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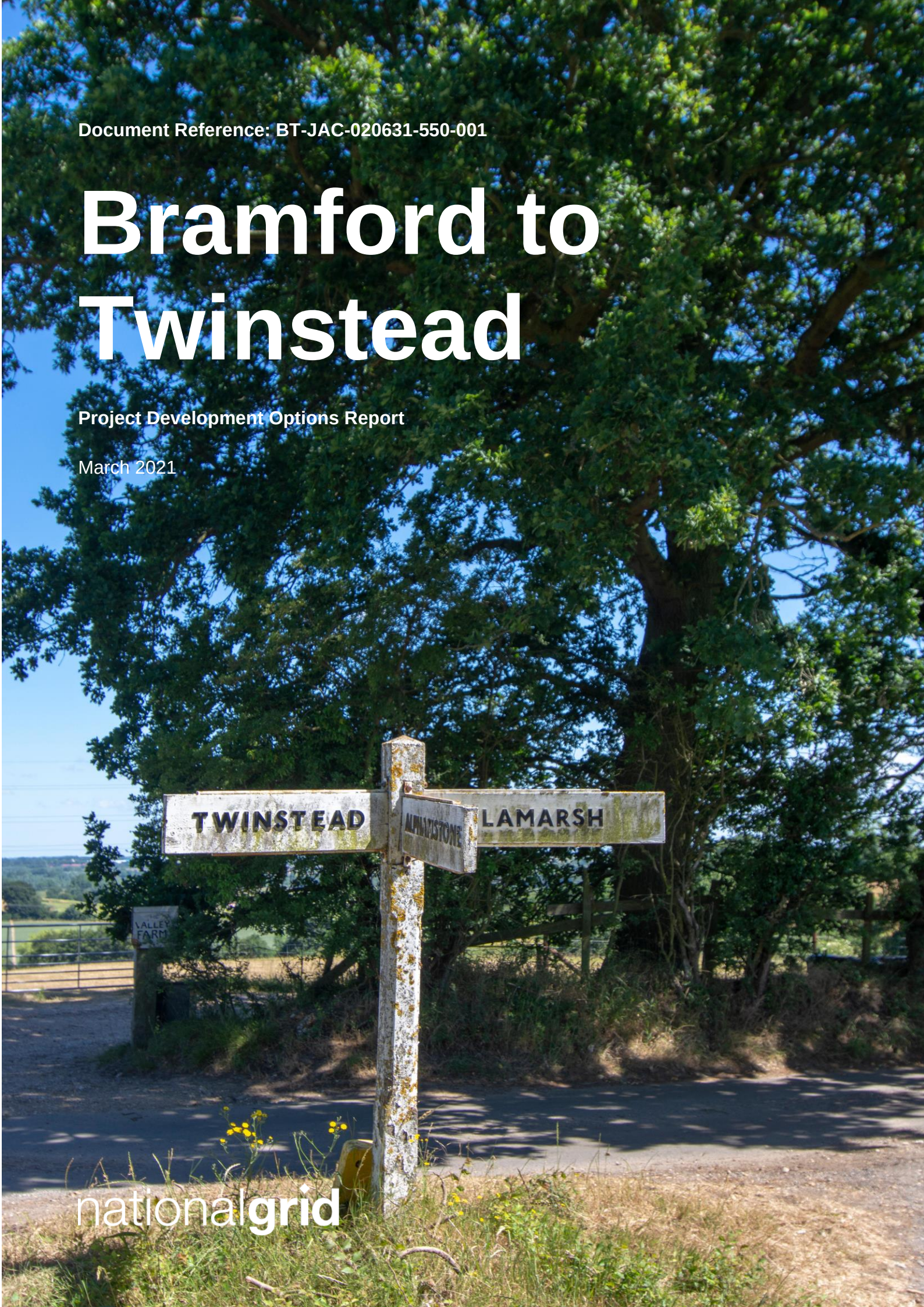
Bramford to Twinstead

Project Development Options Report

March 2021



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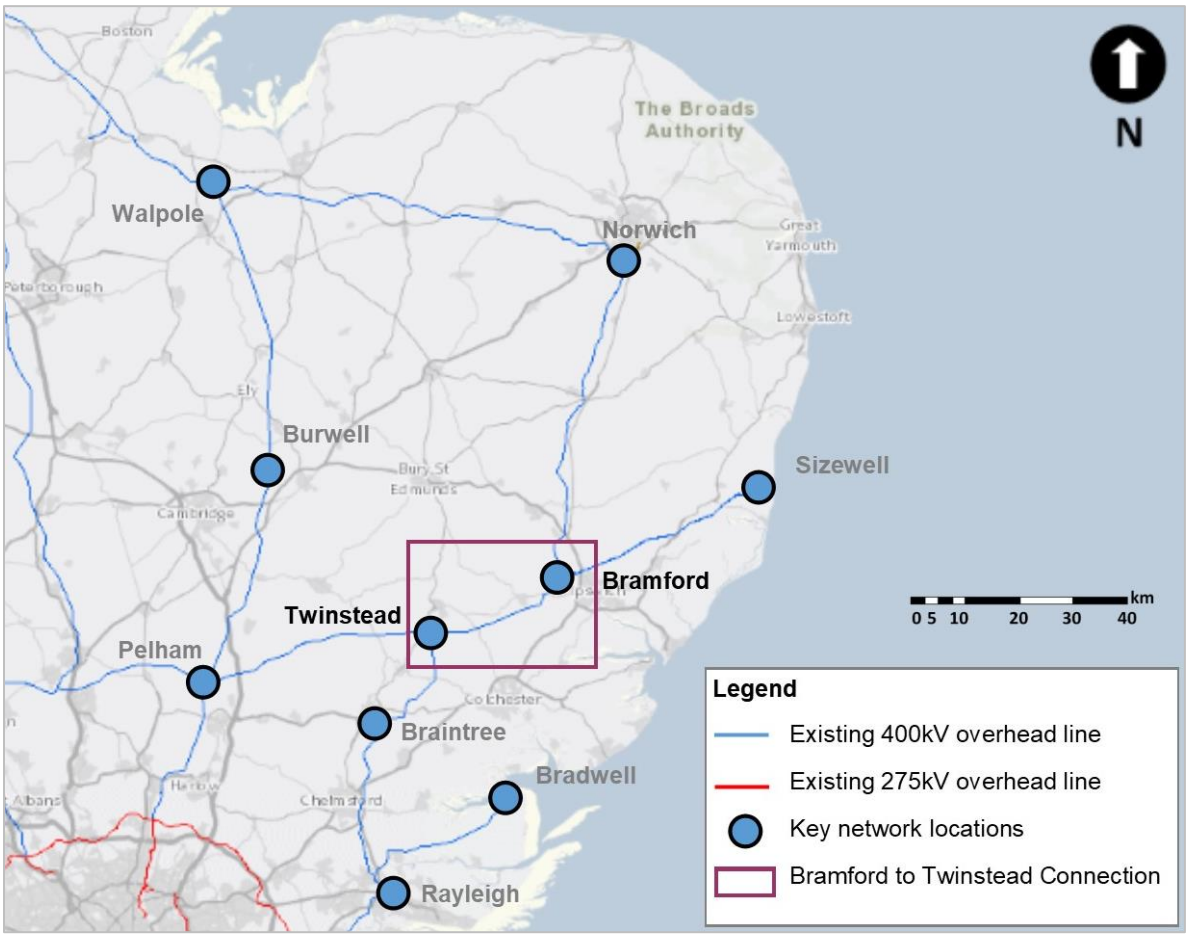
1. INTRODUCTION

1.1 Background to the Bramford to Twinstead Project

1.1.1 National Grid Electricity Transmission (National Grid) owns, builds and maintains the high voltage electricity transmission system in England and Wales. This operates at 275,000 volts (275kV) and 400,000 volts (400kV) and is mainly transmitted along overhead lines, with some underground cables. National Grid holds a transmission licence under the Electricity Act 1989, under which there is a statutory duty to develop and maintain an efficient, coordinated and economical electricity transmission system.

1.1.2 A reinforcement between Bramford and Twinstead (Figure 1.1) was initially developed between 2009 and 2013 to support the connection of new generation projects in East Anglia, primarily new nuclear and wind.

Figure 1.1: Key Existing Electrical Transmission Infrastructure Within East Anglia



1.1.3 The reinforcement project was paused in 2013, primarily as a result of the Sizewell C connection being significantly delayed at that time. Since the project was paused, there has been a significant shift in energy policy across the UK, which has driven a change in the energy landscape across East Anglia.

1.1.4 The level of generation and interconnection capacity expected to connect in East Anglia is significant and is largely driven by new nuclear, offshore wind and interconnection capacity. There is significant development proposed in this area and

the expectation is that this area will continue to see growth to support the UK's Net Zero transition. However, there are still a limited number of physical routes for power to flow in and out of the region and this thereby limits the amount of additional generation that can be incorporated without further reinforcement.

1.1.5 East Anglia is not configured to facilitate this growth in capacity and, with limited network available, there is a limit on what can be achieved through upgrading the existing transmission system. There is also a greater risk of outages from a limited network availability, which if the network is not reinforced, could result in a greater risk of widespread supply interruptions. Therefore, there is a need to invest in the network to provide additional reinforcement to the south and west of Bramford and to connect generators to areas of demand.

1.2 Purpose of this Report

1.2.1 Further work undertaken in 2020 has shown that there is now a need to reinforce the transmission network between Bramford and Twinstead, in order to continue to meet power supply and demand by the end of the decade. National Grid has therefore recommenced work on the project.

1.2.2 As part of the recommencement of the project, National Grid has undertaken a thorough re-appraisal of the project and the decisions taken previously, reflecting the robust approach National Grid takes to meeting its responsibilities to consumers, duties under the Electricity Act and as a responsible developer. This process has ensured that National Grid has a robust understanding of the ongoing validity and appropriateness of the project that was paused in 2013.

1.2.3 The purpose of this report is to set out a summary of the work that was undertaken previously on the project between 2009 and 2013, including the options appraisal and consultation that had informed the project design at that point. The report also sets out the results of the review work that has been undertaken since 2013 to verify the previous project reports and decisions. The report concludes that in general terms the previous project design remains valid with some specific areas requiring further work and consultation. It also sets out the current proposal and the next steps required to take that forward.

1.3 Structure of this Report

1.3.1 This report is structured as follows:

- Chapter 2 – Study Area: This provides a description of the study area including existing environmental features and constraints;
- Chapter 3 – National Grid Approach to Options Appraisal: This summarises the option appraisal process that National Grid follows when identifying options on their projects. It also outlines the key policy that governs decisions in relation to the design of new transmission routes;
- Chapter 4 – Development of the Bramford to Twinstead Project: This provides a summary of the option appraisal work that was undertaken up to the route alignment consulted on in summer 2012;
- Chapter 5 – Further work following the Preferred Alignment Announcement: This sets out the detailed studies that occurred since

2012. This includes refining the alignment in specific locations as a result of consultation feedback responses or as a result of further technical work;

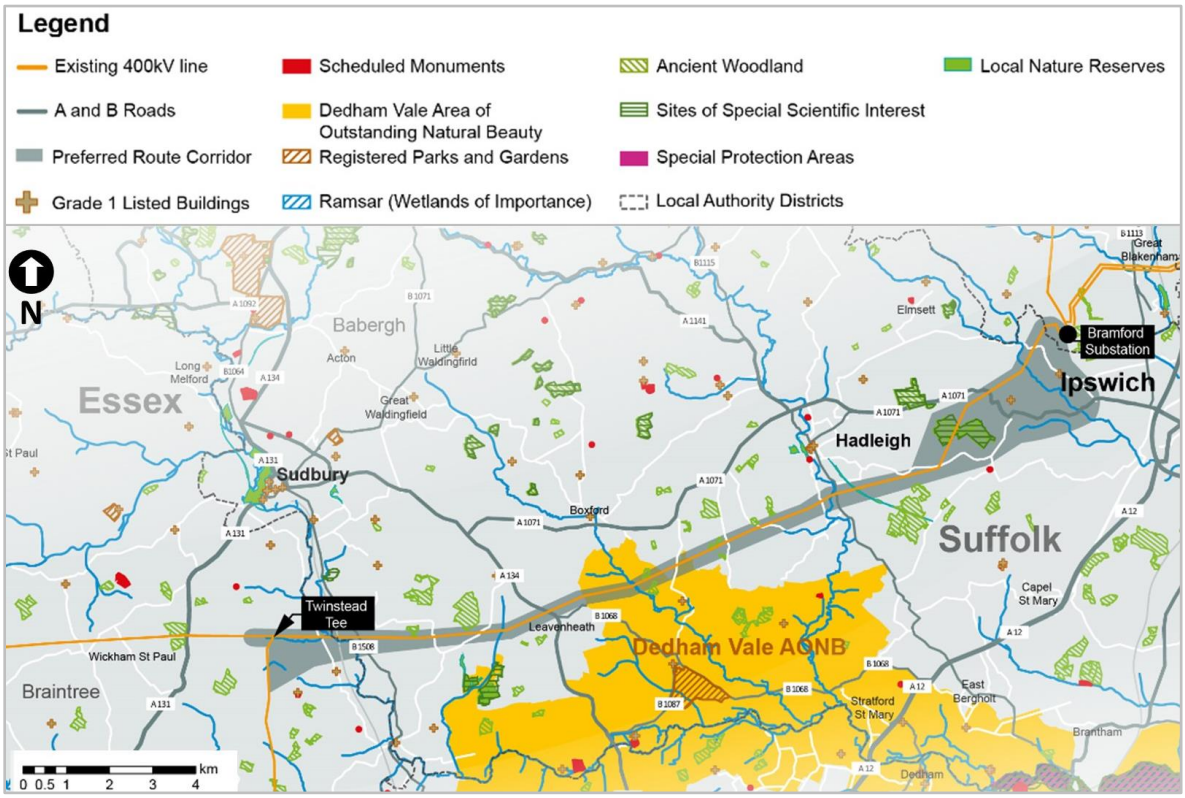
- Chapter 6 – This sets out the further work undertaken since the project restarted in 2020; and
- Chapter 7 – Emerging Proposals and next steps: This provides a description of the proposed design and sets out the next steps on the project as it moves forward towards submitting an application for development consent.

2. STUDY AREA

2.1.1 The study area spans two counties and three local planning authority districts. Bramford Substation lies within the county of Suffolk and the local planning authority of Mid-Suffolk District. Babergh District, also within Suffolk, occupies the majority of the study area, with its boundary with Braintree District, in the county of Essex, at the River Stour close to Twinstead Tee, as illustrated in Figure 2.1.

2.1.2 There is currently an existing 400kV line between Bramford and Twinstead which is operated by National Grid. There is also a 132kV line which is operated by the local Distribution Network Operator (DNO). The DNO in East Anglia is UK Power Networks (UKPN). UKPN distribute electricity at lower voltages to factories, offices and homes.

Figure 2.1: Baseline features and constraints



2.1.3 The area is predominantly rural, with much of the land used for arable crop production. The key towns are Sudbury and Hadleigh, with the county town of Ipswich located just to the east of the study area. Smaller towns, villages and hamlets are dispersed throughout the study area, including Boxford and Leavenheath.

2.1.4 The A1071, A134 and A1141 are the main roads within the study area. The larger towns and villages are located along these roads, with the remainder of the study area comprising a network of minor roads linking smaller villages and isolated properties and farmsteads.

2.1.5 Dedham Vale Area of Outstanding Natural Beauty (AONB) lies to the south of the study area, as shown in Figure 2.1. It is designated as an exceptional example of a lowland river valley. Picturesque villages, rolling farmland, slow meandering rivers, water meadows and ancient woodlands combine to create an example of the traditional English lowland landscape. The area has a rich history and has been the inspiration for many writers and painters, notably Constable.

2.1.6 The existing 132kV and 400kV overhead lines pass through approximately 3km of Dedham Vale AONB, to the northwest of Polstead. Although not designated as part of the AONB, the Stour Valley is covered within the AONB management plan and is managed in a similar way to the AONB.

Figure 2.2: Existing 400kV line passing through Hintlesham Woods (left) and both the existing 400kV and 132kV lines near the River Box (right)

2.1.7 The landscape comprises a broadly flat plateau dissected by several river valleys (the River Stour, River Box, River Brett and Flowton/Belstead Brook). These give rise to lower lying valley areas surrounded by areas of higher ground. The river valleys run in a broadly northwest–southeast direction through the study area with the Rivers Stour, Box and Brett joining together to the south to give rise to the important lowland river valley landscape designated as the Dedham Vale AONB.

2.1.8 There are six Sites of Special Scientific Interest (SSSI) within 3km of the Preferred Route Corridor, including Hintlesham Woods SSSI, which is crossed by the existing 400kV overhead line between Bramford and Twinstead. The woods are one of the largest remaining areas of ancient coppice-with-standards woodland in Suffolk. A variety of birds breed in the woods, including woodcock, nightingale, tawny owl, nuthatch and whitethroat.

