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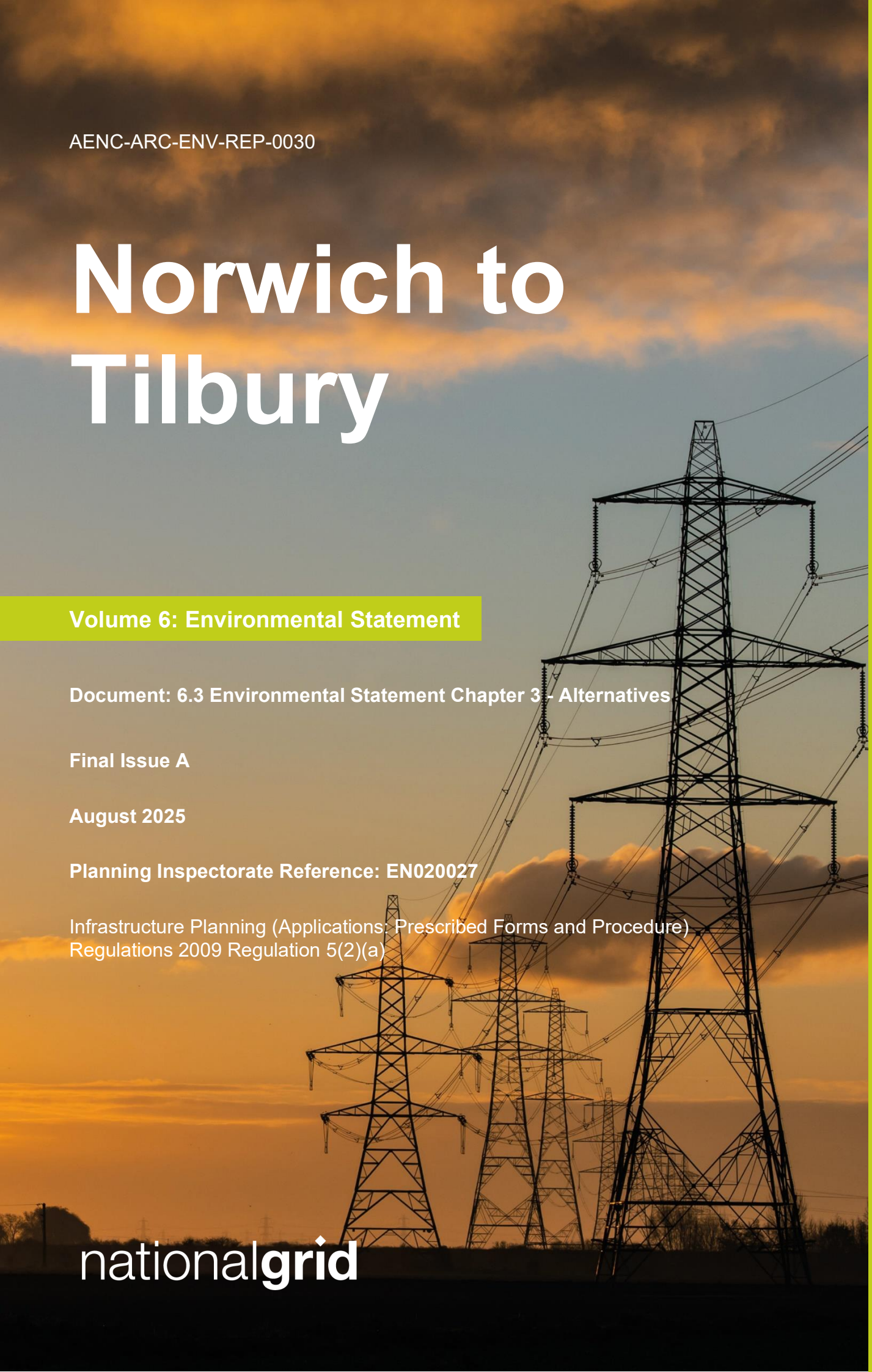

nationalgrid

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3. Alternatives

3.1 Introduction

3.1.1 This chapter forms part of the Environmental Statement (ES) (Volume 6 of the Development Consent Order (DCO) application) that has been prepared to accompany the application for Development Consent for Norwich to Tilbury (the 'Project').

3.1.2 This chapter documents the strategic options assessment that identified the Project as the preferred solution to meet the network reinforcement need, and the reasonable alternatives studied by National Grid Electricity Transmission Plc ('National Grid') during the subsequent design development of the Project. The chapter compares the environmental effects associated with these reasonable Project design alternatives.

3.1.3 Further detailed information relating to the development of the Project and alternatives studied can be found in the Design Development Report, National Grid 2025 (document reference 5.15).

3.1.4 Table 3.1 outlines the structure of this chapter.

Table 3.1 Chapter structure and alternatives considered

Chapter Section	Description of Contents
Section 3.1: Introduction	Introduces the scope, provides a summary of the relevant policy and outlines the structure of the chapter.
Section 3.2: Legal and Policy Background	Sets out the legal and policy requirements relevant to alternatives studied considered within the ES (Volume 6 of the DCO application).
Section 3.3: National Grid's Approach to Options Appraisal	Sets out the different steps within the options appraisal process that National Grid follows when developing its projects.
Section 3.4: Strategic Proposal	Describes the strategic options that were considered, the selection of preferred strategic option/Strategic Proposal in light of which the Project design was developed and the reasons as to why particular strategic options were taken forward or dismissed.
Section 3.5: Corridor Routeing and Substation Siting Alternatives	Describes the routeing activities and the selection of a preferred route corridor for the Project together with siting activities and the selection of a preferred locations for new substations.
Section 3.6: Cable Sealing End Compounds	Describes the alternative locations considered for Cable Sealing End (CSE) compounds proposed on the Project.

Chapter Section	Description of Contents
Section 3.7: Post Consultation Alignment and Siting Alternatives	Describes the refined alignment following non-statutory and statutory consultation.
Section 3.8: Alternative Construction Methods and Arrangements Considered	Describes and justifies alternative technologies selected for the alignment and alternative construction methods that have been considered.

3.1.5 This chapter is supported by the following Consultation Documents, published on the National Grid Norwich to Tilbury Website (https://www.nationalgrid.com/electricity-transmission/network-and-infrastructure/infrastructure-projects/norwich-to-tilbury/document-library):

- Corridor and Preliminary Routeing and Siting Study (CPRSS) (National Grid, 2022)
- Strategic Options Backcheck and Review (SOBR) (National Grid, 2023b)
- Design Development Report for the Project (DDR) (National Grid, 2023a)
- Strategic Options Backcheck and Review (National Grid, 2024b)
- Design Development Report for the Project (National Grid, 2024a)
- Strategic Options Backcheck and Review (document reference 7.17)
- Design Development Report for the Project (document reference 5.15).

3.1.6 The assessment of alternatives for the Project was undertaken as part of a structured project development process that integrated technical assessment with stakeholder engagement. The key stages and their relationship to alternatives assessment were:

- April 2022: Strategic Options Assessment (CPRSS) (National Grid, 2022) identifying preferred strategic proposal to meet the defined need and corridor options
- April-June 2022: Non-statutory consultation on preferred corridor options and graduated swathes for the Project (8 weeks)
- June 2023: Strategic Options Backcheck and Review (National Grid, 2023b) validating strategic approach
- June 2023: Design Development Report (National Grid, 2023a) documenting design refinements and reasonable alternatives considered following 2022 consultation feedback
- June-August 2023: Non-statutory consultation on 2023 preferred draft alignment with proposed infrastructure locations (8 weeks)
- April 2024: Updated Strategic Options Backcheck and Review (National Grid, 2024b) validating strategic approach
- April 2024: Design Development Report (National Grid, 2024a) documenting design refinements and reasonable alternatives considered following 2023 consultation feedback
- April-July 2024: Statutory consultation on 2024 preferred draft alignment with Preliminary Environmental Information Report (8 weeks)

- March 2025: Targeted statutory consultation on proposed changes to Tilbury connection arrangements
- July 2025: Report issued to report on the feedback received to the 2024 statutory consultation and to the targeted statutory and non-statutory consultations held in 2025.

3.1.7 This timeline demonstrates how the strategic work identified the Project and how alternatives assessment evolved through iterative design development of the Project, with each Project consultation document building upon previous assessments and incorporating stakeholder feedback while maintaining consistency with the validated wider strategic framework for the Project. The documents listed above provide the detailed technical evidence base that underpins the alternatives assessment presented in this chapter.

3.2 Legal and Policy Background

3.2.1 This section summarises the legal and policy framework governing the assessment of reasonable alternatives studied for the Project, including requirements under EIA Regulations and relevant National Policy Statements. It should be noted that while this chapter references the current 2024 versions of EN-1 and EN-5 (designated in November 2023 and coming into force in January 2024), some of the Strategic Options and Project Alternatives work was completed under the previous versions of these policy statements. It also addresses National Grid's statutory duties under the Electricity Act 1989, the industry-standard Holford Rules for overhead transmission line routeing and Horlock Rules for substation siting (both formally recognised in current policy guidance) and other policy considerations.

The EIA Regulations 2017

3.2.2 This assessment of alternatives studied in connection with the design development of the Project has been undertaken in accordance with Regulation 14(2)(d) and paragraph 2 of Schedule 4 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'Environmental Impact Assessment (EIA) Regulations'), which requires '*a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*'.

3.2.3 Further details on National Grid's duties under the Infrastructure Planning (Environmental Impact Assessment Regulations 2017) can be found in Chapter 2: Key Legislation and Planning Policy Context (document reference 6.2) and the Planning Statement (document reference 5.6).

The Electricity Act 1989

3.2.4 S9(2) of the Electricity Act 1989 places general duties on National Grid as a licence holder '*to* develop *and maintain an efficient, co-ordinated and economical system of electricity transmission…*'. In addition, s38 and Schedule 9 of the Electricity Act 1989 require National Grid, when formulating proposals for new lines and other works, to:

'…have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and shall do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects'.

3.2.5 Further details on the key planning context (including National Grid's duties under the Electricity Act 1989) can be found in Chapter 2: Key Legislation and Planning Policy Context (document reference 6.2) and the Planning Statement (document reference 5.6).

Countryside and Rights of Way Act 2000 (as amended by the Levelling Up and Regeneration Act 2023)

3.2.6 Areas of Outstanding Natural Beauty (rebranded as National Landscapes in November 2023) are designated under Section 82 of the Countryside and Rights of Way Act 2000 to secure their permanent protection against development that would damage their special qualities. In November 2023, following a review, all AONBs were renamed as 'National Landscapes', although the legal designation remains as AONBs.

3.2.7 National Grid, as a statutory undertaker, has a duty under Section 85 of the Countryside and Rights of Way Act 2000, as amended by Section 245 of the Levelling Up and Regeneration Act 2023, which states that *'In exercising or* performing *any functions in relation to, or so as to affect, land in an area of outstanding natural beauty a relevant authority other than a devolved Welsh authority must seek to further the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty'*. This amendment, which came into force on 26 December 2023, overrides and strengthens the previous duty to 'have regard' to the purposes of conserving and enhancing the natural beauty of an AONB.

3.2.8 The strengthened duty came into force in October 2023, after the Project had undertaken the CPRSS (National Grid, 2022) and two non-statutory consultations but in advance of the statutory consultation undertaken in 2024. Since the introduction of this strengthened duty, National Grid has considered how this duty applies to the Project's route selection and has concluded that the original decision to route through the Dedham Vale National Landscape (an AONB) using underground cable technology remains appropriate and consistent with the duty. This assessment is detailed in Section 3.6 and further information is provided in the Design Development Report (document reference 5.15).

National Policy Statements (NPS)

3.2.9 When preparing the CPRSS (National Grid, 2022), the routeing and siting decisions were informed by the then-current versions of National Policy Statements EN-1 and EN-5, which formed the primary regulatory framework for Nationally Significant Infrastructure Projects, alongside National Grid's statutory duties under the Electricity Act 1989. Section 9(2) of the Electricity Act 1989 places duties on National Grid to develop and maintain an efficient, co-ordinated and economical system of electricity transmission, while s38 and Schedule 9 require National Grid to have regard to preserving natural beauty, conserving flora, fauna and geological features of special interest, and protecting sites of architectural, historic or archaeological interest.

3.2.10 At that time, draft updates to these policies had been published for consultation in late 2021 but had not yet been adopted. The CPRSS (National Grid, 2022) acknowledged this evolving policy landscape while basing its analysis on the extant policy. Since then, these policy statements have been updated and formalized in the 2024 versions (EN-1 and EN-5) published by the Department for Energy Security and Net Zero, which now explicitly reference elements like the Horlock Rules that were previously not included. This chapter references these current policies, while acknowledging the policy context that informed earlier project development stages.

National Policy Statement for Energy (EN-1)

3.2.11 The National Policy Statement for Energy (EN-1) establishes the policy framework for considering alternatives in energy infrastructure applications. The key policy provisions on alternatives are set out in paragraphs 4.3.22 to 4.3.28, which state:

- Paragraph 4.3.22: '*Given the level and urgency of need for new energy infrastructure, the Secretary of State should, subject to any relevant legal requirements (e.g. under the Habitats Regulations) which indicate otherwise, be guided by the following principles when deciding what weight should be given to alternatives: the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner; only alternatives that can meet the objectives of the proposed development need to be considered.'*
- Paragraph 4.3.23: *'The Secretary of State should be guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security, climate change, and other environmental benefits) in the same timescale as the proposed development.'*
- Paragraph 4.3.24: '*The Secretary of State should not refuse an application for development on one site simply because fewer adverse impacts would result from developing similar infrastructure on another suitable site, and should have regard as appropriate to the possibility that all suitable sites for energy infrastructure of the type proposed may be needed for future proposals*.'
- Paragraph 4.3.25: '*Alternatives not among the main alternatives studied by the applicant (as reflected in the ES) should only be considered to the extent that the Secretary of State thinks they are both important and relevant to the decision.'*
- Paragraph 4.3.26: '*As the Secretary of State must assess an application in accordance with the relevant NPS (subject to the exceptions set out in section 104 of the Planning Act 2008), if the Secretary of State concludes that a decision to grant consent to a hypothetical alternative proposal would not be in accordance with the policies set out in the relevant NPS, the existence of that alternative is unlikely to be important and relevant to the Secretary of State's decision.'*
- Paragraph 4.3.27: '*Alternative proposals which mean the necessary development could not proceed, for example because the alternative proposals are not commercially viable or alternative proposals for sites would not be physically suitable, can be excluded on the grounds that they are not important and relevant to the Secretary of State's decision.'*
- Paragraph 4.3.28: '*Alternative proposals which are vague or immature can be excluded on the grounds that they are not important and relevant to the Secretary of State's decision.'*

3.2.12 This fits with the Project's approach of refining reasonable alternatives through detailed Design Development Reports, non-statutory consultation, and statutory consultation.

National Policy Statement for Electricity Works Infrastructure (EN-5)

3.2.13 The National Policy Statement for Electricity Works Infrastructure (EN-5) provides specific policy guidance on alternatives for overhead lines. The key policy provisions on alternatives are set out in paragraphs 2.9.7, 2.9.14-2.9.15, 2.9.20-2.9.25 and 2.10.12-2.10.13, which state:

General Approach to Overhead Lines:

- Paragraph 2.9.7: '*The government does not believe that the development of overhead lines is incompatible in principle with applicants' statutory duty under Schedule 9 to the Electricity Act 1989, to have regard to visual and landscape amenity and to reasonably mitigate possible impacts thereon. However, such overhead lines can give rise to adverse landscape and visual impacts.'.*

Assessment of Alternatives:

- Paragraph 2.9.14: *'Applicants should demonstrate that they have given due consideration to the costs and benefits of feasible alternatives to the overhead line. Such alternatives may include re-routeing, underground or subsea cables. The costs and benefits may include financial costs and benefits, engineering requirements, environmental effects, and the wider community benefits that may result from both the primary proposal and its alternatives. An appreciation of the feasibility e.g. in cost, engineering or environmental terms, of the alternatives should also be included.'*
- Paragraph 2.9.15: '*The ES should set out details of this consideration, including the applicant's rationale for eschewing feasible alternatives to the overhead line, and the mitigation cost-calculation methodology that this rationale may rely upon.'.*

Alternatives in Nationally Designated Landscapes:

- Paragraph 2.9.20: '*Although it is the government's position that overhead lines should be the strong starting presumption for electricity networks developments in general, this presumption is reversed when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Area of Outstanding Natural Beauty).'*
- Paragraph 2.9.21: '*Regardless of the option, the scheme through its design, delivery, and operation, should seek to further the statutory purposes of the designated landscape. These enhancements may go beyond the mitigation measures needed to minimise the adverse effects of the scheme.'*
- Paragraph 2.9.22: '*However, undergrounding will not be required where it is infeasible in engineering terms, or where the harm that it causes (see section 2.11.4) is not outweighed by its corresponding landscape, visual amenity, and natural beauty benefits.'*

- Paragraph 2.9.23: '*Additionally, cases will arise where – though no part of the proposed development crosses a designated landscape – high potential for widespread and significant adverse landscape and/or visual impacts along certain sections of its route may result in recommendations to use undergrounding for relevant segments of the line.'*
- Paragraph 2.9.24: '*In such circumstances, applicants should assess to what extent both the landscape impacts of undergrounding and corresponding benefits are likely to extend beyond the designated area.'*
- Paragraph 2.9.25: '*This assessment should consider the indirect and cumulative impacts of undergrounding, not only on the quality of the designated landscape, but also on biodiversity, cultural heritage, water resources, land use, and the local economy.'.*

Electric and Magnetic Fields (EMFs):

- Paragraph 2.10.12: '*Where it is shown that the levels of EMFs will be within the guidelines published by the International Commission on Non-Ionizing Radiation Protection, and therefore that the application complies with the policies set out in paragraphs 2.10.1 to 2.10.11 above, the Secretary of State should not need to consider further the health aspects of EMFs in relation to that proposed development.'*
- Paragraph 2.10.13: '*In such circumstances, re-routeing a proposed overhead line purely on the basis of EMF exposure or undergrounding a line solely to further reduce the level of EMF exposure are unlikely to be proportionate mitigation measures.'.*

3.2.14 This policy framework established by EN-1 and EN-5 guides the Project's assessment of reasonable alternatives for overhead line technology, routeing options, and undergrounding considerations, as documented through the Design Development Reports and consultation processes.

Holford Rules

3.2.15 Paragraph 2.9.16 of EN-5 recognises the importance of the guidelines provided in the Holford Rules. These guidelines, '*intended as a common-sense approach to overhead line design, were reviewed and updated by the industry in the 1990s and they should be embodied in the applicants' proposals for new overhead lines*', including avoiding, if possible, areas of highest amenity value or scientific interest. A summary of the Holford Rules and how these have been considered on the Project are included in Chapter 2: Key Legislation and Planning Policy Context (document reference 6.2) and the Planning Statement (document reference 5.6).

Horlock Rules

3.2.16 The Horlock Rules (guidelines for the design and siting of substations) were devised by National Grid in 2003 and updated in 2006 in pursuance of its duties under Schedule 9 of the Electricity Act 1989. Paragraph 2.9.18 of EN-5 refers to the Horlock Rules, setting out that, '*These principles should be embodied in applicants' proposals for the infrastructure associated with new overhead lines*', including considering environmental issues from the earliest stage to balance the technical benefits and capital cost requirements.

3.2.17 At the time of writing, the National Energy System Operator (NESO) is developing new Electricity Design Principles (ETDP). According to the draft revised EN-5 (2025), these principles will supplement rather than replace the existing Holford and Horlock Rules, with developers required to have regard to the ETDP "in addition to the Holford and Horlock rules" once published. The ETDP have not yet been published and therefore have not influenced the options appraisal process or the consideration of alternatives undertaken for the Project, which has been based on the established Holford and Horlock Rules frameworks as referenced in current policy.

3.2.18 A summary of the Horlock Rules and how these have been considered on the Project are included in Chapter 2: Key Legislation and Planning Policy Context (document reference 6.2) and the Planning Statement (document reference 5.6).

2025 Revisions to National Policy Statements

3.2.19 In April 2025, the government launched a consultation on proposed changes to EN-1 and EN-5 that ended on 29 May 2025. The consultation covers updates to:

- Draft: Overarching National Policy Statement for Energy (EN-1) (DESNZ, 2024a)
- Draft: National Policy Statement for Electricity Networks Infrastructure (EN-5) (DESNZ, 2024b).

3.2.20 Changes consulted upon in the draft 2025 updates to the energy infrastructure NPSs include alignment with Clean Power 2030 targets and endorsement of the Centralised Strategic Network Plan. The 2025 revisions have strengthened the process for delivering major new infrastructure, reinforcing the government's ambition to deliver clean power by 2030.

3.2.21 The transitional provisions on the status of the 2025 revisions say:

'While the review is undertaken, the current suite of energy NPS remain relevant government policy and EN-1 to EN05 have effect for the purposes of the Planning Act 2008. The Secretary of State has decided that for any application accepted for examination before amending the energy NPSs, the current suite of energy NPS, published in 2024, should have effect. The amended energy NPSs will therefore only have effect in relation to those applications for development consent accepted for examination after the publication of the final amended energy NPSs. However, any emerging draft energy NPSs (or those amended but not having effect) are potentially capable of being important and relevant considerations in the decision-making process. The extent to which they are relevant is a matter for the relevant Secretary of State to consider within the framework of the Planning Act 2008 and with regard to the specific circumstances of each development consent order application'.

3.2.22 At the point of submission of the Project, the NPSs designated in January 2024 were government policy.

3.2.23 If the revised NPSs are designated prior to a decision being made on the application for development consent, deliverables will be reviewed for consistency with the newly-designated NPSs, and any additional requirements would be captured within an errata document post submission. It was confirmed in Section 51 advice received from the Planning Inspectorate that if the new NPSs are adopted after the application has been submitted, the Examining Authority can issue procedural decisions to ask all parties for views on the impacts of new NPSs.

Other Considerations

3.2.24 Advice Note Seven: Environmental Impact Assessment (Planning Inspectorate, 2025) provides guidance on alternatives assessment that is consistent with EN-1 policy requirements. Under the section 'Addressing Alternatives', the advice note states:

- 'The ES must set out an outline of the reasonable alternatives studied by the Applicant and provide an indication of the main reasons for the Applicant's choice, including a comparison of the environmental effects (Regulation 14(2)(d) and Schedule 4).'
- 'The description of alternatives should take into account decisions relating to alternative locations, routes and design options. The justification for the final choice and evolution of the scheme development should be made clear.'.

Definition of 'Reasonable Alternatives' for the Project

3.2.25 Having regard to the requirement of s14(2)(d) and paragraph 2 of Schedule 4 of the EIA regulations and the policy guidance provided in both EN-1 and EN-5, this Project defines 'reasonable alternatives' as options that:

- Meet the network reinforcement need the Project is designed to meet as per Section 1.2 of Chapter 1: Introduction (document reference 6.1)
- Meet the development objectives for the Project (paragraph 4.3.22 of EN1)
- Deliver equivalent infrastructure capacity (400 kV double circuit connections) within the same timeframes (by 2030) (4.3.22 of EN-1)
- Are technically feasible using established or emerging technologies (paragraph 2.9.14 of EN-5 and Section 9(2) of the Electricity Act 1989)
- Provide a solution capable of supporting the system's capacity into the 2030s (paragraph 4.3.27 of EN1)
- Comply with National Grid's statutory duties under the Electricity Act 1989 (Schedule 9)
- Are consistent with the policies set out in the relevant NPS and would not conflict with government policy (Paragraph 4.3.26 of EN-1).

3.2.26 Alternatives that are vague, immature, or lack sufficient detail to enable proper assessment are excluded as they are not important and relevant to decision-making (paragraph 4.3.28 of EN-1).

3.2.27 For corridor routeing, substation, CSE compound and technology selection, reasonable alternatives include consideration of:

- Re-routeing options that avoid or minimise impacts on sensitive receptors
- Underground cable options where significant landscape and visual impacts are identified (as required by Paragraph 2.9.14 of EN-5)
- For designated landscapes, undergrounding unless engineering infeasibility or disproportionate harm is demonstrated (Paragraphs 2.9.20-2.9.25 of EN-5)

- Alternative construction methods, access arrangements, and working practices that could reduce environmental effects (Regulation 14(2)(d) of the EIA Regulations and Advice Note 7)
- Alternative substation and infrastructure designs that achieve equivalent functionality (Paragraph 2.9.18 of EN-5 and Horlock Rules)
- Alignment with the Holford Rules for overhead line routeing and Horlock Rules for substation siting.

Limits of Deviation (LoD) and Design Flexibility

3.2.28 As an NSIP, the DCO provides flexibility through Limits of Deviation (LoD) that allow for necessary adjustments during detailed design and construction phases. The DCO includes provisions for both lateral, longitudinal and vertical LoD, which enable optimal positioning of infrastructure within defined parameters. Accordingly, minor variations in specific pylon positioning or precise alignment within these limits are not treated as separate alternatives, as the assessment considers a worst-case scenario within the established parameters. This approach ensures the environmental assessment remains robust while preserving necessary engineering flexibility, consistent with established NSIP practice.

Scope of Alternatives Assessment

3.2.29 This assessment does not consider an exhaustive list of every theoretical alternative but focuses on reasonable alternatives that would result in substantively different environmental outcomes, consistent with the proportionate approach set out in Paragraph 4.3.22 of EN-1. The Project has undertaken alternatives assessment in accordance with the EIA Regulations and has also considered alternatives where required by specific legislative provisions, including the Habitats Regulations. Options with substantially different capacities, delivery timelines, or those that do not meet the Project's strategic objectives are not considered reasonable alternatives for the purposes of this chapter. This chapter provides a proportionate description of reasonable alternatives, focusing on options that meet the development objectives and are capable of delivering the required infrastructure capacity within the necessary timeframes.

Planning Inspectorate EIA Scoping Opinion

3.2.30 On 4 November 2022, National Grid submitted an EIA Scoping Report (document reference 6.19) to the Planning Inspectorate. The Planning Inspectorate provided a formal EIA Scoping Opinion (document reference 6.20) on the 10 December 2022.

3.2.31 Specifically, the EIA Scoping Opinion (document reference 6.20) requires consideration of the following items, which have been included within this chapter:

- A description of reasonable alternatives studied with an indication of the main reasons for selecting the chosen option, including comparison of environmental effects
- Explanation of specific locations considered for the change from overhead line (OHL) to underground cables, particularly in terms of impacts on the setting of the Dedham Vale National Landscape
- Explanation of the locations selected for substations and CSE compounds

- Consideration of strategic alternatives including offshore options
- Assessment of alternative pylon designs (T pylons/low height steel lattice pylons) as embedded design measures, with the final designs confirmed in this ES (Volume 6 of the DCO application)
- Confirmation of the ‘triple araucaria' conductors as specified in the EIA Scoping Report (document reference 6.19), with consideration of potential noise effects should alternative conductor designs be employed.

3.2.32 Where options assessed do not meet the definition of 'reasonable alternatives' (such as certain offshore cable options that conflict with NPS policy preferences), these are included to address specific scoping requirements under Regulation 14(3) rather than as reasonable alternatives under Regulation 14(2)(d).

3.3 National Grid’s Approach to Options Appraisal

3.3.1 National Grid undertakes options appraisal to identify the most appropriate way to meet the identified need. There are often a number of different ways that a project to meet the defined need could be developed, involving different locations, technologies or designs. Each appraisal which is undertaken for that purpose requires judgements and decisions about the best way to achieve the required outcome and define the project to promote. The options appraisal process provides information to help inform those judgements.

3.3.2 Options appraisal is a robust and transparent process that is used to compare options and to record the positive and negative effects they may have in meeting the defined need, across a wide range of criteria including environmental, socio-economic, technical, and cost factors. The aim is to find a balanced outcome to meeting the identified need while meeting National Grid’s statutory duties. Further details on the options appraisal process can be found in Appendix 3.1: Our Approach to Options Appraisal (document reference 6.3.A1) and in Appendix 3.2: Our Approach to Consenting (document reference 6.3.A2)

3.3.3 The options appraisal involved a hierarchical assessment starting from strategic alternatives (such as broad technology choices and geographic areas) to select a preferred Strategic Proposal i.e. the Project, which is then defined in detail through further design and assessment work. This proposal was then subject to routeing and siting to determine an alignment, which was subsequently refined following statutory and non-statutory consultation. Finally, alternative construction methods were considered.

3.3.4 At each stage in the options appraisal process, transparent methods were used to inform decision-making. This included technical inputs from engineers, planners and environmental consultants to inform the decisions and design. The optioneering process drew on data and evidence collected from both desk studies and field work. Decision-making also took account of feedback from both prescribed bodies and the local community through a programme of engagement and consultation. In addition, the appraisal was subject to challenge and review to ensure the robustness of the decisions made in light of changing circumstances (including technical, environmental, socio-economic, and cost factors).

3.4 Strategic Proposal

Strategic Solution and Three-Project Approach

3.4.1 The strategic assessment identified that the transmission reinforcement need in East Anglia would be met through three separate projects: Norwich to Tilbury onshore reinforcement (the Project), Sea Link offshore reinforcement, and Tilbury to Grain onshore reinforcement. Each project addresses specific capacity requirements and is being progressed separately due to differing technologies, geographic separation, and distinct environmental effects profiles.

Corridor and Preliminary Routeing and Siting Strategy (National Grid, 2022)

3.4.2 The CPRSS (National Grid, 2022) primarily focused on the Norwich to Tilbury element of this strategic solution. Following the need for the reinforcement being identified, National Grid began the optioneering process to determine how best to achieve the reinforcement objectives required in East Anglia. These objectives, as identified in the CPRSS (National Grid, 2022), were to:

- Facilitate the transfer of power from the East Anglia region to the rest of the Main Interconnected Transmission System (MITS)
- Enable the connection of offshore wind generation
- Provide for bidirectional transfer
- Deliver this reinforcement by 2030 to meet connection dates established by government policy and contractual obligations under National Grid's Transmission Owner Licence.

3.4.3 The first stage in the options appraisal process was to determine a preferred Strategic Proposal that would meet the identified need *for* Norwich to Tilbury as part of the wider three-project solution while balancing environmental, socio-economic, technical, and cost factors in accordance with National Grid's statutory duties under the Electricity Act 1989. The process is summarised below. Further detail can be found in the CPRSS (National Grid, 2022).

3.4.4 The strategic evaluation process identified the requirement for reinforcement between Norwich Main and Bramford Substations, and between Bramford and Tilbury Substations, based on network analysis demonstrating that the existing high voltage electricity network in East Anglia does not have the capability needed to reliably and securely transport all the energy that will be connected while meeting the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS). Bramford was identified as a strategic connection point due to its position within the existing network, its ability to provide necessary system connectivity, and its role in maintaining network resilience and compliance with NETS SQSS requirements.

3.4.5 Conceptually, there were numerous options through which reinforcements could theoretically be achieved including a range of different technologies and multiple connection points on the existing National Electricity Transmission System (NETS).

