The engagement timetable is outlined in Plate 150.

9.4.1 During this process, feedback from Essex County Council, Tendring District Council, the Parish Councils, interested residents and landowners is submitted to North Falls and Five Estuaries directly for consideration.

9.4.2 Local residents are able to submit their feedback directly to VEOWF and NFOWF through the usual channels. Where possible and if appropriate, Parish Councils are also be encouraged to act as a conduit for feedback from their respective communities and can play a role in collating and consolidating opinion on the contents of the Design Guide.

9.4.3 Landowners can also submit their feedback directly to VEOWF and NFOWF.

9.4.4 Feedback received is added to this Section after each phase of engagement and agreed actions are noted.

9.5 Essex Design Review Panel #1

9.5.1 The first design review was undertaken in early July 2025. The review comprised a site visit, including stopping at key viewpoints, adjoining roads and PRoW. A subsequent Q&A and discussion session was held at a local venue.

9.5.2 The independent design review panel comprised the following disciplines:

- Landscape architects;
- Heritage specialist;
- Ecologist;
- Transport planner;
- Sustainability;
- Urban Design; and
- Essex County Council officers were also in attendance.

9.5.3 Feedback from the first review was received in August 2025. In summary:

- More detailed information was requested on the heritage context of the wider setting, to assess the implications for the detailed design;
- Greater detail on flood risk was requested, including the implications for surface water drainage;
- Concerns were raised about the viability of certain proposed habitats and the potential impact from farming activities;
- There were suggestions to open up some of the site for public access and/or recreational use, such as the orchard;
- The need to explore further sustainable design options was emphasised; and
- The design team were urged to be bolder with the OnSS colour and form, with precedents suggested from London and the UK.

9.6 Internal Design Review Panel

9.7 Internal reviews were undertaken in August, September and December 2025. The findings of theses reviews, such as clarifications on technical design, have been fed back to the JDG team, with amendments completed prior to wider issue.

Plate 151 - EQRP site visit, July 2025. Source: LUC.

Plate 152 - Drop-in public information day at Lawford Venture Centre., September 2025. Source: SLR

Plate 153 - Drop-in public information day at Lawford Venture Centre., September 2025. Source: SLR

Plate 154 - Drop-in public information day at Lawford Venture Centre., September 2025. Source: SLR

9.8 Phase 1 of Engagement: 18 August to 29 September

9.8.1 During the Phase 1 engagement period, feedback was received from the following parties:

- Essex Design Review Panel;
- Internal Design Review Panel;
- Key Stakeholders (Essex County Council, Tendring District Council, Ardleigh Parish Council, Great Bromley Parish Council and National Grid Electricity Transmission);
- Local Community; and
- Landowners.

Essex County Council

9.8.2 A detailed response was received from Essex County Council (Planning, Landscape, Heritage and PRoW departments). This included suggestions on the restructuring of the document and comments highlighting where compliance with the requirements of the DCO's and design principles outlined at Examination should be demonstrated.

9.8.3 Responses to key aspects of the JDG are summarised below:

- Further clarification required regarding the requirements of the individual DCOs (inclusion of DCO documents, plans, summary of mitigation measures) and clear identification within the JDG of the measures and mechanisms proposed to achieve these requirements at the different stages of the design and build programme. Plans of the two DCO areas were requested;
- Request for further information on the next phases of design; an updated programme, timescales for key design decision, clarification of the clarification of the detailed design process, including mechanisms for further engagement with the design contractor;
- Request for details of indicative construction phasing and a summary of how this will affect the delivery of landscape and ecological mitigation;
- Emphasis on the importance of additional planting along Barn Lane, to screen views of the substation for receptors using local PRoWs;
- Request for further details on drainage; measures to mitigate any potential risk to surface water flooding, rainwater harvesting, ponds and ditches;
- Request for further details on boundaries to clarify standoff distances, habitats requiring protection and other areas where greater public access could be supported, proposed colour palettes etc;
- Support for a potential reduction in compound size, to facilitate additional planting (south, west & east);
- Support for the reduction of external lighting to the absolute minimum level necessary and incorporation of measures to protect local wildlife and tranquillity;
- Request for clarification of the scope for the inclusion of sustainable measures, such as green roofs, PV panels, permeable surfaces etc;
- Request for updated cross sections through the site showing buffer planting, in line with those submitted at examination;
- Support the use of colour palettes originating from local architectural references. Visual Integration and Transition were considered the most suitable colour palettes. Care should be taken in the application of colour to ensure it reflects natural patterns; and
- Request further consideration of the planting types, particularly the shelterbelt detail, the proposed orchards and hedges. Reference to the Local Nature Recovery Strategy was encouraged.

Tendring District Council

9.8.4 Detailed feedback was received from Tendring District Council planning department. The response stressed the need for a less fragmented approach to the planning of the various substations proposed within Tendring, suggesting that their design language, environmental strategies and community interfaces should be harmonised to achieve cohesive ecological and landscape corridors.