2.1.9 Scheduled monuments are nationally important sites designated for their archaeological interest. There are four scheduled monuments within the Preferred Route Corridor and a number of sites in the surrounding area. These are mainly isolated moated sites, such as at Moat Farm (Milden), Naughton Hall and Great Bricett, or the remains of castles, such as at Offton, Lindsey and Wenham. There are also many listed buildings, which are often associated with town and village centres. Grade I listed buildings (the highest grading) include Hintlesham Hall and churches at Burstall, Polstead Hall and Alphamstone.

3. NATIONAL GRID APPROACH TO OPTIONS APPRAISAL

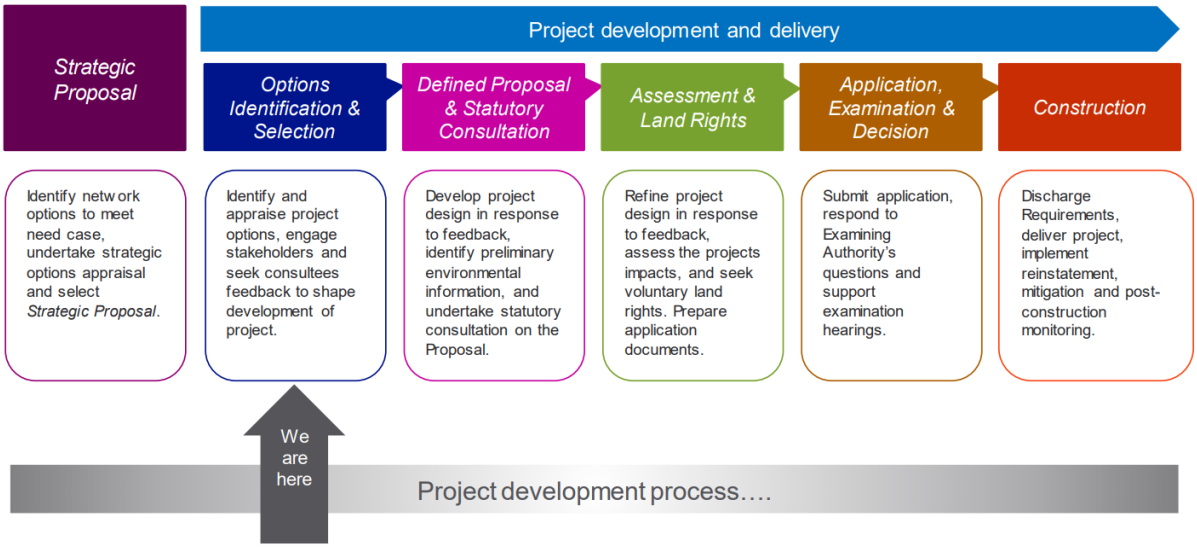
3.1 Introduction

3.1.1 National Grid undertakes options appraisal on each new project. There are often a number of different ways that a project could be developed, perhaps involving different locations, technologies or designs. Each project will require judgements and decisions about the best way to achieve the required outcome. The option appraisal process provides information to help inform those judgements.

3.1.2 Options Appraisal is a robust and transparent process that is used to compare options and to assess the positive and negative effects they may have, across a wide range of criteria including environmental, socio-economic, technical and cost factors. The aim is to find a balanced outcome, bearing in mind the range of National Grid's statutory duties. The assessment is documented to provide in a transparent manner, the information on which decisions are based. Further details on the option appraisal process can be found in Our approach to Options Appraisal[1].

3.1.3 The project is following a staged approach as set out in Figure 3.1. This began by establishing the need for the project and considering a range of strategic options for satisfying the identified need (Strategic Optioneering). Having concluded that the most appropriate strategic option was to reinforce the network between Bramford and Twinstead, consideration was then given to the merits of different route corridors. Following the selection of a preferred corridor, different options and alignments were considered. A summary of the option appraisal process and project decisions for the project can be found in Chapter 4 of this report.

Figure 3.1: National Grid Project Development Staged Process



3.1.4 At each stage in the option appraisal process, transparent methods have been used to inform decision-making. This has included technical inputs from engineers and environmental consultants to inform the decisions and design. The assessment has drawn on data and evidence collected from both desk studies and field work. Decision-making has also taken (and will continue to take) account of feedback from

[1] Our Approach to Options Appraisal (2012) National Grid https://www.nationalgrid.com/uk/electricity-transmission/document/96531/download

both prescribed bodies and the local community through an extensive programme of engagement and consultation. In addition, the project has been (and will continue to be) subjected to periodic internal challenge and review to ensure the robustness of the proposal in the light of a changing environment (including technical, physical and costs).

3.2 General Duties

3.2.1 Section 9(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;…*'.

3.2.2 Section 38 and Schedule 9 of the Electricity Act 1989 requires 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'.

3.2.3 National Grid's Schedule 9 Statement[2] sets out how the company will meet the duty placed upon it by the aforementioned legislation. This includes:

- only seeking to build new lines and substations where the existing transmission infrastructure cannot be upgraded to meet transmission security standards;
- seeking to avoid nationally and internationally designated areas where new infrastructure is required; and
- minimising the effects of new infrastructure on other sites valued for their amenity.

3.2.4 The general duties set out in the Electricity Act 1989 have been followed during the options appraisal on the project.

3.3 Other Guidance

3.3.1 The options appraisal process has also considered other policy and guidance when making judgements and decisions on the project. This has included consideration of the relevant National Policy Statements, the Holford Rules (which apply to the routing and design of overhead lines) and the Horlock Rules (which apply to the location and design of substations). Further details are on these policies and guidance can be found below.

National Policy Statements

3.3.2 The proposed development is classified as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008. NSIPs are projects of certain types, over a certain size, which are considered by the Government to be so nationally important

[2] National Grid's Commitments when Undertaking Works in the UK: Our stakeholder, community and amenity policy (2019) https://www.nationalgrid.com/uk/electricity-transmission/document/81026/download

that permission to build them needs to be given at a national level, by the Secretary of State. Instead of applying to the local authority for Planning Permission, the developer must apply to the Planning Inspectorate for a different permission called a Development Consent Order (DCO).

3.3.3 Decision on NSIPs are made based on the relevant National Policy Statement (NPS). In the case of Bramford to Twinstead, the relevant NPS are the Overarching NPS for Energy (EN-1) and the NPS for Electricity Networks (EN-5). The project will be expected to set out how it has met the policies set out in the NPS within the application for Development Consent and also during the Examination and Decision-Making process. The policies set out within the relevant NPS have been considered when making judgements and decisions on the project.

Holford Rules

3.3.4 The Holford Rules are guidelines which form the basis for decisions of siting overhead transmission lines. They were set out in 1959 but still remain a valuable tool in selecting and assessing potential route options as part of the environmental assessment process. A summary of the Holford Rules can be found in Box 1. These have been an important consideration during the development of the preferred alignment and whether certain sections should be undergrounded.

Box 1: The Holford Rules

1. Avoid altogether, if possible, the major areas of highest amenity value, for example designations including Areas of Outstanding Natural Beauty (AONB).

2. Avoid smaller areas of high amenity value or scientific interest by deviation where this can be done without using too many angle towers, for example Sites of Special Scientific Interest (SSSI). An explanatory note states that where possible routes should be chosen which minimise effects on the settings of areas of architectural, historic and archaeological interest including Conservation Areas, Listed Buildings, Listed Parks and Gardens and Scheduled Monuments.

3. Other things being equal, choose the most direct line, with no sharp changes of direction to minimise use of angle towers.

4. Choose tree and hill backgrounds in preference to sky backgrounds, wherever possible; and where the line has to cross a ridge, secure this opaque background as long as possible and cross obliquely when a dip in the ridge provides an opportunity. Where there is no dip in the ridge, cross directly, preferably between belts of trees.

5. Prefer moderately open valleys with woods where the apparent height of towers will be reduced and views of the line will be broken by trees.

6. Where land is flat and sparsely planted, keep high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, to avoid 'wirescape'.

7. Approach urban areas through industrial zones, where they exist. When pleasant residential and recreational land intervenes between the approach line and the substation, consider carefully the comparative costs of undergrounding, for lines other than those of the highest voltage.

Horlock Rules

3.3.5 National Grid devised the Horlock Rules in 2003, and these were subsequently updated in 2006. The Horlock Rules provide guidelines for the siting and design of new substations, or substation extensions, to avoid or reduce the environmental effects of such developments. In summary, like the Holford Rules, they facilitate consideration of environmental and amenity considerations within the design and

siting of new substation infrastructure. These were considered during the identification of potential locations for the proposed substation near Twinstead.

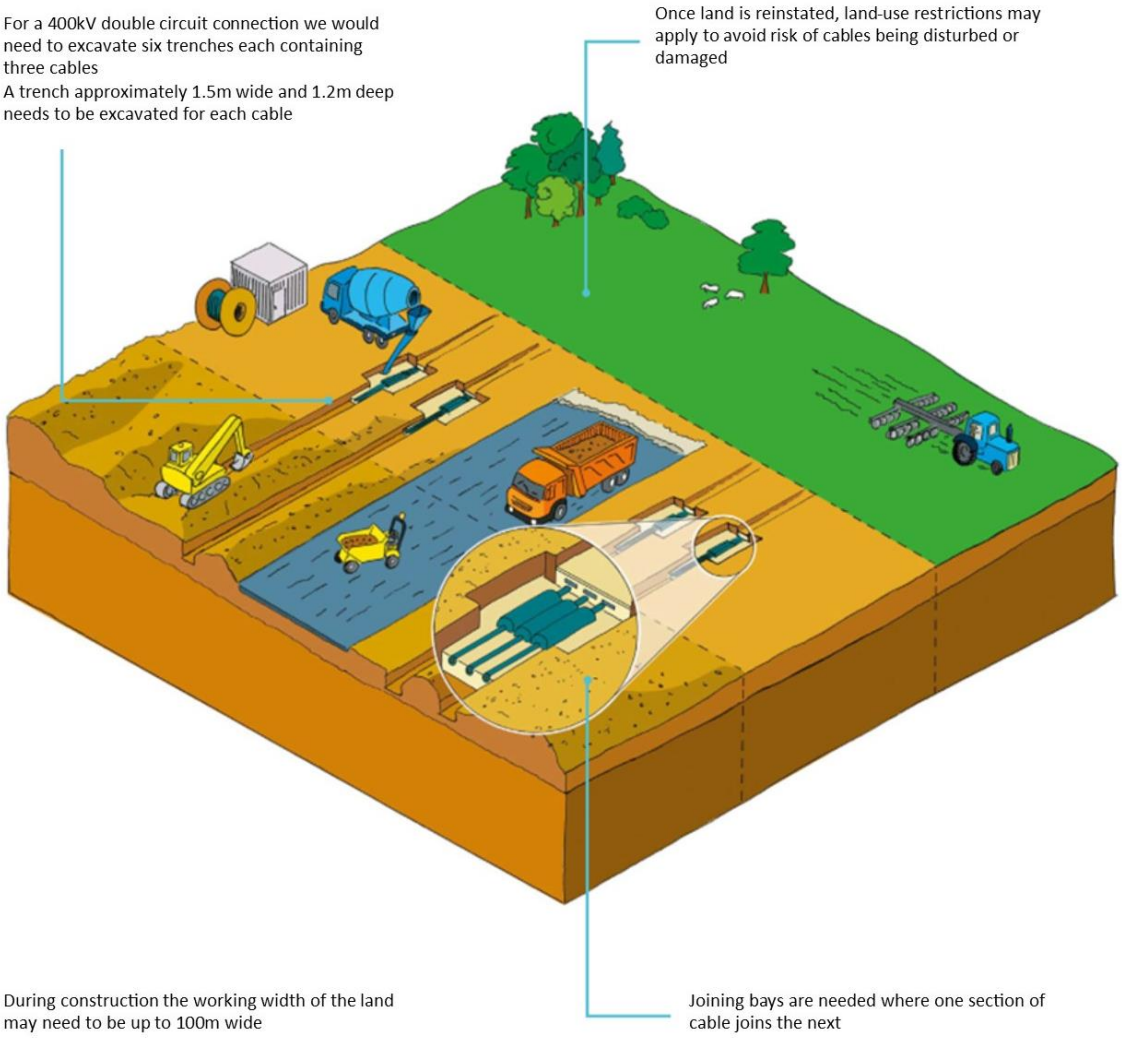
3.4 Overhead or Underground Transmission

3.4.1 National Grid's high voltage electricity transmission network is almost exclusively an overhead line network. National Grid owns and operates approximately 7,200km of overhead lines and approximately 675km of underground cables in England and Wales. Overhead lines are normally less disruptive than underground cables and cause fewer disturbances. They are also cheaper to install and easier to maintain. However, overhead lines can have a visual impact, particularly in areas of high landscape value.

3.4.2 Underground cables by comparison, have higher construction and operational costs compared to overhead lines. They also have a greater risk in the event of faults, as faults need to be discovered, excavated and repairs made to circuits below ground. Installation of high voltage underground cables also causes disturbance to large areas of land with potential for adverse effects on land use during installation and subsequent operation. The working footprint can be up to 100m wide cable areas (Figure 3.2). There can also be potential impacts to areas of ecological and archaeological sensitivity during installation, whereas technical feasibility may be constrained by features such as built form or unsuitable ground conditions. Further details on the merits and challenges of undergrounding can be found in National Grid (2015) Undergrounding High Voltage Electricity Transmission Lines [3].

[3] Available at: https://www.nationalgrid.com/sites/default/files/documents/45349-Undergrounding_high_voltage_electricity_transmission_lines_The_technical_issues_INT.pdf

Figure 3.2: Direct Buried Cable Installation

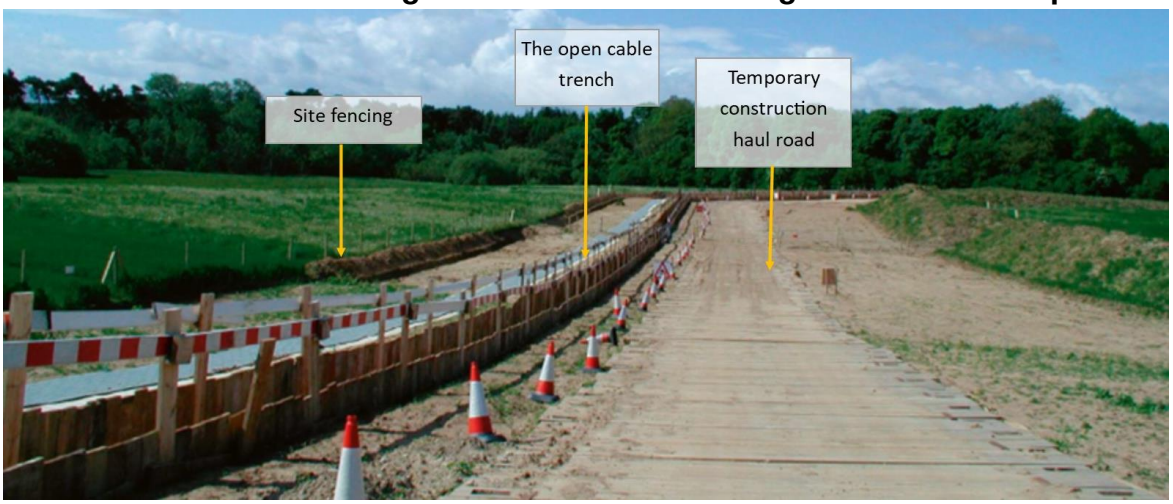


3.4.3 When deciding whether to construct a new overhead line or underground cable National Grid would consider relevant policy, which includes NPS EN-5 paragraph 2.8.8 which states:

'Although Government expects that fulfilling this need through the development of overhead lines will often be appropriate, it recognises that there will be cases where this is not so. Where there are serious concerns about the potential adverse landscape and visual effects of a proposed overhead line, the IPC will have to balance these against other relevant factors, including the need for the proposed infrastructure, the availability and cost of alternative sites and routes and methods of installation (including undergrounding).'

3.4.4 As part of the decision, National Grid needs to consider the landscape in which the proposed line will be set, the additional cost to the consumer of any undergrounding and the environmental and archaeological consequences (paragraph 2.8.9 of EN-5).

Figure 3.3: A cable swathe during construction with a single cable trench open



3.5 Consultation

3.5.1 Under Section 38 and Schedule 9 of the Electricity Act 1989, National Grid has a duty, when putting forward proposals for new development, to have regard to the desirability of the preservation of amenity: the natural environment, cultural heritage, landscape and visual quality, as well as the impact of the works on communities. Section 49 of the Planning Act 2008 places a duty on the applicant to have regard to relevant consultation responses before deciding whether or not the application should be made in the same terms as the proposed application.