Technology Options

3.4.6 Initially, a variety of technology alternatives were considered and evaluated. Professional judgement was applied to analyse viable options while filtering out those that could not meet reinforcement objectives, consistent with the principle that only alternatives that can meet the objectives of the Project need to be considered. This initial screening was undertaken having regard to National Grid's statutory duties under the Electricity Act 1989 (including Section 9(2) duties to develop and maintain an efficient, co-ordinated and economical system of electricity transmission, and Section 38 and Schedule 9 duties to preserve natural beauty and mitigate environmental effects), the industry-standard Holford Rules for overhead line routeing and Horlock Rules for substation siting, and the then-current policy framework including the 2011 versions of National Policy Statements EN-1 and EN-5. This initial screening predated both the definition of reasonable alternatives established in Section 3.2 and the EIA Scoping Opinion (document reference 6.20) requirements, representing National Grid's comprehensive evaluation of all theoretically possible technologies. For the avoidance of doubt not all technologies listed below constitute 'reasonable alternatives' as defined in Section 3.2 above, but they are included to demonstrate the breadth of initial consideration. The technologies initially considered were:

- Increasing operating voltage
- Alternating current (AC) overhead lines
- AC underground cable
- Alternative overhead AC pylon types
- Direct Current (DC) underground cable
- DC overhead lines
- Offshore connections
- Gas insulated lines (GILs).

3.4.7 A brief summary of each option and the factors considered in its evaluation is provided in Table 3.2. Further detailed assessment justifying the evaluation can be found within the CPRSS (National Grid, 2022).

Table 3.2 Main strategic alternatives considered

Technology Considered	Assessment
Increasing operating voltage	Options for increasing operating voltage were considered at two levels: (1) Increasing to 400 kV where existing infrastructure operates at lower voltages (e.g., 275 kV) and (2) Increasing beyond the current British transmission system maximum of 400 kV to higher voltages such as 550 kV or 800 kV. For options beyond 400 kV, this would require replacement of all affected routes, new pylon designs, and appropriate new transformer substations. This approach was deemed high risk due to the need to amend government regulation

Technology Considered	Assessment
	and industry codes, with potential substantial impacts on programme and cost. More importantly, while increasing power flows, it would not achieve the uplift in capability necessary compared to its marginal benefit over 400 kV. On this basis, options to increase operating voltage above 400 kV were not considered further, while increasing existing lower voltage infrastructure to 400 kV was retained as an option where applicable.
AC overhead lines	An established technology offering a simple and cost-effective design. AC overhead lines form the majority of the existing transmission system in Great Britain, with established understanding of their construction and operation. While they can be visibly prominent in the landscape, this technology meets National Grid's statutory duties under the Electricity Act 1989 to develop and maintain the network in an economical and efficient manner, while having regard to environmental considerations under Schedule 9. On this basis, AC overhead line technology was taken forward for further assessment in the CPRSS (National Grid, 2022) as the primary transmission solution capable of delivering the required network reinforcement within the necessary timeframe and at acceptable cost.
AC underground cable	Alternatives using wholly underground AC cables were considered during the CPRSS strategic options assessment but not taken forward as whole- route strategic options. The CPRSS evaluation assessed this technology against multiple criteria including cost, technical feasibility, environmental factors, and deliverability within required timeframes. The strategic assessment identified that AC underground cable routes typically incur substantially higher capital costs when compared with overhead lines (often five to 10 times more expensive, while requiring significantly longer construction periods). For a connection of approximately 180 to 200 km, the additional costs and extended delivery timescales were assessed as not providing proportionate benefits when considered as a whole-route solution. However, the CPRSS (National Grid, 2022) recognised that underground cables could provide environmental benefits in specific locations where overhead lines would result in particularly significant landscape and visual impacts. The strategic assessment therefore identified that AC underground cable technology would be appropriate for targeted sections, particularly in areas of high environmental sensitivity such as nationally designated landscapes, their settings, and other locations where significant landscape and visual impacts might occur.

Technology Considered	Assessment
	This approach – using overhead lines as the primary technology with targeted undergrounding in environmentally sensitive areas – was assessed in the CPRSS (National Grid, 2022) as providing the optimal balance between cost, environmental impact, and deliverability. It was recognised that this would be implemented for specific sections where justified by environmental factors, rather than as a whole-route strategic solution. The conclusions reached in the CPRSS (National Grid, 2022) regarding the appropriate use of underground cables are consistent with current policy guidance in EN-5, which establishes similar principles regarding the use of overhead lines and underground cables in different environmental contexts.
Alternative Overhead AC Pylon types	Alternative overhead AC pylon types include standard lattice, low height and T-pylon type structures. While these represent different visual forms, they do not constitute 'reasonable alternatives' as defined by EN-1 paragraphs 4.3.22-4.3.23, which specify that alternatives must be able to meet the project objectives and deliver equivalent capacity in the same timeframes. As noted in CPRSS Section 1.3.9 (National Grid, 2022), different pylon designs represent design variations within the same technological approach rather than fundamentally different strategic alternatives. EN-5 paragraph 2.9.16 recognizes the Holford Rules, which address pylon design as part of a mitigation hierarchy rather than as distinct alternatives. Not taken forward as a strategic alternative but evaluated as potential mitigation options during detailed design in accordance with EN-5's guidance on minimizing landscape and visual impacts.
DC underground cables	These have advantages over underground AC cables, including less land-take and lower environmental impact. However, the costs of associated converter stations (typically £250 to £350 million per pair) become particularly significant considerations in the overall cost-benefit analysis. For the Norwich to Tilbury connection (approximately 180 to 200 km), while the circuit length is substantial, the economic assessment indicated that the additional costs of converter stations and specialized cable infrastructure would not be justified by the benefits when compared to traditional AC technology with targeted undergrounding in sensitive areas. The CPRSS strategic assessment (National Grid, 2022) included DC underground cable technology in several strategic options to test the economic viability assumptions. Specifically, DC underground cables were assessed as whole-route solutions in strategic options within the Eastern theme, where the longer circuit lengths (180 to 200 km) were considered most likely to demonstrate potential economic

Technology Considered	Assessment
	benefits compared to AC alternatives. This testing was undertaken to provide evidence-based conclusions about the technology's suitability for this scale of network reinforcement. The CPRSS (National Grid, 2022) assessment concluded that while DC underground cable technology offered environmental advantages, the substantial additional costs (primarily driven by converter station requirements) could not be justified when weighed against the network benefits delivered, particularly when compared to AC overhead line solutions with targeted AC underground cables in environmentally sensitive areas. While generally not considered an economical solution, DC underground cable was included as an element in some options to test this evidence regarding economic viability.
DC overhead lines	While these may provide an alternative transmission solution, they would require converter stations (at considerable cost) at each end of the connection section with limited benefit compared with AC overhead line options. The visual appearance of DC pylons would be different, but this potential benefit would be offset by the substantial additional infrastructure required at conversion points. Though generally not considered an economical solution, DC overhead line was included in one strategic option (specifically in the West 3 option presented within the CPRSS (National Grid, 2022) which had the longest single connection section) to test this evidence.
Offshore connections	The CPRSS (National Grid, 2022) assessed offshore transmission connections as an alternative to onshore reinforcement. In the marine environment, DC cables are preferred over AC cables due to engineering complexities and costs. Converter stations would be required at each end of the cables to integrate with the onshore AC-based NETS. Conceptually, offshore connections could be made from either the Necton/Norwich area or Sizewell area to locations such as Grain or Tilbury, thereby connecting into the London demand centre. Alternatively, they could connect into Kent (for example at Richborough) to allow connection with interconnectors. Strategic optioneering for offshore connections involved a new offshore transmission connection for a length of approximately 220 km from the Norwich/Necton area to Thames Estuary locations such as Tilbury and Grain. The CPRSS (National Grid, 2022) strategic assessment concluded that while offshore connections were technically feasible, they presented significantly higher costs due to specialist marine infrastructure, converter station requirements, and extended delivery timescales. Additionally, substantial onshore infrastructure would still be

Technology Considered	Assessment
	required at landing points, meaning environmental impacts would be relocated rather than eliminated. Marine options were included in the strategic options taken forward for appraisal in the CPRSS (National Grid, 2022) in combination with other technologies, but were not selected as the preferred strategic approach due to the cost-benefit analysis favouring onshore alternatives with targeted environmental mitigation.
Gas insulated lines (GILs)	GILs potentially provide an alternative to AC cable but have far greater climate impacts due to the SF6 gas they contain as an insulating medium. Additionally, GILs are not proven for long distance circuits required, to meet the need (180 to 200 km) with most existing applications limited to much shorter spans typically under 10 km in length. On this basis, GIL technology was not considered further.

3.4.8 Through initial optioneering, the following technologies were taken forward within the CPRSS (National Grid, 2022) based on their ability to meet the reinforcement objectives:

- AC overhead lines
- AC underground cables (considered in accordance with EN-5 paragraphs 2.9.14-15 and 2.9.20-25, including for National Landscapes/National Parks, their settings, and other areas where particularly significant landscape and visual impacts might occur)
- DC underground cables
- DC overhead lines
- Offshore connections
- increasing the operating voltage to 400 kV where existing infrastructure operates at lower voltages.

3.4.9 These technology options were assessed for their technical capability to deliver the required capacity. Each technology option was then evaluated across different geographical connection approaches to determine optimal strategic configurations, with detailed assessment considering delivery timescales, costs and other factors.

Geographic Scope of Strategic Options

3.4.10 Following technology selection, the geographical scope of options was considered. The strategic assessment examined three main geographic themes to determine the optimal network configuration:

- **Eastern Theme**: transporting power from the north of East Anglia (with Norwich Main selected over Necton Substation as the preferred starting point) into the south-east England area, connecting via Bramford with existing substations such as Tilbury and Grain to serve the London demand centre and connect with interconnectors

- **Northern Theme**: creating additional capacity by connecting from the north of East Anglia into the north of the existing London area network and then into the south-east England area, connecting with existing substations such as Wymondley, Pelham and Waltham Cross
- **Western Theme**: creating additional capacity by transporting power westward around London, connecting with existing substations such as East Claydon and West Weybridge.

3.4.11 Each theme encompassed the nearest parts of the NETS that would facilitate connection between northern East Anglia and the electricity demand area formed by London and the south-east, while supporting connections to interconnectors in the region.

3.4.12 Reinforcement options were developed by combining the selected technologies with the geographic themes. A total of 27 combinations of circuit options, later reduced to 23 (3 for west, 5 for north and 15 for east) were identified and assessed (as detailed in Table 1.1 of the CPRSS (National Grid, 2022)) that aimed to provide solutions supporting system capacity into the 2030s. These alternatives comprised different technologies applied to different geographical connection points across the three geographic themes, creating comprehensive strategic options for evaluation.

3.4.13 As part of the annual NOA cycle, each combination of options proceeded through the Cost Benefit Analysis (CBA) carried out by the ESO. This used the 'BID3' economic model, which is an economic dispatch optimisation model that simulates European energy markets, including demand, supply and infrastructure. It models the hourly generation of all power stations on the system, taking into account factors such as fuel prices, historical weather patterns and operational constraints.

3.4.14 Predicted constraint savings from each pathway were compared to the capital costs to assess whether 1) investment is economically optimal versus a 'do nothing' counterfactual (i.e. no capital costs are expended and constraint costs are incurred), and 2) if so, which option/pathway is economically optimal. Net Present Value (NPV) is calculated by deducting the present value of capital costs from the present value of predicted constraint costs for each option in each FES. Options were compared using a 'Least Worst Regrets' method, being ranked in order of the highest (i.e. worst) regret for each option, in comparison to all other options, across the four FES (i.e. if an option was the best in all FES, its Least Worst Regret would be 0).

3.4.15 The strategic options assessment concluded that the Eastern theme, specifically Option East 7, provided the highest overall consumer value, and was therefore selected as the preferred solution, because it achieved the lowest economic regret cost (£143m) compared to significantly higher costs for Northern theme options (£340 million to £4,151 million) and Western theme options (£1,660 million to £3,978 million) across different future energy scenarios.

3.4.16 The complete evaluation methodology, detailed assessment of each option, and justification for selections made is documented in the CPRSS specifically in Sections 1.3.19 to 1.3.35 and Tables 1.1 and 1.2 of the CPRSS (National Grid, 2022). The selection of this strategic configuration established the basis for the corridor alignments and technology options developed as part of the Project to respond to the identified need to increase connection capacity from north East Anglia to the Southeast.

3.4.17 Specifically, Option East 7 comprises three distinct elements developed as separate projects:

- Norwich to Tilbury onshore reinforcement (i.e. the Project now applied for in the DCO application): A new 400 kV double circuit from Norwich to Bramford and from Bramford to Tilbury via a new East Anglia Connection Node (EACN) Substation (the Project subject to this DCO application)
- Sea Link project: 2 GW HVDC offshore reinforcement between Sizewell and Richborough (separate DCO application submitted March 2025)
- Tilbury to Grain onshore reinforcement: A new connection between these existing substations (consented separately under Town and Country Planning Act, approved March 2025).

3.4.18 Each element addresses specific boundary capacity requirements and generation group connections as identified in the need case, with three individual projects developed separately to reflect their differing technology provision geographic separation and distinct environmental effects profiles. The remainder of this section focuses only on the onshore reinforcement between Norwich and Tilbury (i.e. the Project). The other elements described above are being progressed as separate schemes due to the general geographic separation of potential effects. The Sea Link project application was submitted to the Planning Inspectorate on March 27, 2025, and is currently in the pre-examination stage. The Tilbury to Grain onshore reinforcement received full planning approval from Thurrock Council in Essex and Gravesham Borough Council in Kent in March 2025 (National Grid Website, 2025).

Strategic Options Backcheck Review Process

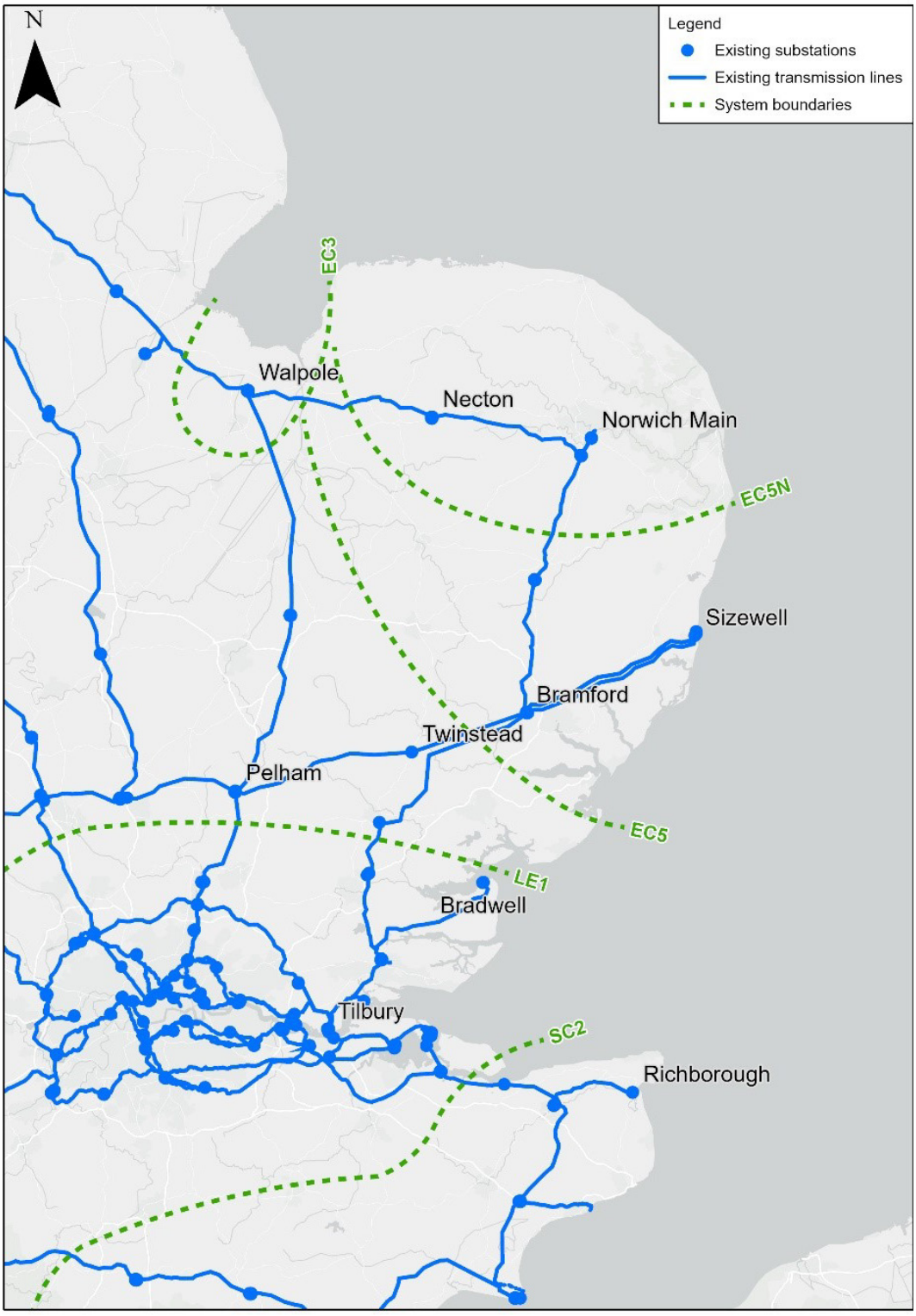
3.4.19 In accordance with National Grid's Approach to Consenting methodology, Strategic Options Backcheck and Review (SOBR) documents are prepared annually as part of an iterative process to validate strategic decisions against evolving circumstances. This ongoing review process ensures that strategic options remain optimal as new information becomes available, including updated generation connection agreements, policy changes, consultation feedback, and environmental baseline updates.

3.4.20 The SOBR process was initiated in 2023 and has been updated annually, with each iteration building upon previous assessments while incorporating the latest available information to test whether the strategic proposal remains the most appropriate solution to meet identified transmission system needs.

Strategic Options Backcheck Review (2023)

3.4.21 The initial SOBR (National Grid, 2023b) was prepared by National Grid to test the assumptions and conclusions made in the original CPRSS as well as other documents based on the latest information available. This assessment provided validation of the strategic proposal through a refined analytical approach focusing specifically on the capacity shortfalls across the relevant transmission system boundaries, which are outlined below in Image 3.1 and described further in this section.

Image 3.1 Considered East Anglia and Southeast Transmission System and system boundaries



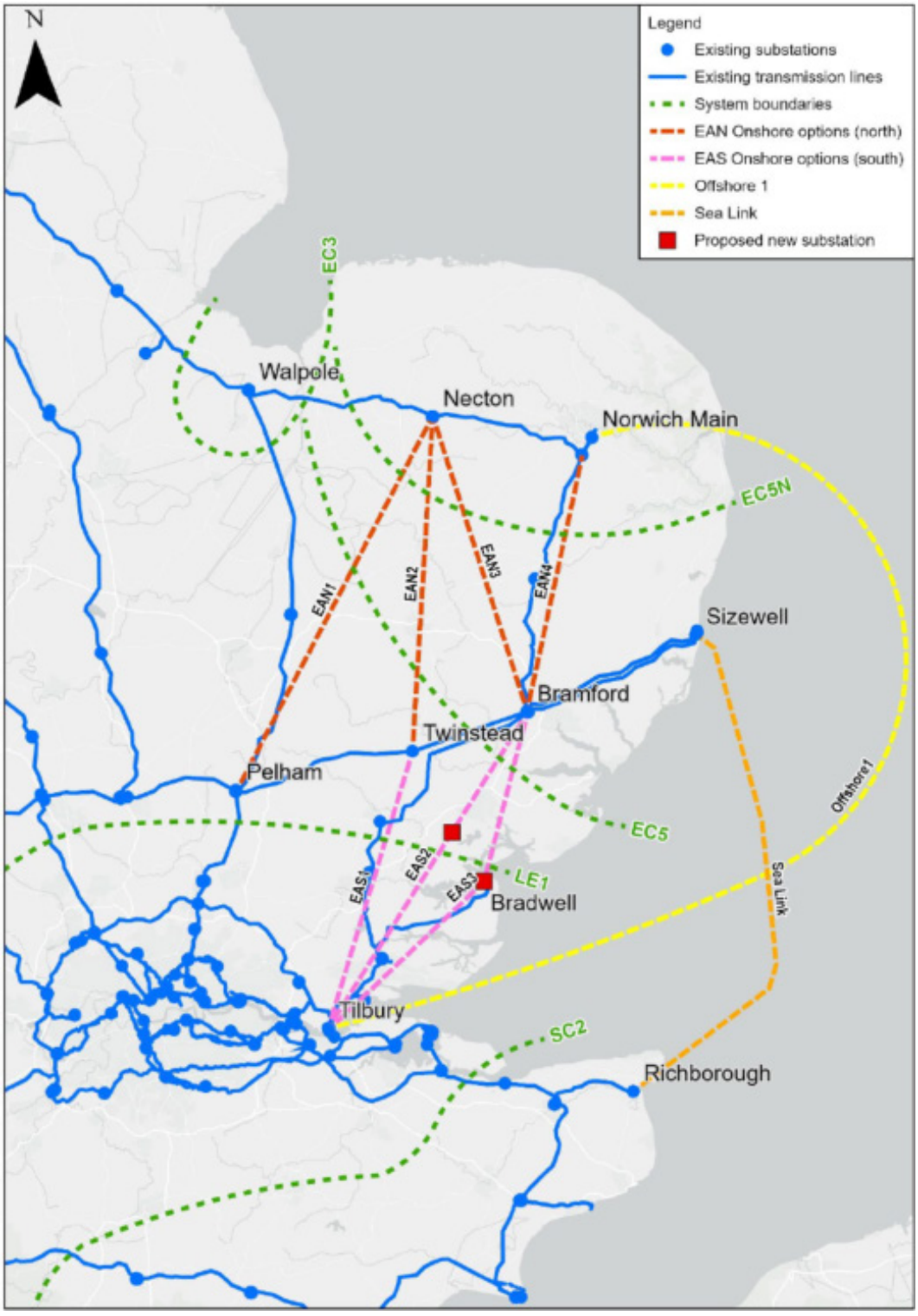
3.4.22 The SOBR identified specific requirements for additional transmission capacity to meet the original need case, including:

- Provision of 9,928 MW of capacity across East Anglia EC5 Boundary and 7,520 MW of capacity across EC5N Boundary
- Provision of 7,476 MW of capacity across the LE1 Boundary
- Provision of 352.1 MW of capacity to the Sizewell Generation Group

- Provision of 3,480 MW of connection capacity from the Essex Coast Generation Group
- Provision of 8,470 MW of capacity from the SC2 Boundary Group.

3.4.23 The SOBR evaluated refined strategic options to meet these requirements, including northern options (EAN 1-4) to resolve EC5N boundary requirements and southern options (EAS 1-3) to resolve EC5 and LE1 boundary requirements. These options are shown on Image 3.2.

Image 3.2 SOBR Strategic Options



3.4.24 The assessment concluded that EAN 4 (Norwich Main to Bramford) combined with EAS 2 (Bramford via new substation to Tilbury) represented the preferred strategic options.

Strategic Options Backcheck Review (2024)

3.4.25 The SOBR was updated in 2024 to incorporate feedback received during the 2023 non-statutory consultation, revised National Policy Statements, updated generation connection agreements, and other relevant developments including the Offshore Co-ordination Support Scheme (OCSS) and the Electricity System Operator East Anglia Network Study. This 2024 backcheck confirmed that the interim preference for the onshore combination identified in 2023 remained unchanged, providing continued validation of the strategic approach.

Strategic Options Backcheck Review (2025)

3.4.26 Following the 2024 statutory consultation and subsequent targeted consultations in 2025, the SOBR process continues to monitor whether any changes to environmental, socio-economic, technical and cost appraisals since the 2024 Strategic Options Backcheck and Review are likely to alter the strategic decision-making and outcomes. The 2025 SOBR (document reference 7.17) concluded that no material changes to environmental, socio-economic, technical or cost appraisals warranted alteration of the strategic decision-making, reaffirming that EAN 4 (Norwich Main to Bramford) combined with EAS 2 (Bramford via new substation to Tilbury) remains the optimal strategic solution. This ongoing review ensures the strategic proposal remains optimal as the Project progresses toward the Development Consent Order application.

Strategic Proposal Validation and Confirmation

3.4.27 This iterative SOBR process has consistently confirmed the strategic preference originally established in the CPRSS (National Grid, 2022), with each annual review validating that the strategic proposal remains optimal. The finding that EAN 4 combined with EAS 2 represents the preferred solution aligns with the Norwich-Tilbury onshore reinforcement component of the broader strategic solution identified in the original CPRSS (Option East 7), providing robust confirmation of the strategic proposal through multiple analytical methodologies and updated assessments over successive years.

Strategic Proposal Summary

3.4.28 The CPRSS (National Grid, 2022) established the preferred Strategic Proposal following comprehensive assessment of alternative strategic options to meet the identified transmission system need. This strategic assessment evaluated multiple technological approaches including offshore connections, onshore alternatives, HVDC options, and various AC configurations, balancing cost, technical performance, environmental and socio-economic effects in accordance with National Grid's statutory duties under the Electricity Act 1989. The assessment determined that steel lattice pylon supported overhead lines would provide the primary technology solution, with targeted underground cable sections in environmentally sensitive areas to optimise system performance whilst meeting statutory environmental duties and policy requirements.

3.4.29 The annual SOBR process (National Grid, 2023b; National Grid, 2024b; document reference 7.17) has consistently confirmed this strategic preference, demonstrating the robustness of the original assessment methodology and conclusions. The confirmed Strategic Proposal comprises:

- **Norwich Main to Bramford Connection**: New 400 kV double-circuit overhead line of approximately 60 km, selected over alternatives including Necton Substation start point and Twinstead Tee routing based on shorter connection distances, reduced environmental effects, and better Holford Rules compliance
- **New EACN Substation within Tendring District**: The CPRSS strategic assessment identified the requirement for a new EACN Substation within the broader East Anglia region to efficiently integrate offshore wind farm connections for which National Grid has contracted connection agreements that it is legally obliged to honor, comprising the Essex Coast Generation Group (Tarchon Interconnector 1,400MW, North Falls 1,000MW, and Five Estuaries 1,080MW). The strategic evaluation considered regional alternatives including coastal locations and determined that the Tendring District location was optimal. This strategic decision was based on avoiding the need to cross the Suffolk & Essex Coast & Heaths National Landscape (which would be required for Felixstowe area alternatives), reducing infrastructure complexity, and minimizing additional connection requirements. The SOBR confirmed this strategic preference, validating that EAS 2 (Bramford via new substation to Tilbury) provided the optimal solution for integrating the Essex Coast Generation Group connections whilst meeting transmission reinforcement requirements.
- **Bramford to Tilbury Connection**: New 400 kV double-circuit overhead line of approximately 120 km via new EACN Substation in Tendring District, selected over offshore and alternative onshore options based on superior cost-benefit analysis, technical feasibility and environmental performance.

3.4.30 This strategic configuration provides the most cost-effective solution to meet identified transmission needs whilst minimising environmental impacts and aligning with National Grid's statutory duties. The Strategic Proposal was therefore carried forward for detailed corridor routeing and siting assessment as documented in subsequent sections.

3.5 Corridor Routeing and Substation Siting Alternatives

3.5.1 Following the establishment of the Strategic Proposal as described in Section 3.5, the next phase was to develop the specific Project through detailed corridor routeing and siting studies. This process translated the strategic-level parameters into specific infrastructure designs, comprising comprehensive assessments for overhead line corridors, underground cable routes, substation locations, CSE compound sites, and associated works required to deliver the transmission connection.

3.5.2 This section sets out the routeing and siting methodology applied and then summarises the corridor options appraisal carried out for the route corridors and EACN Substation siting.

Selection Process/Methodology

3.5.3 National Grid’s routeing and siting approach comprised five stages, as described below.

Stage 1: Options Identification

3.5.4 The identification of route corridor and substation siting options for overhead lines, underground cables, pylons, substations and CSE compounds consisted of three key activities:

- Definition of a Study Area: The Study Area was informed by the connection points identified in the preferred Strategic Proposal, the distribution of areas with high environmental value, physical and human geography considerations, and the balance of environmental impact between direct and indirect routes (see Section 3.5). The Study Area extends to include areas where the Project design is likely to be located which satisfies National Grid's statutory duties and objectives.
- Constraints and opportunities mapping: Geographical Information Systems web mapping was used to identify environmental and technical constraints within the Study Area. Features representing potential constraints were categorised as either 'seek to avoid' (such as internationally designated ecological sites, scheduled monuments, National Landscapes) or 'seek to minimise' (such as Grade II listed buildings, local nature reserves, flood zones) based on professional judgement and relevant environmental legislation, policy and good practice. Buffers were included for some environmental constraints to account for potential indirect effects. The CPRSS (National Grid, 2022) provides detailed constraints mapping including ecological designations, historic environment features, landscape designations, and technical constraints (such as existing infrastructure, ground conditions, access requirements).
- Identification and refinement of options: This process ensured options were designed to minimise environmental impacts. Environmental subject matter experts reviewed constraints and opportunities and set study-specific parameters, then Geographical Information Systems was used to identify corridors through the least constrained areas. Environmental specialists reviewed preliminary corridors and either retained them unchanged, refined existing options (by adjusting boundaries or removing constrained areas), or identified wholly new corridor options where gaps in coverage were identified. Engineering subject matter experts then reviewed these options, making changes with the environmental team to ensure consistency with environmental considerations.

3.5.5 For complex connection routeing with overlapping permutations of options, discrete ‘sections’ of corridors are identified to allow appraisal without duplication. These sections are later combined to form end-to-end corridor options.

Stage 2: Options Appraisal

3.5.6 Corridor options appraisal is a structured process to identify, report and compare the environmental, socio-economic, technical and cost implications of alternative options. This corridor-level assessment is distinct from the strategic options appraisal that established the Norwich to Tilbury Strategic Proposal (as described in Section 3.5) because it operates at a different scale and serves different decision-making purposes. While strategic assessment determines 'what and where' at a network level (selecting the optimal combination of transmission reinforcements to meet system needs), corridor assessment determines 'how and precisely where' at a route level (selecting specific corridors, sites and alignments to deliver the identified strategic solution). The purpose is twofold: (1) to compare route corridors/sites against each other to inform selection of preferred options, and (2) to back-check the performance of preferred route corridors/ sites against the required performance of the preferred Strategic Proposal to ensure it meets the identified need and to ensure consistency with strategic objectives.

3.5.7 The appraisal included the following environmental and socio-economic topics:

- Landscape and Visual
- Ecology
- Noise and Vibration
- Flooding and water
- Historic Environment
- Planning
- Socio-economics.

3.5.8 For each environmental topic, the appraisal considered the nature of identified receptors, receptor value and sensitivity to the Project, and potential environmental effects including whether they could be avoided or mitigated.

3.5.9 Technical and cost factors were assessed in parallel with environmental considerations, including construction and delivery complexity, engineering feasibility and constraints, operability and maintenance requirements, system performance and network capacity, technology suitability for local conditions, planning considerations (including future development proposals), and both capital and lifetime costs. This recognised National Grid's duty to develop and maintain an efficient transmission system.

3.5.10 This integrated approach ensured that environmental assessment drove the detailed comparison between viable options, while technical and cost factors determined overall feasibility and informed the final selection process. The methodology therefore focuses the tabulated assessments on environmental effects as the primary differentiating factor between technically viable options, while ensuring technical and cost considerations remain central to the selection process through the evaluation process described in Stage 3.

3.5.11 The approach aligns with National Grid's statutory duties under the Electricity Act 1989 to develop and maintain an efficient, coordinated and economical transmission system, while fulfilling obligations under the EIA Regulations to assess reasonable alternatives with particular emphasis on environmental effects.

Stage 3: Options Selection

3.5.12 Following individual option appraisal, challenge and review processes were held to analyse outputs and park non-preferred options. Initial decision planning exercises identified any additional information required and opportunities for hybrid corridors.