9.8.5 The need for the projects to respond to the climate emergency and local climate resilience was emphasised, with suggested inclusion of sustainable design features (green roofs, PVs, living walls) and inspired landscape design.

9.8.6 Collaboration with local landowners was urged to address concerns about access, overshading and other impacts on crop yield.

Responses to key aspects of the JDG are summarised below:

- Support for a potential reduction in compound width, to limit visual intrusion and preserve the open character of the landscape;
- Support for a built form that reflects the character and appearance of local agricultural structures, rather than wider architectural precedents;
- Support for the use of materials that enable buildings to blend seamlessly with the rural landscape, such as considered steel-frame buildings with appropriately coloured metal cladding;
- Support for the use of the 'Landscape Subtle' colour palette;
- Acknowledgement that fencing is a critical part of the substation compounds. The location of any fencing should be positioned to ensure that the developers can maintain planting without any reliance on third-party land and maintain access to drainage ditches;
- The need to allow movement of wildlife through the site was emphasised, along with the use of appropriate rabbit-proof fencing;
- Support for the use of timber post and rail fencing for the perimeter of the site;
- Support for the use of a diverse mix of native species, with emphasis on species resilient to heat, drought, which encourage wildlife and are low-maintenance; and
- Comments on recreation usage (walking, cycling, horse riding) emphasised that any loss of amenity or recreational value should be offset by new or enhanced provision, to reflect local needs and aspirations. This should be developed collaboratively with the community and local authorities to deliver meaningful improvements.

Ardleigh Parish Council

9.8.7 The feedback from Ardleigh Parish Council is summarised below:

- Support for a potential reduction in compound width, allowing widened edge planting to the south-east;
- Concern about the impact of the site on quiet, dark nights;
- Concern regarding the feasibility of attenuation ponds within a low rainfall area;
- Support for a low-profile building, 'as invisible as possible';
- Support for sustainable features, such as a green roof and rainwater harvesting;
- Concern regarding the use of Colchester examples within the Environmental Colour Assessment and the 'Accents' palette; 'use the best colours to make the construction disappear';

Plate 155 - Support for low profile built form. Source: LUC.

Plate 156 - Support for safe movement for wildlife. Source: LUC.

Plate 157 - Support for enhanced recreational usage. Source: LUC.

- Concern regarding the appearance of the security fencing, 'not in keeping with the surroundings';
- Preference for a low-level, timber post and rail perimeter boundary;
- Support for the use of native planting;
- Advice to liaise with Essex Wildlife Trust and Essex Local Nature Recovery Teams to establish the most appropriate approach to enhance biodiversity; and
- Concern regarding the fire safety of the site and potential reliance on limited local fire services.

Great Bromley Parish Council

9.8.8 Feedback from Great Bromley was concise and focused on the key points raised in the consultation questionnaire. These are summarised below:

- Support for a potential reduction in compound width, allowing widened edge planting to the south-east;
- Support for a building design which reflects local agricultural structures, such as steel-framed buildings with metal cladding;
- Support for the use of colour palettes that allow the development to blend as closely as possible with the surrounding environment, guided by neighbouring agricultural barns. Visual integration was identified as the preferred approach;
- Further details were requested about the feasibility of photovoltaic panels;
- Support for the use of drought-tolerant, mixed native species within planting schemes. The use of mature specimens as advanced planting was also noted;
- Concern was raised regarding a potential increase in the local rabbit population, with support for the use of rabbit-proof fencing;
- The requirement for North Falls and Five Estuaries to assume full and ongoing responsibility for all fencing and landscape maintenance was stressed. It was noted that fencing locations should provide access for landscape maintenance within North Falls and Five Estuaries land ownership;
- Concerns were expressed regarding the cumulative impacts on Ardleigh Road, arising from the two projects in conjunction with NGET. Comments focused on the increased risks to road users, need for visibility splays and adequate road signage; and
- Comments on recreation usage (walkers, cyclists, horse riders, runners, wheelchair users and families) reiterated the requirement for accessibility, stressing the need for safe, connected routes that are inclusive and accessible to all.

National Grid Electricity Transmission

9.8.9 The response from NGET focused on the coordination between the projects, identifying areas where this had already taken place, as well as areas for future development; such as the routeing of underground cables, drainage and planting zones.