3.5.2 During the previous stages of the project, National Grid has endeavoured to engage with interested stakeholders during the optioneering process before making decisions. Statutory consultees include the relevant planning authorities and environmental bodies such as Historic England (formerly English Heritage), the Environment Agency and Natural England. These organisations had been consulted to seek their views on the project including through thematic sub-group meetings for ecology, landscape and heritage. There has also been engagement with parish councils, the wider public and potentially affected landowners.

3.5.3 The project held a number of public events, open to all and at venues in the local area. Feedback from all of the consultation events has been used to develop and refine the proposed project.

3.5.4 Since restarting the project National Grid has re-commenced engagement with the consultees listed above and is proposing to undertake non-statutory consultation in Spring 2021.

4. DEVELOPMENT OF THE BRAMFORD TO TWINSTEAD PROJECT

4.1 Strategic Options

4.1.1 National Grid commenced the project in 2009, following previous studies which had concluded that there needed to be reinforcement of the network between Bramford substation and Twinstead Tee. The project started by considering strategic options that could deliver the reinforcement. A list of 18 strategic options were identified that would facilitate the connection between power providers and the customers, the Do Nothing and Do Minimum options were considered.

4.1.2 The strategic options were evaluated against the key criteria (as set out in National Grid's statutory and licence obligations) of economy, efficiency, and co-ordination (including system compliance and deliverability) and amenity[4]. The cost of each option was estimated using generalised unit costs for the key elements of the option and reflecting recent contract values. Amenity impacts were based on a desk study of key environmental constraints, such as high level nature conservation, heritage and landscape designations and the definition of major urban areas. Options were either discounted, parked or taken forward for further investigation based on the assessment.

4.1.3 The study recommended that Options S6 (Bramford to Twinstead Tee – not using the corridor of the existing distribution line) and S7 (Bramford to Twinstead Tee – using the corridor of the existing distribution line) were taken forward, as these provided the appropriate reinforcement to the transmission network. These options would provide a relatively direct and efficient route, which would achieve a balance between National Grid's technical, economic and environmental obligations. However, it was recognised that some parts of the option may need to be placed underground to reduce impacts on visual and amenity.

4.1.4 National Grid reviewed and updated the strategic optioneering following recommencement of the project in 2020. The review included looking at whether there were any new options that should be assessed and whether the previous option appraisal remained valid. Table 4.1 includes the list of the options considered. Two options were taken further for further consideration; PSO 19 Bramford to Twinstead as an overhead connection; and PSO 22 Bramford to Twinstead as an underground connection.

4.1.5 An options appraisal comparison of PSO 19 and PSO 22 showed that whilst environmental effects of the options vary, both PSO 19 and PSO 22 could deliver solutions that were expected to be acceptable in policy terms and would meet network reinforcement requirements. However, there would be a considerable cost differential, with PSO 22 being more than five times the capital and lifetime cost of PSO 19. Therefore, the 2020 SOR came to the same conclusion as the original SOR, that a predominantly overhead line from Bramford substation to Twinstead Tee, would be the preferred strategic proposal and best fulfils National Grid's various duties and obligations.

[4] Amenity impacts were advised by the results of a desk study of key environmental constraints such as high level nature conservation, heritage and landscape designations and the definition of major urban areas.

Table 4.1: Summary of Strategic Options

Option	Reason
Doing no physical works	
PSO 1 Do nothing	Option would be a breach of National Grid's licence obligation to provide connections. **DISCOUNTED**
PSO 2 Constraints payments	This would be expensive and would make it difficult to meet the Government's legislated target of net zero carbon emissions by 2050. **DISCOUNTED**
Re-directing potential connections	
PSO 3 Move generation or interconnector customers	While National Grid can advise customers as to which parts of the network have spare capacity for connection, it cannot refuse to connect customers at locations they request for their generation projects. **DISCOUNTED**
Maximising existing connections including by uprating	
PSO 4 Uprating 275kV lines to operate at 400kV	There are no 275kV lines within the region. **DISCOUNTED**
PSO 5 and PSO 6 Uprating existing 400kV lines to operate at 800kV	The UK does not currently have equipment approved for use to operate at tis voltage. This would also require new towers, substations and other equipment designed to operate at the higher voltage. **DISCOUNTED**
PSO 7 Replace the conductors to the highest rated system	This is already a commitment in accordance with National Grid's commitment to maximise the capability of existing routes before building new ones and does not alone generate enough capacity. **DISCOUNTED**
PSO8 Add further circuits to transmission towers.	Whilst four circuit towers have been built elsewhere in the world, no such towers are approved for use in the UK. This option would also fail to address planning standards, which require that the network is designed to withstand the loss of a transmission route. **DISCOUNTED**
Northward reinforcement with new 400kV infrastructure	
PSO 9 New connection from the Bramford to Norwich Main Overhead Line	This does not provide any additional circuits from Bramford and therefore would not resolve the current technical constraints on the network. **DISCOUNTED**
PSO10 New double circuit connection from Bramford to Burwell Main	The new connection would be approximately 60km in length and would require additional work to the network from Burwell Main. This would result in high capital costs and potential high environmental effects. **DISCOUNTED**
Southwards reinforcement with new 400kV infrastructure	
PSO 11 Southwards extension of the double circuit connection from Bramford to Rayleigh Main	This new connection would be approximately 80km in length and would require additional work to the network between Rayleigh and Tilbury. This would result in high capital costs and potential high environmental effects. **DISCOUNTED**
PSO 12 Connect to Rayleigh Main via Bradwell	This is associated with a likely requirement for a tunnel under the River Blackwell and would still require work to be completed between Bramford to Twinstead. This would result in high capital costs and potential high environmental effects. **DISCOUNTED**
PSO 13 and PSO 14 Connection at Tilbury	This new connection would be approximately 90km in length and would require a tunnel beneath the River Blackwater. This would result in high capital costs and potential high environmental effects. **DISCOUNTED**

Option	Reason
Bypassing Bramford with new 400kV infrastructure	
PSO 15 to PSO 17 all seek to bypass Bramford and would connect sources to locations beyond Bramford	These new connection would range between 45-70km in length and would require additional reinforcement works to maintain the network. This would result in high capital costs and potential high environmental effects. **DISCOUNTED**
Westwards reinforcement with new 400kV infrastructure	
PSO 18 Providing an additional single circuit from Bramford to Twinstead Tee	A single circuit does not increase boundary capability sufficiently enough to avoid overloads from Bramford under fault conditions. **DISCOUNTED**
PSO 19 Providing an additional double circuit between Bramford and Twinstead Tee	This meets the need and the identified technical constraints. It has a lower cost that other options and the shorter length is likely to result in lower environmental effects. **This was recommended for further consideration.**
Providing an additional double circuit between Bramford and Pelham (PSO 20) and Braintree (PSO 21) substations.	Both would require the same infrastructure as PSO 19 but require additional infrastructure at a higher cost and with additional environmental effects. **DISCOUNTED**
PSO 22 Providing an additional connection between Bramford and Twinstead Tee that is fully undergrounded	Although an underground option is more expensive, this could have lower visual effects that an overhead line. **This was recommended for further consideration.**
PSO 23 Providing a new connection between Bramford and Waltham Cross	This new connection would be approximately 85km in length and work to substations in urban areas. This would result in high capital costs and potential high environmental effects. **DISCOUNTED**

4.2 Corridor Options

4.2.1 Having identified that a network reinforcement was needed, National Grid went on to consider potential route corridors between the connection points at Bramford and Twinstead Tee.

Route Corridor: A defined linear shape identified on a map which may be of variable width and whose extent at any point is typically defined by constraints or differentiation from other route corridors.

4.2.2 Desk based assessment was supplemented with site visits to identify route corridors which sought to avoid the areas of greatest environmental constraint. The existing 132kV and 400kV overhead lines offered the potential to be used as 'opportunity corridors', where a new overhead line in addition to or replacing the existing could lead to a lower rate of change than a new overhead line in a location where no line presently exists.

4.2.3 Four route corridors were identified, all of which would be technically feasible, and all would have connection points at Bramford Substation and the existing tee at Twinstead. These are shown in Figure 4.1 and comprised:

- **Corridor 1: A new line parallel to the existing 400kV overhead line between Bramford and Twinstead c. 26km in length.** The overhead line would exit Bramford Substation in a westerly direction lying to the north of Hintlesham village. It would parallel the existing 400kV overhead line through Hintlesham Woods SSSI before continuing to the south of

Hadleigh and Polstead Heath. It would pass through approximately 3km of Dedham Vale AONB, in the vicinity of the Box Valley. This corridor would result in an additional 400kV line in this designated landscape. The line would continue to the south of Assington and Sudbury before crossing the B1508, the railway and the River Stour valley and connecting at Twinstead.

- **Corridor 2: This corridor proposes the removal of the existing 132kV overhead line between Burstall and Twinstead and the adoption of its route for a new 400kV overhead line c 29km in length.** The existing 132kV overhead line runs to the south of Bramford Substation and runs close to the existing 400kV overhead line for the majority of the route from a point to the south of Hintlesham Wood where they align, separating only as the 400kV overhead line approaches Twinstead Tee. Like Corridor 1, this option would pass through approximately 3km of Dedham Vale AONB, in the vicinity of the Box Valley. Two alternative options were identified at the eastern end of Corridor 2; Option A would follow the existing 132kV line to the south of Hintlesham and Option B would parallel the existing 400kV line to the north of Hintlesham. This corridor would require an additional Grid Supply Point (GSP) substation close to Twinstead, which would allow the DNO to continue to operate its network in this area.

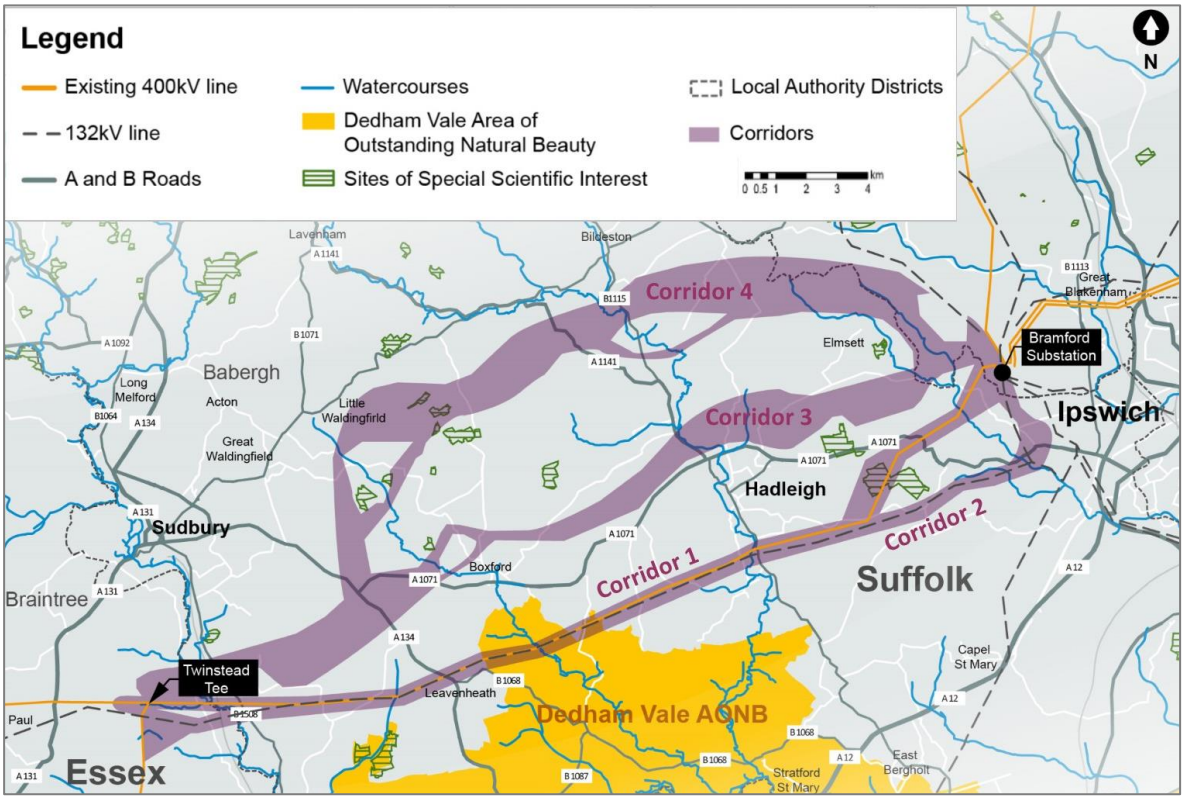
- **Corridor 3: New Route Corridor (Direct Option to the North of Hadleigh) c. 26.5km in length.** Corridor 3 sought to take the most direct route between Bramford Substation and Twinstead Tee to the north of Hadleigh, whilst avoiding the key environmental constraints such as the Dedham Vale AONB. The corridor leaves Bramford Substation in a westerly direction. It continues to the north of Hintlesham Woods and Hadleigh. The corridor crosses the River Brett in the vicinity of the A1141. Corridor 3 narrows in the vicinity of Groton and Boxford to avoid these settlements before splitting to negotiate the linear development of Sherbourne Street. These corridor sub-options would then re-join to the west of Boxford in the vicinity of the River Box. The corridor continues to the west, avoiding settlements including Newton and Little Conrad. It drops in elevation towards the River Stour valley where it crosses the B1508, the railway and River Stour close to the flat valley floor. It then takes to slightly higher ground to approach Twinstead Tee 2km to the west.

- **Corridor 4: New Route Corridor (Northerly Option) c. 30km in length.** Corridor 4 has sought a route to avoid the key environmental constraints, such as the Dedham Vale AONB. It was designed to take a more northerly route to largely avoid the Special Landscape Areas defined in the Local Plan. This corridor runs in a northwest direction from the substation at Bramford. It splits to avoid Flowton before re-joining to run westwards through open land between Naughton and Whatfield. The corridor splits again around Semer and it continues westwards to the River Box. The corridor continues to the west, avoiding settlements including Newton and Little Conrad. It drops in elevation towards the River Stour where it crosses the B1508, the railway and River Stour close to the flat valley floor. It then takes to slightly higher ground to approach Twinstead Tee 2km to the west.

4.2.4 Statutory consultees including environmental bodies and the relevant planning authorities were consulted in 2009. The feedback received during these events was taken into account when developing and refining the corridors. The consultation

responses include noting the potential visual implications of the proposals, especially on iconic views, and the need to consider undergrounding as part of the project development.

Figure 4.1: The Four Route Corridors



4.2.5 Each corridor was assessed against how it performed against National Grid's obligations set out in Sections 9 and 38 and Schedule 9 of the Electricity Act 1989 and also how well each corridor performed against the Holford Rules. A high level environmental assessment was undertaken on each of the four corridors to support the options appraisal. This included both desk-based assessment and site visits to identify designated features and site specific features that could affect the alignment and design.

4.2.6 Corridors 1 and 2 were identified as 'opportunity corridors' as they use the existing overhead line routes which already pass through Dedham Vale AONB. Corridor 1 was considered to have the greatest effect on the AONB, as it would introduce an additional structure into the AONB. Corridor 2 would replace the 132kV overhead line with a new 400kV overhead line. Corridor 2 would give rise to a lower scale of effect on landscape and views than Corridor 1, however building a new 400kV overhead line on the 132kV route adjacent the existing 400kV overhead line would still give rise to notable effects.

4.2.7 Corridor 3 avoids the AONB and the potential for effects on views from within the AONB is considered to be limited. Corridor 4 also avoids the AONB and is considered to have the least effects on the AONB due to distance. However, it would introduce an overhead line into an area regarded locally as high quality landscape, albeit undesignated, where there is presently no existing infrastructure.

4.3 Route Corridor Consultation

4.3.1 The Route Corridor Study (RCS) was published in October 2009 as part of a non-statutory consultation event. This described the four corridors and the assessment work that had been undertaken on this. Twenty public consultation events were held between the end of October 2009 and the end of February 2010 and National Grid received over 3,000 individual pieces of feedback during the consultation. The representations, and National Grid's responses to them, were set out in the Stage 1 Feedback Report.

4.3.2 There was little public support for Corridor 1, which would create an additional line through Dedham Vale AONB. The Suffolk planning authorities and Dedham Vale and Stour Valley AONB Partnership strongly recommended that Corridor 1 be ruled out and statutory bodies English Heritage and Natural England considered that they could not support the option because of significant adverse impacts on the AONB and the settings of listed buildings and conservation areas.

4.3.3 English Heritage and Natural England both considered that Corridor 2 would have the least environmental impact of all route corridors, as it was recognised that this corridor presented an opportunity to minimise the overall scale of change that a new overhead line would bring. Both organisations recommended that undergrounding be considered in the AONB and sought clarity on Corridors 2A and 2B (around Hintlesham). The Suffolk planning authorities also considered that Corridor 2 could lead to the least environmental impact particularly if undergrounding were employed. Other local bodies and the general public strongly supported the selection of Corridor 2, many adding the caveat that undergrounding should be considered.