3.5.13 Decision planning then determined preferred corridors and substation siting zones, guided by the following principles:

- Using or adapting existing infrastructure is generally preferable to creating new infrastructure
- Shorter routes are generally preferable to longer routes (for comparable technology options)
- Financially less-expensive options support National Grid's statutory duty for an ‘efficient, co-ordinated and economical’ network
- Options which avoid, minimise and mitigate environmental or socio-economic impacts are preferable to those with significant residual effects.

3.5.14 The appraisal process incorporated the Holford Rules for overhead line assessment (including directness of route, avoidance of high amenity areas, and visual considerations) and the Horlock Rules for substation siting (including environmental considerations, use of screening, and minimizing visual effects). These established guidelines informed the evaluation criteria and mitigation hierarchy applied during the options selection process.

Stage 4: Development of Graduated Swathe for the Preferred Corridor and Siting Areas

3.5.15 Once preferred corridor options and substation siting areas were agreed, the Project team considered locations for connections and layouts of infrastructure features (including overhead lines, underground cables, CSE compounds and substations) within these areas. These preliminary designs were indicative and subject to revision as more information became available.

3.5.16 The preliminary designs for the Project were presented using a graduated swathe, with areas considered more likely to be developed shown in darker colours than areas considered less likely. This approach indicated probability without ruling out development in other parts of the corridor or area if necessary, based on future feedback, survey findings, or design responses.

Stage 5: Consultation and Design Refinement Process

3.5.17 The preferred options, with their graduated swathes, for the Project were consulted on with stakeholders and the public as part of a non-statutory consultation in 2022.

3.5.18 Early feedback from the non-statutory consultation helped shape the development of the Project's design. This process of design refinement in response to consultation feedback continued iteratively through subsequent non-statutory consultations (2023), statutory consultation (2024), targeted consultations (2025), and ongoing design development through to application submission. The detailed outcomes, design decisions, and rationale for changes (or decisions not to change) arising from each consultation phase are documented in the respective Design Development Reports: the 2023 DDR (National Grid, 2023a), the 2024 DDR (National Grid, 2024a), and the 2025 DDR (document reference 5.15). Additionally, comprehensive responses to all consultation feedback are provided in the Consultation Reports (document reference 5.1). This process and the further design refinement undertaken in response to statutory and non-statutory consultation is outlined in further detail within Section 3.8.

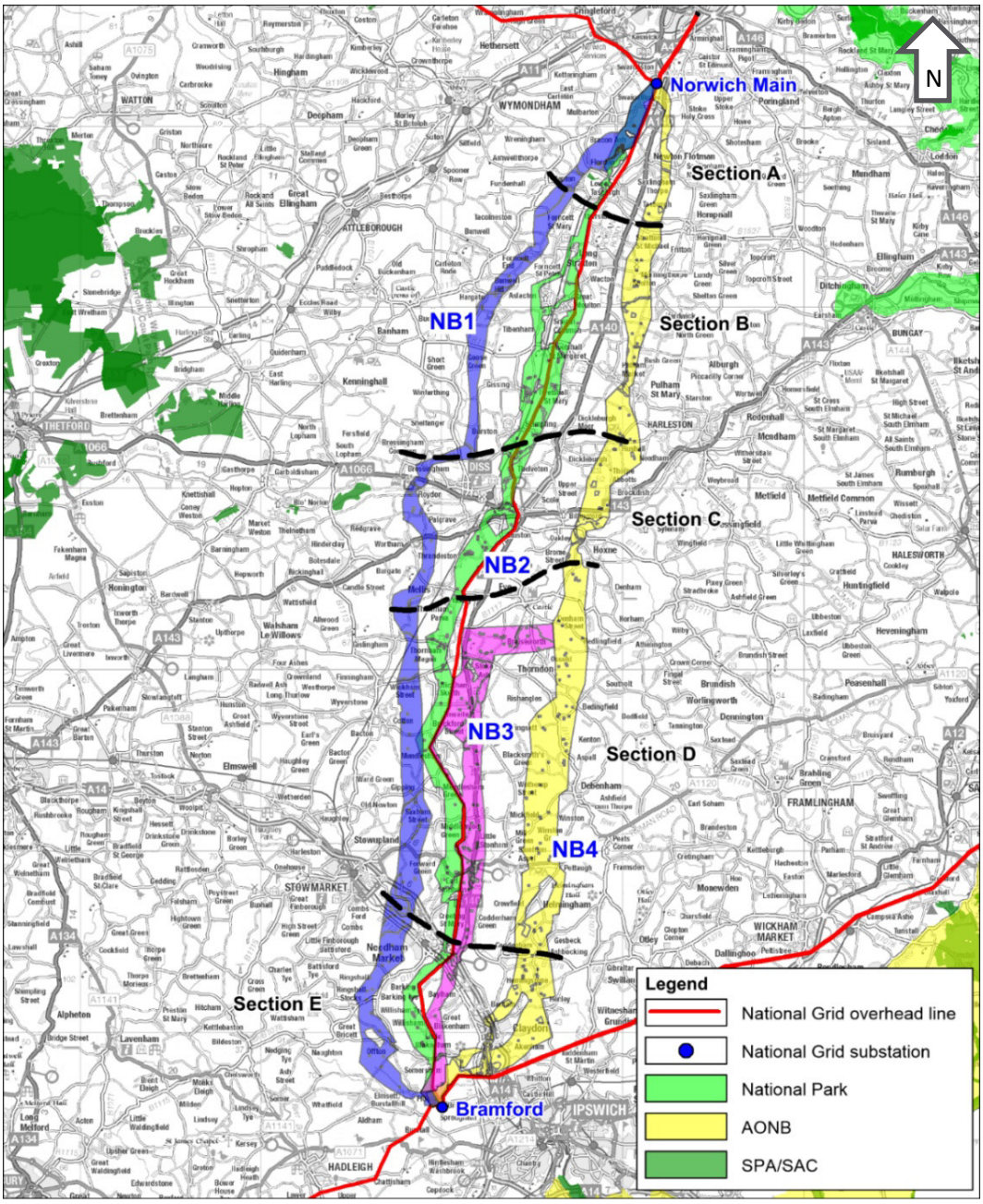
Norwich Main Substation to Bramford Substation

3.5.19 The following four options were identified and taken forward to options appraisal, as presented on Image 3.3:

- Option NB1 (blue route): a corridor largely located between approximately 2.5 km and 5 km to the west of the existing National Grid 400 kV overhead line (red line) which runs between Norwich Main and Bramford Substations.
- Option NB2 (green route): a corridor located between 80 m and approximately 1 km to the west of the existing route (red line).

- Option NB3 (pink route): a corridor section located between 80 m and approximately 1 km to the east of the existing route (red line). This option was not viable as a complete end-to-end connection, with the northern portion combined with Option NB2 (green route), and the southern portion assessed as a standalone section (pink route).
- Option NB4 (yellow route): a corridor largely located between approximately 4 km and 7 km to the east of the existing route (red line).

Image 3.3 Norwich Main Substation to Bramford Substation initial options (not to scale) – as taken from CPRSS (National Grid, 2022)



3.5.20 A summary of the appraisal of the options is provided below. Further detail can be found in the CPRSS (National Grid, 2022).

Options Appraisal

3.5.21 An appraisal of the four initial Norwich Main Substation to Bramford Substation options was carried out using the methodology outlined above. A summary of environmental factors considered for each option is provided in Table 3.3 which should be read in conjunction with Image 3.3. The assessment incorporated the Holford Rules for overhead line routeing, with compliance or deviation from these established guidelines recorded as part of the policy evaluation part of the appraisal. The comparative environmental effects presented in the table provide the basis for identifying the preferred alternative in accordance with Regulation 14(2)(d) of the EIA Regulations.

Table 3.3 Summary of options appraisal – Norwich Main Substation to Bramford Substation NB1 to NB4 (CPRSS (National Grid, 2022))

Corridor	Description	Key Environmental Factors Considered During the Selection Process
Option NB1 (blue route)	A corridor largely located between approximately 2.5 km and 5 km to the west of the existing route (red line)	**Beneficial:** • Visual: Greater separation from existing infrastructure reduces cumulative visual effects • Holford Rules compliance: Good compliance with Rule 2 (avoids smaller areas of high amenity) and Rule 3 (direct alignment). **Adverse:** • Ecology: Potential hydrological effects on Norfolk Valley Fens SAC requiring Habitats Regulations Assessment consideration • Historic Environment: Potential impacts on heritage receptors, though not significantly different from other options.
Option NB2 (green route)	A corridor located between 80 m and approximately 1 km to the west of the existing route (red line)	**Beneficial:** • Ecology: Avoids proximity to Norfolk Valley Fens SAC (unlike Option NB1). **Adverse:** • Landscape and Visual: Risk of adverse landscape and visual effects in multiple sections, particularly where close-paralleling cannot be achieved • Visual Amenity: Risk of placing some properties between the new and existing lines, reducing compliance with Holford Rules on residential amenity • Holford Rules compliance: Reduced compliance with Rule 6 (wirescape separation) and Supplementary Note 1 (residential amenity).

Corridor	Description	Key Environmental Factors Considered During the Selection Process
Option NB3 (pink route)	Option NB3 (pink route): a corridor section located between 80 m and approximately 1 km to the east of the existing route (red line). This option was not viable as a complete end-to-end connection, with the northern portion combined with Option NB2 (green route), and the southern portion assessed as a standalone section (pink route).	**Environmental Effects – Beneficial:** • Ecology: Avoids proximity to Norfolk Valley Fens SAC (inferred from eastern routeing, similar to NB2). **Environmental Effects – Adverse:** • Visual Amenity: Potential for properties to be positioned between new and existing lines where close-parallel alignment achieved (inferred from close-paralleling design intent) • Holford Rules compliance: Poor compliance with Rule 3 (directness) due to incomplete route coverage.
Option NB4 (yellow route)	A corridor largely located between approximately 4 km and 7 km to the east of the existing route (red line)	**Beneficial:** • Holford Rules compliance: Good compliance with Rule 3 (direct alignment) and Rule 7 (approaches urban areas through industrial zones near Ipswich). **Adverse:** • Historic Environment: Directly affects Shotesham Conservation Area through the estate parkland of Grade I listed The Hall and associated listed buildings • Historic Environment: Contains scheduled monuments within corridor south-east of Eye • Holford Rules compliance: Poor compliance with Rule 2 (directly affects smaller areas of high amenity value – conservation area and scheduled monuments).

3.5.22 Following the appraisal of the options, a challenge and review exercise took place to analyse and discuss the outputs of the options appraisal, filter out/remove non-feasible options, and ultimately short-list options to be taken forward for further consideration. The environmental effects comparison revealed that while each corridor had environmental benefits in different sections, none of the individual corridors optimized environmental performance across the entire route length.

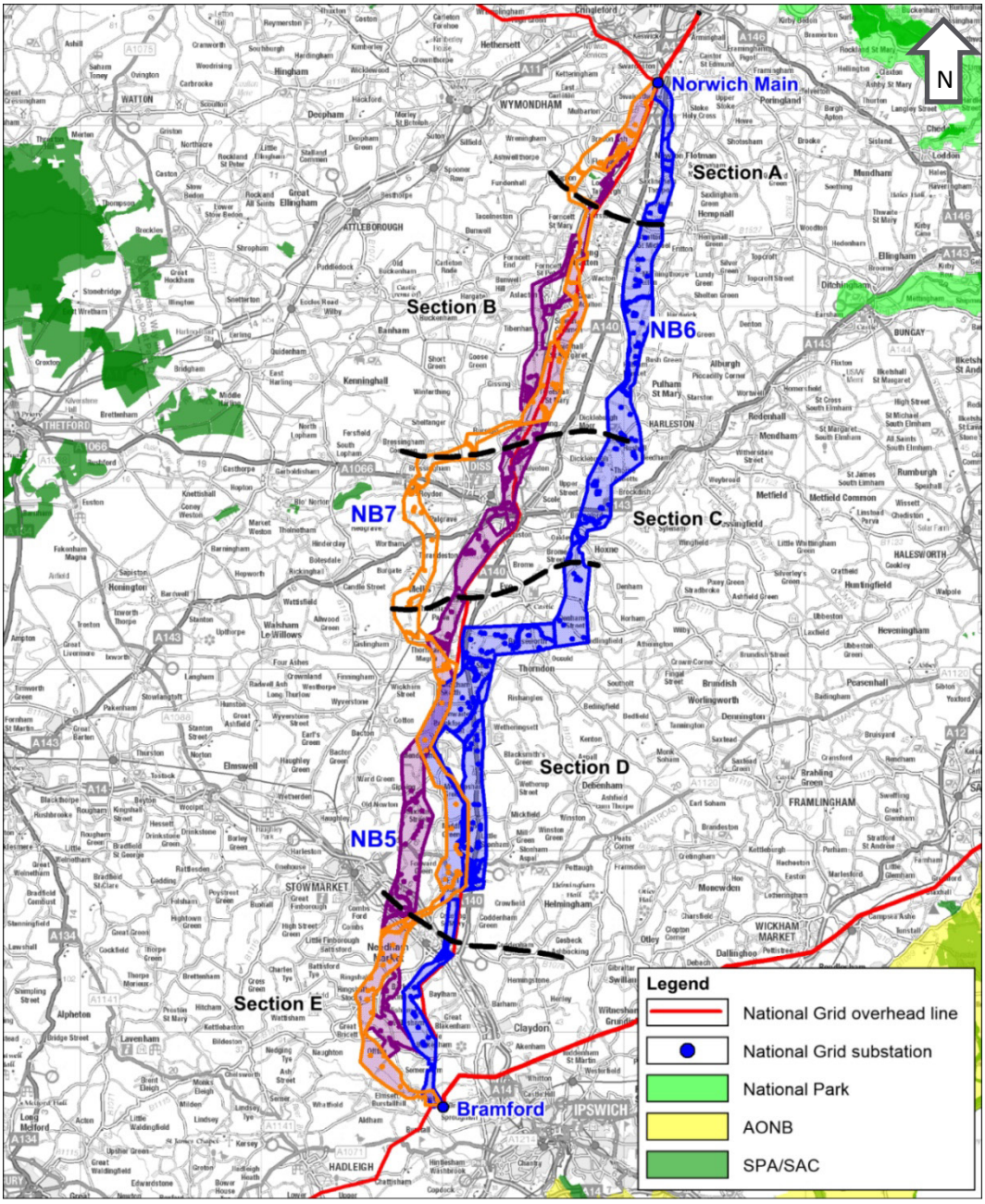
3.5.23 The environmental effects analysis identified that:

- **Option NB1** performed well environmentally in avoiding the Rural River Valleys Landscape Character Area but had adverse effects regarding Norfolk Valley Fens SAC proximity in the northern section
- **Option NB2** avoided the SAC proximity issues but had adverse visual amenity effects from close-paralleling constraints in the southern section
- **Option NB4** had good Holford Rules compliance in some areas but significant adverse historic environment effects in the southern section.

3.5.24 To address these environmental effects, three hybrid corridors were identified that combined the environmentally beneficial sections of different corridors NB1-3 while avoiding their adverse effects areas. These hybrid options were subject to the same options appraisal process to determine whether the environmental effects could be further optimized:

- **Option NB5**: combines NB2 northern section (avoiding SAC effects) with NB1 southern section (avoiding NB2's southern visual amenity issues)
- **Option NB6**: attempts to utilize NB4's beneficial sections while avoiding its historic environment constraints
- **Option NB7**: seeks to maximize NB1's environmental benefits while addressing specific constrained areas through NB2 routeing.

Image 3.4 Norwich Main Substation to Bramford Substation hybrid options (not to scale) – as taken from CPRSS (National Grid, 2022)



3.5.25 A summary of the appraisal of the three options is provided below. Further detail can be found in CPRSS (National Grid, 2022). Table 3.4 should be read in conjunction with Image 3.4.

Table 3.4 Summary of options appraisal – Norwich Main Substation to Bramford Substation NB5 to NB7 (CPRSS (National Grid, 2022))

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Hybrid Option NB5	A corridor consisting of the northern part of Option NB2 (green route) and the southern part of Option NB1 (blue route)	**Beneficial:** • Ecology: Northern section avoids proximity to Norfolk Valley Fens SAC (from NB2 routeing) • Landscape: Southern section avoids locally protected Rural River Valleys Landscape Character Area (from NB1 routeing). **Adverse:** • Landscape and Visual: Risk of adverse landscape and visual effects, particularly in northern sections where close-paralleling constraints occur • Historic Environment: Potential impacts on high value historic environment receptors • Visual Amenity: Risk of properties positioned between new and existing lines in northern section • Holford Rules compliance: Risk of adverse visual amenity effects from inadequate separation between new and existing lines where close-paralleling attempted.
3.5.26 Hybrid Option NB6	3.5.27 A corridor consisting of the northern part of Option NB4 (yellow route), a section of Option NB3 (pink route), and the southern part of Option NB2 (green route)	**Beneficial:** • Ecology: Avoids proximity to Norfolk Valley Fens SAC through eastern and close-parallel routeing sections. **Adverse:** • Landscape: Effects on Local Character Area in northern section • Historic Environment: Corridor crosses core area of Shotesham Conservation Area (from NB4 northern section) • Holford Rules compliance: Poor compliance with Rule 2 (affects smaller areas of high amenity – conservation area).

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Hybrid Option NB7	A corridor consisting of the northernmost, central and southernmost parts of Option NB1 (blue route), with linking sections to Option NB2 (green route) between those sections	**Beneficial:** • Landscape: Avoids locally protected Rural River Valleys Landscape Character Area (from NB1 sections). **Adverse:** • Ecology: Close proximity to Norfolk Valley Fens SAC requiring Habitats Regulations Assessment • Landscape and Visual: Risk of adverse landscape and visual effects in multiple sections where route switches between parallel and non-parallel alignments • Holford Rules compliance: Less compliant with Rule 3 (directness) than other options due to multiple changes in direction required to switch between parallel and non-parallel sections.

Options Selection

3.5.28 For the Norwich to Bramford component of the Project, seven corridors were assessed through comparative environmental effects analysis in accordance with Regulation 14(2)(d) of the EIA regulations.

3.5.29 The analysis identified Option NB1 (as shown on Image 3.3) was the preferred option based on the following environmental effects favouring Option NB1:

- Landscape: Avoids locally protected Rural River Valleys Landscape Character Area, unlike other assessed options
- Visual Amenity: Minimises the potential for residential properties to be surrounded in close proximity by overhead lines to a greater extent than other viable options, reducing the likelihood of unacceptable levels of effect on general residential amenity
- Historic Environment: Avoids direct effects on conservation areas and scheduled monuments, unlike Option NB4 which directly affected Shotesham Conservation Area and contained scheduled monuments
- Holford Rules Compliance: Better compliance with Rule 6 (wirescape separation) compared to close-parallel options (NB2, NB5, and NB7, which incorporate sections running in close proximity to the existing overhead line).

3.5.30 The analysis identified the following environmental factors that lead to the rejection of other alternatives:

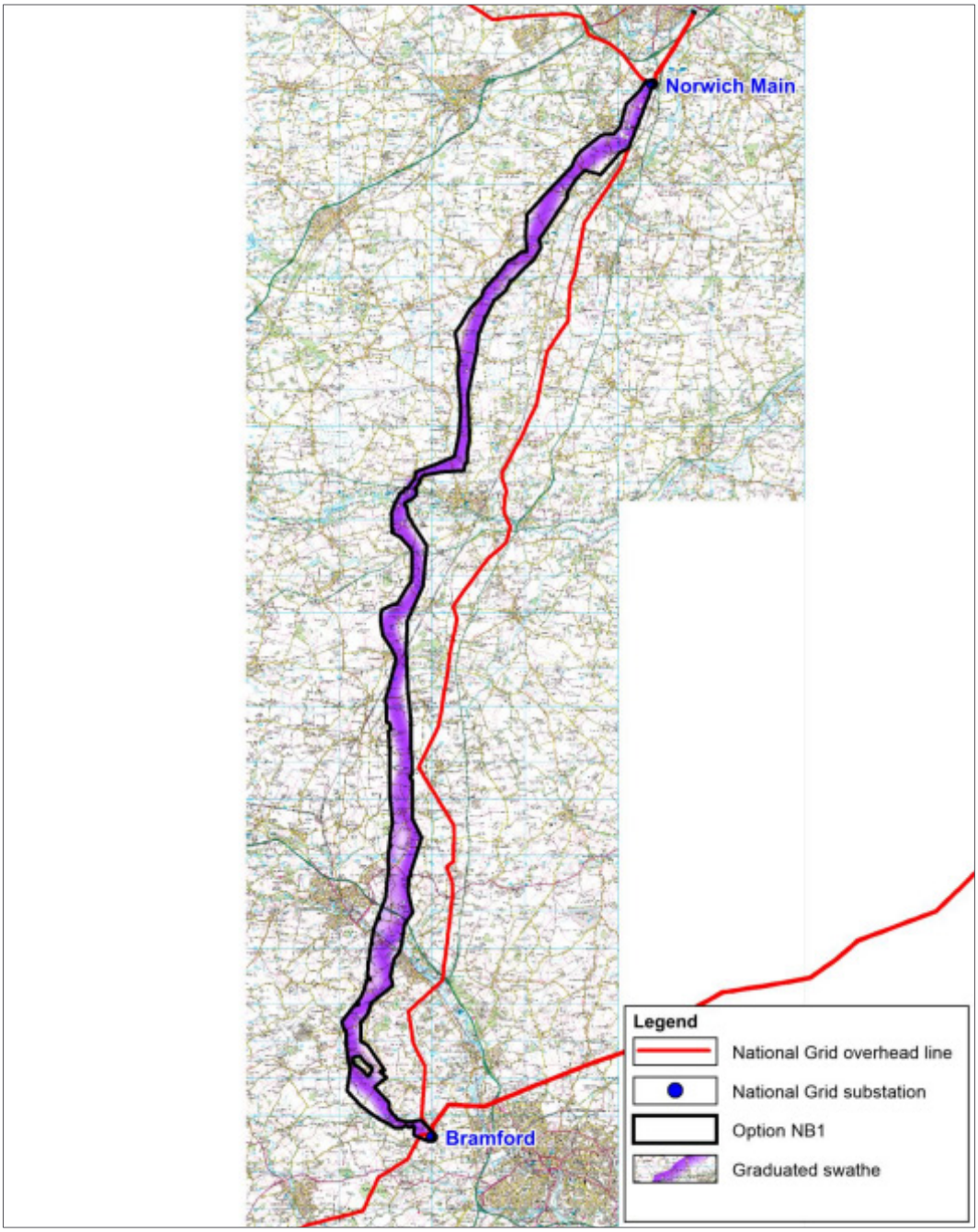
- Options NB2, NB5, NB7: Risk of adverse visual amenity effects from inadequate separation between new and existing lines where close-paralleling attempted
- Option NB4: Significant adverse historic environment effects through direct impact on Shotesham Conservation Area and scheduled monuments
- Option NB7: Reduced compliance with Holford Rule 3 (directness) due to multiple direction changes required.

3.5.31 While Option NB1 has potential for effects on Norfolk Valley Fens SAC requiring Habitats Regulations Assessment consideration, it was concluded that potential likely significant effects would be minimised through embedded design measures so that significant effects do not arise, whereas the adverse effects of rejected alternatives were considered more difficult to mitigate effectively.

3.5.32 Technical complexity and cost factors also favoured Option NB1, with this option representing the most economical and technically feasible solution.

3.5.33 To communicate the findings of the analysis to stakeholders in a manner that does not imply an inappropriate level of certainty, the areas within the preferred option corridor that may host the route alignment are indicated by different densities of shading, referred to as a graduated swathe (as shown on Image 3.5). Darker tones indicate areas where development is considered more likely, lighter tones indicate where it is considered less likely, and areas without shading indicate where development is considered unlikely but still possible.

Image 3.5 Norwich Main Substation to Bramford Substation graduated swathe



Bramford Substation to EACN Substation

3.5.34 EACN Substation siting is addressed separately in Section 3.7.

3.5.35 The following four initial potential route corridors were identified and taken forward to options appraisal. Unlike the Norwich to Bramford section, corridor options were composed of sections, so that those common to more than one option could be appraised without duplication. Sections also reflect the potential interaction of corridor options between Bramford Substation and the EACN Substation and those between the EACN Substation and Tilbury Substation (allowing for coordinated assessment of connecting infrastructure across multiple route segments). These are presented on Image 3.6:

- Option BE1: A relatively direct corridor passing through the Dedham Vale National Landscape (underground cable) (Section A on Image 3.6)
- Option BE2: A relatively direct corridor passing through a more easterly part of the Dedham Vale National Landscape and through the westernmost part of the Suffolk & Essex Coast & Heaths National Landscape (underground cable) (northern part of Section A, Section B and the southern part of Section A on Image 3.6)
- Option BE3: An overhead line corridor passing to the west of the Dedham Vale National Landscape and seeking to allow routeing in close-parallel with the with the National Grid 400 kV overhead line existing route (red line), which runs west-southwest from Bramford (Section C, Section E and Section F on Image 3.6)
- Option BE4: An overhead line corridor passing to the west of the Dedham Vale National Landscape and seeking to maximise the distance from the northern part of the National Landscape (Section D, Section E and Section F on Image 3.6).

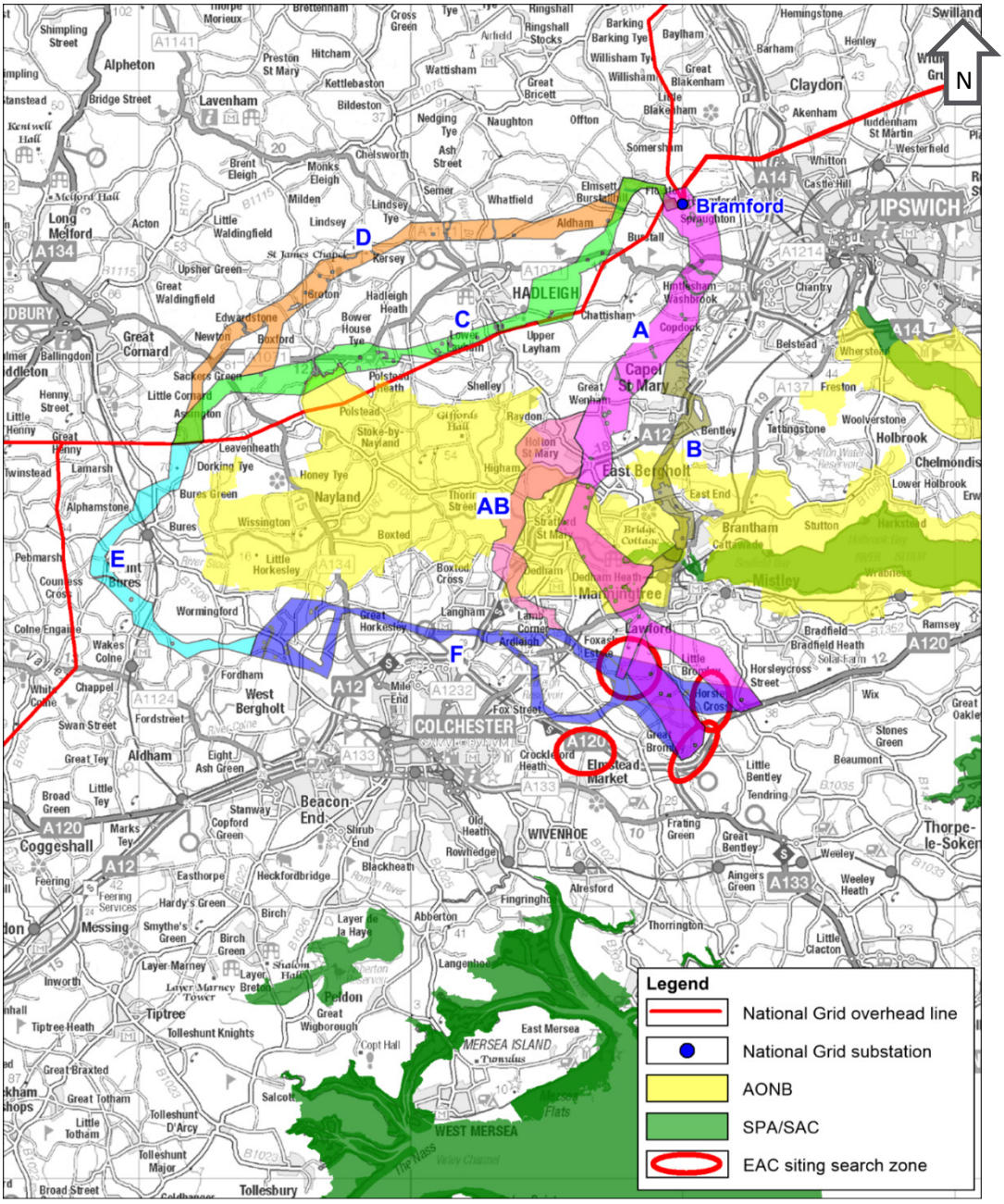
3.5.36 Following the initial appraisal, a challenge and review exercise took place to analyse and discuss the outputs of the options appraisal, filter out/remove non-feasible options, and short-list options to be taken forward for further consideration. Environmental analysis revealed that while the direct routes through the National Landscape (Options BE1 and BE2) minimized connection length, they had varying levels of adverse effects on sensitive ecological receptors and visitor areas within the Dedham Vale National Landscape. Conversely, routes avoiding the National Landscape (Options BE3 and BE4) eliminated effects on the designated landscape but significantly increased connection length and associated environmental impacts.

3.5.37 A key technical finding of this process was that Option BE3's close-parallel route to the north of the existing route (red line) would only likely be achievable for a relatively short part of the route, limiting the environmental benefits of close-paralleling while still requiring passage close to the National Landscape boundary.

3.5.38 Based on this environmental effects comparison, an additional hybrid corridor was identified that could optimize environmental performance by combining the benefits of a direct route with enhanced protection for the most sensitive areas within the National Landscape:

- Option BE5: A relatively direct corridor passing through a more westerly part of the Dedham Vale National Landscape, achieving greater separation from sensitive ecology receptors and from areas of particular focus for National Landscape visitors (northern part of Section A, Section AB and the eastern part of Section F on Image 3.6).

Image 3.6 Bramford Substation to EACN Substation options (not to scale) – as taken from CPRSS (National Grid, 2022)



Options Appraisal

3.5.39 An appraisal of the four initial viable Bramford Substation to EACN Substation options was carried out using the methodology outlined above. A summary of environmental factors considered for each option is provided in Table 3.5. This should be read in conjunction with Image 3.6.