Local Community

9.8.10 Nine responses were received from members of the local community (excluding landowners mentioned below). A desire for the substation to move to an alternative location was clearly expressed, along with concerns about the potential cumulative impacts in conjunction with the proposed NGET and Tarchon substations. Responses to key aspects of the JDG are summarised below:

- Residents welcomed a potential reduction in the overall area of the substation compound. The overall preference was for a widened edge to the southeast, which would allow increased screening planting to integrate the OnSS within its surroundings;
- Residents expressed a preference for sustainable substation buildings, 'to fit the rural landscape'. To achieve this, the following suggestions were made:
  - a.Buildings to be kept as low as possible;
  - b.Buildings to reflect local agricultural buildings (form and materiality);
  - c.Buildings to have pitched roofs;
  - d.Buildings to incorporate sustainable measures (green roof, solar panels, rainwater harvesting, environmentally-friendly materials), where possible; and
  - e.Use of the 'Visual Integration' or 'Transitional' colour palettes, using subtle tones already found within the landscape and nearby agricultural buildings. Use of the 'Accents' and 'Electricity' concepts was strongly opposed.
- Residents noted that the security fencing was 'ugly' and not in keeping with the surroundings; they also expressed a desire for fence colours that would echo the landscape (green or brown). No obvious preference emerged for the three options suggested for the site perimeter. Some expressed concern that site fences should be permeable to provide access for hedgehogs and other small mammals, whilst others advised the use of rabbit-proof fencing to protect adjacent farmland;
- The use of mixed, native species rather than non-indigenous stock was emphasised in responses. Whilst some responders condoned the use of evergreens ('foreign'), others expressed a wish for their inclusion, to provide screening during winter months. The use of mature planting stock, drought-resilient species and the timing of planting were all mentioned as a way to hasten screening of the site;
- Residents urged the need for sustainable and achievable habitat creation proposals, reinforced by a long-term maintenance regime and monitoring; and
- Residents provided informative responses regarding the recreational use of the local area; including dog walking, rambling, cycling, running (with specific events noted), horse riding and observing nature. The need to maintain the quiet and tranquil character of PRoW and country lanes was emphasised, along with the need to provide accessible routes into the open countryside for all ages. The functional requirements of the landscape as a home for flora and fauna was also stressed.

Landowners

- The responses received from landowners displayed commonality in the issues raised. Key concerns were the maintenance of proposed planting adjoining agricultural land, the potential increase in population of agricultural pests (rabbits), overshading of crops by shelterbelts, the requirement for safe access and egress from agricultural land for farm vehicles (visibility splays), and the provision of suitable easements for maintenance of irrigation systems and drainage ditches.
- Those landowners living in proximity to the OnSS site expressed a preference for the substation buildings to blend into the environment. This included requests for the built form to resemble local agricultural barns, with the use of steel frames and metal cladding. Preference was expressed for the use of 'an appropriate colour scheme', rather than vivid colourways such as the Electricity or Accents concepts.

9.9 Essex Design Review Panel #2

9.10 A second design review session was held online on the 4th November 2025. The session commenced with a recap of the feedback received following the first review, with the NFOWF and VEOWF teams outlining how comments had directly led to scheme changes. The second part of the presentation provided more detail on the design development.

9.11 Feedback was received in early December 2025. In summary:

- Embed the standards set by the National Infrastructure Commission and other national principles into the JDG;
- Include references to inspiring infrastructure precedents in architecture and landscape;
- Ensure substation palette and fencing use muted, soft tones and integrate with planting to maintain rural character;
- Simplify the site enclosure and explore whether the extent of fencing can be reduced. Develop a fencing strategy that includes temporary protection and eventual removal to maximise integration with planting;
- Minimise the visual impact of construction and permanent access points;
- Provide specific details on sustainability targets (e.g. embodied carbon, operational energy/water, end-of-life scenarios) and be clear as to why certain measures (green roofs, PV panels) cannot be incorporated;
- Set clear planting targets and strategies to establish larger, mature screening and habitat value as early as possible;
- Ensure that the detailed LEMPs include management of the different habitats, especially around water features, including frequency of cutbacks and creation of 'rides' (long narrow glades which open up the woodland to light);
- Integrate and promote public footpaths as part of the site's public benefits, exploring circular routes and healthy living links. Consult the community on potential footpath types, usage and connectivity to wider networks;
- Continue to engage proactively with EQRP and local community, integrating feedback into ongoing project development. Use engaging, accessible methods—visual aids, leaflets, provocations—to consult all demographic groups, not just self-selected respondents; and
- Present CGIs, 3D visuals, elevations, and sections to demonstrate integrated design.

9.12 Phase 2 of Engagement: 3rd February - 17th March 2026

9.12.1 The Phase 2 engagement process follows a similar process to Phase 1, with a six-week period identified in which to gather feedback.

9.12.2 Information will be shared to the local authorities, Parish Councils, landowners and the community via the established pathways. An online briefing will be held to outline the updated Design Guide, what has changed and identifying any specific areas for feedback.

9.12.3 Local authorities, parish councils and local residents who participated in the Phase 1 engagement stage will be invited to attend. The briefing is open to anyone who is interested and will be promoted through the parish councils. A detailed feedback form will be provided, although participants are welcome to submit their own responses.