4.3.4 The Suffolk planning authorities, English Heritage and Natural England all recommended that Corridor 3 and 4 be ruled out, the main reasons being the impact on unspoilt and historic character of the countryside, where there is presently no existing infrastructure. Both corridors received little support, with large numbers of the general public recording their objections to these corridors.

4.3.5 The consultation on the route corridors identified Corridor 2 as the least worst by a large proportion of the consultees, although in the majority of cases this was subject to the consideration of undergrounding of some or all of the entire route.

4.4 Identification of the Preferred Corridor

4.4.1 The consultation feedback was used to review and validate the results of the corridor assessment work and to confirm the preferred corridor that would be taken forward. The review considered the merits of the four alternative corridors taking into account National Grid's statutory duties (including cost comparison), compliance with planning policy, consultation representations, environmental impacts (including visual, historic environment, biodiversity, socio-economic and flood risk and climate change resilience) and engineering deliverability.

4.4.2 Wholly underground solutions were discounted based on cost and technical grounds. The review concluded that the basis of the project should be an overhead line connection between Bramford and Twinstead, but that the undergrounding of sections of the proposed overhead line, to mitigate the potential impacts of the project on sensitive locations, should be evaluated.

4.4.3 Corridor 1 was identified as being the lowest cost option, but the introduction of a third line through Dedham Vale AONB was considered to weigh significantly against

the option. It would also result in a direct impact on Hintlesham Woods SSSI. The assessment and review work concluded that Corridor 1 was not preferred.

4.4.4 Although Corridor 2 passes through parts of the Dedham Vale AONB, it also presented an opportunity to remove the existing 132kV overhead line. This would minimise the scale of change on the landscape and was a view supported by a number of statutory consultees. It was recognised that Corridor 2 offered the potential for achieving an acceptable connection. However, given the policy background and the Holford Rules, it was important to review the merits of the corridors which do not pass through the AONB, and the scope for mitigation of adverse effects.

4.4.5 Corridors 3 and 4 were considered in response to seeking to avoid impacts on the AONB. However, both would introduce a new overhead line into an area regarded locally as high quality landscape, where there is presently no existing electricity infrastructure, and both would involve a longer overhead line than Corridor 2. The assessment work concluded that although the corridors avoid the AONB, Corridors 3 and 4 were not unconstrained in terms of planning policy and environmental sensitivities and this resulted in several of the statutory consultees and members of the public raising clear objections to these corridors.

4.4.6 The review concluded that Corridor 2 was the preferred corridor based on both previous assessment work and on the consultation responses, as it would result in the least scale of change to the existing environment. It was recognised that Corridor 2 would involve the removal of a section of the existing 132kV overhead line, which was seen as a benefit, and that a new 400kV/132kV substation may be required west of Twinstead Tee to maintain security of supply to the 132kV distribution network.

4.4.7 The decision to progress with Corridor 2 was presented in the Selection of Preferred Corridor Report (PCR), which was published in June 2011. The PCR set out the reasons for the selection and rejection of the different corridors.

4.4.8 The work undertaken since the project re-start in 2020 suggest that Corridor 2 remains appropriate and no change to the corridor option selected is proposed.

4.5 Alignment Options

Alignment: The actual route of an existing overhead line/underground cable or a proposed detailed route for an overhead line/ underground cable associated with a route corridor. A route corridor may contain a number of possible alignment options.

4.5.1 In July 2011, National Grid announced its preferred corridor (Corridor 2) for developing a project for a 400kV overhead line connection between Bramford substation and Twinstead Tee. This corridor incorporates the route of a 132kV overhead line comprising part of the electricity distribution system under the control of UK Power Networks (UKPN), which would be partly removed as a result of the connection.

4.5.2 The preferred corridor (Corridor 2) was initially split into seven sections areas based on the landscape character areas and feedback from consultation.

- A – Bramford substation and the Burstall area;
- B – Hintlesham;
- C – Brett Valley;
- D – Polstead;

- E – Dedham Vale up to the AONB boundary;
- F – Leavenheath and Assington; and
- G – Stour Valley

4.5.3 Sections A and B were subsequently combined as the landscape characteristics were considered similar and combining the two would allow consideration of the issues relating to Corridors 2A and 2B and reduce the potential for confusion.

Indicative Alignments

4.5.4 An important reason for selecting Corridor 2 was that there would be a smaller scale of change in taking down the 132kV overhead line and erecting a new 400kV overhead line in a similar area and close to the existing 400kV overhead line. This was an opinion that was given in many representations received during the consultation on the route corridor. Therefore 'indicative alignments' were developed on this basis.

4.5.5 The indicative alignments were developed starting within a preferred direct line between Bramford and Twinstead Tee, and then taking into account the Holford Rules, to avoid sensitive sites and residential areas as far as possible. The visual preference was for the existing and proposed lines to run in parallel and close together, to reduce wirescape. Health and safety requirements suggested that there should be a minimum separation distance of 80m between the two lines.

4.5.6 While a connection solution involving overhead lines entirely to the north or to the south of the existing 400kV overhead line could be accommodated, it would be more difficult to adopt a solution which involved the new alignment switching from one side of the existing 400kV overhead line to the other. This is because its construction would involve additional structures, higher costs and could result in a complex programme of outages which would be difficult to accommodate given other constraints on the management of the electricity transmission system in East Anglia.

4.5.7 Therefore, the alignment work resulted in two indicative overhead alignments for the majority of the route, one to the north of the existing 400kV overhead line and one to the south. In addition, a wider range of options were initially considered for Section AB and the area around Hintlesham Woods SSSI. An underground cable alignment was also identified for the whole length of Section AB, along with potential locations for the cable sealing end (CSE) compounds that would be required to switch from an overhead line to an underground cable connection and back again.

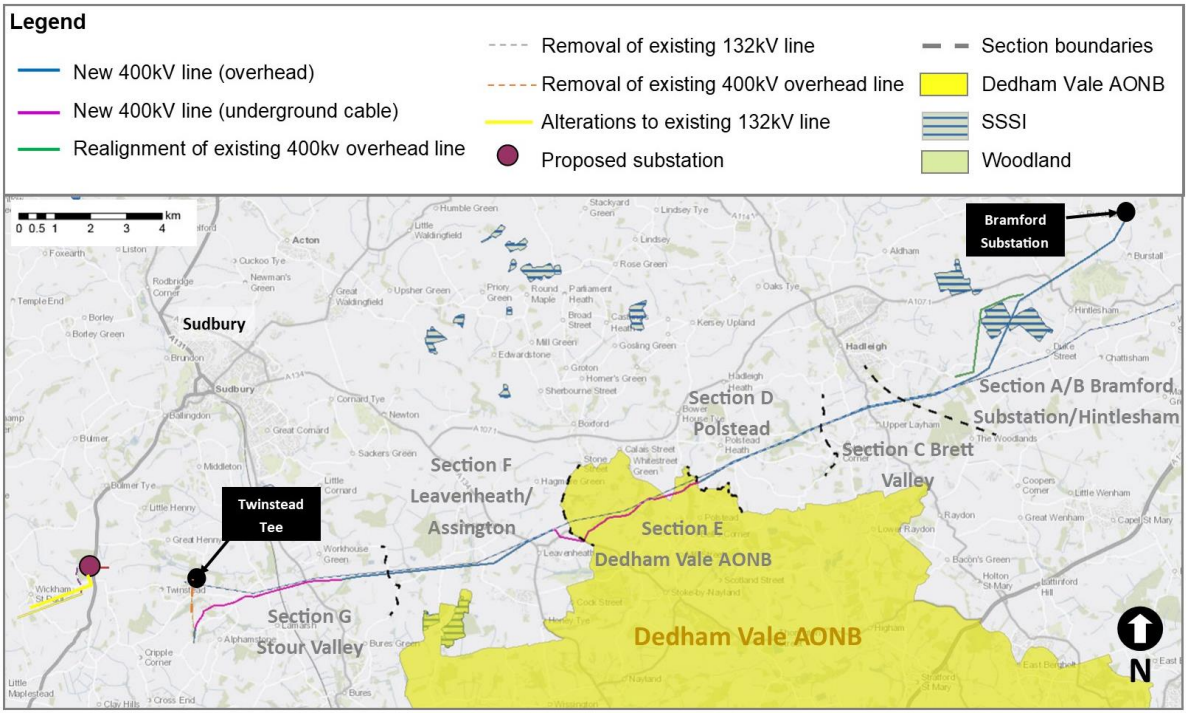
4.5.8 Further work was also undertaken to identify whether any specific sections should be partly or wholly undergrounded. The assessment considered National Grid's statutory duties and policy considerations. The options appraisal considered environmental, socio-economic, technical and cost issues when deciding how the connection should be installed (overhead or underground) and its appropriate alignment. The appraisal also took into account comments from statutory consultees, including both Essex and Suffolk County Council, that were received during the consultation on the route corridor with regards to undergrounding, particularly in sensitive areas such as Dedham Vale AONB and in the Stour Valley, which is covered by the same management plan.

Interim Alignment

4.5.9 The potential effects of the north and south alignments were assessed to determine the least environmentally constrained 'interim alignment', which was set out in the Connections Option Report (COR), published in May 2012. The interim alignment is shown in Figure 4.2 and comprised:

- Section AB – Bramford Substation to Hintlesham – the Corridor 2B southern alignment would involve constructing a new overhead line from Bramford substation to the south of the existing line. It would use the existing 400kV alignment through Hintlesham Wood. In order to permit this, the existing 400kV overhead line would be routed onto a new alignment north of Ramsey Wood, re-joining the existing line near Clay Lane;
- Section C - Brett Valley - a new overhead line alignment to the south of the existing line;
- Section D – Polstead - a new overhead line alignment to the south of the existing line;
- Section E – Dedham Vale AONB – an underground cable section from Heath Road, Polstead Heath to Leavenheath (4.2km);
- Section F – Leavenheath and Assington - a new overhead line alignment to the south of the existing line;
- Section G – Stour Valley - an underground cable section from west of Dorking Tye to the Bramford-Braintree-Rayleigh overhead line south of Twinstead Tee (3.8km).

Figure 4.2: Interim Alignment



4.5.10 The COR also identified the need for further studies in the following locations. Details on these are set out in Chapter 5 of this report:

- Further studies in relation to determining which option to take forward in Section AB, following consultation with English Heritage;
- Further work to determine the final location of the CSE Compounds; and
- Further work to identify and confirm options for the new sub-station to west of Twinstead and to consult on these options.

4.6 Interim Alignment Consultation

4.6.1 Non-statutory consultation was undertaken in the summer of 2012 to obtain comments on the interim alignment set out in the COR and to determine the 'preferred alignment'. Many site or area specific representations were received. In the main, the issues raised had already been taken into account in the assessment included in the COR and had already influenced the decision-making process. However, the consultation identified some areas where further work was required to assess certain components of the intended alignment. These were the subject of specific studies, which are summarised in Chapter 5 of this report.

4.6.2 A summary of the issues raised in the consultation and National Grid's response were presented in the COR Consultation Feedback Report, which was published in October 2012. The responses were taken into account and in October 2012 National Grid confirmed its preferred alignment (as set out in the COR) and the proposed locations of undergrounding (Dedham Vale and Stour Valley).

4.6.3 The work undertaken since the project re-start in 2020 suggest that the overall interim alignment remains broadly appropriate, subject to further detailed refinement and re-consideration of the areas of undergrounding.

5. FURTHER WORK FOLLOWING THE PREFERRED ALIGNMENT ANNOUNCEMENT

5.1 Introduction

5.1.1 The COR identified areas where further work was required as part of the project development. Responses received during the non-statutory consultation on the interim alignment also identified areas where further work was required to confirm the alignment in a specific location. A summary of these studies are set out in Section 5.2 and 5.3.

5.2 Section AB (Bramford Substation to Hintlesham)

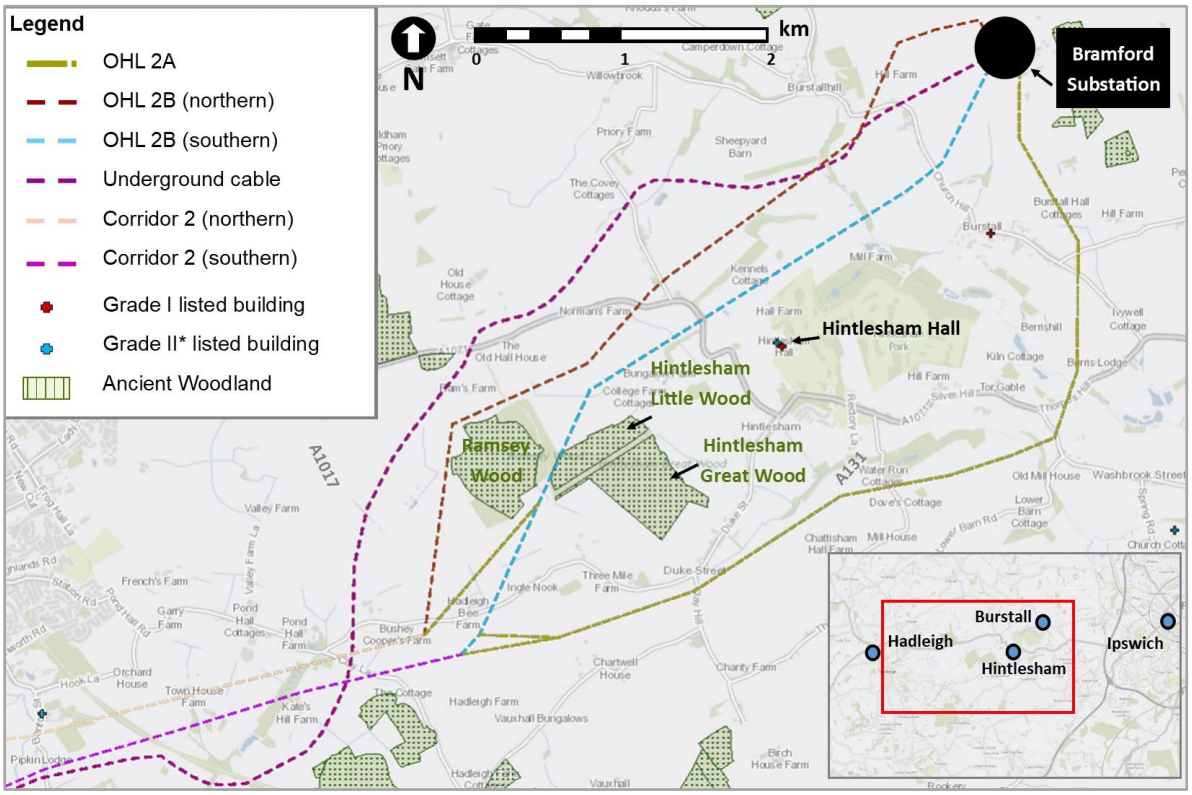
5.2.1 During the consultation on the route corridor, English Heritage drew attention to the potential for visual impacts on the Grade I listed Hintlesham Hall. Natural England also stated that further work was required to understand the impact of the connection on Hintlesham Woods SSSI before making a decision.

5.2.2 Further work was undertaken by National Grid to identify potential options at Hintlesham, including options that went through and around the SSSI. These options and the accompanying assessment was documented in the Preliminary Options Appraisal of Potential Overhead Alignments on Corridor 2B at Hintlesham Woods SSSI, which formed Appendix A of the COR. This study was followed by the consideration of further options around Hintlesham Woods (Figure 5.1), which were presented within the main body of the COR and comprised:

- OHL 2A Alignment: This overhead option would run due south from Bramford substation to the east of Burstall Bridge, where it would follow the route of the existing 132kV overhead line to the south of Hintlesham.
- OHL 2B Northern Alignment: This option would use the alignment of the existing 400kV overhead line for a short section out of Bramford substation. It would then lie to the north of and broadly parallel the existing 400kV overhead line. This option would cross the A1071 and would run around the northern and western edge of Ramsey Wood.
- OHL 2B Southern Alignment: This would run southwest from Bramford substation and lie to the south of the existing 400kV overhead line from Mill Farm to College Farm. From here the new overhead line would take the route of the existing 400kV overhead line through Hintlesham Woods and the existing 400kV overhead line would be routed around the northern and western edge of Ramsey Wood. Both the existing and new 400kV overhead lines would converge to the east of Primrose Farm.
- Underground cable alignment: The underground cable option would run west from Bramford substation passing to the south of Burstall Hill. It would take a more direct route to the southwest and southwards, avoiding avoid buildings, woodland and a County Wildlife Site, to cross beneath Hadleigh Railway Walk where it is on a slight embankment. The underground cable option would not require a CSE compound at the eastern end, as connections could be accommodated within Bramford Substation. It was

assumed that the western CSE compound would be located to the east of Hadleigh Railway Walk.