Table 3.5 Summary of options appraisal – Bramford Substation to EACN Substation Sections A to F (CPRSS (National Grid, 2022))

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Option BE1	A relatively direct corridor passing through the Dedham Vale National Landscape (Section A shown on Image 3.6)	**Beneficial:** • Landscape: Underground cable through National Landscape minimises long-term visual impacts compared to other overhead line alternatives. • Holford Rules compliance: Good compliance with Rule 3 (directness) through shorter, more direct alignment, providing better environmental performance than extended avoidance routes. • Cumulative effects: Shorter route reduces overall environmental impact compared to Options BE3 and BE4. **Adverse:** • Ecology: Potential for Likely Significant Effects (LSEs) on the Stour and Orwell Estuaries SPA and supporting Cattawade Marshes SSSI due to proximity and potential impact pathways, presenting higher ecological risk than western options (BE3, BE4) • Landscape: Temporary construction impacts within National Landscape during underground cable installation, though effects more localised than BE2 • Historic Environment: Effects on multiple listed buildings and passes through edges of Dedham and Lawford conservation areas, unlike the other Options (BE2, BE3, BE4 and BE5) which avoid these specific conservation areas.
Option BE2	A relatively direct corridor passing through a more easterly part of the Dedham Vale National Landscape and through the westernmost part of the Suffolk & Essex Coast & Heaths National Landscape (northern part of Section A, Section B and the southern part of Section A – shown on Image 3.6)	**Beneficial:** • Holford Rules compliance: Good compliance with Rule 3 (directness) offering environmental benefits over extended western routes. **Adverse:** • Landscape: Impacts on two National Landscapes requiring extensive underground cable installation, representing greater designated landscape impact than any other option

Corridor	Description	Key Environmental Effects Considered During the Selection Process
		• Ecology: Proximity to Stour and Orwell Estuaries SPA and Cattawade Marshes SSSI requiring Habitats Regulations Assessment, with similar risk level to BE1 but greater complexity due to dual landscape crossing • Water Environment: More significantly impacted by River Stour compared to other options, requiring more complex engineering solutions in sensitive areas • Holford Rules compliance: Whilst achieving directness, impacts on multiple designated areas reduces compliance with Rule 1 compared to other options.
Option BE3	A corridor passing to the west of the Dedham Vale National Landscape and seeking to allow routeing in close-parallel with the existing route (red line) (Section C, Section E and Section F – shown on Image 3.6)	**Beneficial:** • Landscape: Avoids passing through National Landscape, unlike Options BE1, BE2, and BE5 • Ecology: Effects on ecology likely acceptable with careful routeing, significantly reducing ecological risk compared to eastern options • Holford Rules compliance: Good compliance with Rule 1 (avoiding major areas of highest amenity) compared to through-AONB options. **Adverse:** • Landscape: May still result in adverse effects on National Landscape setting despite avoidance, though less severe than direct impacts of BE1, BE2, BE5 • Relatively difficult from landscape perspective – may require extensive mitigation to address landscape and visual impacts • Narrow section at Hadleigh Heath where ancient woodland restricts routeing options, presenting greater ecological constraint than BE4.

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Option BE4	A corridor passing to the west of the Dedham Vale National Landscape and seeking to maximise distance from the northern part of the National Landscape (Section D, Section E and Section F – shown on Image 3.6)	**Beneficial:** • Landscape: Avoids passing through any National Landscapes, providing greatest protection for designated landscapes of all options • Ecology: Effects on ecology likely acceptable with careful routeing, offering lowest ecological risk of all assessed options • Visual: Less likely to result in significant adverse effects on visual/residential amenity, compared to all other options due to maximum separation • Holford Rules compliance: Best compliance with Rule 1 (avoiding major areas of highest amenity) of all options. **Adverse:** • Landscape: May still result in adverse effects on National Landscape setting within locally designated Stour Valley Project Area, though less severe than BE3 • Historic Environment: Effects on set-piece views of Kersey Conservation Area would need careful consideration, presenting unique heritage impact not found in other options • Holford Rules compliance: Poorest compliance with Rule 3 (directness) due to most extended route length, resulting in greater cumulative environmental impact than direct alternatives • Cumulative effects: Extended route length results in greater overall environmental impact across wider geographical area compared to direct options.

3.5.40 Following the initial appraisal, a challenge and review exercise took place to analyse and discuss the outputs of the options appraisal, filter out/remove non-feasible options, and short-list options to be taken forward for further consideration. Environmental analysis revealed that while the direct routes through the National Landscape (Options BE1 and BE2) minimized connection length, they had varying levels of adverse effects on sensitive ecological receptors and visitor areas within the Dedham Vale National Landscape. Conversely, routes avoiding the National Landscape (Options BE3 and BE4) eliminated effects on the designated landscape but significantly increased connection length and associated environmental impacts.

3.5.41 A key technical finding of this process was that Option BE3's close-parallel route to the north of the existing route (red line) would only likely be achievable for a relatively short part of the route, limiting the environmental benefits of close-paralleling while still requiring passage close to the National Landscape boundary.

3.5.42 Based on this environmental effects comparison, an additional hybrid corridor was identified that could optimize environmental performance by combining the benefits of a direct route with enhanced protection for the most sensitive areas within the National Landscape:

- Option BE5: A relatively direct corridor passing through a more westerly part of the Dedham Vale National Landscape, achieving greater separation from sensitive ecology receptors and from areas of particular focus for National Landscape visitors (northern part of Section A, Section AB and the eastern part of Section F on Image 3.6).

3.5.43 An appraisal of additional hybrid Bramford Substation to EACN Substation option was carried out using the methodology outlined above, with a summary of environmental factors considered for each option is provided below in Table 3.6. This should be read in conjunction with Image 3.6.

Table 3.6 Summary of options appraisal – Bramford Substation to EACN Substation Sections A to F (CPRSS (National Grid, 2022))

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Option BE5	A relatively direct corridor passing through a more westerly part of the Dedham Vale National Landscape, achieving greater separation from sensitive ecology receptors and from areas of particular focus for National Landscape visitors (northern part of Section A, Section AB and the eastern part of Section F – shown on Image 3.6).	**Beneficial:** • Landscape: Greater separation from particularly highly valued parts of the Dedham Vale National Landscape compared to Options BE1 and BE2, whilst avoiding extended route impacts of BE3 and BE4 • Ecology: Increased distance from Stour and Orwell Estuaries SPA and SSSI with lower potential to affect these designations compared to BE1 and BE2, whilst avoiding extended route impacts of BE3 and BE4 • Visual: Environmental effects largely short-term during construction phase, offering better long-term visual outcomes than BE2 whilst maintaining directness • Holford Rules compliance: Optimised compliance balancing Rule 1 (avoiding highest amenity) and Rule 3 (directness) better than other options • Conservation areas: Avoids direct effects on Dedham and Lawford conservation areas unlike BE1. **Adverse:** • Landscape: Temporary construction impacts within National Landscape from underground cable installation, though more limited than BE1's broader National Landscape impact and BE2's dual landscape impact • Ecology: Potential for HRA process but with lower risk than Options BE1 and BE2 while presenting higher risk than western avoidance options BE3 and BE4.

Options Selection

3.5.44 For the Bramford Substation to EACN Substation component, five corridor sections were assessed through comparative environmental effects analysis in accordance with Regulation 14(2)(d) of the EIA Regulations. The environmental effects comparison identified a fundamental choice between routes passing through the Dedham Vale National Landscape versus routes avoiding it entirely.

3.5.45 The assessment identified Option BE5 as the preferred option based on the following environmental effects favouring Option BE5:

- Landscape: Greater separation from particularly highly valued parts of the Dedham Vale National Landscape compared to Options BE1 and BE2, whilst maintaining the environmental benefits of a direct route compared to extended western alternatives
- Ecology: Lower risk of Likely Significant Effects on the Stour and Orwell Estuaries SPA and supporting Cattawade Marshes SSSI compared to Options BE1 and BE2, whilst avoiding the extended environmental impact corridor of western routes
- Historic Environment: Avoids direct effects on Dedham and Lawford conservation areas, unlike Option BE1, whilst providing better heritage protection than extended routes through multiple landscape settings
- Holford Rules Compliance: Optimised balance between Rule 1 (avoiding highest amenity areas through careful routeing) and Rule 3 (directness) compared to other assessed options.
- Cumulative Effects: Underground cable minimises long-term landscape effects whilst shorter route length reduces overall environmental impact compared to avoidance routes.

3.5.46 Key factors leading to a rejection of non-preferred alternatives for the Bramford Substation to EACN substation included:

- Options BE1 and BE2: Higher risk of adverse ecological effects on internationally designated sites and greater impacts on conservation areas within the National Landscape
- Options BE3 and BE4: While avoiding direct National Landscape impacts, these western routes presented significantly greater cumulative environmental effects due to extended route length, potential adverse effects on National Landscape setting, and impacts across a wider geographical area including the locally designated Stour Valley Project Area
- Option BE3: Additional environmental constraints from ancient woodland restrictions at Hadleigh Heath and reduced landscape compliance compared to BE4
- Option BE4: Poor compliance with Holford Rule 3 (directness) resulting in greatest overall environmental impact through extended route requirements.

3.5.47 A key factor in deciding which corridor to take forward was driven by whether the connection should pass through the Dedham Vale National Landscape or avoid it. It was assessed that while undergrounding through the National Landscape would have an effect on the landscape, it would facilitate a more direct route. This could be

approximately half the length of a route that avoids the Dedham Vale National Landscape. Routes avoiding the National Landscape by passing north of Colchester presented significant additional challenges, including greater technical complexity with multiple constrained sections at Layham, Boxford, and Lamarsh Lane, increased construction complexity, and the need for additional crossings of existing infrastructure such as the proposed Bramford to Twinstead overhead lines. Moreover, routes north of Colchester may still result in adverse effects on the setting of the National Landscape.

3.5.48 It was concluded that Option BE5 (northern part of Section A, Section AB and the eastern part of Section F, shown on Image 3.6) was the preferred option due to its greater distance from particularly highly valued parts of the Dedham Vale National Landscape, less potential for adverse effects on the historic environment and as it presents lower risk of Likely Significant Effects on the internationally designated sites (Stour and Orwell Estuaries SPA and supporting Cattawade Marshes SSSI) and their qualifying features compared to other options through the National Landscape. Additional factors supporting this selection included the direct route being approximately half the length of western avoidance alternatives, while western routes presented significant technical challenges including greater technical complexity with multiple constrained sections and increased construction complexity.

3.5.49 Following the identification of Option BE5 as the preferred option, an analysis of potential routeing within the corridor was undertaken by engineering subject matter experts and reviewed by environment topic experts. The analysis identified areas within the preferred option corridor within which Project infrastructure was considered more or less likely to be located, shown as a graduated swathe on Image 3.7. This graduated swathe uses darker tones to indicate areas where development is considered more likely and lighter tones where development is considered less likely.

Consideration of the Levelling Up and Regeneration Act 2023 Duty

3.5.50 Following the introduction of the strengthened duty under Section 245 of the Levelling Up and Regeneration Act 2023 in October 2023, National Grid undertook a retrospective assessment to confirm whether this duty would affect the corridor selection decision between routing throuh the Dedham Vale National Landscape (Option BE5) versus routing around it (Options BE3 and BE4).

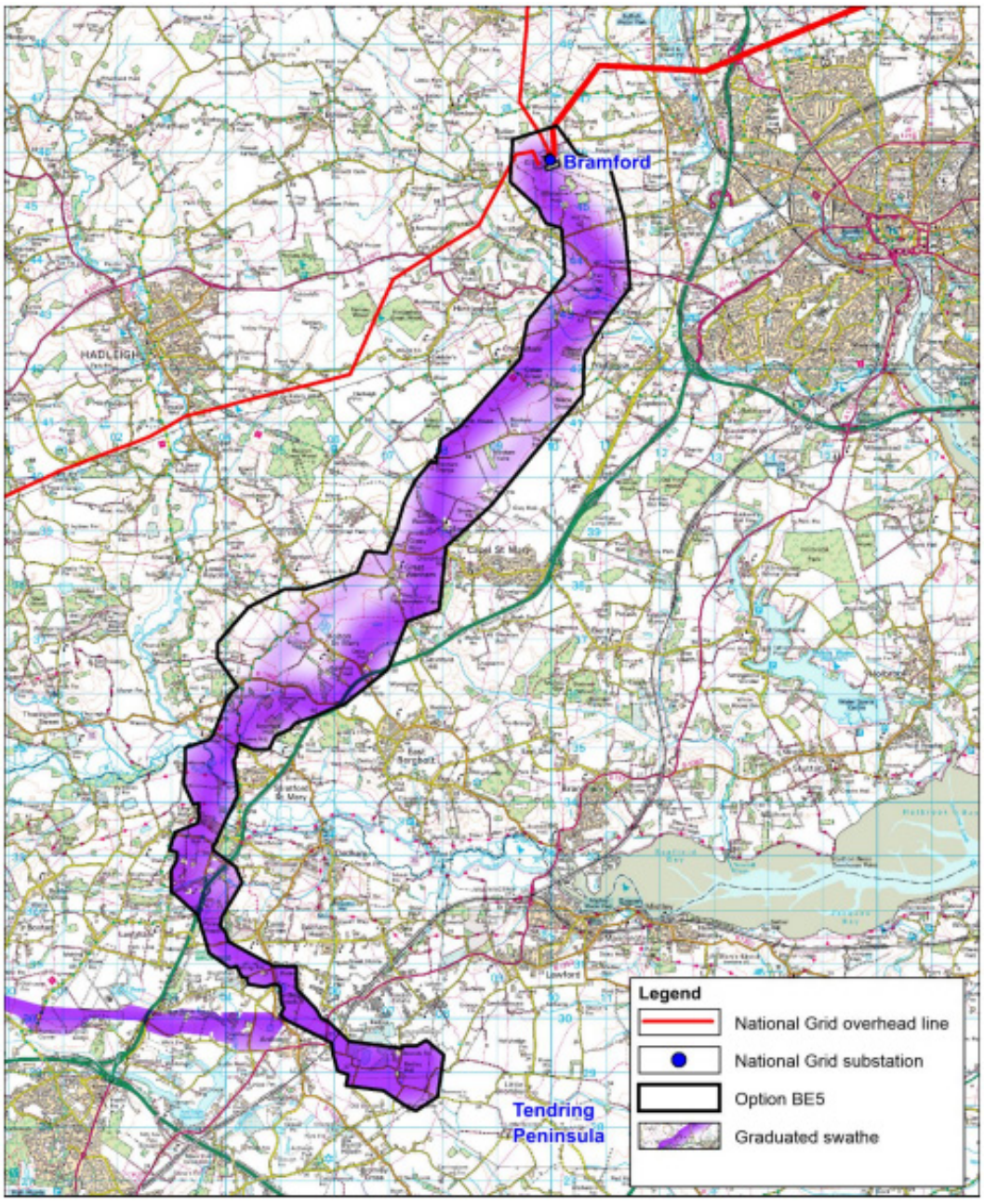
3.5.51 This assessment considered whether the duty to *'seek to further the purpose'* of conserving and enhancing natural beauty of the National Landscape would require a different approach to corridor selection. The analysis found that:

- Routing around the Dedham Vale National Landscape (Options BE3/BE4) would require approximately 25 km of additional overhead line infrastructure compared to the selected route
- While such routing would reduce the length of underground cable within the National Landscape from approximately 5.8 km to approximately 3 km, this reduction would be achieved at the cost of significantly greater environmental impacts across a wider area
- The alternative route would still require approximately 16 km of underground cable in total, including an estimated 3 km within the National Landscape boundary due to constraint locations

- The environmental benefits of avoiding the designated landscape are outweighed by the additional environmental costs associated with the extended overhead line route.

3.5.52 National Grid concluded that the strengthened duty does not require adoption of a route around the National Landscape. The selected Option BE5, using underground cable technology through the National Landscape, represents an appropriate balance between minimising effects on the designated landscape while maintaining compliance with National Grid's statutory duties under the Electricity Act 1989 to be economic and efficient. The approach of careful routeing and siting to identify an alignment away from particularly highly valued parts of the protected landscape, combined with underground technology, demonstrates how the Project seeks to further the purposes of the National Landscape while meeting the strategic network reinforcement need.

Image 3.7 Bramford Substation to EACN Substation graduated swathe (from CPRSS (National Grid, 2022))



EACN Substation

3.5.53 The need for a new EACN Substation in the Tendring peninsula area emerged from strategic discussions between offshore windfarm developers and the Electricity System Operator (as outlined in Section 3.5). National Grid determined that combining the connection needs for new offshore wind generation with the required network reinforcement between Norwich and Tilbury would result in reduced total infrastructure requirements and lower overall costs compared to developing these needs separately. The Tendring peninsula location was specifically preferred over alternatives (such as Felixstowe) because it would avoid the need to cross the Suffolk & Essex Coast & Heaths National Landscape, reduce the complexity of substation siting in constrained areas, and minimize the number of required additional connections. A Tendring location also allows for more efficient integration with both the Bramford to Tilbury reinforcement and offshore wind farm connections from the Clacton area, limiting the total length of transmission infrastructure needed and reducing overall environmental effects.

Options Identification

3.5.54 Within the Tendring peninsula, the assessment followed a systematic approach to identify and compare environmental effects of potential substation locations. An initial long-list of 45 relatively unconstrained candidate areas of at least 24ha was identified across the peninsula through geographical information systems mapping and constraints analysis (refer to CPRSS Sections 6.3.1 (National Grid, 2022)).

3.5.55 These areas were subject to comparative environmental assessment considering factors including scope for mitigation, proximity to residential properties and heritage assets, ecological constraints and opportunities, availability of natural screening, and potential impacts on valued landscape elements.

3.5.56 Through this environmental assessment process, nineteen candidate areas were identified as potentially being the least environmentally sensitive and were included on a short-list for detailed assessment (refer to CPRSS Section 6.3.2 – 6.3.3 (National Grid, 2022)).

3.5.57 The short-listed areas were subject to further analysis regarding their potential to accommodate the EACN Substation and windfarm customer substation infrastructure. This analysis considered whether all infrastructure could be co-located within one area, or whether areas close to each other (i.e. within approximately 1 km) could combine to accommodate all infrastructure.

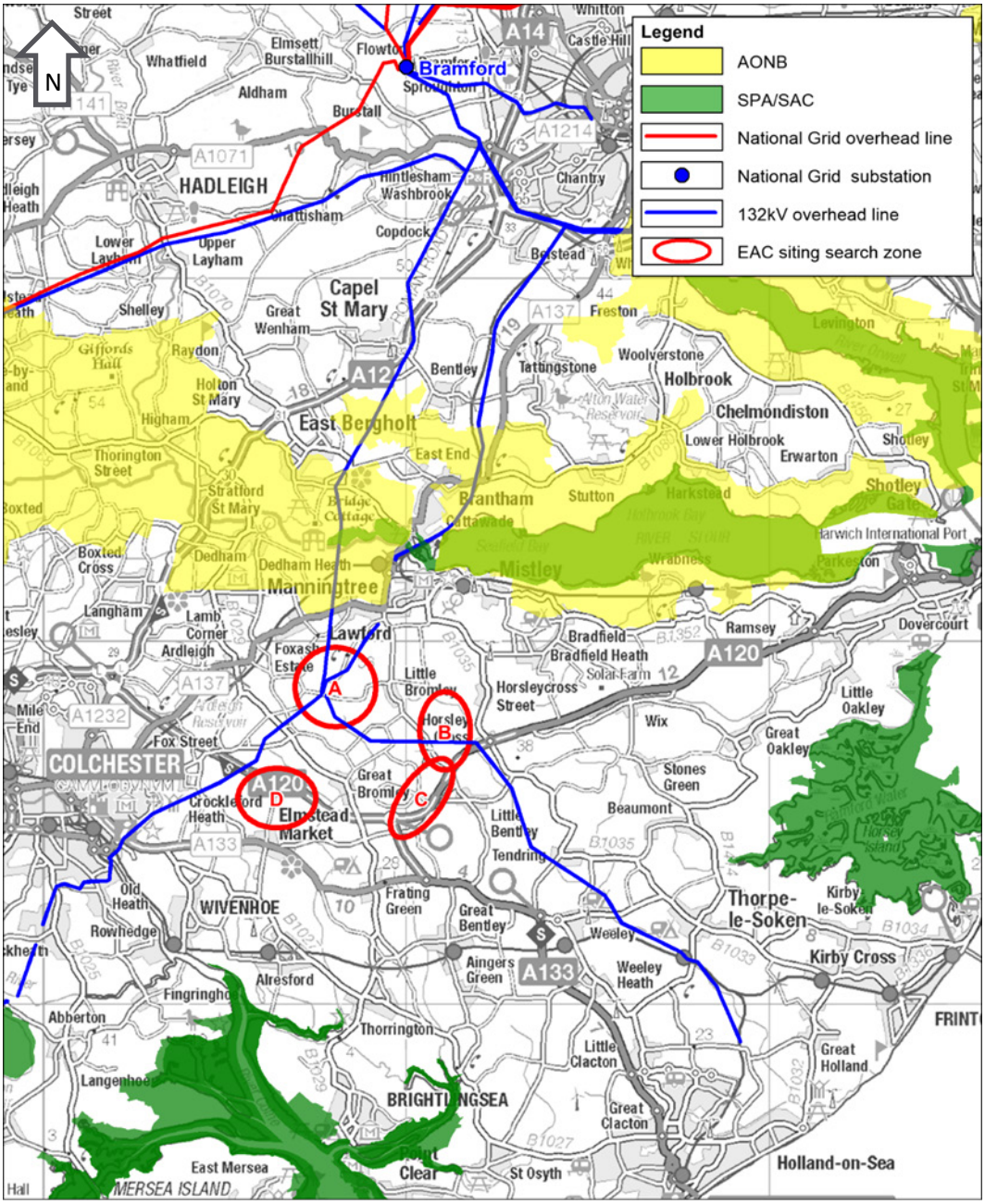
3.5.58 Ten of the areas were found to either have limited potential to accommodate the EACN Substation and windfarm customer substation infrastructure due to technical constraints including inadequate area size, challenging ground conditions, or proximity to existing infrastructure, or not to offer advantages over areas that performed better in the high-level environmental analysis. The technical constraints that excluded these areas included insufficient land area to accommodate both the EACN Substation and the associated customer connection infrastructure required for the three confirmed customer connections (North Falls 1000 MW offshore wind, Five Estuaries 1080 MW offshore wind, and Tarchon 1400 MW interconnector), challenging ground conditions that would compromise construction feasibility, and proximity to existing infrastructure that would create operational conflicts or safety concerns.

3.5.59 Nine areas, grouped into four zones, were therefore taken forward to options appraisal (as shown on Image 3.8)[1]:

- Zone A: an extensive zone including three individual sites centred on the 132 kV substation near Little Bromley in the north-west of the peninsula
- Zone B: a zone consisting of a single large area to the north-west of the A120 between Bentley Road and Horsley Cross
- Zone C: a zone consisting of two areas to the immediate north-west of the A120 and to the immediate north-east of the junction of the A120 with the A133 near Hare Green
- Zone D: a zone consisting of three areas to the immediate south of the A120 to the north of Elmstead Market.

[1] Following the 2025 DDR, additional consideration was given to alternative locations including the former RAF Boxted airfield site. However, this alternative was not progressed due to the requirement for multiple additional corridors to accommodate the three confirmed customer connections, increased environmental effects from longer customer connection routes, and the potential need for additional infrastructure including connections to Lawford Substation. The assessment confirmed that Zone A remained the preferred option as it provides the optimal balance of environmental effects, technical feasibility, and economic efficiency whilst having capacity to accommodate all three customer connections within the surrounding area.

Image 3.8 EACN Substation option zones (not to scale) – as taken from the CPRSS (National Grid, 2022)



3.5.60 A summary of the options appraisal of the four zones and corridors leading to them is provided below. Further detail can be found the CPRSS (National Grid, 2022).

Options Appraisal

3.5.61 An appraisal of the four zones considered for the EACN Substation site was carried out using the methodology outlined above. A summary of environmental factors considered for each option is provided in Table 3.7, which should be read in conjunction with Image 3.8

Table 3.7 Summary of options appraisal – EACN Substation Zones A to D (CPRSS (National Grid, 2022))

Zone	Description	Key Environmental Effects Considered During the Selection Process
Zone A	Area centred on the 132 kV substation near Little Bromley in the north-west of the peninsula (shown on Image 3.8).	**Beneficial:** • Landscape and Visual: Parts of zone with existing screening elements and natural enclosure provide better mitigation opportunities compared to Zone B's more open character • Horlock Rules compliance: Good accessibility via existing road network, with selected Bentley Road access route serving this zone's locationBetter accessibility via existing road network compared to Zone D's constrained access arrangements **Adverse:** • Portions closer to settlements could result in adverse visual effects than Zones B and C due to denser settlement pattern compared to their more rural settings • Historic Environment: Adjacent to Grade II listed buildings presenting similar heritage constraints to Zones B and C, though requiring less extensive mitigation than Zone D's Grade II impacts.
Zone B	Area to the north-west of the A120 between Bentley Road and Horsley Cross (shown on Image 3.8).	**Beneficial:** • Development acceptable with careful siting, though requiring more mitigation than Zone C's preferred landscape characteristics • Horlock Rules compliance: Good access potential via A120 and Bentley Road connections, though requiring highway widening for construction access. **Adverse:** • Potential for significant adverse effects on setting of Grade II listed buildings, presenting similar but less severe heritage constraints than Zone D's Grade II* designation impacts • Landscape and Visual: More visually open nature compared to Zone A's existing screening, requiring additional mitigation measures.

Zone	Description	Key Environmental Effects Considered During the Selection Process
Zone C	Areas to the immediate north-west of the A120 near Hare Green (shown on Image 3.8).	**Beneficial:** • Landscape and Visual: Preferred zone from a landscape and visual perspective compared to all other assessed zones (CPRSS Section 6.5.6 (National Grid, 2022)) • Horlock Rules compliance: Development would entail both 400 kV overhead lines to be approximately 5 km longer than Zone A, resulting in greater cumulative environmental effects. **Adverse:** • Historic Environment: Both areas adjacent to Grade II listed buildings presenting similar heritage considerations to Zones A and B, but significantly less severe than Zone D's Grade II* impacts
Zone D	Areas to the immediate south of the A120 north of Elmstead Market (shown on Image 3.8).	**Beneficial:** • Access: Proximity to A120 provides infrastructure benefits, though with greater access constraints than northern zones • Horlock Rules compliance: Access constraints despite A120 proximity, with greater access limitations than northern zones. **Adverse:** • Ecology: Ancient woodland proximity poses greater consenting risk than other zones; higher ecological risks compared to Zones A, B, and C due to open water associations • Landscape and Visual: More significant adverse effects on Landscape Character Areas compared to other zones; bunding requirements more problematic for local landscape character than northern zones • Historic Environment: Most significant adverse environmental effects including severe heritage impacts where significant adverse effects could not be avoided on Grade II Elmstead Hall.

Options Selection

3.5.62 For the EACN Substation component, four zones were assessed through comparative environmental effects analysis alongside technical feasibility and cost considerations. The environmental effects comparison identified Zone A as the preferred option based on the following factors:

- Landscape and Visual: North/central part of Zone A has a relatively high incidence of existing screening providing good mitigation opportunities
- Historic Environment: While adjacent to Grade II listed buildings, presents significantly less severe heritage constraints than Zone D where clear views from the south front of Elmstead Hall (Grade II Listed Building) would result in significant adverse effects that could not be avoided
- Connection Effects: Strategic positioning requires shortest overhead line connections (approximately 5 km less than Zone C and 4 km less than Zone D), significantly reducing environmental impact across the wider landscape
- Customer Connection Accommodation**:** Zone A and its surrounding area have capacity to accommodate the three confirmed customer connections (North Falls 1000 MW offshore wind, Five Estuaries 1080 MW offshore wind, and Tarchon 1400 MW interconnector), including associated converter station infrastructure. While a more coastal location would reduce customer connection lengths, this would be offset by significantly increased costs and environmental effects from longer National Grid infrastructure connections to the transmission system
- Economic Cost Savings: Zone A performed the best from an economic cost savings perspective when compared to the other options
- Cumulative Assessment: When account is taken of the 400 kV overhead lines and customer connections, Zone A would require the shortest length of connection and is the preferred zone.

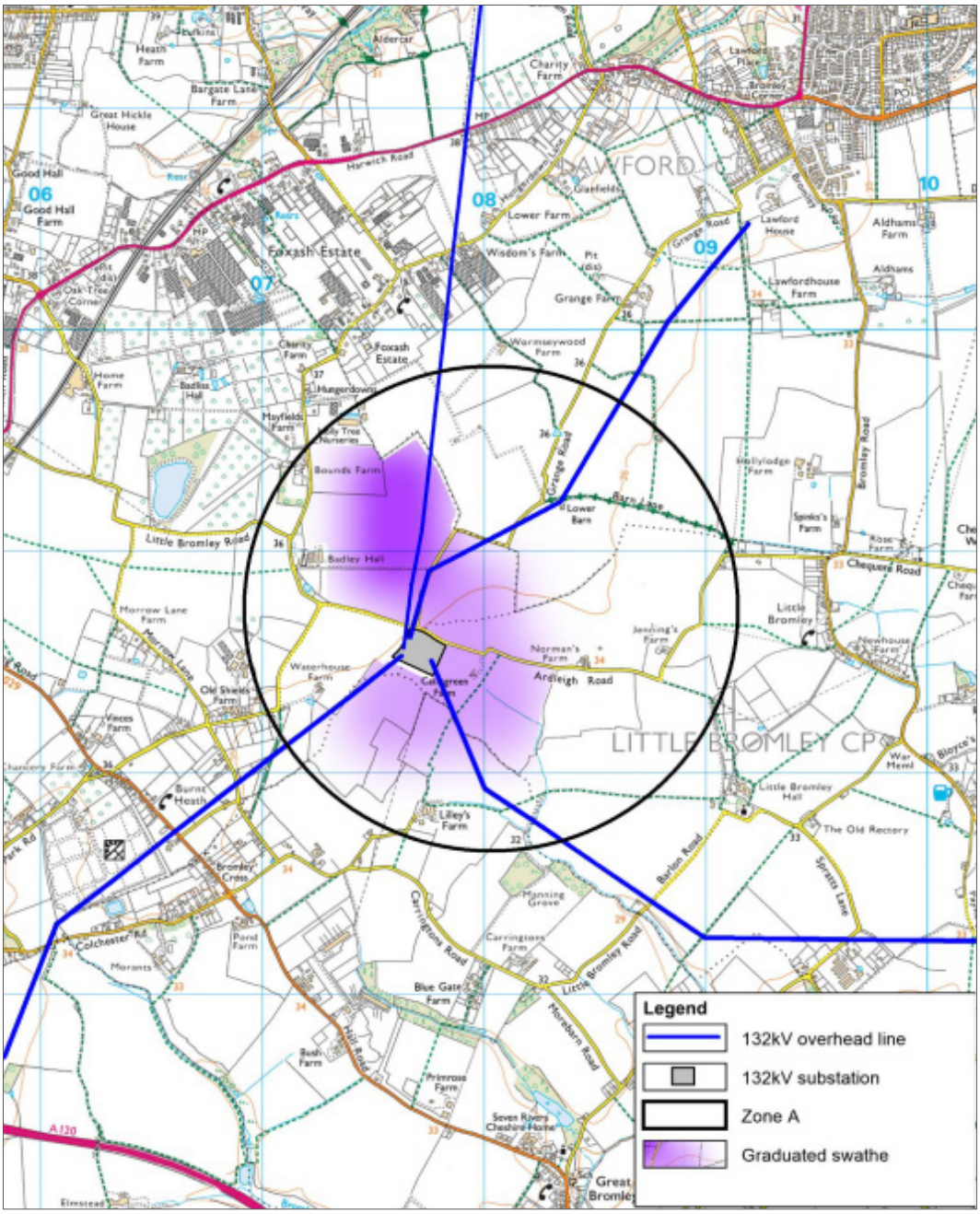
3.5.63 Key factors leading to a rejection of non-preferred alternatives for the Bramford Substation to EACN substation included:

- Zone C: While considered the most suitable zone when considering the substation infrastructure in isolation, the development of Zone C would entail both 400 kV overlines to be approximately 5 km longer, resulting in greater cumulative environmental effects
- Zone D: Most significant adverse environmental effects including severe heritage impacts where significant adverse effects could not be avoided on Grade II Elmstead Hall
- Zone B: Performed less well than Zone A in relation to substation infrastructure assessment.

