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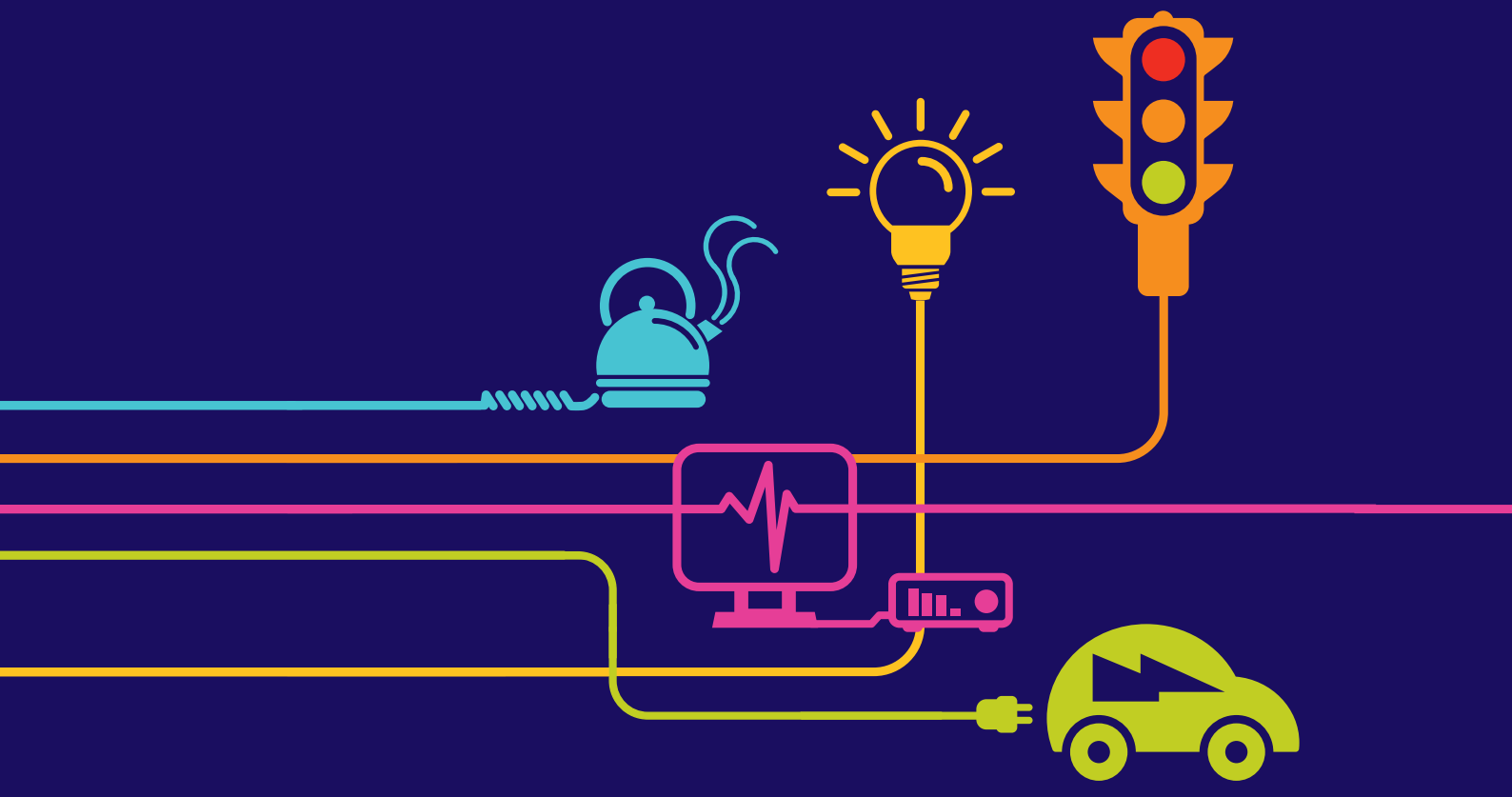
Environmental Statement Project Need and Alternatives Appendices 2S to 2V

Hinkley Point C Connection Project

Regulation 5(2)(a) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



Application Reference EN020001

May 2014

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Environmental Statement

Hinkley Point C Connection Project

5.2.2 – Project Need and Alternatives – Appendices (orange highlight indicates the contents of this Volume)

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2B	Hinkley Point C Connection Strategic Optioneering Report Additional Information (2010)
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2D	Hinkley Point C Connection Project Route Corridor Study (2009)
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2U	Western Power Distribution Undergrounding Cable Sealing End Platform Pylon Location Technical and Environmental Appraisal (2013)
2V	Western Power Distribution Undergrounding of Sections of 132kV Overhead Lines G, BW Route and Seabank Line Entries Technical and Environmental Appraisal (2013)

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Appendix 2S – Western Power Distribution Connection between the Proposed Sandford Substation and the Existing N Route Overhead Line Technical and Environmental Appraisal (2013)