Figure 5.1: Options Around Hintlesham



5.2.3 Although more expensive, the study concluded that a corridor to the north of Hintlesham (2B) would be favoured over a corridor to the south (2A) due to the effects on landscape, visual and heritage. Corridor 2B would result in a minor positive effect to the south of Hintlesham, where around 4km of 132kV overhead line would be removed from the landscape between Chattisham and Hintlesham. Out of the 2B options, Corridor 2 (southern) was chosen as it would closer parallel the existing 400kV line, with lower effects on landscape and views. It would also be technically easier to engineer. Therefore, OHL 2B (southern) was identified as the preferred alignment within the COR, as it would allow greater paralleling with the existing 400kV line and would be technically easier to tie in to Bramford substation.

5.2.4 During consultation on the COR, English Heritage made representations regarding the potential for harm to the setting to Hintlesham Hall, a Grade I listed building. The COR Consultation Feedback Report (2012) concluded that further work should be undertaken to provide English Heritage with additional information in relation to the potential effects on Grade I listed Hintlesham Hall before making a decision on the alignment in Section AB.

5.2.5 As a result of this, National Grid formally responded to English Heritage and the local authorities in November 2012 with further details about the impact to Hintlesham Hall. This response included an assessment of the significance of the group of listed buildings at Hintlesham Hall, including the contribution of the setting to that significance. The response concluded that the interim alignment in the COR (Corridor 2B) would harm the significance of Hintlesham Hall through development within its setting, but that the harm would be less than substantial. It also concluded that other heritage assets would benefit from the removal of the 132kV line.

5.2.6 Consideration was also given to a partial underground cable option solution within Corridor 2B, which would avoid effects on Hintlesham Hall and on other properties highlighted in representations. However, the additional cost would be substantial and, taken together with adverse effects on ecology and buried archaeology, these factors would outweigh the benefits which would accrue. This option was therefore discounted.

5.2.7 Further discussions were undertaken with English Heritage and the local planning authorities during early 2013. This included discussions around the alignment and specific pylon locations, which informed the emerging proposals.

5.2.8 National Grid has re-commenced discussions with Historic England (formerly English Heritage) in 2021 to review the proposed option to take account of any changes since 2013. These discussions are ongoing however the preferred option remains the same as in 2013 for the reasons outlined above.

5.3 Further proposed changes following consultation

5.3.1 Following the announcement of the preferred alignment in 2012, National Grid received representations during the non-statutory consultation on the interim alignment from property owners who proposed localised changes to the alignment in specific areas. These were all subjected to further assessment by the engineering and environmental teams and compared to the COR alignment to see whether the COR option or the suggested alternative should be taken further.

Burstall

5.3.2 The COR concluded that the preferred alignment for the connection should involve an overhead line running from Bramford substation to the south of the existing 400kV overhead line. Representations were made proposing an alternative alignment which involved the two overhead lines running in close parallel from Bramford substation and passing to the north of properties at Orchardlands. This would require the existing 400kV to be diverted and a section of the existing 400kV north of 4YL005 could be dismantled.

5.3.3 Two variations of this suggested change were considered, but both required diversion of the existing 400kV line which the COR alignment did not. The COR alignment was therefore preferred and the proposed alternative discounted.

Kate's Hill

5.3.4 The COR alignment passed to the north of Kate's Hill and more detailed design development indicated that this would require a pylon to be situated close to that property. An alternative alignment was suggested, passing to the south of Kate's Hill and following the alignment of the existing 132kV overhead line. This option had previously been discounted as it would result in 400kV overhead lines on both sides of the property. However further environmental assessment suggested that an alignment further to the south would move the alignment and pylons further away from Kate's Hill Farm and would better respond to landowner feedback. The alternative option would not result in more adverse effects on other environmental topics and would also be acceptable to other landowners in the area. Therefore, National Grid made a change to the preferred alignment to incorporate the proposed change.

Pipkin Lodge, Layham

5.3.5 The COR concluded that the interim alignment to the west of the Hadleigh Railway Walk should run broadly parallel to, and south of, the existing 400kV overhead line with a deviation pylon required directly to the south of Pipkin Lodge. Representations were made suggesting an alternative pylon position to the east of Benton Street, stating that this would have less of an effect on views from Pipkin Lodge and on a ring ditch. A further advantage would be that the pylon would be screened by trees in views from Benton Street, approaching from the Layham direction. This was assessed further, and no other significant environmental or socio-economic effects were identified for the alterative. Therefore, National Grid made a change to the preferred alignment to incorporate the proposed change.

Overbury Hall

5.3.6 The COR alignment closely followed that of the existing 132kV overhead line, where it passed close to Overbury Hall (a grade II listed building), albeit screened by existing mature tree belts. Representations were received that suggested that the alignment be directed further to the north. Three additional options were assessed in response to this suggestion. Consideration was also given to the use of low height pylons to reduce the effects on Overbury Hall. All of the alternatives would require modifications to, or the replacement of, the existing 400kV overhead line, together with realignment of the proposed connection. While there would be benefits to the setting of, and views from Overbury Hall, the overall effects on the landscape and views and on ecology would be greater for the alternatives than those associated with the COR alignment in each case. Therefore, the COR alignment remained as the preferred alignment and the proposed alternatives were discounted.

Hill View, Assington

5.3.7 Representations were received suggesting alternatives be considered at Hill View. This included undergrounding, which had already been considered and dismissed within the COR. The representation also included an alternative option to run the new overhead line in parallel with the existing 400kV overhead line. Further work was undertaken to consider this proposed alternative. This work concluded that although the effect of the alternative on the landscape would be less than for the COR alignment, it would offer no other significant technical, cost, environmental or socio-economic benefits which would justify incurring the range of amenity issues associated with their proximity to the residential property. Therefore, the COR alignment remained as the preferred alignment and the proposed alternative was discounted.

5.4 Cable Sealing End Options

5.4.1 The 2012 COR concluded that there was a case for undergrounding certain sections of the project in Section E (Dedham Vale) and Section G (Stour Valley). Each of the underground sections would require a CSE compound at each end to connect it to the adjacent overhead line. The COR identified indicative locations where the CSE compounds could be located. This included environmental studies to consider the potential effects on landscape, visual amenity, biodiversity and cultural heritage. Further work was undertaken after the COR was published looking at the detailed location for each CSE Compound.

Section E (Dedham Vale) Eastern CSE Compound (Dollops Wood)

5.4.2 A large number of options were developed for the eastern CSE compound, which was located close to Dollops Wood, within Dedham Vale AONB. The majority of these assumed the use of horizontal directional drilling (HDD) under Dollops Wood – an approach responding to representations from the public in order to reduce impacts to the woodland. Options that required the CSE compound to be located within Dedham Vale AONB were ruled out on the grounds of conflict with national policy as there were alternatives outside the AONB boundary.

5.4.3 The COR suggested that the eastern CSE compound could be located to the southeast of Sprott's Farm, east of the AONB boundary. This location was identified as it provided an opportunity to screen the compound next to the adjacent Dollops Wood, supplemented by additional planting.

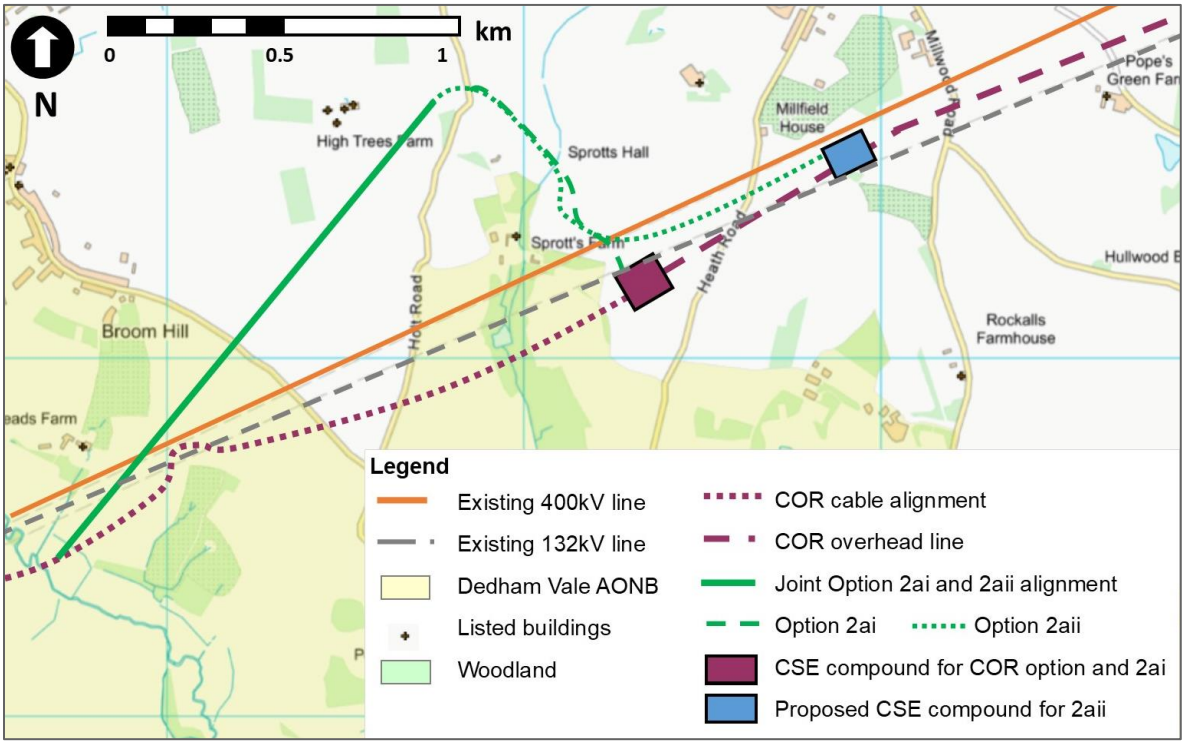
5.4.4 Further assessment work was undertaken following the publication of the COR to determine the detailed location. The preferred option was to HDD beneath the wood, as this would have the least effect on environmental features. It would involve splitting the cable circuits east of Dollops Wood into two groups, to enable each to pass through a separate gap in the woodland to the east of Dollops Wood.

5.4.5 A geotechnical feasibility study was produced in 2013, which included installing boreholes to understand the ground conditions at the site to inform the technical assessment. This identified that HDD at this location would have high construction and environmental risks due to the topography and the ground conditions. This led to the need to consider alternative options at this location, to see if an alternative option at Dollops would result in lower project risks.

5.4.6 Following recommencement of the project in 2020, further work was undertaken to identify potential alternative options at Dollops Wood. This study identified a long list of options that involved both the current COR and HDD option (Option 1ci). It also identified alternative alignments to the north that avoided the woodland (Option 2ai and 2aii which lie to the north of Sprott's Hall).

5.4.7 Technical design and engineering work is ongoing at this location and two options remain under consideration. The final proposed option will be consulted upon as part of the statutory consultation for the project.

Figure 5.2: Alternative Options at Dollops Wood



Section E (Dedham Vale) Western CSE Compound (Boxford Fruit Farm)

5.4.8 Three options were initially considered for the western CSE compound and a fourth was later added as a result of discussions with individual landowners and land agents. The COR suggested that the western CSE compound could be located to the immediate west of Boxford Fruit Farm, as this location offered separation from the AONB to the east and there would be an opportunity to locate the compound adjacent to existing tree planting along the boundary to the orchard.

5.4.9 This would allow the Bramford to Twinstead terminal pylon to be aligned more closely with the existing 400kV overhead line to permit wider synchronicity of the lines. This option was therefore preferred and continues to be so.

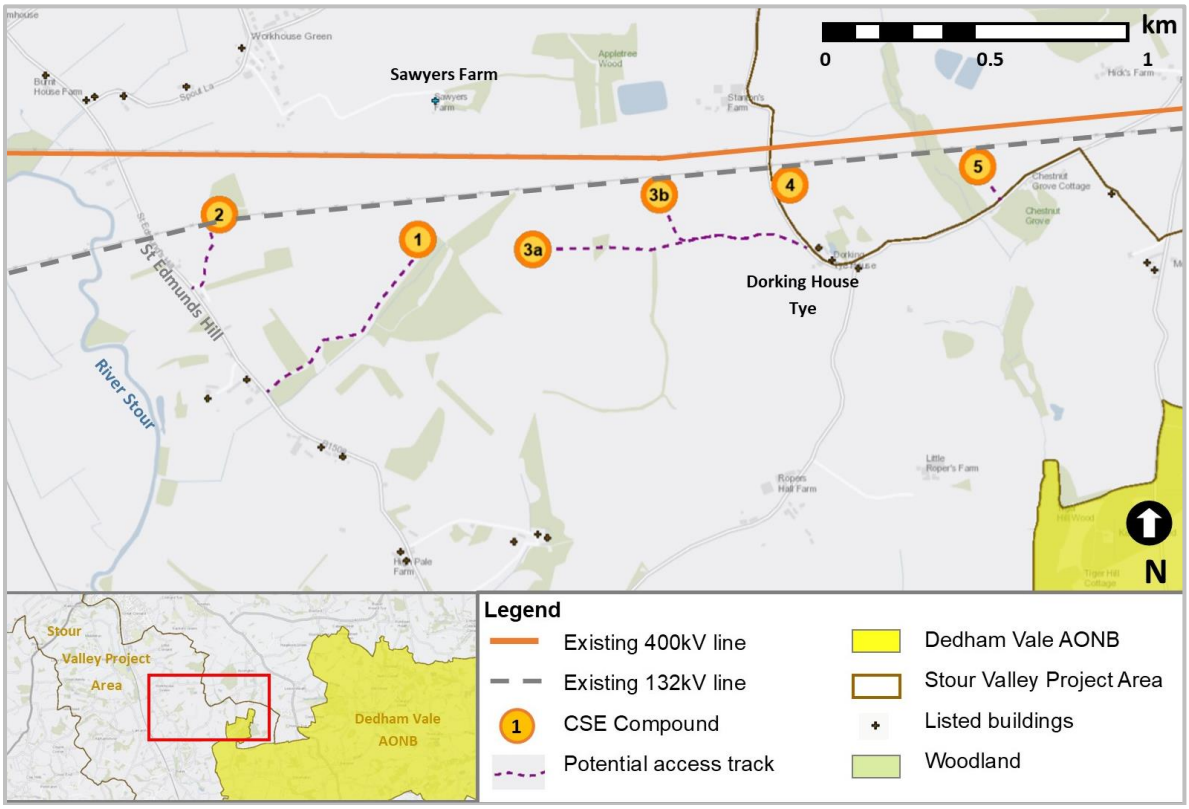
Section G (Stour Valley) Eastern CSE Compound (Sawyers Farm)

5.4.10 The COR concluded that the eastern CSE compound could be located to the south of Sawyer's Farm and west of Upper Road, as this location took advantage of a natural depression on the edge of the Stour Valley and the presence of existing vegetation to screen the site. The COR noted that the location would fall within the setting of the listed building at Sawyer's Farm and would result in negative effects which could not be mitigated entirely. However, the setting was considered to be already influenced by the presence of overhead lines and the magnitude of effect on this listed building would be minor.

5.4.11 Following recommencement of the project in 2020, further work was undertaken to verify the undergrounding and the location of the CSE compound in this location. This work identified that the extent of proposed undergrounding did not cover options that lay outside of the Stour Valley Project Area. The review concluded that further site selection optioneering was required in relation to the CSE compound to justify the extent of proposed undergrounding within the Stour Valley Project Area.

5.4.12 The 2020 options appraisal identified a long list of options (Figure 5.3) that involved both the current CSE compound location (Option 1) and also alternative locations, including sites located outside of the Stour Valley Project Area (Options 4 and 5).