3.5.64 The environmental assessment demonstrated that Zone A would result in the shortest length of overhead line which would mean fewer pylons and thus fewer effects compared to other zones. In addition, the identification of Option BE5 (the selected corridor option for the Bramford to EACN section) and Option ET1 (the selected corridor option for the EACN to Tilbury section), both of which utilise Section F, confirmed Zone A as the preferred zone from an environmental, technical and cost perspective.

3.5.65 Following selection of Zone A as the preferred zone, a graduated swathe analysis was undertaken to identify areas within the zone where substation infrastructure is considered more or less likely to be located (as shown on Image 3.9).

Image 3.9 EACN Substation graduated swathe – as taken from CPRSS (National Grid, 2022)



EACN Substation to Tilbury Substation

Options Identification

3.5.66 The preliminary corridor identification exercise identified 12 potential route corridor sections through systematic consideration of environmental constraints and opportunities mapping. Sections also reflect the potential interaction of corridor

options between the EACN Substation and Tilbury Substation. Corridor options are shown on Image 3.10:

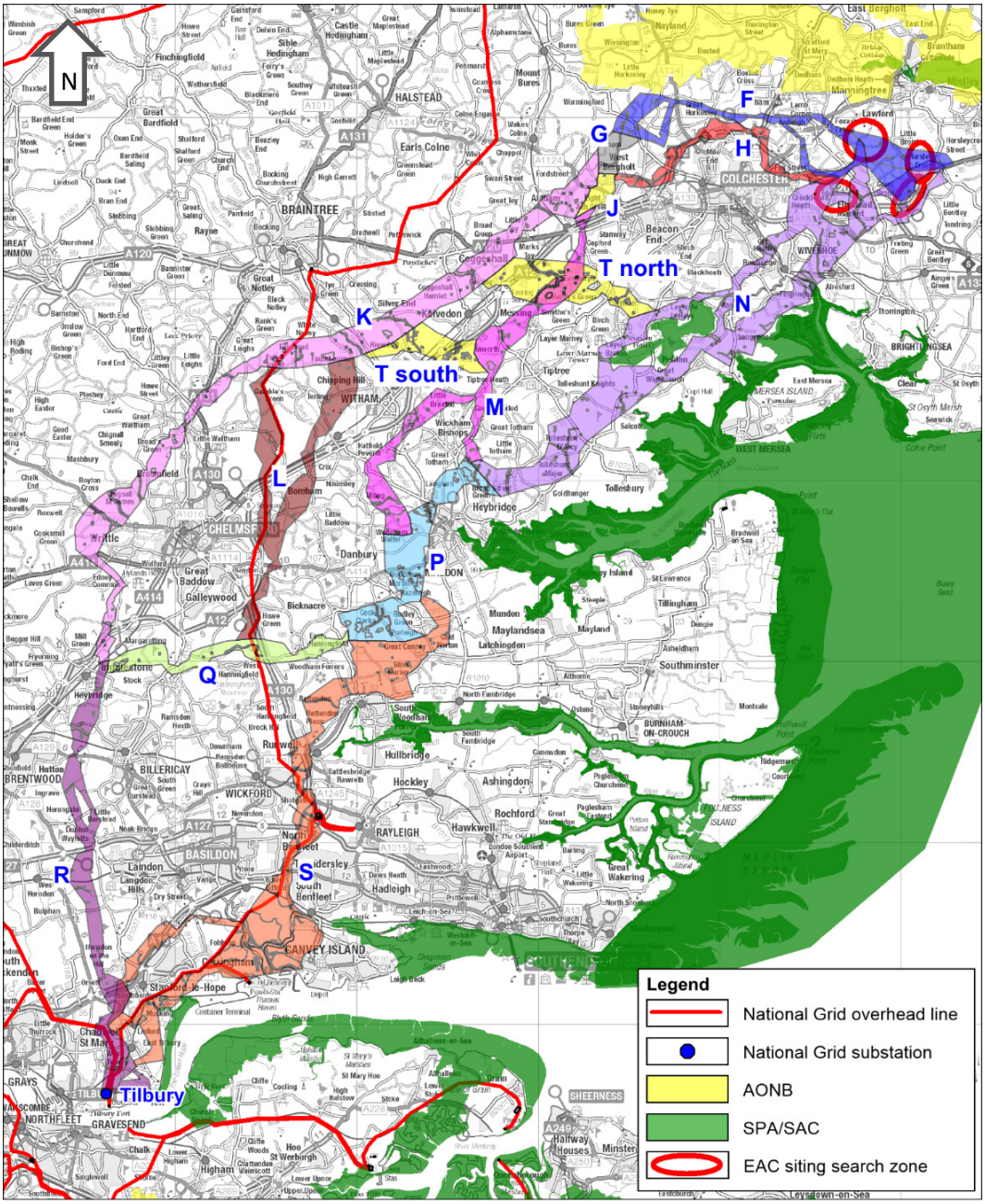
- Section F: a section routeing north of Colchester and to the north of Ardleigh Reservoir
- Section G: a short section required to link Section F to Sections J or K
- Section H: a section routeing north of Colchester and to the south of Ardleigh Reservoir
- Section J: a short section required to link Section G to Section M, or Section H to Sections K or M
- Section K: an extensive section that allows the sections routed to the north of Colchester (Sections F and G, and Sections H and J) to continue southward via an inland route, to the west of Chelmsford
- Section L: a section that allows the sections routed to the north of Colchester that link to Section K, to continue southward via an inland route, to the east of Chelmsford
- Section M: a section that allows the sections routed to the north of Colchester, that link to Section J, to continue southward to join the more easterly routes in the vicinity of Maldon
- Section N: a section routeing to the south-east of Colchester and continuing southward across the coastal plain toward Maldon
- Section P: a relatively short section to the west of Maldon that links Section N or M to the north, with Sections Q or S, to the south
- Section Q: a section on a broadly east–west alignment that allows sections routed to the south-east of Colchester (Sections N and P) to continue southward via an inland route to the west of Billericay and Basildon (Section R)
- Section R: an extensive section with the potential to link all sections, other than Section S, to Tilbury via an inland route to the west of Billericay and Basildon
- Section S: an extensive section with the potential to link all sections that link to Section P from the north to Tilbury via Rayleigh, to the east of Basildon.

3.5.67 The corridor sections were then subject to an iterative process of review and refinement by both environmental and technical specialists, which resulted in removing some parts of the corridor due primarily to engineering constraints, and the extension of corridors to provide alternative routes to avoid and minimise environmental constraints. Environmental factors driving refinements included avoiding internationally designated ecological sites, minimizing impacts on National Landscape settings, and reducing effects on historic environment features. Two additional sections were also identified south of Colchester based on environmental effects analysis that identified opportunities to provide more inland alternatives with reduced coastal designation impacts:

- Section T North: a section that allows a link from Section N east of Colchester to continue southwards via an inland route on either Section M or Section K
- Section T South: a more southerly section south of Colchester that allows a link from Section M to Section K to continue southward via a more inland route.

3.5.68 All 14 corridor sections were taken forwards to options appraisal and are presented on Image 3.10. The sections were designed to be combined in various permutations to form end-to-end corridor options for comparative environmental effects assessment in accordance with Regulation 14(2)(d) requirements.

Image 3.10 EACN Substation to Tilbury Substation options (not to scale) – as taken from CPRSS (National Grid, 2022)



Options Appraisal

3.5.69 A summary of the appraisal of the 14 options is provided in Table 3.8. Further detail can be found in the CPRSS (National Grid, 2022). This should be read in conjunction with Image 3.10.

Table 3.8 Summary of options appraisal – EACN Substation to Tilbury Substation (CPRSS (National Grid, 2022))

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Section F	A section routeing north of Colchester and to the north of Ardleigh Reservoir	**Beneficial:** • Historic Environment: Northern parts of section have no significant heritage constraints compared to southern sections (i.e. Section H) • Landscape and Visual: Likely to be environmentally acceptable from landscape and visual perspective with normal routeing and siting. **Adverse:** • Historic Environment: Southern branch passes very close to scheduled hill fort at Pitchbury Ramparts presenting greater heritage constraint than Section H • Landscape and Visual: Potential for significant effects on Dedham Vale National Landscape near Little Horkesley compared to Section H which provides greater separation • Visual Amenity: Some localised visual effects in narrow parts due to residential properties • Holford Rules compliance: Reduced compliance with Rule 2 (avoiding smaller areas of high amenity) compared to Section H due to Pitchbury Ramparts proximity.
Section G	A short section required to link Section F to Sections J or K	**Beneficial:** • Overall Assessment: No significant environmental effects concerns from historic environment or landscape perspective when compared in isolation • Environmental Impact: Minimal environmental effects identified as a linking section • Holford Rules compliance: Maintains route directness without significant deviations. **Adverse:** • No substantial environmental effects identified.
Section H	A section routeing north of Colchester and to the south of Ardleigh Reservoir	**Beneficial:** • Landscape and Visual: Greater separation from Dedham Vale National Landscape than Section F • Historic Environment: No significant environmental effects concerns from historic environment perspective

Corridor	Description	Key Environmental Effects Considered During the Selection Process
		• Holford Rules compliance: Better compliance with Rule 2 (avoiding smaller areas of high amenity) compared to Section F. **Adverse:** • Landscape and Visual: Highly constrained by residential properties and commercial areas creating significant visual amenity effects
Section J	A short section required to link Section G to Section M, or Section H to Sections K or M	**Beneficial:** • Overall Assessment: Effects likely acceptable with careful routeing and siting compared to coastal alternatives. • **Adverse:** • Landscape and Visual: Significant visual amenity effects from constraining factors including Fordham, Lexden Heath, and residential development.
Section K	An extensive section that allows northern routes to continue southward via an inland route, west of Chelmsford	**Beneficial:** • Ecology: Effects on ecology likely acceptable with careful routeing compared to coastal alternatives, including Sections M, N, and P, which were assessed as presenting higher environmental risks due to proximity to designated sites (Section M), high risk of Likely Significant Effects on multiple designated sites (Section N), and unavoidable impacts on conservation areas (Section P) • Landscape and Visual: Lower environmental risk from landscape and visual perspective with mitigation • Holford Rules compliance: Better compliance with Rule 1 (avoiding major areas of highest amenity) compared to coastal sections. **Adverse:** • Landscape and Visual: Significantly constrained at Little Waltham and Newney Green creating localised visual effects • Historic Environment: Several areas requiring enhanced measures for historic environment beyond normal routeing compared to less constrained sections.

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Section L	A section that allows connection to route east of Chelmsford	**Beneficial:** • Visual Amenity: Eastern leg has reduced visual effects on residential receptors compared to western leg • Cumulative Effects: Potential for cumulative visual effects with existing overhead lines requiring additional landscape mitigation. **Adverse:** • Ecology: Higher ecological constraints with increased risk of effects on designated sites compared to preferred inland alternatives • Historic Environment: Significant impacts on Chelmer and Blackwater Navigation Conservation Area that cannot be avoided • Cumulative Effects: Western leg significantly affected by existing infrastructure creating cumulative visual effects.
Section M	A section that allows northern routes to continue southward to join easterly routes near Maldon	**Beneficial:** • Landscape and visual: Lower consenting risk subject to measures addressing cumulative wirescape effects. **Adverse:** • Ecology: Relatively constrained from ecological perspective with higher risk of Likely Significant Effects on designated sites compared to inland alternatives • Historic Environment: Significant impacts on Chelmer and Blackwater Navigation Conservation Area that cannot be avoided • Landscape and Visual: Both legs heavily constrained creating visual amenity effects with sections of limited mitigation opportunities • Visual Amenity: Routeing through Benton Hall Golf and Country Club significantly affects recreational landscape.

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Section N	A section routeing south-east of Colchester and continuing toward Maldon	**Beneficial:** • No comparative environmental effect benefits when assessed against other alternatives. **Adverse:** • Ecology: Most constrained section ecologically with high risk of Likely Significant Effects on multiple designated sites compared to all other assessed sections • Water Environment: Environmental effects from Colne Estuary crossing requirements • Environmental Feasibility: Multiple areas of significant environmental constraint restricting mitigation flexibility.
Section P	A relatively short section west of Maldon linking northern sections with southern sections	**Beneficial:** • Lower consenting risk subject to detailed consideration of cumulative effects. **Adverse:** • Historic Environment: Unavoidable effects on Chelmer and Blackwater Navigation Conservation Area.
Section Q	A section allowing easterly routes to continue southward via inland route west of Billericay and Basildon	**Beneficial:** • Historic Environment: No significant environmental effects concerns from historic environment perspective compared to heritage-constrained sections. **Adverse:** • Visual Amenity: Moderately affected by residential properties, listed buildings and Crondon Park Golf Club creating localised visual effects.
Section R	An extensive section linking northern sections to Tilbury via inland route west of Billericay and Basildon	**Beneficial:** • Ecology: Preferred over Section S from ecological perspective due to reduced risk of effects on designated sites • Environmental Risk: Lower environmental risk with mitigation measures for landscape and visual effects compared to coastal alternatives • Holford Rules compliance: Better compliance with Rule 1 (avoiding major areas of highest amenity) compared to Section S. **Adverse:**

Corridor	Description	Key Environmental Effects Considered During the Selection Process
		• Landscape and Visual: Approach to Tilbury Substation environmentally constrained requiring extensive landscape mitigation.
Section S	An extensive section linking routes via Rayleigh, east of Basildon to Tilbury	**Beneficial:** • No significant environmental advantages identified over alternative routeing options. **Adverse:** • Ecology: Higher ecological constraints with increased risk of effects on designated sites compared to inland alternatives • Visual Amenity: Dense pattern of settlement creating potential visual effects for large populations compared to inland alternatives.
Section T North	A section linking from Section N east of Colchester to continue southwards via Sections M or K	**Beneficial:** • Overall environmental impacts: Effects could be minimised through careful routeing. **Adverse:** • Landscape and Visual: Visual effects from crossing of A12 dual carriageway and associated widening scheme.
Section T South	A more southerly section south of Colchester linking Section M to Section K	**Beneficial:** • Landscape and visual: Overall impact on landscape and visual considered neutral compared to other more constrained alternatives. **Adverse:** • Ecology: Environmental constraints present higher environmental risk due to proximity to designated sites compared to inland alternatives • Historic Environment: Adverse impact on historic environment requiring mitigation.

3.5.70 Following the appraisal, a challenge and review exercise took place to analyse and discuss the outputs of the options appraisal, filter out non-feasible options, and short-list options to be taken forward to the decision exercise. The environmental effects analysis revealed that while individual sections had varying environmental constraints, combining them into end-to-end corridor options could optimise environmental performance by utilising the least constrained sections while avoiding areas of highest environmental sensitivity. The evaluation did not identify any corridor sections as non-feasible on environmental or technical grounds. Based on the environmental effects comparison, The exercise identified six end-to-end corridor options formed from permutations of sections that provided reasonable alternatives for detailed assessment:

- ET1: an option routeing to the north of Colchester and to the west of Chelmsford, consisting of either Sections F and G, or Sections H and J, plus Sections K and R (as shown in Image 3.10)
- ET2: an option routeing to the south-east of Colchester and via Maldon and Rayleigh, consisting of Sections N, P and S (as shown in Image 3.10)
- ET3: an option routeing to the north of Colchester and via Maldon and Rayleigh, consisting of either Sections F, G and J, or Sections H and J, plus Sections M, P and S (as shown in Image 3.10)
- ET4: an option routeing to the north of Colchester and via Maldon and to the west of Basildon, consisting of either Sections F, G and J, or Sections H and J, plus Sections M, P, Q and R (as shown in Image 3.10)
- ET5: an option routeing to the north of Colchester and to the east of Chelmsford, consisting of either Sections F and G, or Sections H and J, plus Sections K, L, Q and R (as shown in Image 3.10)
- ET6: an option routeing to the east of Colchester and south of Colchester consisting of either Sections N and T North, or Sections N, T North, M and T South, plus Sections K and R (as shown in Image 3.10).

3.5.71 Decision planning was undertaken to consider the environmental effects of the options identified on receptors in the Study Area. Project team representatives from technical disciplines alongside environmental and planning specialists were involved to ensure the discussions were comprehensive and considered all constraints. Each option was considered in turn, with environmental effects and technical factors being noted.

3.5.72 A summary of options and their appraisal is provided in Table 3.9. This should be read in conjunction with Image 3.10.

Table 3.9 Final route options appraisal – EACN Substation to Tilbury Substation

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Option ET1	An option routeing to the north of Colchester and to the west of Chelmsford, consisting of Sections F, G, K and R	**Beneficial:** • Ecology: Lower risk of effects on international and national ecological designations due to greater distance from coast, reducing risk of Adverse Effects on Site Integrity compared to coastal alternatives ET2, ET3, and ET6 • Landscape and Visual: Preferred from landscape and visual perspective compared to all other assessed options • Holford Rules compliance: Better compliance with Rule 1 (avoiding major areas of highest amenity) compared to coastal alternatives. **Adverse:** • Landscape and Visual: Potential for significant adverse effects on Dedham Vale National Landscape in the vicinity of Little Horkesley • Visual Amenity: Some localised visual effects in narrow parts of Section F due to residential properties, and significant visual and heritage effects at Little Waltham and Newney Green in Section K • Ecology: Section R in proximity to Thames Estuary and Marshes SPA/Ramsar site though with lower potential for adverse effects compared to Section S alternatives
Option ET2	An option routeing to the south-east of Colchester and via Maldon and Rayleigh, consisting of Sections N, P and S	**Beneficial:** • No environmental advantages identified over other alternatives. **Adverse:** • Ecology: Highest potential for likely significant effects on international and national ecological designations (SPAs, Ramsar sites, SACs, SSSIs) of all assessed options • Landscape and Visual: Traverses open and relatively undeveloped coastal plain between Colchester and Maldon creating significant landscape character effects • Historic Environment: Section P unavoidably crosses Chelmer and Blackwater Navigation Conservation Area which cannot be mitigated through routeing • Visual Amenity: Dense settlement pattern in Section S creates potential for significant visual effects on large populations compared to inland alternatives

Corridor	Description	Key Environmental Effects Considered During the Selection Process
		• Holford Rules compliance: Poor compliance with Rule 1 (avoiding major areas of highest amenity) due to routing through coastal designations and internationally protected sites.
Option ET3	An option routeing to the north of Colchester and via Maldon and Rayleigh, consisting of either Sections F, G and J, or Sections H and J, plus Sections M, P and S	**Beneficial:** • Landscape and Visual: Avoids traversing coastal plain between Colchester and Maldon compared to Option ET2. **Adverse:** • Ecology: Significant potential for likely significant effects on ecological designations though lower than ET2 • Historic Environment: Section P unavoidably crosses Chelmer and Blackwater Navigation Conservation Area • Visual Amenity: Section S passes through dense pattern of settlement with potential visual effects on large numbers of people compared to inland alternatives ET1 and ET5 • Holford Rules compliance: Poor compliance with Rule 1 (avoiding major areas of highest amenity) due to Section P crossing conservation areas and routing through designated coastal areas.
Option ET4	An option routeing to the north of Colchester and via Maldon and to the west of Basildon, consisting of either Sections F, G and J, or Sections H and J, plus Sections M, P, Q and R	**Beneficial:** • Ecology: Lower risk of effects on ecological designations compared to coastal route ET2 • Landscape and Visual: Section R preferred over Section S for reduced visual effects on entry to Tilbury. **Adverse:** • Visual Amenity: Greater potential for visual effects on golf courses compared to more direct inland routes • Holford Rules compliance: Moderate compliance with Rule 1 but poorer than ET1 due to longer routing through varied landscape settings.

Corridor	Description	Key Environmental Effects Considered During the Selection Process
Option ET5	An option routeing to the north of Colchester and to the east of Chelmsford, consisting of either Sections F and G, or Sections H and J, plus Sections K, L, Q and R	**Beneficial:** • Ecology: Lower risk of effects on ecological designations compared to coastal route ET2. **Adverse:** • Ecology: Section L has potential for adverse ecological effects requiring HRA compared to western inland alternatives • Cumulative Effects: Greater potential for cumulative visual effects due to interaction with existing 400 kV and 132 kV lines east of Chelmsford compared to Option ET1 • Visual Amenity: Greater potential for visual effects on golf courses compared to more direct inland routes • Holford Rules compliance: Reduced compliance with Rule 3 (directness) due to additional relatively sharp changes of direction required compared to Option ET1.
. Option ET6	An option routeing to the east of Colchester and south of Colchester consisting of either Sections N and T North, or Sections N, T North, M and T South, plus Sections K and R	**Beneficial:** • Ecology: Lower risk of effects on ecological designations compared to coastal route ET2. **Adverse:** • Ecology: Requires use of Section N which has higher potential for ecological impacts on multiple internationally and nationally designated sites including Colne Estuary SPA/Ramsar, Blackwater Estuary SPA/Ramsar, Essex Estuaries SAC, and Abberton Reservoir SPA/Ramsar compared to northern alternatives. • Section T South has higher ecological constraints with increased risk of effects on designated sites compared to preferred inland alternatives would have negative effects requiring HRA • Holford Rules compliance: Poor compliance with Rule 1 (avoiding major areas of highest amenity) due to Section N routing through coastal designations and internationally protected sites • Greater technical complexity in Section N compared to northern Colchester sections.

Options Selection

3.5.73 For the EACN Substation to Tilbury Substation component, 14 corridor sections were assessed, resulting in six end-to-end corridor options evaluated through viable environmental effects comparison.

3.5.74 The environmental effects analysis identified Option ET1 (Sections F, G, K and R) as the preferred option based on the following environmental effects:

- Ecology: Significantly lower risk of effects on international nature conservation sites (SPAs, Ramsar sites, SACs) and associated SSSIs due to greater distance from coast, reducing risk of Adverse Effects on Site Integrity compared to coastal alternatives ET2 and ET6
- Historic Environment: Avoids unavoidable impacts on conservation areas, unlike coastal options where Section P crosses Chelmer and Blackwater Navigation Conservation Area without mitigation possibility
- Landscape and Visual: Preferred from landscape and visual perspective, avoiding traversal of open coastal plain and dense settlement patterns that characterize coastal alternatives
- Cumulative Effects: Reduced overall environmental impact through shorter, more direct inland routeing compared to extended alternatives
- Holford Rules compliance: Better compliance with Rule 1 (avoiding major areas of highest amenity) through inland routeing away from internationally designated sites.

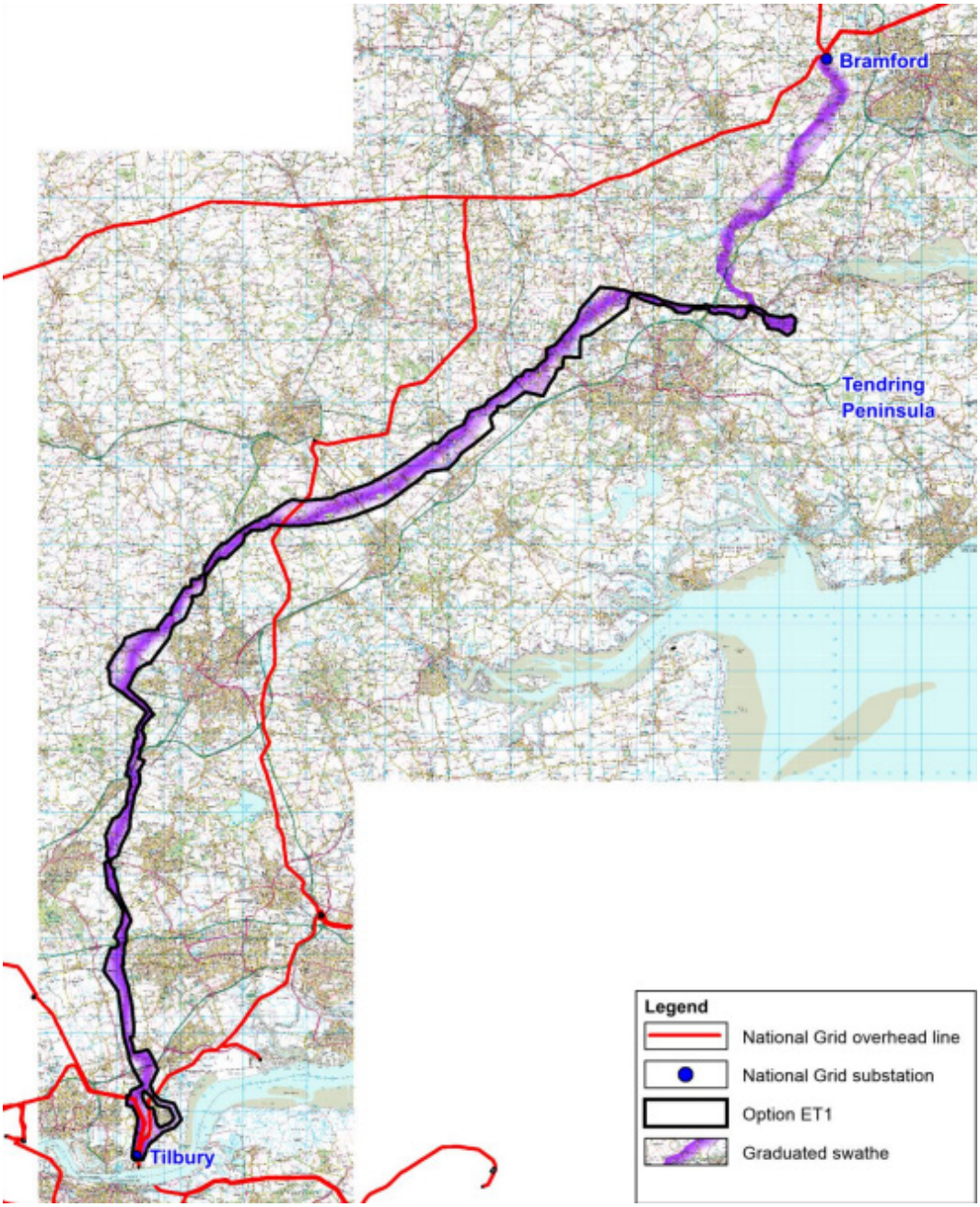
3.5.75 Key factors leading to a rejection of non-preferred alternatives for the EACN Substation to Tilbury Substation included:

- Options ET2 and ET6: Highest potential for Likely Significant Effects on multiple international designations requiring Appropriate Assessment under the Conservation of Habitats and Species Regulations 2017, with significant risk of Adverse Effects on Site Integrity that could not be adequately mitigated or compensated
- Option ET3: Substantial potential for ecological effects on designated sites combined with unavoidable conservation area impacts and significant visual effects on large populations through dense settlement areas
- Options ET4 and ET5: While avoiding the highest ecological risks of coastal routes, presented greater environmental constraints through additional infrastructure requirements and cumulative visual effects compared to Option ET1.

3.5.76 The environmental assessment applied the principle that where Adverse Effects on Site Integrity cannot be ruled out, alternatives with lesser or more mitigatable impacts must be preferred. The inland options presented significantly lower risk of Adverse Effects on Site Integrity (AEoSI) to European sites and were also preferred on historic environment grounds, either avoiding conservation areas entirely or providing sufficient space for alignments to avoid them.

3.5.77 Technical complexity and cost factors also supported Option ET1, being £107 million less than the coastal connection ET2. The preferred corridor and graduated swathe for this component are shown in Image 3.11.

Image 3.11 EACN Substation to Tilbury graduated swathe – as taken from CPRSS (National Grid, 2022)



3.6 Cable Sealing End Compounds

3.6.1 Cable Sealing End compounds are essential infrastructure components that facilitate the transition between overhead lines and underground cables within the Project. These compounds are required at specific locations where environmental constraints, technical considerations, or policy requirements necessitate a change in transmission technology from overhead lines to underground cables or vice versa. CSE compound locations are functionally determined by higher-order Project decisions including route corridor selection, substation positioning, and technology choices (particularly the decision to underground through designated landscapes in accordance with NPS EN-5 policy requirements), with alternatives assessment focusing on optimizing specific positioning within these functionally required geographic areas.

3.6.2 When siting the CSE compounds, National Grid applied the same principles used for broader infrastructure planning, ‘seeking to avoid’ or ‘seeking to minimise’ based on environmental sensitivity in order to, respectively, either avoid or minimise effects while achieving the Project objectives. Key siting considerations included avoiding areas of high ecological value (such as designated sites and ancient woodland), minimising impacts on the historic environment (including scheduled monuments and listed buildings with 50 to 100 m buffers), avoiding areas of high landscape value (such as National Landscapes with 1 km buffers), and addressing technical constraints like flood risk zones. CSE compounds would also require appropriate access for construction and maintenance, with preference given to sites that can be screened by existing vegetation or topography to reduce visual impacts.

3.6.3 The assessment of CSE compound alternatives evolved through multiple consultation phases and design development stages, commencing with the initial assessment for the 2023 preferred draft alignment and continuing through subsequent design refinements following consultation feedback. While CSE compound requirements are established by broader infrastructure decisions, reasonable alternatives for specific positioning exist within each functionally required area, assessed through comparative environmental effects analysis.

3.6.4 Through the iterative design process, four key areas were identified where CSE compounds were required, each evaluated through comparison of environmental effects, with technical feasibility and cost considerations informing selection decisions where environmental effects were comparable between options:

- North of Dedham Vale National Landscape – CSE compound to facilitate transition from underground cable through the designated landscape to overhead line connection to Bramford Substation
- Great Horkesley East and West – Twin CSE compounds to facilitate underground cable section through sensitive landscape areas, with eastern compound near Horkesley Plantation and western compound west of Crabtree Lane
- Fairstead – Twin CSE compounds to enable underground cable crossing beneath existing 400 kV overhead line infrastructure
- Tilbury North – New Gas Insulated Switchgear (GIS) substation and two associated CSE compounds to facilitate undergrounding approximately 0.55 km of the existing ZB overhead line due to connection layout constraints. This arrangement represents an environmental alternative to the previous direct connection approach, removing approximately 4.5 km of underground cable installation and avoiding significant interactions with the Freeport area and potential Thames Estuary Marshes SSSI designation.

3.6.5 The environmental effects of alternatives for each of these areas are compared in the following tables, with selected options identified based on the environmental effects comparison. Alternative locations and technologies were assessed for each area through detailed environmental effects analysis in accordance with Regulation 14(2)(d) of the EIA Regulations. This approach ensures that all reasonable locational alternatives are considered within the constraints established by Project requirements, providing appropriate evidence that alternatives have been assessed whilst recognizing the inherently constrained nature of CSE compound siting decisions.

Table 3.10 CSE compound siting north of Dedham Vale National Landscape

Location	Key Environmental Effects Considered During the Selection Process
Site 1 – East of Holton St Mary (Alternative location alongside B1070 near Oaks Farm and Four Sisters Farm)	**Beneficial:** • Infrastructure: Shorter length of underground cables compared to selected site 4. **Adverse:** • Historic Environment: Potential effects on listed buildings, particularly at Little Wenham • Residential Amenity: Greater effects on residential amenity compared to selected site 4 • Landscape: Transfer of effects to receptors at Great Wenham • Horlock Rules: Poor compliance with screening principles due to insufficient natural screening and closer proximity to residential properties. **Selection Decision:** • Discounted due to transfer of effects to other receptors and greater effects on listed buildings and residential amenity.
Site 2 – Nort heast of Site 1 (Alternative location approximately 500 m northeast of Site 1 with existing tree screening)	**Beneficial:** • Landscape: Some existing tree belt screening available. **Adverse:** • Historic Environment: Potential effects on listed buildings, particularly at Little Wenham • Residential Amenity: Greater effects on residential amenity compared to selected option • Alignment: Less direct alignment with more changes of direction if routed via north of Notley Enterprise Park (less compliant with Holford Rule 3) • Horlock Rules: Limited compliance with screening principles despite some tree belt screening due to continued proximity to residential properties. **Selection Decision:** • Discounted as it does not offer shorter underground cable length and would result in less direct alignment.