Figure 5.3: Stour Valley East CSE Compound Locations



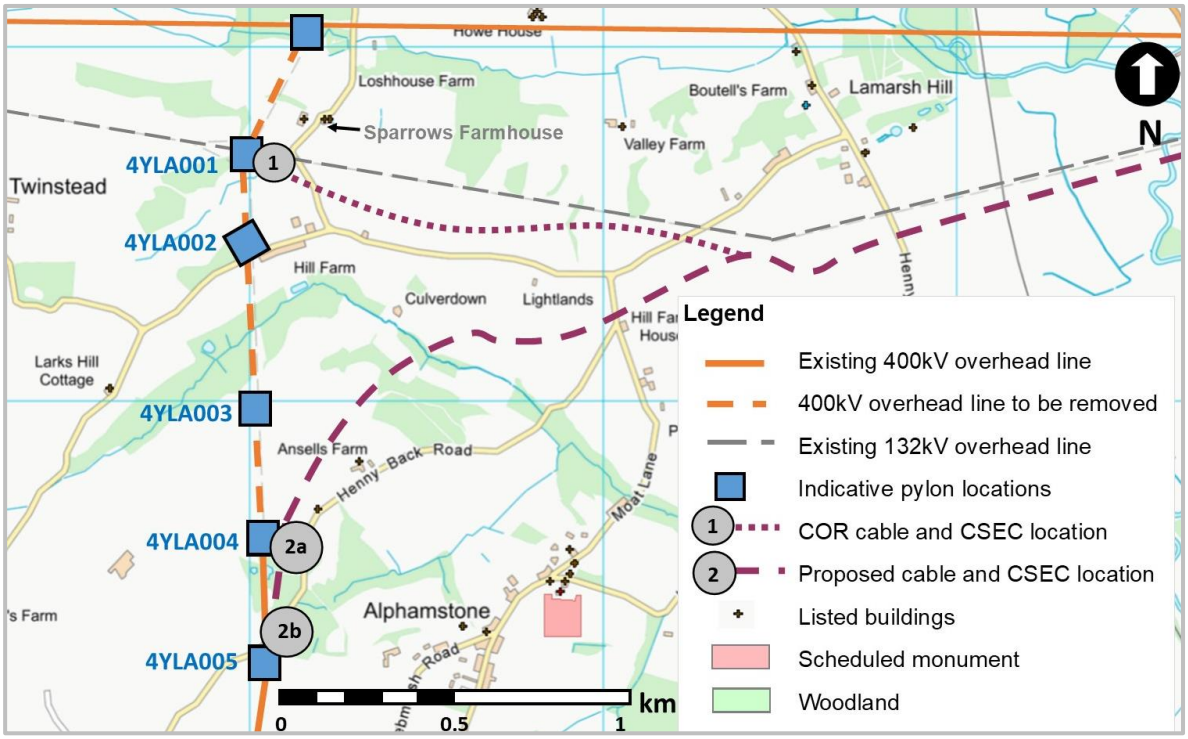
5.4.13 The long list of options was screened from a technical and environmental perspective and the short-listed options were assessed in further detail. The shortlist assessment identified that Option 1 remained the preferred options from both a technical and environmental perspective, as it reduces the length of cable required and the site makes use of existing woodland to partly screen the compound site to help mitigate the landscape and visual effects.

Section G (Stour Valley) Western CSE Compound

5.4.14 The COR suggested that the western CSE compound could be located adjacent to pylon 4YLA001 on the Bramford–Braintree-Rayleigh overhead line. This location was chosen as it lay within a natural valley, with an existing mature hedgerow and woodland screening. The location would fall within the setting of the listed buildings at Sparrow's Farm, particularly the barn to the west of Sparrow's Farm, which is a Grade II listed building.

5.4.15 National Grid received a number of comments on the western CSE compound during consultation on the COR, including representations from Braintree District Council, who suggested that the CSE compound could be relocated to a site 1km further south, near pylon 4YLA005. National Grid responded to these representations by undertaking a further study into the location of the CSE compound. The study was presented in the Western CSE End Compound study, published in November 2012.

Figure 5.4 Stour Valley Western CSE Compound Location



5.4.16 The study considered two alternative locations for relocating the CSE compound; either closer to pylon 4YLA004 (2a) or 4YLA005 (2b) see figure 5.4. Both of these alternative options would reduce the impacts on the setting of Sparrow's Farm and on views from public rights of way. The new options required extending the undergrounding further south and would result in the removal of additional spans of the existing 400kV line to the north. Option 2a was considered preferred as it would result in fewer hedgerow and protected lane crossings and would benefit from existing mature screening. It would also be located further away from Alphamstone Complex Local Wildlife Site.

5.4.17 The study concluded that a CSE compound in the vicinity of pylon 4YLA004 (2a) should be taken forward instead of the COR option. A further consultation invited the views of the local authorities and local communities and the feedback generally supported the change of location. Following the 2020 review of this location, no changes are currently proposed.

5.5 Distribution Network Options

5.5.1 The project incorporates the route of a 132kV overhead line comprising part of the electricity distribution system owned and operated by the DNO, UK Power Networks (UKPN). This 132kV overhead line runs from Burstall Bridge, 2.5km to the south of Bramford substation, to the vicinity of Twinstead Tee. The project would involve removing the existing 132kV overhead line in order to accommodate the 400kV network reinforcement. Following the removal of the 132kV overhead line, additional work would be required to maintain the local connection and the current security of supply to local homes and businesses.

5.5.2 UKPN identified eight options to maintain the security of local electricity supplies in July 2012. These comprised:

- Option 1: Do nothing;
- Option 2: Replace 132kV circuits between Twinstead and Burstall Bridge (132kV UG cable circuits);
- Option 3: Extension of the 132kV PCB overhead line from Twinstead 33kV Reinforcement;
- Option 4: 33kV Reinforcement;
- Option 5: Reinforce Braintree GSP substation and install new 132kV circuits to Rushley Green;
- Option 6: New GSP substation at Twinstead;
- Option 7: New GSP substation at Coggeshall; and
- Option 8: New GSP substation at Earls Colne.

5.5.3 Options 1 and 4 would not meet the requirements of the UKPN Distribution Licence conditions and were discounted. Option 5 was discounted as it relied on the implementation of another project, which had not yet gained consent. There was an increased complexity issue associated with Options 7 and 8, which would either require a permanent derogation of standards from Ofgem or would require a larger and more costly substation. Therefore, the UKPN report concluded that Option 6, developing a substation in the vicinity of Twinstead Tee, should be the preferred option for replacing the capacity lost following the removal of the existing 132kV overhead line.

5.5.4 In 2012 it was proposed that the GSP substation would contain a single transformer that changes or 'transforms' the level of a voltage from one value to another value. In this case, it would transform the voltage from 400kV network (owned and operated by National Grid) to the lower 132kV to be distributed by the DNO (in this case UKPN) to factories, offices and homes. Other components within the GSP would include protection isolation, cooling fans, diesel generator, water tank and switching devices.

5.5.5 This UKPN report was reviewed by National Grid, who also carried out further analysis of the 132kV connection options in accordance with its own options appraisal methods, including assessing lifetime cost and environmental and socio-economic issues. The assessment also considered the Holford Rules and the Horlock Rules and likely compliance with NPS EN-1 and EN5.

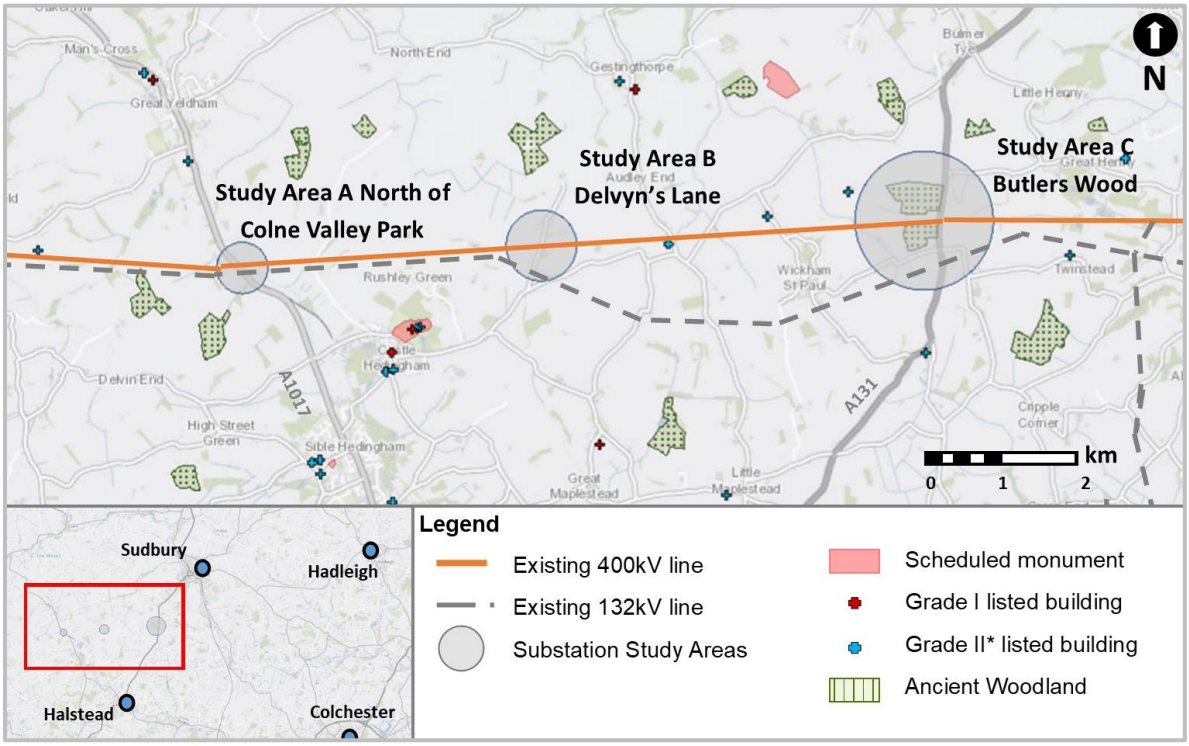
5.5.6 The National Grid work concurred with the work undertaken by UKPN by confirming that the preferred option was to develop a new GSP substation to the west of Twinstead Tee. The report concluded that this represented the most efficient, coordinated and economical option, whilst giving rise to fewer overall environmental effects than the other options considered.

5.5.7 National Grid also included further appraisal work to identify potential sites for the GSP substation. An initial desk based study identified eight potential sites within the study area, which extended from Twinstead Tee to Thaxted and was focused along the 400kV overhead line. Three were taken forward for further investigation. National Grid identified individual locations within each of the Substation Study Areas for more detailed options appraisal (Figure 5.5). These were:

- Study Area A: Land north of Colne Valley Farm Park (Site A1)

- Study Area B: Land at Delvyn's Lane (Sites B1-B5);
- Study Area C: Land at Butlers Wood and Waldegrave Wood (Sites C1-C4).

Figure 5.5: Substation Study Areas



5.5.8 In each Study Area location, further consideration was given to options which involved constructing an entirely Air Insulated Switchgear (AIS) solution (400kV and 132kV elements) and options that considered constructing a 400kV AIS element with a 132kV Gas Insulated Switchgear (GIS) element.

5.5.9 All options were assessed against the following criteria: technical implications; environmental effects; socio-economic impacts; and cost. The study concluded that a substation between Butler's and Waldegrave (Study Area C) was preferred, as it would have the least impact on the landscape character of the area, visual amenity, ecology and the historic environment. This option would also be the least constrained from a technical perspective and have the shortest access road.

5.5.10 National Grid consulted on these options in early 2013. A Consultation Feedback Report was published in August 2013. No representations were received in support of Options 2, 3, 7 or 8. Twenty five representations were received in support of the preferred option (Option 6). Forty nine representations were received in support of Option 5. National Grid reviewed the cost estimates for Options 2, 5 and 6 as part of the response to the consultation. This showed that, in terms of lifetime costs, Option 6 would be over £30m cheaper than the other options favoured in representations, which would make it the most cost effective strategic option in the longer term.

5.5.11 The majority of representations agreed that Study Area C was the most suitable and all but one of the representations received relating to Study Area C agreed that Location C2 was the best location. A number of detailed concerns were raised, mainly related to landscape impact, which would be addressed through the detailed design of the project and associated mitigation measures. Some representations suggested potential mitigation, including lowering the ground levels at the site, setting

the substation further back from the A131, or providing greater amounts of earth bunding and tree screening.

5.5.12 National Grid reviewed all of the representations made and concluded that the previous selection of Location C2 remained robust. National Grid also determined that the design should adopt AIS, a position supported in representations. In confirming this as the preferred option, National Grid acknowledged the need for further consideration of mitigation at the site, including both the design of the access road and junction with A131 and the management of construction traffic on the local highway network.

5.5.13 Since restarting the project in 2020, National Grid recommenced discussions with UKPN to ensure the previous proposals are still appropriate. The work to support this is still ongoing however there may now be a requirement for two transformers at the GSP substation site. This would require a larger footprint than assumed within the Substation Options Appraisal Study. National Grid has undertaken further consideration during 2020 to identify whether the larger footprint could be accommodated at the preferred substation site (Butler's Wood). The results of this work have shown that the site can accommodate two transformers, if required, within the existing woodland screening.

5.5.14 The engineering work with UKPN is ongoing and the final substation design will be included within the statutory consultation material, this will include landscape mitigation and the access design.

5.6 Pylon Design Assessment

5.6.1 A pylon design assessment was undertaken in 2013, which considered different designs of pylons that could be used on the project. The study considered three types of pylon and considered the potential effects of each. The dimensions of each are set out in Table 5.1. The T-pylon and the low height steel lattice pylon are wider than the standard steel lattice pylon. There is little difference between the construction work involved in the pylon types.

Table 5.1: Summary of Strategic Options

Suspension Pylon Type	Height	Base at Widest Point	Number of Cross Arms	Width of Widest Cross Arm	Number of Earth Wires
Standard steel Lattice Pylon	49.95m	9.3m	3	20.8m	1
Low-Height Steel Lattice Pylon	35.3m	7m	2	29.2m	1
T-pylon	34.5m	2m	1	22.4m (31m inc. insulators)	2

5.6.2 The assessment considered the potential environmental effects of each pylon type, including landscape and visual, ecology and historic environment. It considered the effects in terms of visibility alongside the existing 400kV overhead line, which comprises steel lattice pylons.

5.6.3 The assessment concluded that although the low-height steel lattice pylon and the T-pylon would be lower, with potential benefits on distant views, introducing a notably different pylon design to the existing 400kV standard steel lattice pylons would have greater adverse effects on close views. The standard steel lattice pylons would also

have a greater span which would allow the design to pass over sensitive features more easily, resulting in less habitat loss than low-height steep lattice pylons or T-pylons. The assessment concluded that the standard steel lattice pylon would be the preferred pylon design.

6. PROJECT RESTART

6.1 Review work

6.1.1 As set out within Section 1, the project was paused in 2013, due to a delay in the delivery of a number of the East Coast generating schemes.

6.1.2 As part of the recommencement of the project in 2020, National Grid has undertaken a thorough re-appraisal of the project and the decisions taken to date, reflecting the robust approach National Grid takes both to its responsibilities to consumers and its duties as a responsible developer. In adopting this approach, National Grid is able to have regard to, and build on, the consultation and stakeholder inputs which helped to shape the project prior to the pause in 2013, while ensuring that the design and the decision making which informed it are representative of the current context. This process has ensured that National Grid has a robust understanding of the project that was paused in 2013 and has confidence in its ongoing validity and appropriateness for progressing further.

6.1.3 This exercise involved looking at the original economic, technical, planning and environmental conditions from 2009-2013 and identifying any changes to those that would affect the decision to proceed with the project.

6.1.4 A thorough reconsideration and reappraisal was undertaken of all elements of the project as it was at the time it was paused in 2013. As part of this exercise, the need case and strategic approach were re-examined and re-affirmed, based on current understanding of the network and commitments within the region. The engineering approach was also reconsidered, including the technologies proposed for the new 400kV connection. Furthermore, the planning and environmental context was thoroughly reappraised, including the appropriateness of the proposed approach and the possible extent of mitigation. The 2020 work also included further studies in areas identified within the COR and the previous consultation responses.

6.1.5 In reviewing the previous decision-making process, and indeed the decisions themselves, National Grid has been able to verify the outcomes of these exercises and reach a fully informed and up-to-date position on the project. The outcome of this process is that the project and its design evolution, as set out in this document, remains largely appropriate and is suitable for progressing. Where the review process identified areas where further consideration was appropriate, these areas have been addressed either through additional work (where possible at this stage) as outlined within the text above or will be addressed through future consultation with stakeholders.

6.1.6 Specifically, further work has been undertaken during 2020 to assess the alternative options where there were new or different constraints identified. For example, a realignment of the cables at Dollops Wood (see Section 5.4) and whether the proposed substation site at Butler's Wood could accommodate two transformers (see Section 5.5). These have been considered as part of the updated project designs.

6.2 Cost analysis

6.2.1 National Grid has a duty to be economic and efficient, as the cost of new connections is added to energy bills. As part of this duty, has reviewed the decisions for overhead

lines and underground cables in each section. This has included a review of the cost assumptions made previously and an update of these where appropriate.

6.2.2 In summary the costs for certain options are provided in Table 6.1 below. It should be noted that market and material costs have changed since 2013 and are likely to do so again before we reach construction, but based on current information and designs, in today's (or equivalent) prices, the capital cost estimates rounded to the nearest £m, are provided and offer a basis for comparative assessment.

Table 6.1: Summary of Costs for Underground and Overhead Line Options

Option	Description	2021 Capital Cost
Proposed Option (Predominantly Overhead Line with Underground Cables in Dedham Vale AONB and Stour Valley Project Area)	Substations, Overhead Line, 2 x Underground Cable Sections in Dedham Vale AONB and Stour Valley Project Area, 4x Cable Sealing End Compounds	£363m
Predominantly Overhead Line with Underground Cables in Dedham Vale AONB only	As proposed option apart from Overhead Line in Stour Valley Project Area instead of Underground Cable and 2x Cable Sealing End Compounds	£245m
Predominantly Overhead Line with Underground Cables in Stour Valley Project Area only	As proposed option apart from Overhead Line in Dedham Vale AONB instead of Underground Cable and 2x Cable Sealing End Compounds	£256m
Entirely Overhead Line	Substations, Overhead Line for whole route	£142m
Entirely Underground Cable	Substations, Underground cable for whole route	£694m

6.2.3 In addition to the review of capital costs, lifetime costs also need to be considered. Lifetime costs take account of other costs such as the cost to monitor, maintain and replace equipment and also the cost of electrical losses during operation of the assets. Detailed analysis was undertaken and included in Appendix B of the COR for various scenarios. In summary, the cost to maintain underground cables is higher than for overhead lines. Conversely, the cost of electrical losses is higher for overhead lines than underground cables. However, it remains the case that the determining factor in considering the cost difference between overhead lines and underground cables remains the capital cost as outlined above.

6.2.4 The review work and cost analysis has confirmed that an underground cable should be progressed for Section E Dedham Vale, due to the area being designated as an AONB of national importance. The decision to retain an overhead line, as set out in the COR, has been confirmed through the review work for sections AB, C, D and F.

6.2.5 Although recognised as a landscape of value and with links to famous artists, the Stour Valley (Section G) is not formally designated as an Area of Outstanding Natural Beauty and the review has identified this area as requiring further work to understand whether the additional cost of an underground cables (£118m) in this location is justified. Therefore, the non-statutory consultation seeks views from stakeholders and consumers as to whether the previous decision to underground this section still provides value for money.

6.2.6 In particular, National Grid would like to understand views on:

- The landscape and cultural value of the Stour Valley;

- Progress on proposals to extend the Dedham Vale AONB boundary in the Stour Valley towards Sudbury;
- The construction effects of undergrounding in the Stour Valley (see Section 3.4 of this report for more details); and
- Anything else National Grid should consider.

7. EMERGING PROPOSALS AND NEXT STEPS

7.1 Introduction

7.1.1 National Grid has published this report to support non-statutory consultation in 2021. The consultation is designed to provide an update to existing and new consultees about the project and provide an opportunity to feedback on those proposals. This report includes a summary of the project development and options appraisal process undertaken prior to the project pause and documents the review undertaken and any changes proposed since the project was restarted.

7.1.2 The project will be applying for Development Consent, where the Secretary of State will determine whether the project should be approved. This section sets out the emerging proposals that may form the basis of the application.

7.2 Emerging Proposals

7.2.1 The emerging proposals reflect the substantial options appraisal work and consultation that has been undertaken on the project to-date, and the thorough review that the decision-making processes and outcomes undertaken as part of the recommencement of the project in 2020.

7.2.2 The proposed reinforcement would run from Bramford Substation in Suffolk to Twinstead Tee in Essex. It would be 27km long, comprising both overhead line and underground cables (see the figures in Appendix A). The route roughly follows the existing 132kv line, which would be removed as part of the project. The reinforcement would include the removal of approximately 4km of overhead line within Dedham Vale AONB. It also runs parallel to the existing 400kV (4YLA) overhead line for parts of the route.

7.2.3 The emerging proposal comprises the following principal components:

- Construction of a 27km 400kV electricity transmission connection between Bramford Substation and Twinstead comprising overhead line and underground cables (including construction of four CSE compounds at the points where overhead lines meet underground cables;
- Construction of a new 400/132kV grid supply point (GSP) substation at Butler's Wood and associated works to tie this into the existing network and a permanent access track;
- The removal of c. 25km of the existing 132kV overhead line between Burstall Bridge (approximately 2.5km south of Bramford Substation) and Twinstead Tee;
- Temporary Pylon diversion from 4YLA005 – Twinstead Tee 4YL073 to allow the building of the proposed CSE compound at Stour Valley West;
- The removal of four spans (three pylons c. 1.5km) of the existing Bramford to Braintree to Rayleigh 400kV overhead line between Twinstead Tee and the proposed CSE compound at Stour Valley West;

- The modification of the existing Bramford to Pelham 400kV overhead line ('4YL' overhead line) to be re-routed around Hintlesham Woods, including temporary pylons; and
- Various associated works including but not limited to access tracks, construction compounds, watercourse crossings and connection works.

7.2.4 As set out in Section 4.5 of this report, the project is divided into sections to manage assessment and presentation of project information. The sections for the alignment and proposed site for the substation comprise the following:

- Section AB – Bramford Substation and Hintlesham: Comprising a new overhead line from Bramford substation. It would pass through Hintlesham Woods using the existing 400kV alignment. In order to permit this, the existing 400kV overhead line would be routed onto a new alignment north of Ramsey Wood, rejoining the existing line near Clay Lane;
- Section C – Brett Valley: a new overhead line alignment to the south of the existing line;
- Section D – Polstead Heath: a new overhead line alignment to the south of the existing line;
- Section E – Dedham Vale: a new underground cable section from Heath Road, Polstead Heath to Leavenheath (approximately 4km);
- Section F – Leavenheath and Assington: a new overhead line alignment to the south of the existing line;
- Section G – Stour Valley an underground cable section from west of Dorking Tye to the Bramford-Braintree-Rayleigh overhead line south of Twinstead Tee (approximately 4km); and
- Proposed substation location between Butler's Wood and Waldegrave Wood.

7.2.5 National Grid is seeking views on the emerging proposals as part of the non-statutory consultation, particularly regarding the undergrounding in Section G (Stour Valley).

7.3 Next Steps

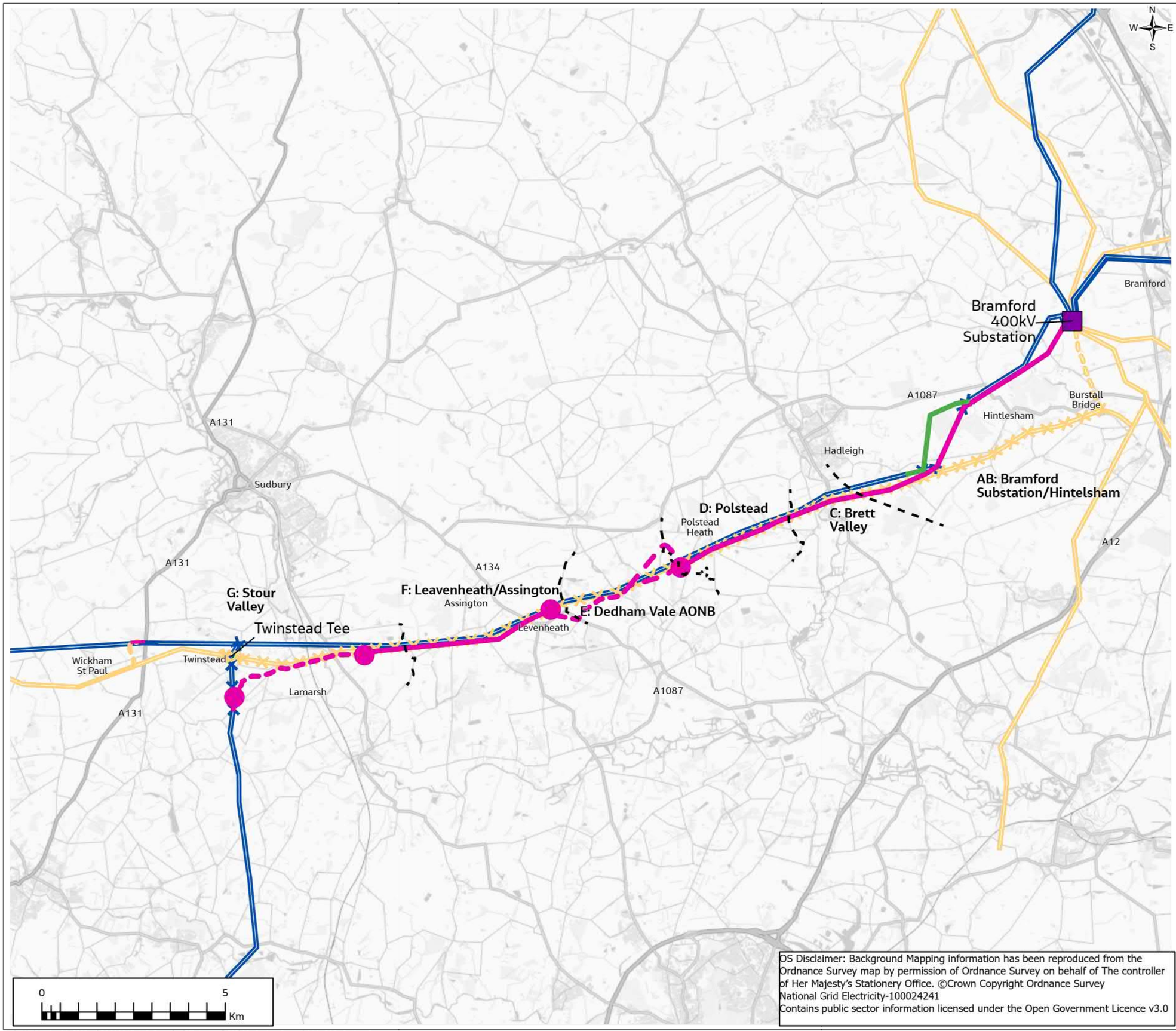
7.3.1 National Grid will review the responses from the non-statutory engagement and will continue to develop the designs and undertake further environmental assessment work. National Grid will be submitting a further EIA Scoping Report to the Planning Inspectorate in Spring 2021. The designs will be updated based on any feedback and the updated proposals along with further detail will be presented at the proposed statutory consultation later in the year. A Preliminary Environmental Information Report (PEIR) will be prepared to accompany the statutory consultation. The PEIR represents an interim or preliminary assessment of known and potential significant environmental effects, based upon current detail and understanding of project.

7.3.2 Following the statutory consultation, National Grid will review the responses received and will make final updates to the proposals. The Environmental Statement will be prepared, which will set out the likely significant effects of the project. Once the relevant documents are finalised, a submission will be made to the Planning

Inspectorate, seeking consent for the reinforcement and associated development and seeking powers of compulsory purchase of land and rights, as necessary.

APPENDIX A: PLANS SHOWING EMERGING PROPOSALS

FIGURE 1

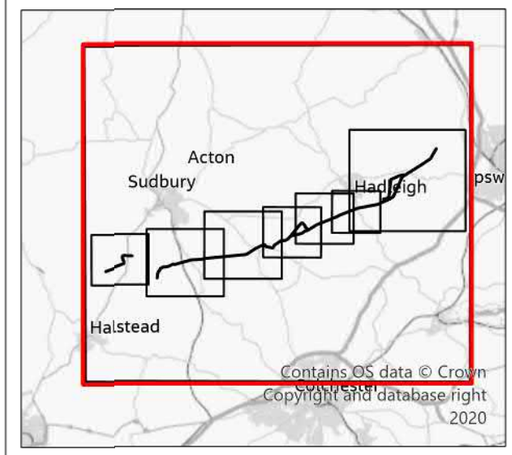


Legend

- Section boundaries
- Existing Bramford substation
- Existing 400kV ohl
- Existing 132kV ohl
- Existing 132kV underground

Indicative alignment

- Modification works to 400kV overhead line
- Proposed 400kV overhead line
- Proposed realignment of existing 400kV overhead line
- Proposed route for 132kV underground cable
- Proposed route for 400kV underground cable
- Proposed works to 132kV overhead line
- Dollops Wood alternative options
- Proposed overhead line removal -132kV
- Proposed overhead line removal - 400kV
- Proposed substation site
- Proposed CSE compounds



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0	03/2021	Draft	PM	TC	CW	CW

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Page 1 of 8

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FIGURE 1

Bramford 400kV Substation

AB: Bramford Substation/Hintelsham

C: Brett Valley

Legend

- Section boundaries
- Existing 400kV ohl
- Existing 132kV ohl
- Existing 132kV underground

Indicative alignment

- Modification works to 400kV overhead line
- Proposed 400kV overhead line
- Proposed realignment of existing 400kV overhead line
- Proposed route for 132kV underground cable
- Proposed route for 400kV underground cable
- Proposed works to 132kV overhead line
- Dollops Wood alternative options
- Proposed overhead line removal - 132kV
- Proposed overhead line removal - 400kV
- Proposed substation site
- Proposed CSE compounds
- Listed Building grade I
- Listed Building grade II*
- Ancient Woodland
- Site of Scientific Special Interest (SSSI)
- Stour Valley Project Area
- Areas of Outstanding Natural Beauty

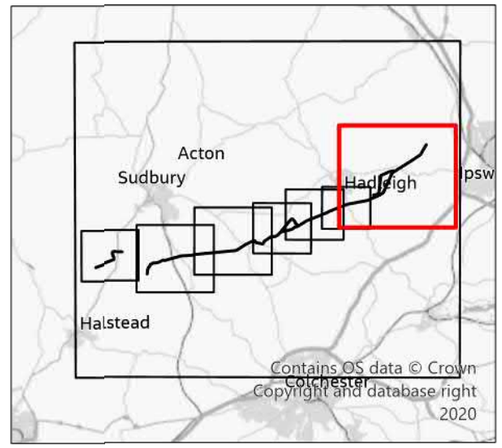

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FIGURE 1

AB: Bramford Substation/Hintelsham

C: Brett Valley

D: Polstead

Legend

- Section boundaries
- Existing 400kV ohl
- Existing 132kV ohl
- Existing 132kV underground

Indicative alignment

- Modification works to 400kV overhead line
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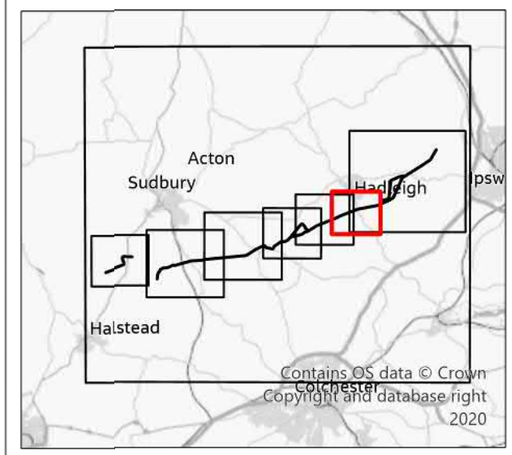

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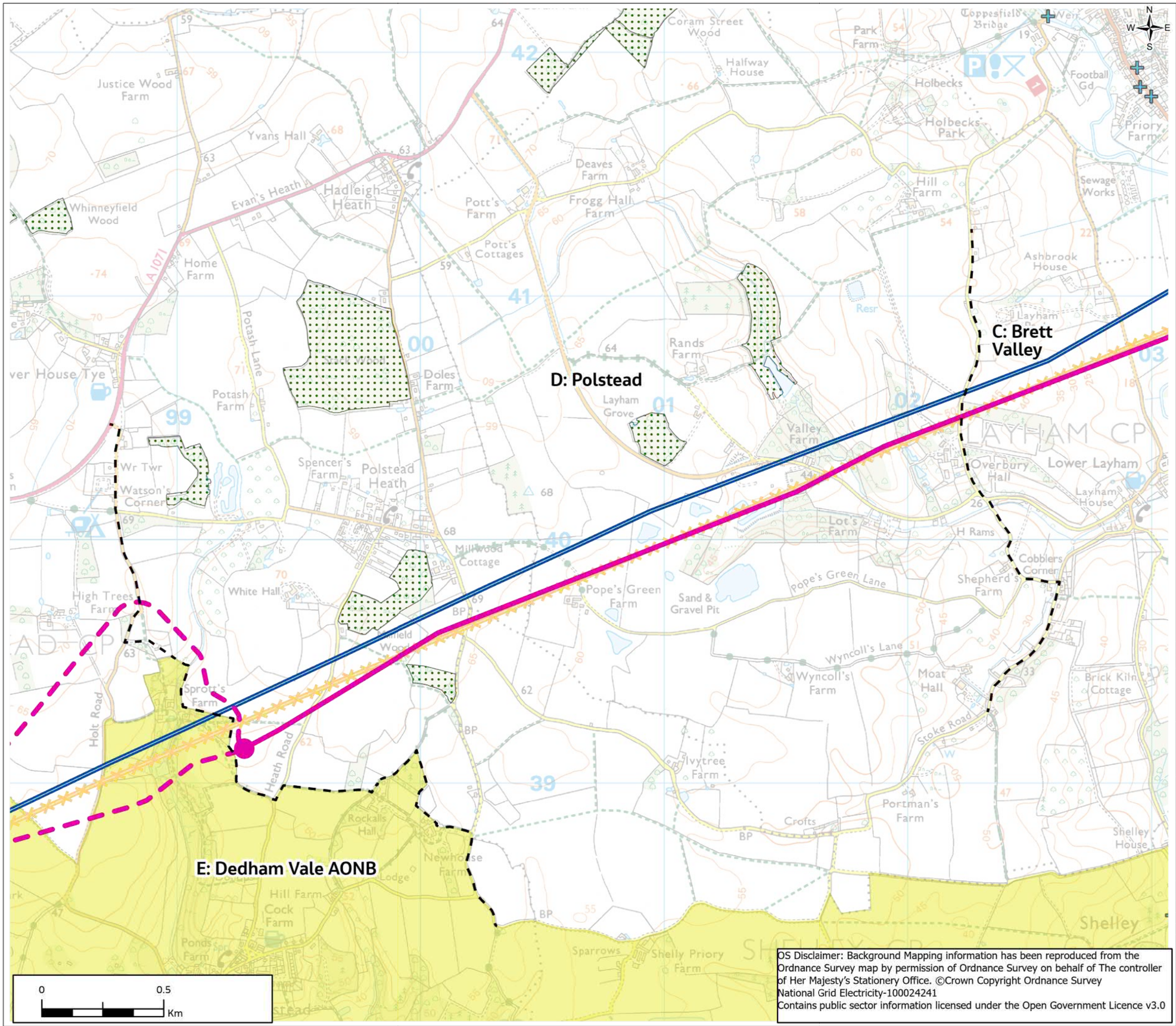
FIGURE 1