Location	Key Environmental Effects Considered During the Selection Process
Site 3 – Raydon Airfield (Alternative location at southern extent of Raydon airfield, to the east of Raydon)	**Beneficial:** • No beneficial effects identified. **Adverse:** • Landscape: Closer to the edge of AONB in more open position • Community: Would substantially transfer effects from receptors in Great and Little Wenham to receptors in Raydon • Visual: Less well screened compared to selected option. **Selection Decision:** • Discounted due to proximity to AONB edge and substantial transfer of effects to Raydon receptors.
Site 4 – Notley Enterprise Park (Selected location abutting buildings at south-western end of existing Notley Enterprise Park)	**Beneficial:** • Historic Environment: Reduces effects on Grade I listed buildings at Little Wenham and provides greater distance from residential receptors in Little and Great Wenham • Aviation: Allows continued safe flight activity at Raydon Wings airstrip (maintains 1.3 km distance compared to 500 m for alternatives) • Infrastructure: Complies with Horlock Rules through siting near industrial development (consistent with Horlock Rule principle of locating substations near existing industrial facilities) • Alignment: Consistent with Holford Rule 1 by avoiding unnecessary diversion • Landscape: Benefits from industrial context and screening opportunities (increasing compliance with Holford Rules 2 and 4). **Adverse:** • Heritage: Potential greater effects on undesignated memorial on former airfield site • Ecology: May lead to loss of small area of undesignated woodland (subject to detailed routeing) **Selection Decision:** • **PREFERRED** – optimal balance of environmental effects, particularly heritage protection and aviation compatibility, with strong compliance with Horlock Rules for substation siting and Holford Rules for alignment.

3.6.6 Through initial assessment of four potential sites, Site 4 adjacent to Notley Enterprise Park was selected as the preferred location based on optimal compliance with Horlock Rules (siting near industrial development), enhanced aviation compatibility (maintaining 1.3 km separation from Raydon Wings airstrip), and improved heritage protection through greater distance from Grade I listed buildings at Little Wenham compared to alternative sites.

3.6.7 Following consultation feedback on the 2023 preferred draft alignment, the CSE compound location was subsequently refined from the original Notley Enterprise Park site to a location north of Wenham Grove but south of the disused railway. This refinement provided enhanced screening from long-distance National Landscape views, increased separation from Little Wenham heritage assets from 750 m to 1,500 m, and continued support for flight activities at Raydon Airfield, further strengthening compliance with Holford Rules 2 and 4 by increasing separation from high amenity heritage assets (Rule 2) and taking better advantage of natural screening to provide opaque rather than sky backgrounds (Rule 4).

Table 3.11 Great Horkesley CSE Compounds (East and West)

Location	Key Environmental Effects Considered During the Selection Process
Great Horkesley East – Lodge Farm Alternative (Alternative location adjacent to farm buildings south of Lodge Farm on Boxted Road)	**Beneficial:** • No beneficial effects identified. **Adverse:** • Landscape and Visual: Less substantial screening from residential properties compared to selected option • Horlock Rules: Does not optimally utilise existing natural screening opportunities (poor compliance with Horlock Rules principle of taking advantage of screening provided by landform and existing features) • Environmental Context: Less suitable environmental setting compared to woodland location. **Selection Decision:** • Discounted due to inferior screening and reduced compliance with Horlock Rules natural screening principles.

Location	Key Environmental Effects Considered During the Selection Process
Great Horkesley East – Horkesley Plantation (Selected location between Horkesley Plantation and Harrow Wood)	**Beneficial:** • Landscape and Visual: Substantial screening from residential properties by existing woodland to north-east and south-west, fully compliant with Horlock Rules natural screening requirements • Infrastructure: Woodland backclothing provides existing screening that can be reinforced • NPS EN-5 Compliance: Underground cable technology adopted in vicinity of Dedham Vale AONB to reduce potential impacts on designated landscape. **Adverse:** • Construction: Gas pipeline constraint limits positioning flexibility (though better to oversail by overhead line than cross by underground cables). **Selection Decision:** • **PREFERRED –** optimal compliance with Horlock Rules through effective use of natural screening.
Great Horkesley East – Alternative Eastern Locations (Various alternatives to eastern edge of field, next field east around TB032, or east of TB029/TB030)	**Beneficial:** • Visual: Potential to reduce visual effects to specific residential receptors at over 400 m separation. **Adverse:** • NPS EN-5 Assessment: Effects on AONB and residential amenity do not meet thresholds identified in NPS EN-5 to justify additional underground cable. **Selection Decision:** • Discounted due to gas pipeline constraints, increased cable length requirements, and failure to meet NPS EN-5 thresholds.

Location	Key Environmental Effects Considered During the Selection Process
Great Horkesley West – TB040 Alternative (Alternative location near pylon TB040 to west of Pond Farm)	**Beneficial:** • No beneficial effects identified. **Adverse:** • No additional environmental benefit compared to selected option • Economics: Less efficient cable routeing arrangement requiring longer infrastructure with associated increased environmental footprint • Fails to implement Horlock Rules principle of effective space utilisation to 'limit the area required for development consistent with appropriate mitigation measures'. **Selection Decision:** • Discounted due to longer infrastructure requirements with no environmental benefit and reduced compliance with Horlock Rules efficiency principles.
Great Horkesley West – Crabtree Lane (Selected location west of Crabtree Lane and north of B1508)	**Beneficial:** • Topography: Positioned where landform dips into valley, providing natural screening in full compliance with Horlock Rules requirement to 'take advantage of the screening provided by landform and existing features' • Landscape and Visual: Reduces effects from overhead line as it continues westward, implementing Horlock Rules principle to 'keep visual, noise and other environmental effects to a reasonably practicable minimum'. **Adverse:** • Drainage: Valley location may require additional drainage design considerations during construction, though manageable through standard engineering practices • Maintenance Access: Valley position may present minor operational access considerations requiring appropriate access route design. **Selection Decision:** • **PREFERRED –** exemplary compliance with Horlock Rules through utilisation of natural valley screening specifically implementing the principle of taking 'advantage of the screening provided by landform and existing features and the potential use of site layout and levels'.

3.6.8 Underground cable technology (approximately 5.3 km total length) is required in Great Horkesley vicinity due to the proximity to the Dedham Vale National Landscape in accordance with NPS EN-5 paragraph 2.9.20 policy requirement for undergrounding in nationally designated landscapes. CSE compounds are proposed to be positioned at eastern and western ends to facilitate transitions between overhead line and underground cable sections based on environmental effects considerations outlined above. Both selected locations demonstrate compliance with Horlock Rules principles through strategic utilisation of existing natural screening features – woodland screening at the eastern location and valley topography at the western location – thereby implementing the fundamental Horlock Rules requirement to 'take advantage of the screening provided by landform and existing features.'

Table 3.12 Fairstead CSE Compounds

Location	Key Environmental Effects Considered During the Selection Process
Fairstead East – Original TB118 Location (Alternative location maintaining original eastern CSE compound position near TB118 on 2023 preferred draft alignment)	**Beneficial:** • Alignment: More direct overhead line routeing with fewer changes of direction consistent with Holford Rule 3. **Adverse:** • Infrastructure: Longer underground cable crossing length beneath existing 400 kV overhead line • Economics: Increased underground cable installation costs not justified by environmental benefits. **Selection Decision:** • Discounted due to interaction with game shooting drives and effects on plantation willow, with increased cable length providing no environmental justification.
Fairstead Alternative Northern Route (Alternative overhead line alignment to north of woodland at Hallhook Row, north of TB113 to TB115 on 2023 preferred draft alignment)	**Beneficial:** • Ecology: Avoids effects on plantation willows. **Adverse:** • Historic Environment: Moves overhead line closer to Grade II listed building at Westock's Farm (though maintaining approximately 300 m separation) • Visual: Limited existing screening vegetation in northern location. **Selection Decision:** • Discounted due to proximity to listed building and lack of natural screening opportunities.

Location	Key Environmental Effects Considered During the Selection Process
Fairstead East and West – Selected Twin CSE Locations (Eastern compound positioned north-east adjacent to 400 kV overhead line, western compound positioned within same field east of shallow valley and Fairstead Road)	**Beneficial:** • Ecology: Avoids plantation willows and sensitive valley floor habitat • Landscape: Utilises existing landform and woodland/hedgerow screening which can be strengthened, consistent with Horlock Rules natural screening principles • Infrastructure: Optimised underground cable crossing length beneath existing 400 kV overhead line • Game Shooting: Addresses conflict with multiple game shooting . **Adverse:** • Heritage: Moves overhead line closer to Grade II listed building at Westock's Farm, though maintaining approximately 300 m separation from nearest pylon or CSE compound infrastructure. **Selection Decision:** • **PREFERRED –** optimal balance addressing ecological concerns and game shooting conflicts while maintaining appropriate separation from heritage assets and providing economic efficiency This selection demonstrates exemplary compliance with multiple Horlock Rules principles, specifically: – ‘Take advantage of the screening provided by landform and existing features’ – ‘Protect as far as reasonably practicable areas of local amenity value, important existing habitats and landscape features’ – ‘Use space effectively to limit the area required for development consistent with appropriate mitigation measures’ – Balance ‘technical benefits and capital cost requirements against the consequential environmental effects’.

3.6.9 The preferred option for Fairstead comprises twin CSE compounds with the eastern compound positioned north-east immediately adjacent to the existing 400 kV overhead line and the western compound located within the same field to the east of the shallow valley and Fairstead Road. This configuration was selected as it addresses consultation feedback regarding multiple game shooting drives and effects on plantation willow along the shallow valley floor while providing a more economical solution through reduced underground cable crossing length.

3.6.10 The positioning specifically ‘utilises existing landform and woodland/hedgerow screening that can be further strengthened’, directly implementing the Horlock Rules principle that siting should ‘take advantage of the screening provided by landform and existing

features.' The location 'would help to reduce the level of potential effects' through natural screening opportunities, maintaining approximately 300 m separation from heritage assets while providing an optimal balance of environmental, technical and economic considerations in full accordance with Horlock Rules methodology.

Table 3.13 Tilbury connection alternatives

Alternative	Key Environmental Effects Considered During the Selection Process
Alternative A – Direct Connection to Tilbury Substation (Original 2024 Consultation Design)	**Beneficial:** • Technical Performance: Meets network reinforcement requirements and achieves the same system reinforcement outcome as alternative connection arrangements **Adverse:** • Biodiversity: Significant interaction with area of focus for potential Thames Estuary Marshes SSSI designation • Construction Effects: Extensive 4.5 km underground cable installation requiring multiple trenchless crossings under railways, pipelines and existing overhead lines • Hydrology: Underground cable route would impact flood storage areas with potential effects on local drainage and flood risk • Heritage: Tunnel alternative would require headhouse potentially affecting Grade II listed Church of St James at West Tilbury • Economic Development: Interaction with Thames Freeport development area restricting economic growth potential. **Selection Decision:** • Discounted – Significant effects on potential SSSI designation area, extensive construction disturbance, constraints on regionally important economic development, and high cost (>£100 m additional for tunnel alternative).

Alternative	Key Environmental Effects Considered During the Selection Process
Alternative B – Connection via Tilbury North Substation and YYJ Line Modification (Post 2024 consultation design)	**Beneficial:** • Ecology: Avoids potential Thames Estuary Marshes SSSI designation area • Construction: Eliminates 4.5 km underground cable and multiple trenchless crossings • Economic Development: Removes restrictions on Thames Freeport development • Hydrology: Avoids flood storage area impacts. **Adverse:** • Land Use: Potential interface with proposed housing allocation east of Chadwell St Mary (up to 8 hectares within ~90 hectare allocation) • Visual: New GIS substation infrastructure south of Orsett Golf Course • Socioeconomic: Overhead line continues to cross Orsett Golf Course. **Selection Decision:** • **PREFERRED –** Achieves same system reinforcement outcome while avoiding major environmental constraints. Enhanced system performance in some demand conditions. Utilises existing YYJ 400 kV overhead line infrastructure with two new CSE compounds for ~600 m underground section.

3.6.11 The post-2024 consultation design solution for the Tilbury connection comprises a new Gas Insulated Switchgear (GIS) Tilbury North Substation connected into the existing YYJ 400 kV overhead line via modifications requiring two CSE compounds to underground approximately 600 m of the existing line. This approach was developed following 2024 statutory consultation to address delivery challenges with the previous direct connection design. The configuration avoids the 4.5 km underground cable installation that would have been required for direct connection to Tilbury Substation, eliminates interactions with the Thames Freeport development area and potential Thames Estuary Marshes SSSI designation area, and enables overhead line crossing of the proposed Lower Thames Crossing. While the GIS substation requires a larger permanent footprint than the previously proposed CSE compound, this arrangement delivers the same electrical system reinforcement outcome while providing enhanced deliverability and environmental performance.

3.7 Post-Consultation Design Evolution (Alignment and Siting Alternatives)

3.7.1 This section presents the reasonable alternatives adopted and not adopted as a result of multiple rounds of non-statutory and statutory consultation feedback, demonstrating how the Project design has evolved iteratively though stakeholder engagement in accordance with Regulation 14(2)(d) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

3.7.2 In spring 2022, a non-statutory public consultation was held for a period of eight weeks, between April 2022 and June 2022. This consultation introduced the Project and the need for it, explained how National Grid had developed its proposals from the strategic optioneering through to a preferred option that best met that need, and sought the views of the public and stakeholders on the same. The graduated swathe (referred to as the 'Scoping Report Corridor' within the EIA Scoping Report (document reference 6.19)) was consulted on, including potential locations for the EACN Substation and CSE compounds. The consultation sought feedback on environmental constraints, local knowledge, and community concerns to inform design development.

3.7.3 In summer 2023, an additional non-statutory public consultation was held for a period of eight weeks, between June 2023 and August 2023. The 2023 non-statutory consultation presented a preferred draft alignment (referred to below as the 2023 preferred alignment) which was developed using feedback from the 2022 non-statutory consultation and subsequent design development and backcheck. This included updates to pylon locations, CSE compound locations, locations of underground cables and the proposed location for the new EACN Substation. Changes to the proposed plans, both inside and outside of the 2022 graduated swathe, were presented as part of this. Information shared for this round of consultation is found in the DDR (National Grid, 2023a).

3.7.4 Statutory consultation was held in 2024, between April and July 2024 for a period of eight weeks. As part of the statutory consultation material, a Preliminary Environmental Information Report was prepared. The statutory consultation presented the 2024 preferred draft alignment and associated infrastructure including substation locations and CSE compounds, which was developed using the feedback from the 2023 consultation and subsequent design development and backcheck, incorporating both permanent and temporary elements of the Project.

3.7.5 Following the 2024 statutory consultation, which was undertaken between April and July 2024 for a period of eight weeks, National Grid undertook a comprehensive review of all feedback received alongside the findings of environmental and engineering studies and backchecking of previous studies. Subsequently, targeted statutory and non-statutory consultations were held in 2025 to present specific design refinements developed in response to the 2024 consultation feedback. All feedback provided was considered in the context of environmental and socio-economic constraints and opportunities, engineering feasibility and risks, cost and programme considerations, and planning policy requirements.

3.7.6 Table 3.14 provides a chronological summary of the consultation phases undertaken for the Project and their key outcomes:

Table 3.14 Summary of consultation phases

Consultation Phase	Period	Key Focus	Documentation
Non-statutory consultation	April – June 2022	Presentation of Project, the need for it and the currently preferred strategic option for delivery including the proposed preferred corridor and graduated swathes that best met the need	CPRSS (National Grid, 2022)
Non-statutory consultation	June – August 2023	2022 preferred draft alignment including updates to pylon locations, CSE compound locations, locations of underground cables and the proposed location for the new EACN Substation	SOBR (National Grid, 2023b) DDR (National Grid, 2023a)
Statutory consultation	April – July 2024	2023 preferred draft alignment incorporating permanent and temporary elements including substations and SECs	SOBR (National Grid, 2024b) DDR (National Grid, 2024a)
Targeted statutory consultation and non-statutory consultations	Q1 2025	2023 preferred draft alignment incorporating overhead line alignment (with pylon locations), sections of underground cable, locations of CSE compounds, the location of the EACN Substation, third party utilities diversion works, permanent access roads (where necessary), permanent drainage, environmental mitigation, areas identified for on-site Biodiversity Net Gain and temporary works detail.	DDR (document reference 5.15)

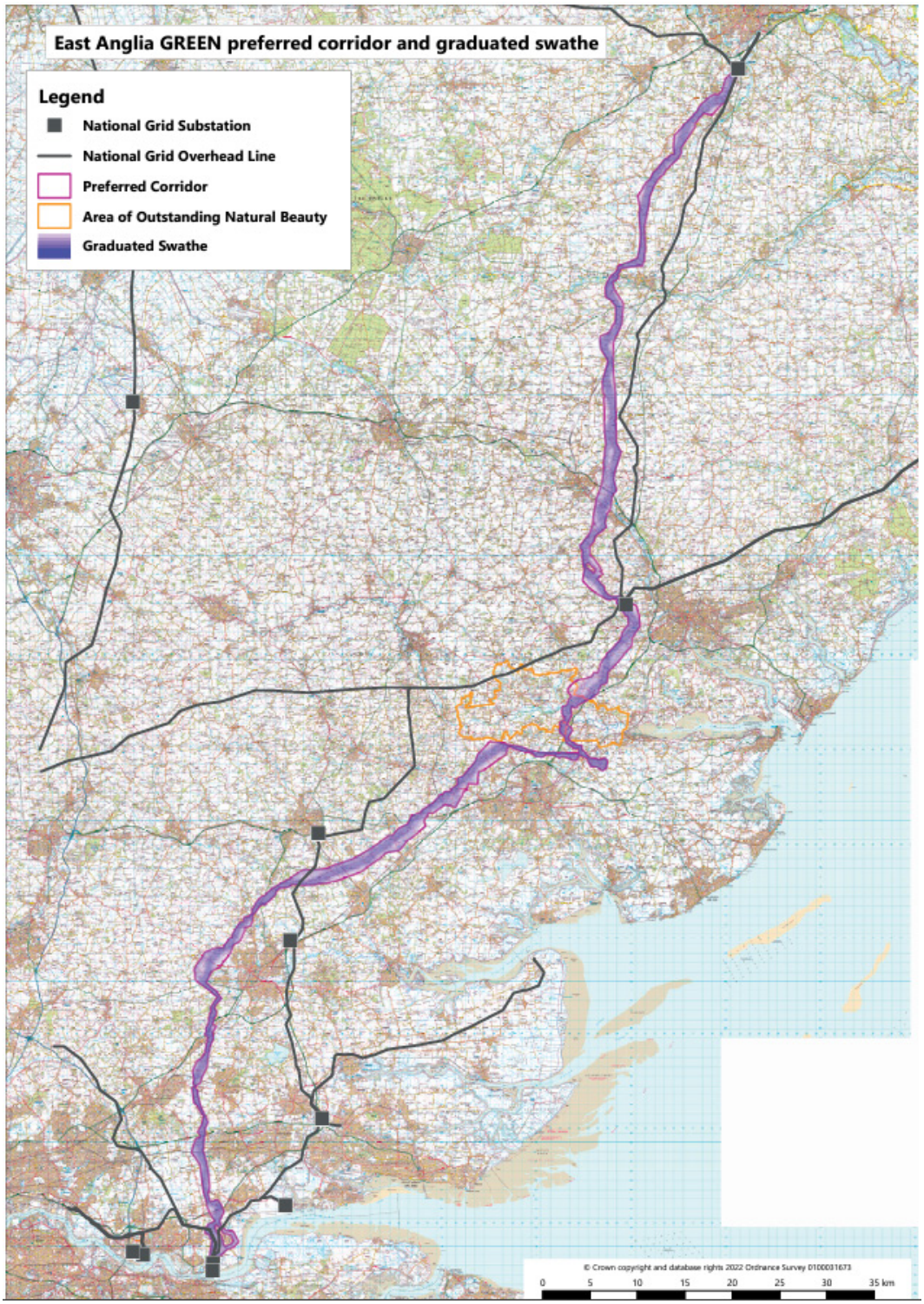
Non-Statutory Consultation 2022 – Preferred Corridor

3.7.7 Following the routeing and siting stage (described in Section 3.6), a combined preferred corridor, presented on Image 3.12, was developed and presented for initial non-statutory consultation in 2022. This was represented as a graduated swathe to graphically indicate areas of the preferred corridor within which Project infrastructure was considered more or less likely to be located.

3.7.8 The graduated swathe used darker tones to indicate areas in which development was considered to be more likely and lighter tones to indicate where it was considered less likely. The absence of any shading indicated that development in these areas was considered unlikely, although remained possible if other areas were ruled out by new information from consultation responses, environmental studies, and technical assessments. Areas within the graduated swathe that the analysis identified as having very little potential to host a draft alignment were removed from the graduated swathe, prior to consultation.

3.7.9 The graduated swathe was used as a basis for further detailed routeing and siting development work and was modified following non-statutory public consultation, taking into account stakeholder consultation responses, engagement, and surveys.

Image 3.12 Preferred corridor and graduated swathe presented at the 2022 non-statutory consultation – as taken from CPRSS (National Grid, 2022)



Changes Following the 2022 Non-Statutory Consultation

3.7.10 A total of 3,787 feedback submissions were received during the 2022 non-statutory consultation period from local communities, stakeholders and other consultees. Following the 2022 non-statutory consultation, the 2023 preferred draft alignment was developed, which comprised an overhead line route, underground cable sections, locations for CSE compounds and the location of the EACN Substation.

3.7.11 The feedback obtained at the 2022 non-statutory consultation helped to shape and guide the development of the 2023 preferred draft alignment. All feedback provided was considered in the context of environmental and socio-economic constraints and opportunities, engineering feasibility and cost, National Grid's statutory duties under the Electricity Act 1989 to develop and maintain an efficient, coordinated and economical transmission system, and planning policy considerations.

3.7.12 Following the 2022 non-statutory consultation, National Grid undertook a comprehensive assessment of reasonable alternatives informed by consultation feedback, updated environmental information, and technical studies. This assessment considered alternatives across multiple categories including corridor realignments, technology changes, substation and infrastructure siting, and construction methods.

3.7.13 The assessment methodology applied National Grid's established options appraisal criteria to evaluate alternatives that would result in substantively different environmental outcomes (as defined in Section 3.2). Reasonable alternatives were identified based on their potential to deliver equivalent infrastructure capacity while offering environmental, technical system, or capital/lifetime cost benefits over the preferred option. All reasonable alternatives were evaluated against environmental, socio-economic, technical, and cost factors, with particular consideration given to alternatives that could address consultation feedback while meeting the Project's statutory requirements. The assessment applied the Holford Rules for overhead line routeing (balancing avoidance of highest amenity areas with directness requirements) and Horlock Rules for substation and infrastructure siting (emphasizing natural screening opportunities), alongside policy requirements including NPS EN-1 provisions for proportionate consideration of alternatives and NPS EN-5 paragraph 2.9.20 presumption for undergrounding in National Landscapes.

3.7.14 The comprehensive assessment resulted in both alternatives that were adopted into the design and alternatives that were rejected following detailed evaluation. Changes adopted included corridor realignments to reduce effects on sensitive receptors and technology changes to underground cable in areas where policy requirements or environmental constraints justified the additional costs. Alternatives that were assessed but not adopted included options that would have resulted in greater environmental effects, increased costs disproportionate to environmental benefits, or technical approaches that did not meet policy thresholds for justification.

3.7.15 A comprehensive summary of the reasonable alternatives considered in response to the 2022 non-statutory consultation feedback is presented in Table 3.15, which details both alternatives adopted and alternatives rejected, including the rationale for each decision. Further detail on the design development process and alternatives assessment can be found in DDR (National Grid, 2023a).

Table 3.15 Reasonable alternatives considered following 2022 non-statutory consultation (alternatives that informed the development of the 2023 preferred draft alignment)

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Route alignment change East of Wortham Ling – Divert alignment to pass east of Wortham Ling, rejoining preferred corridor south-east of Diss at A143 crossing	Consultation feedback requesting avoidance of sensitive receptors near Wortham Ling	**Beneficial:** • Historic Environment: Reduces potential effects on Grade I listed Church of St Mary • Ecology: Reduces effects on areas of woodland • Social: Reduces effects on care and wellbeing business • Avoids the oversailing of land with planning consent. • Topography: Route passes on lower ground. **Adverse:** • Historic Environment: Transfers some effects onto Grade I listed St Remigius Church • Social: Potential increased effects on recreational receptors and the main access to Wortham Ling (Open Access Land/SSSI).	**Adopted** – Decision aligns with National Grid's statutory duty under Electricity Act 1989 Schedule 9 to '*have regard to the desirability of preserving natural beauty... and protecting sites, buildings and objects of architectural, historic or archaeological interest*' and Holford Rule 2 (avoid major areas of highest amenity value, including heritage assets). The benefits of avoiding multiple sensitive receptors (heritage, ecological, residential, commercial) outweighed the limited adverse effects transferred to other receptors. The alternative better aligns with policy objectives to avoid areas of highest sensitivity.
Route alignment change North of Flowton – Divert to the east at south of Offton, paralleling existing 132 kV overhead line route to north and east of Flowton, connecting into Bramford Substation	Consultation feedback requesting reduction of impacts on heritage assets, residential amenity and cumulative effects	**Beneficial:** • Historic Environment: Reduces potential impact on heritage assets • Residential: Reduces potential impacts on residential amenity • Cumulative: Reduces cumulative effects through paralleling existing infrastructure.	**Adopted –** Decision aligns with Holford Rule 6 (reduce wirescape effects) through paralleling existing 132 kV infrastructure. Compliance with National Grid's statutory obligations and duties while reducing heritage and residential amenity impacts

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		Adverse: • Route length: Marginally longer route than other alternatives.	justifies minor route length increase.
Route alignment change West of Great Wenham – Alternative corridor connecting underground cable route through AONB/National Landscapes to CSE compound south of Notley Enterprise Park	Consultation feedback requesting reduced impacts on Dedham Vale AONB and heritage assets	**Beneficial:** • Historic Environment: Reduces potential impacts on heritage assets • Residential: Reduced residential amenity impacts • Landscape: Reduced effects on Dedham Vale AONB. **Adverse:** • Cost: Increase costs associated with design changes.	**Adopted –** Required for consistency with National Grid's statutory duties and heritage policies, with underground cable through Dedham Vale National Landscape complying with NPS EN-5 paragraph 2.9.20 policy presumption for undergrounding in nationally designated landscapes. CSE compound siting follows Horlock Rules guidance for avoiding areas of highest amenity value.
Western alternative around Diss (further west of consultation corridor)	Consultation feedback suggesting alternatives to both sides of Diss, combined with technical assessment of routeing options	**Beneficial:** • No beneficial effects identified . **Adverse:** • Ecology: Would cross Waveney Valley adjacent to Waveney and Little Ouse SAC, along with area adjacent to SSSI with water meadow environment • Holford compliance: Less compliant with Holford Rule 2 (avoid major areas of natural beauty).	**Rejected –** Technical assessment found greater ecological effects than consultation corridor or eastern alternatives. Less compliant with Holford Rule 2. Would not provide overall environmental benefits compared to preferred alternatives.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Eastern alternatives around Diss (passing around east side of Diss)	Consultation feedback suggesting alternatives to both sides of Diss, combined with technical assessment of routeing options	**Beneficial:** • Potential reduction in some local effects. **Adverse:** • Infrastructure: Would require crossing railway line • Historic Environment: Effects on Grade I Listed Church of St Andrew at Frenze • Residential: Limited by residential properties and railway crossing requirements.	**Rejected –** Would result in closer proximity to more residential properties and affect heritage setting at Margaretting. Less direct route with insufficient environmental benefits to justify constraints.

Non-Statutory Consultation 2023 – Preferred Draft Alignment

3.7.16 The 2023 preferred draft alignment (including pylon locations, areas of underground cable, CSE compounds and the location of the EACN Substation) was subject to further non-statutory consultation.

Changes Following the 2023 Non-Statutory Consultation

3.7.17 A total of 4,167 feedback submissions were received during the 2023 non-statutory consultation period from local communities, stakeholders and other consultees. The feedback obtained at the 2023 non-statutory consultation helped to shape and guide the development of the 2024 preferred draft alignment together with the draft Order Limits and all associated temporary works.

3.7.18 All feedback provided was considered in the context of environmental and socio-economic constraints and opportunities, engineering feasibility and cost, and planning policy and legislative considerations including National Grid's statutory duties under the Electricity Act 1989 to develop and maintain an efficient, coordinated and economical transmission system. The assessment framework included the Holford Rules for overhead line routeing and Horlock Rules for substation and CSE compound siting.

3.7.19 Following the 2023 non-statutory consultation, National Grid undertook a comprehensive assessment of reasonable alternatives informed by consultation feedback, updated environmental assessment findings, and technical studies. The assessment evaluated alternatives across multiple categories including infrastructure types, route alignments, technology options, and construction methodologies.

3.7.20 The comprehensive assessment process considered alternatives that would result in substantively different environmental outcomes (as defined in Section 3.2), applying consistent evaluation criteria across environmental, socio-economic, technical, and cost factors. The assessment methodology incorporated the Holford Rules for overhead line routeing (optimizing compliance between avoiding highest amenity areas and maintaining route directness) and Horlock Rules for substation and infrastructure siting (emphasizing environmental screening and appropriate site selection). The strategic options and early corridor assessment work (2022 to s2023) was undertaken in accordance with the NPS policy framework in effect at that time, while later design refinement and the final Environmental Statement preparation was undertaken in accordance with the current NPS EN-1 and EN-5 (designated January 2024), including provisions for proportionate consideration of alternatives and requirements for environmental benefits to justify additional costs of undergrounding.

3.7.21 A comprehensive summary of the reasonable alternatives considered in response to the 2023 non-statutory consultation feedback is presented in Table 3.16, which details both alternatives adopted and alternatives rejected, including the environmental comparison and decision rationale for each. Further detail on these changes and alternatives considered can be found in the DDR (National Grid, 2024a).