Legend

- Section boundaries
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- Existing 132kV ohl
- Existing 132kV underground

Indicative alignment

- Modification works to 400kV overhead line
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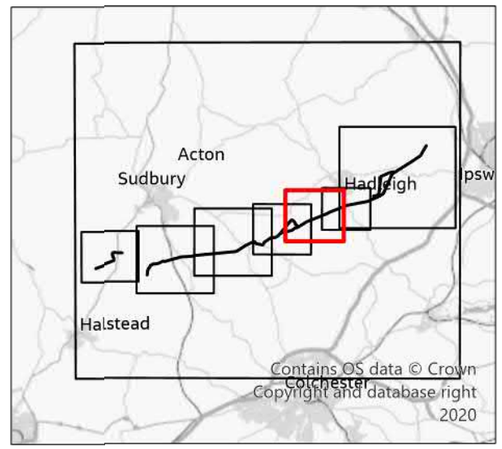

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FIGURE 1

D: Polstead

E: Dedham Vale AONB

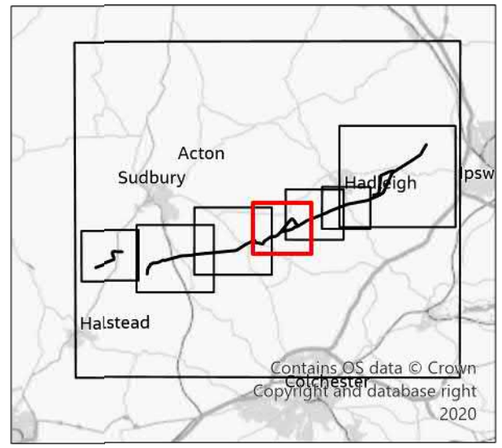
F: Leavenheath/Assington

Legend

- Section boundaries
- Existing 400kV ohl
- Existing 132kV ohl
- Existing 132kV underground

Indicative alignment

- Modification works to 400kV overhead line
- Proposed 400kV overhead line
- Proposed realignment of existing 400kV overhead line
- Proposed route for 132kV underground cable
- Proposed route for 400kV underground cable
- Proposed works to 132kV overhead line
- Dollops Wood alternative options
- Proposed overhead line removal -132kV
- Proposed overhead line removal - 400kV
- Proposed substation site
- Proposed CSE compounds
- Listed Building grade I
- Listed Building grade II*
- Ancient Woodland
- Stour Valley Project Area
- Areas of Outstanding Natural Beauty



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Jacobs No.	B2416601	
Client No.		
Drawing No.	AAA_B2B_OptionsReport	

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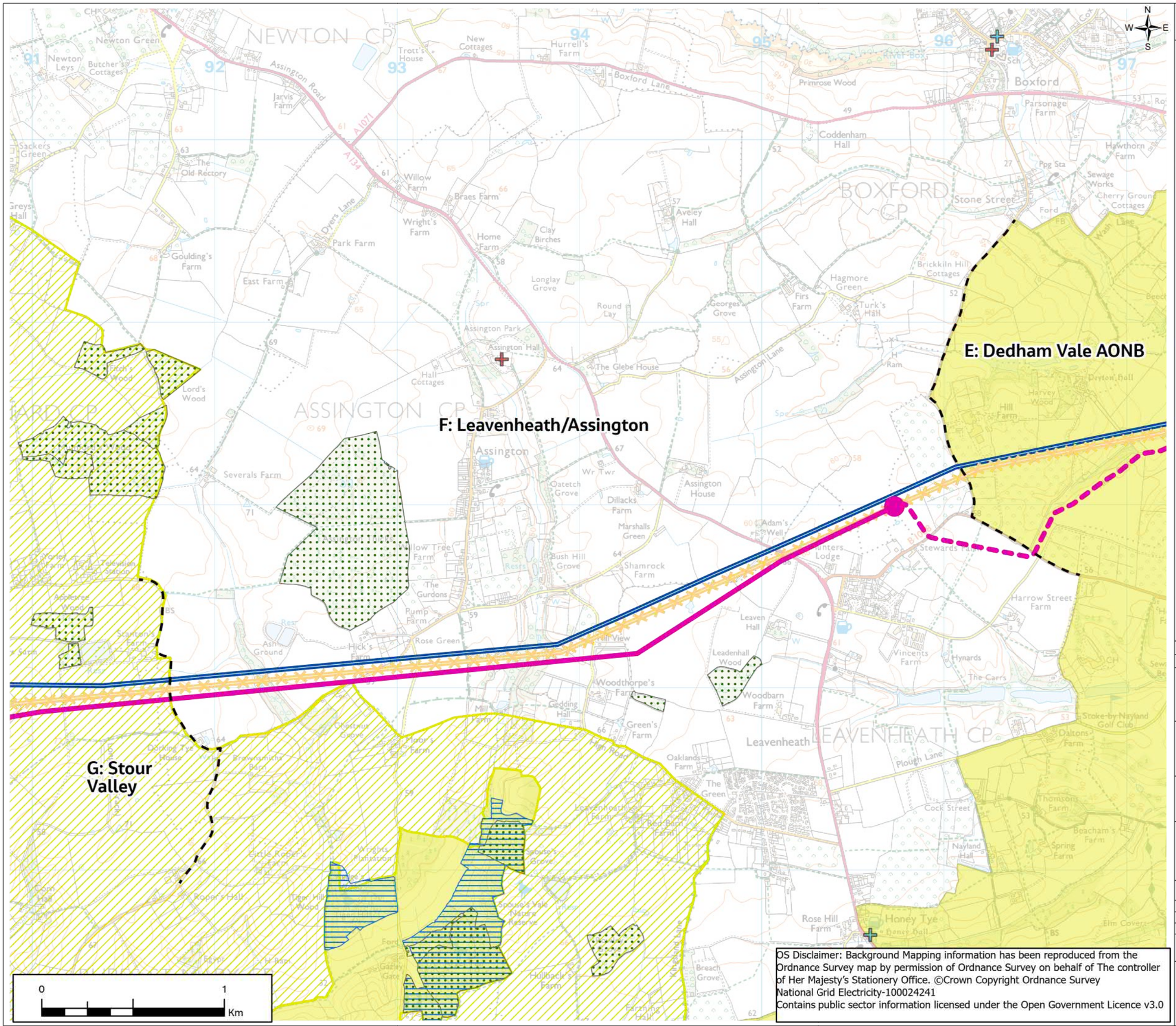
FIGURE 1



Legend

- Section boundaries
- Existing 400kV ohl
- Existing 132kV ohl
- Existing 132kV underground

Indicative alignment

- Modification works to 400kV overhead line
- Proposed 400kV overhead line
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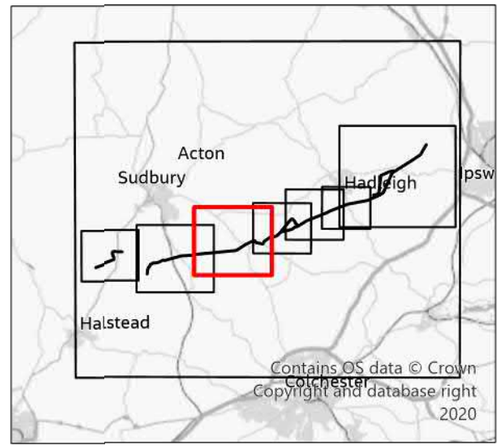

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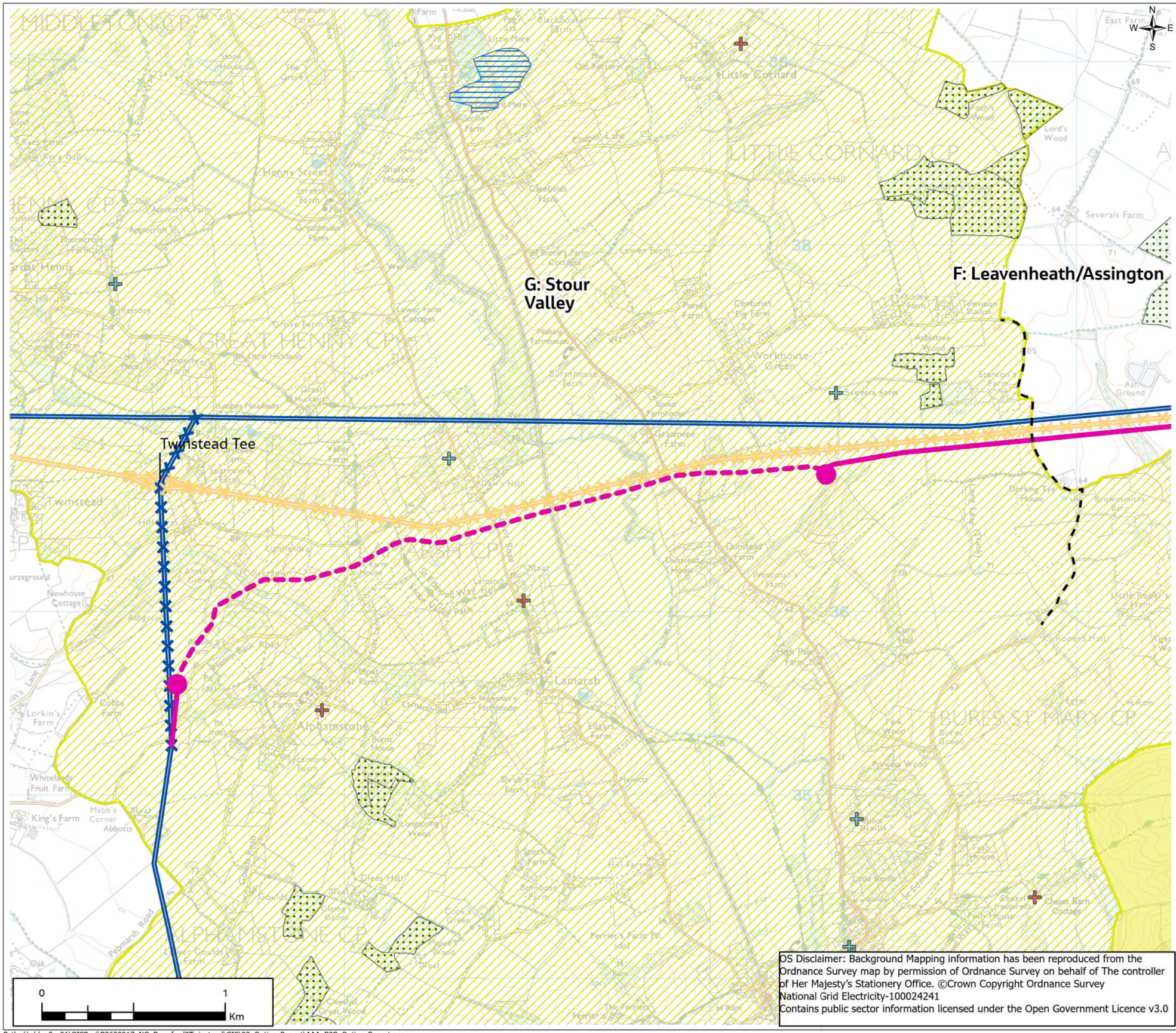
FIGURE 1



Legend

- Section boundaries
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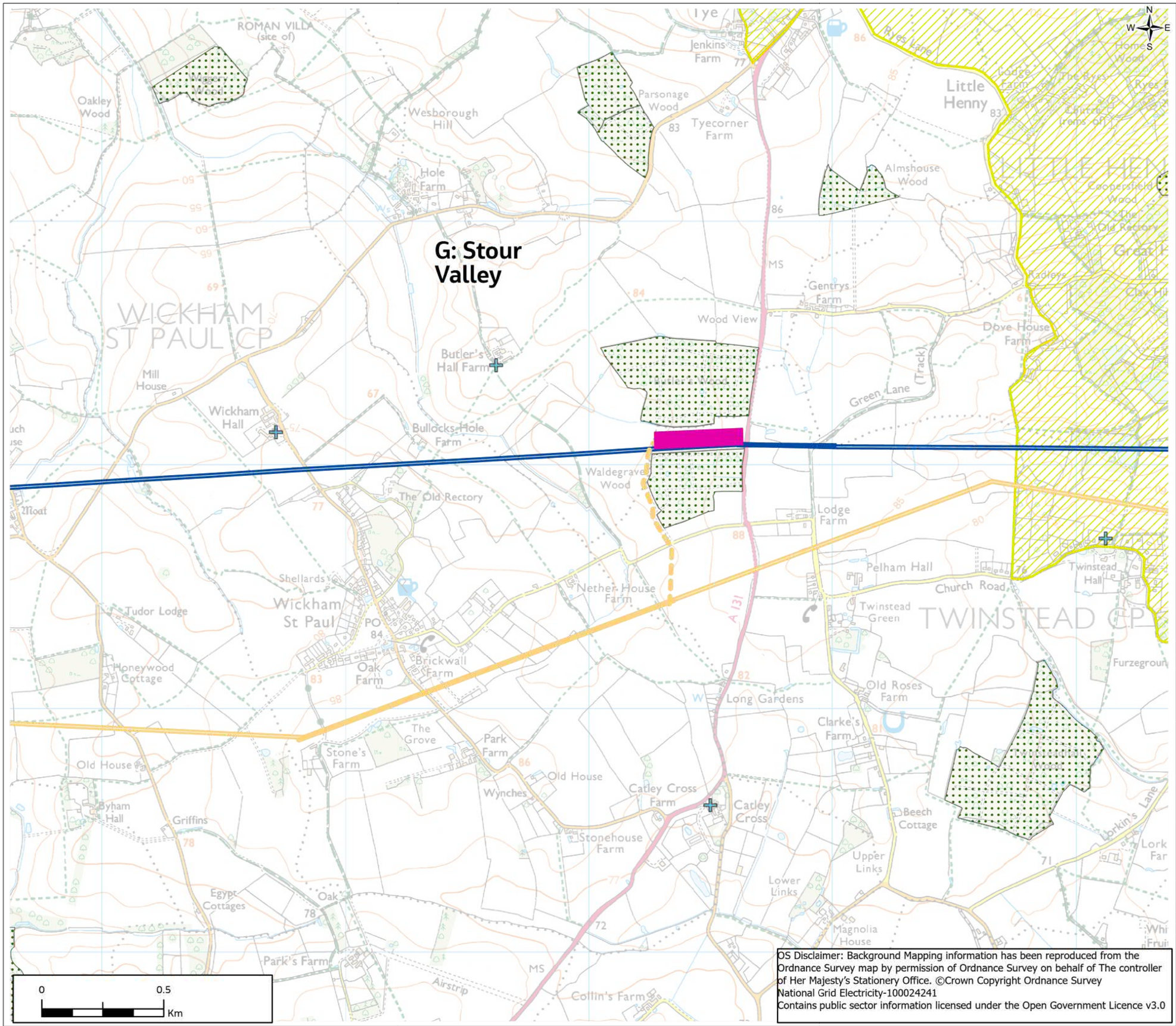
FIGURE 1



Legend

- Existing 400kV ohl
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Indicative alignment

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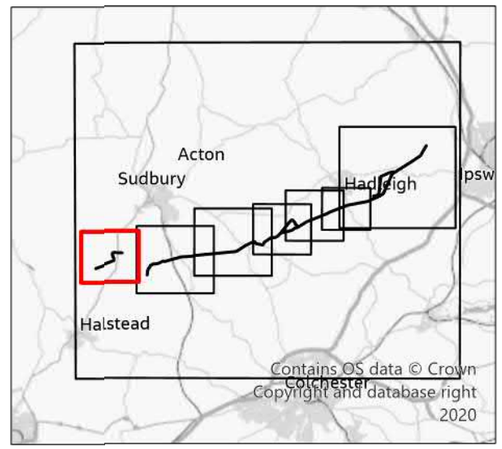

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