Table 3.16 Reasonable alternatives considered following 2023 non-statutory consultation (alternatives that informed the development of the 2024 preferred draft alignment)

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Use of T-pylons as an alternative to standard lattice pylons instead of standard lattice pylons	Consultation feedback suggesting T-pylons would reduce visual impacts	**Beneficial:** • Visual: Lower height than standard lattice pylons which could help reduce visibility in some settings. **Adverse:** • Operational maintenance: T-pylons require permanent access arrangements suitable for Mobile Elevated Work Platforms as they cannot be climbed which could have additional operational effects • Ground disturbance: Reduced height could result in the need for more frequent, bulkier, angle pylons being required to avoid features due to insufficient line clearance • Cumulative conflicts between T-pylons and existing overhead line infrastructure due to different conductor configurations and structural requirements.	**Rejected** – While T-pylons offer some visual benefits, the limited improvement does not meet the proportionate consideration test required NPS EN-1 paragraph 4.3.22. Cost-benefit analysis showed additional operational complexity and technical constraints outweighed marginal visual benefits in this rural context.
Selection between Air Insulated Switchgear and Gas Insulated Switchgear for substations	Technical assessment and consultation feedback on substation design preferences	**Beneficial (GIS):** • Land use: Smaller footprint reducing land-take and agricultural impacts I Visual: More compact development reducing landscape footprint. **Adverse (GIS):** • Visual: Requires building structures (GIS halls) creating different visual profile and potential landscape effects	**Both adopted** – Site-specific technical requirements justify different approaches in substation technology. AIS selected for EACN Substation optimizes operational benefits where space permits. GIS selected for Tilbury North Substation where spatial constraints require footprint

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Operational maintenance: More complex maintenance requirements. **Beneficial (AIS):** • Operational maintenance: Easier maintenance access reducing operational land use requirements • Technical: Established operational procedures reducing technical risk • Economic: Lower whole-life costs. **Adverse (AIS):** • Land use: Larger footprint requiring additional land-take with potential agricultural land loss.	optimisation. Decisions align with good design principles in NPS EN-1 paragraph 4.5.1.
Route alignment and technology change Great Horkesley to Colne Valley- Route around north and west of Dedham Vale AONB following A12 more closely with underground cable technology	Consultation feedback requested alternative routeing to reduce effects on AONB and surrounding area	**Beneficial:** • Landscape: Reduces landscape effects by avoiding routeing past Colchester, eliminates effects on AONB through undergrounding. **Adverse:** • Economic: Additional economic costs associated with underground cable technology.	**Adopted** – Underground cable technology required by NPS EN-5 policy presumption for AONBs (para 2.9.20). Environmental benefits of avoiding designated landscape outweigh additional costs. Alternative aligns with statutory duties under Electricity Act Schedule 9
West of Flordon – Move route further west of Flordon Hall	Consultation feedback requesting greater separation from Grade II* listed Flordon Hall	**Beneficial:** • Historic Environment: Marginally reduces effects on views from the east of the Grade II listed Flordon Hall. **Adverse:** • Visual: Requires longer route and three additional angle pylons	**Rejected** – Comparative assessment showed alternative would not provide overall environmental benefit. Heritage effects transferred rather than avoided, with additional residential, visual and land use impacts. Less

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Holford Rules: Transfers effects to Grade II listed Mergate Hall and increases effects on residential properties, conflicting with Holford Rule 2 (avoid smaller areas of high amenity value and minimize residential impacts) and Rule 3 (choose the most direct line with fewer angle pylons) • Route efficiency: Longer route conflicts with efficient network design principles.	direct route and increasing effects on residential development conflicts with Holford Rule principles for transmission line planning.
Further west of Diss (overhead line) – Move route further west of Diss settlement	Consultation feedback requesting greater separation from Diss residential areas	**Beneficial:** • Residential amenity: Slightly reduces effects on residential amenity due to fewer residential properties in close proximity to the overhead line alternative. **Adverse:** • Ecology: Greater ecological effects due to closer proximity to designated sites (Redgrave and Lopham Fens SSSI, Redgrave and Lopham Fen National Nature Reserve, and Redgrave and South Lopham Fens Ramsar site) effects on peaty soils and nature recovery areas for both overhead line and underground cable alternatives. • Hydrology: Potential impacts on wetland hydrological systems.	**Rejected** – demonstrated alternative would result in significantly greater environmental effects overall. Impacts on Ramsar site and SSSI would conflict with statutory duties under Electricity Act 1989 Schedule 9 and Conservation of Habitats and Species Regulations 2017. Preferred alignment better fulfills environmental protection requirements.
East of Diss (overhead line and cable) – move route further east of Diss settlement	Consultation feedback requesting alternative routeing east of Diss	**Beneficial:** • Construction: Improves access arrangement compared to the proposal alignment.	**Rejected** – assessment showed alternative would significantly increase overall environmental effects across multiple receptors. Technical

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		Adverse: • Historic Environment: Potential effects on Grade I listed St Andrews Church • Land use: Longer route increasing land-take and agricultural impacts • Residential amenity: Effects on two to three times more residential properties compared to alternatives west of Diss • Recreational: Interaction with Stuston Common Golf Course • Technical complexities with the requirement for underground cabling to manage interactions with existing overhead line infrastructure.	complexities requiring underground cabling would increase construction impacts without corresponding environmental benefits. Alternative conflicts with proportionate consideration principles.
Waveney Valley alternative – Use underground cable through Waveney Valley instead of overhead line	Consultation feedback objection to cables as opposed to overhead line Design development consideration of technology alternatives in sensitive landscape	**Beneficial:** • Visual and landscape: Potentially reduces landscape and visual effects • Residential amenity: Marginal benefits for a small number of properties along A1066 with southward valley views • Historic Environment: Reduced effects on setting of Grade I listed St Remigius Church. **Adverse:** • Ecology: Extensive ground disturbance through 700 m of sensitive peat habitats affecting carbon storage and ecological functions • Historic Environment: Increased impacts on paleoenvironmental remains near	**Rejected** – assessment and NPS EN-5 policy evaluation concluded underground cable not justified. Ground conditions restrict HDD to 150 m requiring environmentally disruptive open cut techniques through protected peat habitats. Alternative does not meet NPS EN-5 paragraph 2.9.20 presumption criteria (not in designated landscape) or paragraph 2.9.23 threshold for widespread significant impacts. Environmental costs outweigh landscape benefits.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		undesignated moat I Habitat loss: Substantial vegetation removal for construction access • Recreation: Construction disruption to Angles Way long-distance path • Technical: Ground conditions restrict HDD to 150 m requiring predominantly environmentally disruptive open cut techniques. • Hydrological and ecological: Technical constraints require two separate HDD sections cantered on main river channels with remainder installed by environmentally disruptive open cut techniques • Other considerations: Additional cost and technical complexity associated with underground cable installation in challenging ground conditions compared to standard overhead line construction.	

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Low height pylons at Waveney Valley – Use low height lattice pylons through Waveney Valley	Design development consideration of pylon height alternatives as part of mitigation hierarchy review. Consultation response seeking visual mitigation measures	**Beneficial:** • Visual: Reduces visual effects from longer views, limiting views to the tops of pylons above treelines • Landscape: Some reduction in longer-distance landscape effects. **Adverse:** • Visual: Increases visual effects to users within the valley due to transitional wirescape effects from changing from standard lattice to low height pylons • Visual appearance: Bulkier and more dense profile despite lower height creating heavier visual profile for close receptors • Habitat loss: Wider pylon footprint potentially requiring greater vegetation clearance • Design consistency: Mixed pylon types compromising coherent design approach • Technical constraints: Restrictions on angle of change of direction for low height pylon designs limit application to only repositioned RG87 and one or two pylons to the south.	**Rejected** – Assessment showed no clear environmental improvement overall. Alternative would not remove limited visibility of pylon tops above treeline but may increase visual effects for recreational route users along valley floor due to transitional wirescape effects. Low height pylons may also increase tree removal needed due to wider span. Alternative creates visual inconsistency without corresponding benefits. Standard lattice pylons provide more coherent design approach aligned with good design principles in NPS EN-1.
Palgrave to Mellis area 132 kV – Remove and underground existing 132 kV overhead line, use former alignment for 400 kV line	Consultation feedback requesting infrastructure rationalisation and reduced effects on Mellis village	**Beneficial:** • Historic Environment: Reduces effects on Mellis village and Mellis Conservation Area and reduces effects on an unscheduled moat	**Adopted** – Regulation 14(2)(d) assessment showed clear overall environmental benefits from reducing cumulative infrastructure impact and protecting heritage assets.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Material efficiency: Reduces number of pylons for the Project. **Adverse:** • Visual: Increases effects on residential amenity as a result of the taller 400 kV replacing the 132 kV overhead line.	Network rationalisation aligns with good design principles in NPS EN-1 and efficient network development under Electricity Act 1989 section 9. Infrastructure consolidation provides demonstrable environmental improvement prioritizing heritage preservation.
Alternative alignment West of Gislingham – Move route further to the west of Gislingham	Consultation feedback requesting moving the route further to the west of Gislingham	**Beneficial:** • No substantial benefits identified. **Adverse:** • Residential amenity: Increases effects on residential properties on the western side of Gislingham, rather than the east • Historic environment: Increases impacts on listed buildings • Route efficiency: Approximately 500 m longer routeing than the consultation corridor.	**Rejected** – Assessment under Regulation 14(2)(d) showed no environmental benefits with multiple adverse effects. Alternative would transfer residential and heritage impacts to different receptors without overall improvement. Longer route conflicts with efficient network design principles and increases land-take impacts.
Close parallel at Mendlesham – Move route to parallel the existing 400 kV overhead line	Consultation feedback requesting moving the route to parallel the existing 400 kV overhead line	**Beneficial:** • No substantial benefits identified. **Adverse:** • Visual: Increases visual and residential amenity effects by placing more properties between existing and proposed overhead lines or positioning lines closer to properties.	**Rejected** – Assessment under Regulation 14(2)(d) showed no environmental benefits with clear adverse effects on residential and visual amenity. Alternative would create cumulative infrastructure impacts without corresponding environmental improvements.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Landscape: Creates corridor of multiple overhead lines with increased landscape impact.	
South of Offton – Replace 132 kV overhead line with underground cable from north of Offton Wood	Consultation feedback requesting infrastructure rationalisation and heritage protection	**Beneficial:** • Heritage: Reduces effects on the setting of Offton Castle • Residential Amenity: Doubles separation distance to Park Farm and benefits properties at Spring Farm and Valley Farm that would otherwise be positioned between multiple overhead lines • Technical/Economic: Avoids multiple crossings requiring cable sealing end platform pylons – more economic and efficient solution • Economic: Cost efficiencies through network optimisation • Aviation: Limits the change in overhead line infrastructure for RAF Wattisham's activities by removing overhead line infrastructure. • Cumulative Effects: Reduces effects on approach to Bramford Substation and wirescape impacts (Holford Rule 6). **Adverse:** • No substantial adverse effects identified.	**Adopted** – Clear environmental benefits from heritage protection, residential amenity improvements, and infrastructure rationalisation. Supports statutory duties under Electricity Act 1989 Schedule 9 and aligns with NPS EN-1 good design principles.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Underground cable at Ardleigh – Use underground cable 'in and out' of the EACN Substation rather than combination of overhead line and underground cable	Consultation feedback exploring underground cable compliance with NPS EN-5 thresholds	**Beneficial:** • Visual: Negates operational effects of overhead line infrastructure. **Adverse:** • Infrastructure: Introduction of CSE compound east of Dead Lane would need underground cables that would require deeper installation with consequent increase in long-term maintenance risks.	**Rejected** – Assessment under Regulation 14(2)(d) and NPS EN-5 policy evaluation concluded underground cable was not justified. Area is not designated landscape and effects do not meet threshold in NPS EN-5 paragraphs 2.9.20 or 2.9.23. Additional infrastructure and costs are not proportionate to environmental benefits. Technical constraints around cable crossings and maintenance access further support overhead line as preferred technology choice.
West of Aldham, Fordham, Fordstreet – Move route to the west of the villages rather than east	Consultation feedback requesting moving the route to the west of the villages rather than east as per the design presented at consultation	**Beneficial:** • Aviation: Reduces potential effects in flight activity from Wormingford Airfield • Residential amenity: Fewer residential properties within 200 m of the alignment. **Adverse:** • Route efficiency: Western alternative would be 0.6 km longer with additional pylons (3 additional standard pylons and 3 additional angle pylons) • Residential amenity: Transfers effects to other receptors within the villages • Historic environment: Increases effects on heritage assets including Grade I listed Crepping Hall (at approximately 400 m	**Rejected** – Assessment under Regulation 14(2)(d) showed limited benefits outweighed by heritage impacts and route efficiency concerns. Alternative transfers rather than reduces residential effects while creating new heritage impacts on Grade I listed building and multiple associated moat sites. Less direct route conflicts with Holford Rule 3 (directness principle) and efficient network design principles established in NPS EN-5 paragraph 2.9.16.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		distance) and concentration of moated sites associated with listed buildings. • Economic. Longer, less economical alternative requiring additional infrastructure.	
West of Great Waltham- Move route further west towards Pleshey	Consultation feedback requesting moving the route further west towards Pleshey	**Beneficial:** • Historic Environment: Reduces some potential heritage effects on listed buildings as routeing would be through cropped farmlands where there are relatively fewer listed buildings. **Adverse:** • Route efficiency: Western alternative would be 2.5 to 3 km longer, requiring an additional eight or nine pylons • Residential amenity: Transfer of effects on residential amenity from properties along the preferred alignment to different residential receptors, including properties at around 100 m separation near Little Leighs and properties on the west edge of Great Waltham with open views towards Pleshey where there is little existing screening vegetation • Recreation: Interaction with The Wilderness Foundation Outdoor Education Centre including potential disruption to short residential educational camps • Historic environment: Introduces potential additional effects to a scheduled monument east of Howletts and effects to	**Rejected** – Assessment under Regulation 14(2)(d) concluded alternative would transfer heritage effects to more sensitive scheduled monuments rather than providing overall heritage benefit. Significantly longer route with substantial additional infrastructure conflicts with Holford Rule 3 (directness principle) established in NPS EN-5 paragraph 2.9.16 and efficient network development principles. Technical complexities and recreational impacts outweigh limited heritage benefits identified. Preferred alignment effects not inconsistent with relevant NPS EN-5 policies, supporting retention of shorter, more direct route.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		the scheduled monument (motte and Bailey of Pleshey Castle) and listed buildings at Pleshey due to relative openness of views • Technical: Requires crossing a gas pipeline which introduces technical difficulties and may necessitate additional installation of cathodic protection over several kilometres.	
Low height lattice pylons in proximity to Great and Little Waltham – Use low height lattice pylons instead of standard lattice pylons	Design development consideration exploring pylon height alternatives following 2024 statutory consultation, Historic England post-consultation meetings and 2025 targeted consultation feedback	**Beneficial:** • Visual: Low height lattice pylons would reduce visual effects from the conservation areas and Langley's Historic Park and Garden and from distant views. • Historic environment: Reduces visibility from designed garden avenue view to the north-east from Grade I Listed Langleys house, with only the top of the low height lattice (above the cross arm) visible rather than the full top cross-arm of standard lattice pylons. **Adverse:** • Visual: Low height lattice pylons are shorter but more bulky (wider) which have a heavier appearance compared to standard lattice pylons, creating adverse visual effects for closest receptors including properties on Chelmsford Road • Construction and maintenance: Additional construction and maintenance risks associated with low height lattice design	**Adopted in part** – Assessment under Regulation 14(2)(d) and consultation feedback evaluation led to hybrid approach. Historic England expressed preference for low height pylons in post-consultation meetings, particularly north of River Chelmer. Targeted consultation feedback indicated preference for reduced extent of low height pylons to minimize visual effects for nearest residential properties. Final design adopts low height lattice pylons north of River Chelmer where heritage benefits are greatest, with standard lattice pylons south of river proposed to be positioned further back from Chelmsford Road to reduce

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		among factors influencing their relatively infrequent use • Landscape character: Effects on landscape character likely to be similar or greater due to introduction of lower height pylons into shallow valley area, with increased width requiring greater levels of tall vegetation clearance.	visual effects for local receptors.
Straighten alignment at Edney Common – Route more directly in the vicinity of Edney Common to reduce effects on farming activities	Consultation feedback requesting routeing more directly in the vicinity of Edney Common to reduce effects on farming activities	**Beneficial:** • Agriculture: Reduces effects on agricultural activities • Route efficiency: Alignment would be straighter and more consistent with the Holford Rules. **Adverse:** • Ecology: Routeing through ancient woodland and changes to habitats not compatible with preservation of ancient woodland. • Biodiversity: Changes to habitats not compatible with preservation of ancient woodland which is irreplaceable priority habitat l Policy: Conflicts with statutory protection for ancient woodland under NPPF.	**Rejected** – Assessment under Regulation 14(2)(d) concluded ancient woodland impacts would constitute significant environmental harm that cannot be mitigated. Ancient woodland is irreplaceable priority habitat protected under NPPF paragraph 180. Agricultural benefits do not justify irreversible ecological harm. Alternative retained 2023 preferred draft alignment with minor pylon positioning adjustments.
East of Margaretting – Move route to the east of Margaretting	Consultation feedback requesting moving the route to the east of Margaretting	**Beneficial:** • No substantial benefits identified. **Adverse:** • Route efficiency: Alternative would be approximately 1 km longer, less direct and	**Rejected** – Assessment under Regulation 14(2)(d) showed no environmental benefits with clear adverse effects on recreational facilities and route efficiency. Alternative would

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		with much larger angle change around the A12 crossing requiring additional pylons • Residential amenity: Generally transfers effects to other receptors (heritage and residential) including increased levels of residential amenity effects for alternatives passing to the west of Swan Lane due to increased number of properties in closer proximity around Maldon Road and Swan Lane • Recreational: Impacts on Hylands Park on southern edge and direct oversail of Hyland Golf Complex.	transfer effects to recreational assets without overall environmental improvement. Less direct route with larger angle changes conflicts with Holford Rule 3 (directness principle) established in NPS EN-5 and efficient network development principles. Multiple route variations considered (east and west of Swan Lane) but all were less preferred due to increased level of effects and longer route length.
West of Ingatestone Hall – Route partly following railway to west of Ingatestone Hall	Reduce effects on Ingatestone Hall (where main views are to the east) and allow greater separation to Grade I Listed Church of St Giles.	**Beneficial:** • Historic environment: Reduces effects on Ingatestone Hall and greater separation from St Giles Church. **Adverse:** • Route efficiency: Less direct and requires greater change of direction on relatively higher ground • Holford Rules compliance: Less compliant with Holford Rules.	Rejected – Less preferred due to directness and Holford Rules compliance issues.
East of Ingatestone/Wid Valley – Eastwards alternative restricted by River Wid	Design development consideration of routeing alternatives in Wid Valley	**Beneficial:** • Historic environment: Reduces effects on Ingatestone Hall (Grade I listed building) and greater separation from St Giles Church (Grade I listed building).	Adopted – Preferred option balancing heritage protection with route efficiency.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		Adverse: • Route efficiency: Routeing would be less direct and require a greater change of direction on higher ground. • Landscape: Positioning on higher ground may increase landscape and visual prominence.	
West of Blind Lane via Herongate – Adopt or close parallel existing 132 kV overhead line that passes west of Blind Lane	Consultation feedback requesting consideration of alternatives that either adopted or close paralleled the existing 132 kV overhead line that passes west of Blind Lane	**Beneficial:** • Infrastructure efficiency: Close parallelling of existing 132 kV infrastructure. **Adverse:** • Technical: Route constrained by high-pressure gas pipeline, introducing technical challenges • Policy: Oversailing of the Herongate Woodland Cemetery which is not consistent with the Holford Rules of planning policy • Recreation: Introduces effects on the South Essex Golf Centre (recently rebranded to The Heron Country Club). • Residential amenity: Close to residential receptors • Historic Environment: Increases effects on a scheduled monument (moated site east of Heron Hall).	**Rejected** – Assessment under Regulation 14(2)(d) and spatial constraints analysis showed technical challenges and policy conflicts outweigh infrastructure benefits. Oversailing cemetery conflicts with Holford Rules, and gas pipeline constraints create significant technical difficulties. Heritage and recreational impacts further compromise alternative viability.
Underground cable at Dunton Hills Garden Village – Use underground cable at	Consultation feedback requesting the use of underground cable at	**Beneficial:** • Visual: Reduces operational visual effects by removing the proposed overhead line.	**Rejected** – Assessment under Regulation 14(2)(d) and NPS EN-5 policy thresholds (paragraphs 2.9.20 and 2.9.23)

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Dunton Hills Garden Village instead of overhead lines	Dunton Hills Garden Village instead of overhead lines	**Adverse:** • Policy: Underground cable not justified as area is not subject to designation as AONB or similar nationally designated landscape, therefore not meeting the policy threshold in NPS EN-5 paragraph 2.9.20 where the presumption for overhead lines is reversed. • Policy: Does not meet the threshold in NPS EN-5 paragraph 2.9.23 for cases where there is '*high potential for widespread and significant adverse landscape and/or visual impacts*' that would justify undergrounding. • Biodiversity: Would result in 2 to 3 ha of development land loss (as no development could occur above the cables) with substantial additional costs of around a minimum 2 km of underground cable • Residential amenity: Increases temporary construction effects on residential properties.	concluded no clear policy basis for underground cable in this location. Area lacks designation status and impacts do not meet widespread significant adverse effects threshold. Additional costs and construction impacts not justified by policy framework.
Low-height lattice pylons in proximity to Thurrock Airfield – Use low-height lattice pylons instead of standard height lattice pylons	Design development consideration exploring pylon height alternatives near aviation facility following consultation feedback	**Beneficial:** • Aviation safety: Low height lattice pylons would reduce effects on operations of the airfield by keeping pylon heights lower. **Adverse:** • Policy: Less well aligned with the Holford Rules due to 30-degree angle change design limit restrictions which substantially exceed required angle changes for optimal	**Rejected** – Assessment under Regulation 14(2)(d) concluded aviation benefits could be achieved through alternative pylon positioning. Consultation feedback regarding flight activities at Thurrock Airfield was addressed through standard lattice pylons being retained, with pylon separation

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		infrastructure crossings and planning policy compared to standard lattice pylons • Visual: Low height lattice pylons are shorter but more bulky (wider) which have a heavier appearance • Design consistency: Creates inconsistent pylon types along route. • Technical constraints: Cannot achieve right-angle crossing arrangement required for infrastructure protection while maintaining flight activities due to design limitations.	reduced (by introducing an additional pylon between TB235 and TB240) to keep pylon heights lower and maintain positioning closer to Langdon Hills Golf Course so that flight activities at Thurrock can continue unimpeded. Balanced position adopted with crossing closer to right angles than previously published and wider Order Limits retained to provide flexibility for detailed design.
Replace overhead line to Tilbury Substation with underground cable – Use underground cable from north of Lower Thames Crossing to the existing Tilbury Substation	Design development consideration of technology alternatives following consultation feedback and technical review	**Beneficial:** • Visual: Reduces operational visual effects • Economic: Avoids potential impacts on economic viability of the Freeport area by removing overhead line infrastructure. **Adverse:** • Traffic: Additional construction traffic for the use of underground cable in the locality • Flooding: Additional infrastructure within the Tilbury Flood Storage Area • Technical: Additional technical challenges and Project cost.	**Adopted** – Original technical assessment concluded that due to space restrictions between two existing overhead lines and the proposed LTC works, the crossing of the LTC works would be best achieved by underground cables, with continuation through to Tilbury Substation. However, following further consultation feedback and technical review identifying challenges with Freeport interaction and development constraints, an alternative connection arrangement was developed. Assessment under Regulation 14(2)(d) of the

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
			revised solution concluded the new approach was preferable. The adopted solution comprises a new Tilbury North Substation connected to the existing YYJ 400 kV overhead line, avoiding approximately 4.5 km of underground cable from south of Orsett Golf Course to Tilbury Substation. This alternative achieves the same system reinforcement outcome while avoiding Freeport area interactions, reducing underground cable length from approximately 25 km to approximately 22 km project-wide, and allowing LTC crossing by overhead line rather than underground cable (consistent with NPS EN-5 preference for overhead lines). The change removes multiple challenging construction sections requiring trenchless techniques and delivers enhanced system performance in some demand conditions.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
CSE compound at Orsett and underground cable to Tilbury Substation (alternative to the Tilbury North Substation) – Establish CSE compound adjacent to Orsett Golf Club with underground cable to existing Tilbury Substation	Design development consideration of alternative connection arrangements	**Beneficial:** • Visual: Reduces operational visual effects by replacing overhead line with underground cable • Economic development: Avoids potential impacts on the economic viability of the Freeport area by removing overhead line infrastructure. **Adverse:** • Traffic: Additional construction traffic for the use of underground cable in the locality • Recreation: Potential effects on Orsett Golf Club from CSE compound siting and construction activities • Flooding: Additional infrastructure within the Tilbury Flood Storage Area • Techncial: Additional technical challenges including complex crossings of existing rail line and existing 400 kV overhead line infrastructure • Substantial additional Project cost • Technical constraints from achieving line entry to Tilbury Substation.	**Rejected** – Assessment under Regulation 14(2)(d) concluded technical challenges of achieving connection to Tilbury Substation and substantial additional costs outweigh visual and economic benefits. Complex infrastructure crossings create significant technical risks and construction impacts on recreational facilities not justified by environmental benefits achieved.

Statutory Consultation 2024 – Preferred Draft Alignment

3.7.22 The resulting 2024 preferred draft alignment comprised of an overhead line alignment (with pylon locations), sections of underground cable, locations of CSE compounds, the location of the EACN Substation, third party utilities diversion works, permanent access roads (where necessary), permanent drainage, environmental mitigation and areas identified for on-site Biodiversity Net Gain (known as 'Environmental Areas') and all associated temporary works associated with the construction and operation (and maintenance) of the Project. This was subject to further statutory and non-statutory consultation.

Changes Following the 2024 Statutory Consultation

3.7.23 Following the 2024 statutory consultation, which was undertaken between April and July 2024 for a period of eight weeks, National Grid undertook a comprehensive review of all feedback received alongside the findings of environmental and engineering studies and backchecking of previous studies. Subsequently, targeted statutory and non-statutory consultations were held in 2025 to present specific design refinements developed in response to the 2024 consultation feedback. All feedback provided was considered in the context of environmental and socio-economic constraints and opportunities, engineering feasibility and risks, cost and programme considerations, and planning policy requirements.

3.7.24 The Design Development Report (document reference 5.15) addresses both the main changes requested and those changes raised by a larger number of respondents from both the 2024 statutory consultation and the 2025 targeted consultations, including those which may not have led to a change of Project design. In all cases, factors relevant to the change have been considered (which can be multiple and potentially conflicting) and a balanced decision made taking into account environmental and socio-economic effects, engineering feasibility and risks, cost and programme amongst other factors.

3.7.25 Based on the findings documented in the SOBR and various DDRs, a comprehensive assessment of reasonable alternatives was undertaken across the entire route in response to extensive feedback received during the 2024 statutory consultation. The assessment framework applied National Grid's established methodologies including the Holford Rules for overhead line routeing and Horlock Rules for substation and CSE compound siting, alongside planning policy and legislative considerations including National Grid's statutory duties under the Electricity Act 1989, the strengthened duty under the Levelling Up and Regeneration Act 2023, and relevant National Policy Statements EN-1 and EN-5.

3.7.26 The most substantial alternatives assessment concerned the Tilbury connection arrangements, which formed the key subject of the 2025 targeted statutory consultation. This involved comprehensive evaluation of multiple substation sites (Sites 1-6) and connection methods. This assessment resulted in the selection of Tilbury North (Site 3) as the preferred solution, providing significant environmental benefits including removal of 4.5 km underground cable from Thames Estuary and Marshes SPA/Ramsar site zone of influence, elimination of Freeport development restrictions, and avoidance of heritage impacts near the Grade II listed church at West Tilbury.

3.7.27 In addition to the main design changes detailed above, a number of minor design refinements have been incorporated into the Project following the 2024 statutory consultation. These modifications represent detailed design optimisations within the established Limits of Deviation rather than reasonable alternatives requiring separate assessment under the EIA Regulations. As defined in Section 3.2, minor variations in specific pylon positioning or precise alignment within established parameters are not treated as separate alternatives, as the environmental assessment considers a worst-case scenario within the established parameters. These refinements are detailed in the DDR (document reference 5.15).

3.7.28 The feedback received to the 2024 statutory consultation; 2025 targeted consultations and the development of the submission alignment resulted in changes outside the original 2022 consultation corridor. The changes made, whether prompted by feedback, environmental and technical assessments or in response to other technical appraisal considerations, demonstrate the continued iterative approach to design development through the consenting process.

3.7.29 Maps and further details of the above together with the main alternatives considered and subsequently adopted or discounted are provided in the DDR (document reference 5.15). A summary of the key reasonable alternatives to the 2024 preferred draft alignment considered in response to the feedback from the 2024 statutory consultation and 2025 targeted consultations is presented in Table 3.17. Further detail can be found in the DDR (document reference 5.15).

Table 3.17 Reasonable alternatives considered following 2024 statutory and non-statutory consultation (alternatives that informed the development of the 2025 preferred draft alignment)

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Waveney Valley Alternative (WVA) – Underground cable alternative assessed for 2 km section between RG80-RG92 to replace overhead line crossing of Waveney Valley	Consultation feedback requesting underground cable to address perceived heritage, landscape and visual amenity effects, particularly concerning Grade I listed Church of St	**Beneficial:** • Historic Environment: Potential reduction in setting effects on Grade I listed Church of St Remigius • Residential amenity: Limited benefits for small number of properties along A1066 with views over valley • Landscape: Reduced landscape effects in Waveney Valley from absence of overhead infrastructure. **Adverse:** • Ecology: Significant loss of potential priority habitat (lowland fen) and hydrological impacts on Wortham Ling SSSI • Ecology: Extensive tree removal requirements in organic matter (peaty) soils with irreplaceable habitat loss • Technical: Multiple excavations required due to geology constraints, artesian water complications • Environmental: Conflicts with Waveney and Little Ouse Recovery (WaLOR) project for river naturalisation • Cost: Disproportionate additional costs relative to environmental benefits.	**REJECTED** – The assessment demonstrates compliance with EN-5 paragraph 2.9.23 requirements for considering underground cable where landscape and heritage effects may justify additional costs. However, the significant ecological impacts, technical complications with trenchless installation methods, conflicts with WaLOR project, and disproportionate costs relative to environmental benefits do not meet the Secretary of State's decision-making criteria in EN-5 paragraph 2.9.25. The overhead line alternative was retained following detailed assessment against NPS EN-5 criteria.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Tilbury Connection Alternatives – Assessment of six alternative sites (Sites 1-6) for new Tilbury North Substation connection, evaluating multiple locations from north-west of existing infrastructure to locations along Project alignment	2024 statutory consultation feedback identifying that original connection point may not be deliverable, requiring assessment of alternative substation locations	Site 1 **Beneficial:** • No comparative beneficial environmental effects identified. **Adverse:** • Programme: 2+ year delay leading to in-service date beyond 2030 • Cost: High constraint cost payments incompatible with economic duties. Site 2 **Beneficial:** • No comparative beneficial environmental effects identified. **Adverse:** • Historic environment: Effects on listed buildings and scheduled monuments near Heath Place • Residential: Insufficient spacing between residential properties. Site 3 **Beneficial:** • Environmental: Avoids long-term tree loss over underground cable routes • Construction: Reduced temporary construction effects, avoids long-term tree loss • Landscape: Reduced effects on Chadwell Escarpment Urban Fringe and Tilbury Marshes LCAs.	**Site 3 ADOPTED, Sites 1,2,4,5,6 REJECTED** – Site 3 selected as optimal balance of environmental impact, technical feasibility, and programme deliverability. Site 1 scoped out under EN-1 paragraph 4.3.23 as incapable of meeting same need case due to programme delays incompatible with 2030 delivery requirement. Site 2 rejected due to multiple constraints including heritage, residential proximity and transport infrastructure. Site 4 rejected due to additional housing allocation impacts and increased golf course effects. Sites 5 and 6 rejected due to future connectivity constraints and additional costs respectively. Decision demonstrates compliance with National Grid's statutory duties under Electricity Act 1989 to be economic and efficient while achieving network reinforcement objectives.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		Adverse: • No comparative adverse environmental effects identified. <u>Site 4</u> **Beneficial:** • No comparative beneficial environmental effects identified. **Adverse:** • Housing: Additional impacts on Chadwell St Mary housing allocation and Southfields opportunity area • Recreation: Increased effects on Orsett Golf Course from two overhead line crossings. <u>Site 5</u> **Beneficial:** • Construction efficiency: Reduced temporary construction effects through reduced underground cable length • Biodiversity: Avoids some long-term tree loss over underground cable routes • Landscape and visual: Reduced landscape effects on Chadwell Escarpment Urban Fringe and Tilbury Marshes • Socio-economics: Reduced effects on West Tilbury Urban Fringe. **Adverse:** • Land take: Requires additional CSE compound south of Orsett Golf Course	

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Residential: Similar housing allocation effects at Chadwell St Mary as Site 3 • Socio economic: Constrained by very limited future connection potential. <u>Site 6</u> **Beneficial:** • Residential: Potentially avoids effects on Chadwell St Mary housing allocation **Adverse:** • Socio economic: Routes through area that may provide green space for housing development • Residential: Potentially avoids effects on Chadwell St Mary housing allocation • Economic: Additional costs from longer underground cables • Construction efficiency: Additional complexity from trenchless crossing under Muckingford Road.	
Gislingham Western Route – Alternative routing passing further west around Gislingham village	Consultation feedback requesting western routing to reduce effects on Gislingham community.	**Beneficial:** • Residential: Potentially reduced effects on some residential properties in Gislingham village • Visual: May reduce visual amenity effects for some receptors in the village. **Adverse:** • Alignment: Longer route length requiring additional pylons	**Rejected** – Assessment concluded western alternative would transfer effects to other receptors without overall environmental benefit. Longer route with additional angle changes less consistent with Holford Rule 3 principles of directness. Additional infrastructure requirements and costs not justified by

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Alignment: More angle changes reducing compliance with Holford Rule 3 (directness) • Environmental: Transfer of effects to other residential receptors in western areas • Landscape: Potential increased landscape effects from longer route requiring additional infrastructure.	environmental benefits. Consultation corridor alignment remains preferred as achieving better balance between community effects and technical efficiency. Decision consistent with proportionate alternatives assessment under EN-1 paragraph 4.3.25.
132 kV Route Following (Bramford-Lawford) – Following existing 132 kV overhead line alignment between Bramford and Lawford Substations	Ongoing consultation preference for following existing infrastructure alignment to reduce landscape effects.	**Beneficial:** • Landscape and visual: Utilises existing infrastructure corridor reducing new landscape intrusion • Landscape and visual: May reduce magnitude of change in some locations by following established transmission corridor. **Adverse:** • Residential: Existing 132 kV line passes very close to residential properties (~30 m from centreline) • Residential: Greater scale of 400 kV infrastructure requires more separation – insufficient space available at multiple locations including Mace Green and White Horse Road in East Bergholt • Woodland: Increased woodland removal required due to greater clearance needs for 400 kV infrastructure • Alignment: Multiple angle changes required for deviations to address constraints	**Rejected** – Existing 132 kV alignment unsuitable for 400 kV infrastructure due to insufficient separation from residential properties. Scale difference between 132 kV and 400 kV infrastructure requires greater clearances that cannot be achieved within existing corridor. Multiple constraint locations would require extensive deviations with additional angle changes, reducing Holford Rule compliance. Increased woodland removal requirements present additional environmental disbenefit. Alternative would create greater overall environmental effects despite using existing corridor. Assessment demonstrates that following existing infrastructure

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Construction: Subsequent increase in environmental effects from additional infrastructure requirements.	not always optimal for different technology scales.
Alternative CSE Locations North of Dedham Vale National Landscape – Multiple Cable Sealing End compound siting options evaluated north of the designated landscape	2024 statutory consultation feedback requesting improved CSE positioning to reduce landscape, heritage, and community effects.	Raydon CSE Compound **Beneficial:** • Landscape and visual: Enhanced screening from long-distance views including from National Landscape • Historic environment: Reduces heritage effects on war memorial and Little Wenham heritage assets (increasing separation from ~750 m to ~1500 m) • Historic environment: Avoids effects on model aircraft club at previous location • Aviation: Enables continued flight activities at Raydon Airfield. **Adverse:** • Residential: Some transfer of effects to properties at Vauxhall. North of Brimlin Wood **Beneficial:** • No comparative beneficial environmental effects identified. **Adverse:** • Landscape: Would require longer underground cable (~1 km) affecting 1 km of overhead line removal through farmland	**Preferred CSE Location Adopted** – Raydon CSE positioned north of Wenham Grove but south of disused railway balances multiple objectives. Reduced National Landscape effects consistent with EN-5 paragraph 2.9.20 duties. Heritage benefits align with Schedule 9 Electricity Act requirements. Aviation benefits support collaborative infrastructure development per EN-1 paragraph 5.5.5. Economic efficiency maintained while achieving environmental benefits. North of Brimlin Wood rejected as underground cable extension not justified under EN-5 paragraph 2.9.23 criteria.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
		• Economic: Less economical solution not justified under EN-5 paragraph 2.9.23 criteria.	
TB40-TB64 Western Alternative – Alternative routing to pass west of Ford Street, Fordham and Aldham villages rather than to the east	2024 statutory consultation feedback requesting western routing to reduce village effects.	**Beneficial:** • Residential: Reduced residential amenity effects (28 properties within 200 m vs 49 for eastern route) • Landscape: Lower overall landscape effects, reduced conflict with landform and tree cover • Recreation: Reduced recreational effects (less dense Public Right of Way (PRoW) network, avoids open access land). **Adverse:** • Alignment: ~0.6 km longer requiring estimated 3 additional pylons and 3 additional angle pylons • Flood risk: Crosses flood zone approximately twice the width of eastern alternative • Aviation: Closer proximity to Wormingford Airfield potentially affecting flight activities • Residential: More residential properties around western crossing may limit pylon siting options • Heritage: Transfer of effects to Grade II listed building at Chippetts Farm with more open views.	**Rejected** – While western alternative shows some environmental benefits, assessment concluded these were outweighed by route efficiency and heritage concerns. Longer route with additional infrastructure less consistent with Holford Rule 3 (directness) and National Grid's economic duties. Heritage effects on Grade II listed Chippetts Farm present additional constraint. Aviation proximity to Wormingford Airfield adds operational complexity. Project effects on eastern route considered policy-compliant and do not engage EN-5 paragraphs 2.9.20-2.9.21 thresholds. Economic efficiency favours eastern route.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
Minerals Scenario TB128-133 – Contingency routing around potential mineral extraction allocation	Essex County Council engagement identifying potential minerals plan allocation between TB128-TB131.	Scenario B **Beneficial:** • Resource: Avoids constraint and sterilisation of mineral abstraction • Ecology: Maintains appropriate stand-off from ancient woodland. **Adverse:** • Residential: Moves alignment closer to residential properties and Grade II listed building at Long's Farm (reducing separation from ~400 m to ~200 m) • Alignment: Requires one additional pylon, less direct route.	**Accepted** – Two-scenario approach provides necessary flexibility to respond to uncertain mineral allocation status. Scenario B justified as less preferred option would avoid extensive mineral resource sterilisation. At 200 m separation, effects on residential properties and listed building remain policy-compliant. Aligns with National Grid's duty to be economical and efficient by avoiding long-term resource constraint. Additional costs justified by avoiding mineral sterilisation impacts.

Alternative description	Consultation request / Origin	Comparison of Environmental Effects	Decision and Rationale
TB135-143 Pylon Type Assessment between Great Waltham and Little Waltham – Standard lattice vs low-height lattice pylon evaluation	2024 statutory consultation feedback on heritage effects and community concerns about pylon design.	Standard Lattice Pylons **Beneficial:** • No beneficial environmental effects identified. **Adverse:** • Heritage: Greater heritage effects from views within Great Waltham conservation area, Langleys Registered Park and Garden, and Little Waltham Conservation Area • Heritage: Greater visibility of pylon tops in designed garden avenue view from Grade I listed Langleys. Low-height Lattice Pylons **Beneficial:** • Heritage: Removes/reduces visibility from conservation areas and registered park • Heritage: Reduces impact on Grade I listed Langleys setting (though not changing EIA assessment level) • Landscape: Screening benefits from intervening vegetation at distance. **Adverse:** • Visual: Greater footprint and bulkier profile • Visual: More noticeable in close views without intervening vegetation • Construction: Additional construction and maintenance risks.	**Mixed Approach Adopted** – Hybrid solution with low-height lattice pylons north of River Chelmer (TB136-TB140) and standard lattice pylons south of river (TB141-TB143). Responds to heritage concerns while addressing community preferences. Low-height design justified north of river for heritage benefits to Grade I listed Langleys and conservation areas. Standard lattice retained south of river responding to community feedback. Approach balances heritage protection duties under Schedule 9 Electricity Act with community concerns and technical efficiency.

3.8 Alternative Construction Methods and Arrangements Considered

3.8.1 This section sets out the reasonable alternative design and construction methods that have been considered on the Project and the reasons why options were taken forward or discounted. Construction methodology alternatives remain relatively undetermined at this stage of design development, as detailed construction approaches will be refined during the detailed design phase when factors such as contractor preferences, availability of transport routes in relation to other nearby projects, and site-specific conditions are better understood. Some information presented below builds upon alternatives analysis presented in earlier sections of this chapter.

3.8.2 The following alternative design and construction methods and technology options have been considered:

- Underground cable installation methodology
- Access arrangements to the EACN Substation
- Helicopters for construction (except for stringing)
- Use of the existing highway network as an alternative to the proposed haul roads
- Multi-modal transport of materials.

Underground Cable Installation Method

3.8.3 National Grid would install underground cables in areas identified by consideration of the policy in NPS EN1 and NPS EN5. This includes areas such as National Landscapes, to reduce visual impact. For this Project, underground cables are proposed in four locations: Dedham Vale National Landscape (16.8 km), Great Horkesley (3.9 km), Fairstead (0.15 km), and North Tilbury (0.6 km).

3.8.4 Ordinarily, for opencut trench installation, trenches would be dug to accommodate each cable and joint bays would be necessary at intervals to allow for the jointing of the individual sections of cable. In these areas a widening of the easement corridor (the strip of land within which underground cables are installed) may be required for the arrangement of joints. The works required to bury a cable have the potential to affect archaeology, vegetation and wildlife along the construction corridor. A CSE compound is needed where a section of cable is terminated and the circuit continues on to an overhead line (and vice versa), which enables the transition from cable conductor to the overhead line conductor.

3.8.5 National Grid has considered the choice of construction method for installing the underground cables during the 2023 design development phase following the 2022 non-statutory consultation, with further refinement during 2024 following the 2023 consultation as part of the options appraisal for identifying the preferred alignment and this has been refined since based on the results of environmental surveys, technical assessments (including ground investigations) and feedback during consultation.

3.8.6 Open-cut trenches were used as the starting point, as these are quicker and cheaper to install than trenchless methods allowing land to be reinstated quicker. In addition, National Grid has continued to consider the use of trenchless crossing techniques,

which although more expensive and time consuming to undertake, can avoid impacts on specific features such as rivers, railways and habitats. However, trenchless techniques have the potential to introduce different environmental effects including noise, groundwater effects and an increased risk of break out of drilling mud during construction. Therefore, the use of trenchless techniques needs to be carefully considered alongside environmental and technical surveys (particularly ground conditions) to identify if it is a suitable method at a given location.

3.8.7 Underground cable installation methods have been selected based on site-specific constraints and technical requirements. Trenchless methods are utilised where open-cut installation is not technically feasible or environmentally acceptable, whilst open-cut methods are employed where constraints do not necessitate alternative techniques. Key locations where trenchless methods are required include crossings of major infrastructure, water features, and sensitive environmental areas (archaeological sites, areas of particular heritage sensitivity and woodland areas. In all other locations, open-cut trenching is employed as the standard installation method, providing the most economical and efficient approach where environmental and technical constraints permit.

3.8.8 Table 3.18 compares the environmental effects of the two underground cable installation techniques.

Table 3.18 Underground cable installation techniques

Technique	Key Environmental and Technical Factors Considered
Opencut trenching	**Beneficial:** • Construction efficiency: Relatively quick to construct and install cables compared to trenchless methods. Use of ducting systems allows for more flexible construction programming and quicker land reinstatement compared to direct burial methods where trenches remain open longer. **Adverse:** • Ecology: Results in vegetation loss where the trench crosses hedgerows, woodlands and other habitats • Economic development: Disturbance to land use including agricultural operations during construction • Transport and Access: Potential closures and diversions of roads and Public Rights of Way during construction • Drainage: Natural drainage and runoff need to be managed within the excavated area during construction • Historic Environment: Trenches are excavated so have an increased risk of encountering archaeological remains during construction • Hydrogeology: Trenches can create a preferential pathway for groundwater flows, which can affect groundwater-based habitats and archaeology.

Technique	Key Environmental and Technical Factors Considered
Trenchless crossing techniques	**Beneficial:** • Visual and Landscape: Reduced effects on landscape character, visual amenity, biodiversity, setting of historic assets and surface water due to being able to retain (and leave relatively undisturbed) vegetation and land use above the trenchless crossing • Ecology: Cables are installed beneath tree roots so trees can remain above the cables and can be avoided during construction, which has landscape and visual benefits • Historic Environment: Limited excavation (mainly associated with drill pits) compared to an open trench as the drill profile can pass beneath archaeological remains. **Adverse:** • Construction efficiency and cost: Trenchless crossings take longer to install compared to opencut methods due to the number of drills required • Impact footprint: Requires wider working areas for drill pit locations and compound areas for drilling equipment • Hydrogeology and geology: Trenchless crossings are not suitable in all geology and can have an impact on groundwater, during both construction and operation, by creating a preferential pathway for groundwater flow. This can affect the water table in groundwater-based habitats • Sedimentation: There is an inherent risk of breakout of drilling mud at the surface associated with some trenchless crossing methods which would need to be managed and mitigated • Noise and Vibration: Trenchless crossings require drilling, which is a noisy activity and certain activities associated with the drilling cannot be stopped once commenced, which can lead to increased noise levels at night at nearby noise-sensitive receptors.

3.8.9 The options appraisal process determined that opencut trenching would be used in the majority of locations where underground cables are required. At five specific locations, technical requirements and regulatory constraints necessitate the use of trenchless methods, rather than these representing alternatives assessed under Regulation 14(2)(d).

3.8.10 The specific locations where trenchless methods are required due to technical or regulatory constraints are:

- Higham Road: to avoid impacts on the highway during construction
- River Stour (north part): to avoid impacts on the river, the marginal habitats and navigation
- River Stour (south part): to avoid impacts on the river, the marginal habitats and navigation
- A12 Highway Crossing: to avoid impacts on the highway during construction
- Railway Crossing (east of Ardleigh): to avoid impacts on the railway line and its services during construction.

3.8.11 A summary of the trenchless crossings is shown on Figure 4.1: Proposed Project Design (document reference 6.4.F1). The locations of the trenchless crossing presented below are subject to further micro-siting/engineering design which would be informed by ground investigations. Ground investigations would be undertaken during the detailed design phase prior to construction commencement.

3.8.12 The preferred approach for open-cut installations is to use ducting. Ducting involves installing protective ducts in the trench through which cables are subsequently pulled, whereas direct burial involves placing cables directly in the excavated trench with appropriate bedding and backfill materials. A ducted system would result in a more flexible construction programme and enable quicker reinstatement of ground compared to a traditional direct burial method, where the trench would remain open for much longer. There may be locations where ducting is not the best solution, such as where topography limits installation techniques. In such cases, standard open-cut methods may be employed (i.e. direct burial).

3.8.13 For trenchless crossings, cables are typically installed through pre-drilled ducts or conduits. Further detail, including the underground cable installation method chosen at each location, can be found within the DDR (National Grid, 2024a).

EACN Substation Access Alternatives

3.8.14 Following the identification of the preferred EACN Substation location on the Tendring Peninsula, a comprehensive access appraisal was undertaken in December 2023 to identify suitable access arrangements for both construction and operational phases. The appraisal assessed four alternative access routes from the A120 to determine the most appropriate access strategy while minimizing environmental and traffic impacts in accordance with Regulation 14(2)(d) of the EIA Regulations.

Table 3.19 EACN Substation access alternatives

Option	Description	Environmental Considerations	Decision and Rationale
Option 1 – A120/Harwich Road Roundabout	Access via proposed new 5th arm from A120/Harwich Road roundabout to joint haul road (approximately 5.4 km total route length)	**Beneficial:** • No highway capacity constraints identified through junction assessment. **Adverse:** • Requires significant additional land take for approximately 2.4 km of new haul road construction • Extended land occupation duration • Visual impacts on residential properties in proximity to haul road • Potential dust implications during dry weather conditions.	**Discounted** – Environmental impacts from extensive new haul road construction and associated land take not justified when public highway alternatives available.
Option 2 – Park Road Junction	Access from A120 via Park Road junction to joint haul road (approximately 5.4 km total route length)	**Beneficial:** • No capacity issues identified at Park Road/A120 junction. **Adverse:** • Requires significant additional land take for approximately 2.4 km of new haul road • Extended land occupation • Visual impacts on residential properties • Potential dust implications • Temporary capacity constraints at Horsley Cross Roundabout during peak construction (RFC 0.86).	**Discounted** – Similar environmental impacts to Option 1 from new haul road requirements, with additional temporary traffic capacity concerns at Horsley Cross Roundabout.

Option	Description	Environmental Considerations	Decision and Rationale
Option 3 – Bentley Road	Access from A120 via Bentley Road to joint haul road utilizing existing public highway (approximately 4.0 km total route length)	**Beneficial:** • Utilises existing public highway infrastructure minimizing additional land take requirements • No capacity issues at Bentley Road/A120 junction • Shortest route length reducing overall environmental impact. **Adverse:** • Similar temporary capacity constraints at Horsley Cross Roundabout during peak construction as Option 2 (RFC 0.86), though impacts considered minimal through trip generation refinement.	**Preferred –** Optimal environmental balance utilizing existing infrastructure while minimizing land take and construction impacts.
Option 4 – B1035 Clacton Road	Access from A120 via B1035 Clacton Road through Five Estuaries/North Falls cable corridor (approximately 4.7 km route length)	**Beneficial:** • Potential coordination opportunities with cable installation works. **Adverse:** • Extends land occupation duration for cable corridor • Construction practicality concerns over water features and corridor widening for HGV access • Visual impacts on Clacton Road residents • Extended visual impacts along haul road route • Deemed not viable by North Falls and Five Estuaries projects.	**Discounted** – Technical and environmental constraints make option unviable, with extended construction impacts and coordination difficulties outweighing potential benefits.

3.8.15 The assessment concluded that Option 3 (access via Bentley Road) represented the preferred alternative, providing optimal environmental balance by utilising existing public highway infrastructure and minimising additional land take requirements. Whilst temporary capacity constraints were identified at Horsley Cross Roundabout during peak construction periods, refinement of trip generation demonstrated minimal impacts. The selected access arrangement avoids the significant environmental impacts associated with new haul road construction required by Options 1 and 2, whilst providing a technically viable solution compared to the coordination constraints of Option 4.

Use of Helicopters and Drones During Construction

3.8.16 National Grid has considered the use of helicopters and unmanned aerial vehicles (drones) as construction support methods for specific activities during the Project construction phase. Construction methodology alternatives remain relatively undetermined at this stage of design development, as detailed construction approaches would be refined during the detailed design phase when factors such as contractor preferences, availability of transport routes, and site-specific conditions are better understood.

3.8.17 For overhead line conductor installation, helicopters are proposed to support stringing activities by installing the pilot cable (the pulling bond, which is used to pull the conductors onto the pylons). Using helicopters would be more efficient in terms of time and vehicle movements, as the helicopter would be able to install the main heavy-duty bond in a single flight, whereas conventional ground-based methods require an initial lightweight bond to be installed to pull through two or three progressively stronger bonds. The helicopter method would take one to two days to install the six bonds required compared with potentially several weeks for conventional methods.

3.8.18 The use of helicopter assistance offers environmental benefits through reduced vehicle movements and shortened construction duration, but introduces different environmental considerations including temporary noise and visual effects during operations, potential ecological disturbance, and increased carbon emissions from helicopter fuel consumption. Helicopters are not proposed for other aspects of pylon construction owing to the proximity of residential properties and the number of roads to be crossed.

3.8.19 National Grid proposes to utilise helicopter assistance for conductor stringing in appropriate locations where this offers clear environmental benefits whilst avoiding helicopter use in areas of high residential density or sensitive ecological receptors. The final construction methodology would be confirmed during detailed design in consultation with appointed contractors and relevant stakeholders.

3.8.20 Drone technology has also been considered for specific monitoring and surveying activities during construction, offering reduced environmental effects compared to manned helicopter operations for these limited applications.

Use of the Existing Highway Network as an Alternative to the Proposed Haul Road

3.8.21 National Grid assessed alternative approaches to construction vehicle movements, comparing the use of existing highway networks with the provision of a dedicated

haul road system. This assessment was undertaken by the Project team in response to the linear nature of the Project and the characteristics of the road network, which present constraints to materials and equipment movement. The Project is crossed by numerous roads suitable for HGV traffic but also by many that are not appropriate for potentially two-way HGV movement, as detailed in the DDR 2024 (National Grid, 2024a), DDR 2025 (document reference 5.15) and Chapter 16: Traffic and Transport (document reference 6.16).

3.8.22 The assessment identified that the most appropriate transport solution was to establish a series of Primary Access Routes (PARs) connecting to the trunk road network, linked along the Project corridor by new site access points (bellmouths) leading to off-highway haul roads. This approach allows HGVs to cross unsuitable parts of the highway network at designated crossover points whilst utilising the haul roads for the majority of movements.

3.8.23 Table 3.20 sets out the key environmental considerations for the two construction vehicle movement alternatives assessed.

Table 3.20 Environmental considerations for construction vehicle movements

Technique	Key Environmental Effects Considered
Use of the existing highway network	**Beneficial:** • Less land-take for the Project and reduced impact on agricultural land, habitats, and Public Rights of Way severance • Reduction in material requirements for the Project (associated with materials required for haul road construction). **Adverse:** • Would require significant and extensive traffic management throughout construction and temporary works to public transport infrastructure • Additional vehicle movements on the existing highway • Construction traffic using roads through settlements which would have adverse environmental effects (air quality, noise, etc.).
Use of Project haul roads	**Beneficial:** • Avoids significant and extensive traffic management on the existing highway network and works to public transport infrastructure • Fewer construction vehicles on the existing highway network • Routeing of the haul roads can be managed to reduce environmental effects on nearby receptors where practicable. **Adverse:** • Requirement for a large quantity of stone and material to construct the haul road, leading to increased traffic movements for material delivery, potential impacts on archaeological features during construction, increased carbon emissions from material transport, temporary loss of agricultural land, time and costs involved in haul road decommissioning post-construction. • Greater impact on agricultural land, habitats, and Public Rights of Way severance.

3.8.24 Following comparative assessment, the use of a largely continuous haul roads was adopted as the preferred approach. This decision was based on the significant benefits of reducing construction traffic on local road networks, avoiding extensive traffic management requirements, and enabling better control of environmental effects through strategic routing. The haul road approach confines traffic to designated PARs and crossing locations, reducing potential impacts on settlements and sensitive receptors.

Multi Modal Transportation of Materials for Construction

3.8.25 National Grid has considered alternative means of delivering materials from outside the region to construction areas within the Order Limits through evaluation of multi-modal transport options. Further detail can be found in the Multi-Modal Study within the Transport Assessment (document reference 7.11).The transport strategy for the Project has been informed by the requirement for the movement of materials (stone, concrete, steelwork, conductors, and cables), equipment and construction personnel. The strategy development has considered the nature and location of existing transport infrastructure including roads suitable for two-way HGV movements and Abnormal Indivisible Loads (AILs), ports with appropriate water depth and offloading facilities, and available rail paths and offloading facilities.Multi-modal considerations are relevant to the long-distance movement of materials from source to the Strategic Road Network and are influenced by commercial considerations in the context of a potentially global supply chain and contractor preferences. National Grid is investigating the potential use of existing aggregate handling facilities, including those on the rail network, along with the potential use of aggregate import facilities at ports within the region. These facilities have the potential to provide import locations to meet the needs of the Project.Locally, deliveries and movements to construction sites are expected to utilise HGVs, Light Goods Vehicles and private vehicles. These local deliveries and movements, between the Strategic Road Network and site access points (connecting the public highway to the haul road), are the focus of the Project design and assessment. The specific siting of different elements and facilitating local access has been informed by highway safety, environmental and socio-economic considerations. Avoidance of effects therefore forms an inherent part of the design development approach.

3.8.26 The potential for material reuse between different Project sections may lead to modifications to construction programmes to optimise logistics and reduce overall transport requirements.

Abbreviations

Abbreviation	Full Reference
AC	Alternating current
AEoSI	Adverse Effects on Site Integrity
AIL	Abnormal Indivisible Load
AIS	Air Insulated Switchgear
AONB	Area of Outstanding Natural Beauty
CPRSS	Corridor and Preliminary Routeing and Siting Study
CSE	Cable Sealing End
DC	Direct current
DCO	Development Consent Order
DDR	Design Development Report
EACN	East Anglia Connection Node
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Field
ES	Environmental Statement
ESO	Electricity System Operator
GIL	Gas insulated line
GIS	Gas Insulated Switchgear
GW	Gigawatt
HDD	Horizontal directional drill
HGV	Heavy Goods Vehicles
HRA	Habitats Regulations Assessment
HVDC	High voltage direct current
kV	Kilovolt
National Grid	National Grid Electricity Transmission Plc
NETS	National Electricity Transmission System
NETS SQSS	National Electricity Transmission System Security and Quality of Supply Standard
NPS	National Policy Statement

Abbreviation	Full Reference
NSIP	Nationally Significant Infrastructure Project
The Project	Norwich to Tilbury
RAF	Royal Air Force
SAC	Special Area of Conservation
SOBR	Strategic Options Backcheck and Review
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
PRoW	Public Rights of Way

Glossary

Term	Description
Abnormal Indivisible Load	A large load which cannot 'without undue expense or risk of damage' be divided into two or more smaller loads for the purposes of being transported by road, and which exceeds limits set out in terms of weight (>44 tonnes), length (>18.65 m), and width (>2.9 m).
Alignment	The proposed overhead line and underground cable route.
Ancient woodland	Land that has been continually wooded since at least 1600 in England. Regarded as 'irreplaceable habitat' in national planning policy and guidance. Ancient woodland greater than 2 ha is recorded on the Natural England Ancient Woodland Inventory.
Angle/tension pylon	Pylon where a horizontal insulator string attaches the conductors. Tension or 'angle' pylons are used at points where the overhead line alignment changes direction.
Biodiversity Net Gain	An approach for developments to ensure habitats for wildlife are left in a measurably better state than they were before the development.
Cable Sealing End	Structures used to transfer transmission circuits between underground cables and overhead lines.
Cable Sealing End compound	Electrical infrastructure used as the transition point between overhead lines and underground cables. A compound on the ground acts as the principal transition point.
Conservation Area	An area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance as defined in s69(1)(a) in the Planning (Listed Building and Conservation Areas) Act 1990.
Design Development Report	National Grid document which describes how the Project has evolved throughout the Project lifecycle as a result of feedback and consultation.
Development Consent Order	A statutory instrument which grants consents and other rights to build a Nationally Significant Infrastructure Project, as defined by the Planning Act 2008.
Electric and Magnetic Fields	All equipment that generates, distributes or uses electricity produces Electric and Magnetic Fields (EMF), and EMFs also occur naturally. Electric fields are created by differences in voltage: the higher the voltage, the stronger the resultant field. Magnetic fields are created when electric current flows: the greater the current, the stronger the magnetic field.
Environmental Areas	These are locations identified for environmental embedded measures, mitigation and/or Biodiversity Net Gain/environmental enhancement

Term	Description
Environmental Statement	The main output from the EIA process, an ES is the report required to accompany an application for development consent (under the Infrastructure Planning (EIA) Regulations 2017) to inform public and stakeholder consultation and the decision on whether a project should be allowed to proceed. The EIA Regulations set out specific requirements for the contents of an ES for Nationally Significant Infrastructure Projects.
Habitats Regulations Assessment	The process by which plans and projects are assessed as to whether they are likely to have a significant effect on a European site either alone or in combination with other plans or projects, under the Conservation of Habitats and Species Regulations 2017 (as amended).
Haul road	A route used by construction traffic within the Order Limits to access a working area from a site access point.
Heavy Goods Vehicles	Goods vehicles weighing more than 3,500 kg.
Kilovolt	1,000 volts
Lattice pylon	Pylon type widely used on the national electricity transmission networks. Both standard lattice pylons (approximately 50 m in height) and low height lattice pylons (approximately 40 m in height) are proposed on the Project.
Listed building	A measure of a building's special architectural and historic interest. There are three categories of listed buildings, Grades I, II* and II, depending on the level of interest.
National Electricity Transmission System	The National Electricity Transmission System (NETS) is the high-voltage electricity transmission network in England and Wales. The NETS transmits electricity in bulk from where it is generated to where it is needed, forming a highly interconnected system that enables reliable electricity supplies across England and Wales.
National Electricity Transmission System Security and Quality of Supply Standard	The NETS SQSS sets out a coordinated set of criteria and methodologies that the Transmission Licensees shall use in the planning and operation of the National Electricity Transmission System.
National Landscape (Previously called Area of Outstanding Natural Beauty)	Formally designated under the National Parks and Access to the Countryside Act of 1949 to protect areas of the countryside of high scenic quality that cannot be selected for National Park status due to their lack of opportunities for outdoor recreation (an essential objective of National Parks). As of November 2023, all AONBs became 'National Landscapes'. This reflects ambitions for the areas to play a key part in the international '30 by 30′ commitment (to protect and conserve a minimum of 30% of land and sea for biodiversity by 2030).

Term	Description
Nationally Significant Infrastructure Project	Typically a large scale development of national importance that requires development consent from the Secretary of State, under the Planning Act 2008.
Overhead line	Conductor (wire) carrying electric current, strung from pylon to pylon.
Substation	Substations are used to control the flow of power through the electricity system. They are also used to change (or transform) the voltage from a higher to lower voltage to allow it to be transmitted to local homes and businesses.
Underground cable	An insulated conductor carrying electric current designed for underground installation. Underground cables link together two Cable Sealing End compounds.

Bibliography

Department for Energy Security and Net Zero (2024a) *Overarching National Policy Statement for Energy (EN-1)*.

Department for Energy Security and Net Zero (2024b) *National Policy Statement for Electricity Networks Infrastructure (EN-5)*.

HM Government (2020) *Energy White Paper: Powering our Net Zero Future*.

National Grid (2022) *East Anglia Green Energy Enablement (GREEN) – Corridor and Preliminary Routeing and Siting Study Report*.

National Grid (2023a) *Design Development Report.*

National Grid (2023b) *Strategic Options Report.*

National Grid (2024a) *Design Development Report.*

National Grid (2024b) *Strategic Options Backcheck and Review.*

National Grid Electricity System Operator (ESO) (2021) 2021 Network Options Assessment [online] https://www.neso.energy/publications/transitional-centralised-strategic-network-plan-tcsnp/key-documents-tcsnp Accessed 6 May 2025.

National Grid Electricity System Operator (ESO) (2022) 2022 Network Options Assessment [online] https://www.neso.energy/publications/transitional-centralised-strategic-network-plan-tcsnp/key-documents-tcsnp Accessed 6 May 2025.

Planning Inspectorate (2025) *Advice Note Seven: Environmental Impact Assessment: process, preliminary environmental information and environmental statements* [online] Available at: https://www.gov.uk/government/publications/nationally-significant-infrastructure-projects-advice-note-seven-environmental-impact-assessment-process-preliminary-environmental-information-an Accessed 6 May 2025.

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