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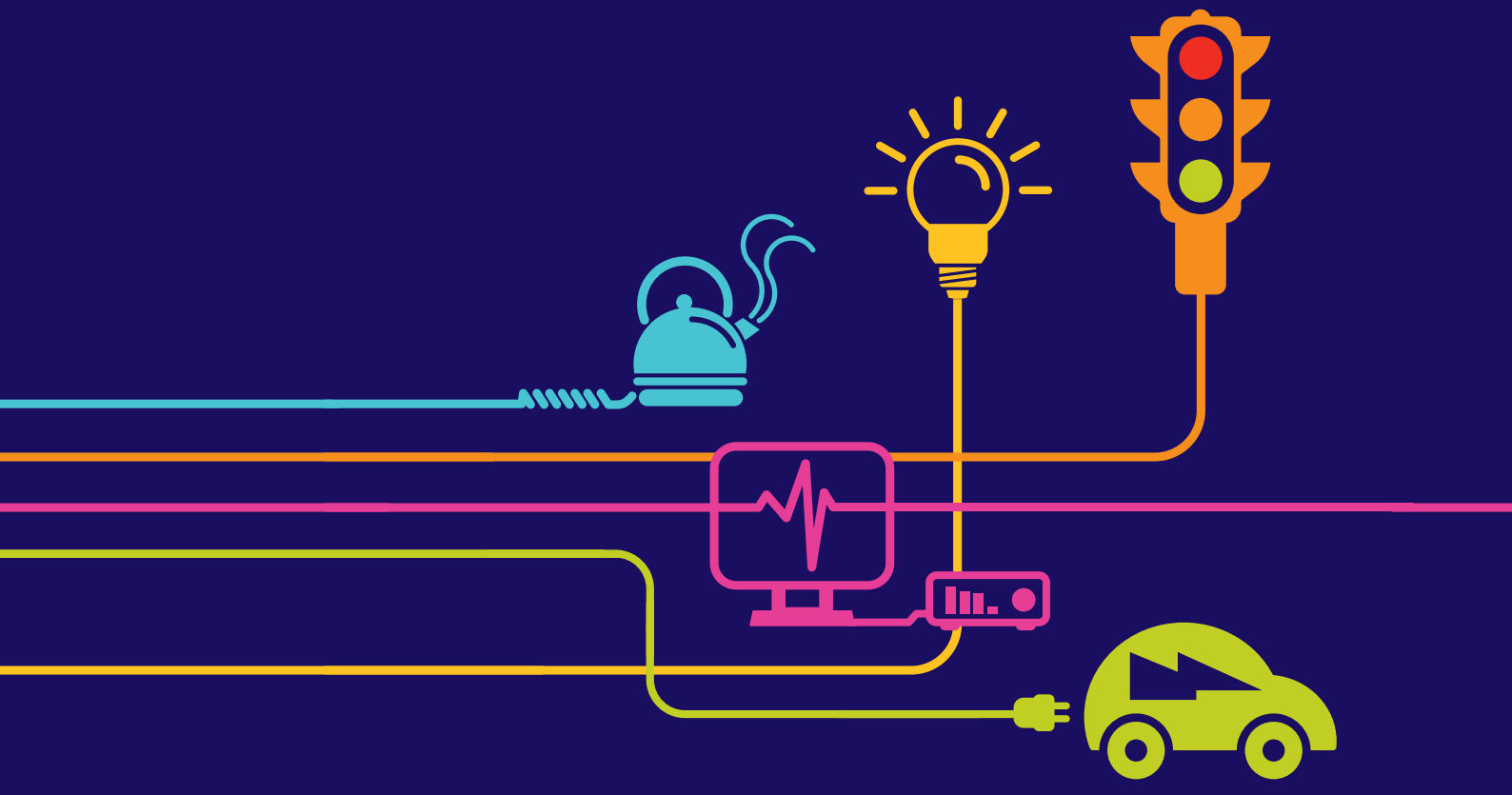
Western Power Distribution Connection between the proposed Sandford Substation and the existing N route overhead line Technical and Environmental Appraisal

Hinkley Point C Connection Project



August 2013

Hinkley Point C Connection Project

Western Power Distribution

Technical & Environmental Options Appraisal:

Connection between the proposed Sandford substation and the existing 132,000 volt N Route overhead line

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August, 2013

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1. Introduction

1.1 This report has been prepared jointly by National Grid Electricity Transmission Limited (National Grid) and Western Power Distribution (South West) PLC (WPD).

1.2 The purpose of this report is to inform statutory consultees and other stakeholders of the range of options considered by WPD and National Grid for restoring supplies to Churchill Bulk Supply Point (BSP)[1] by connecting the existing 132kV N Route overhead line to the proposed Sandford Grid Supply Point (GSP)[2] (see Figure 1.1), and to invite comments on the analysis and recommendations made within.

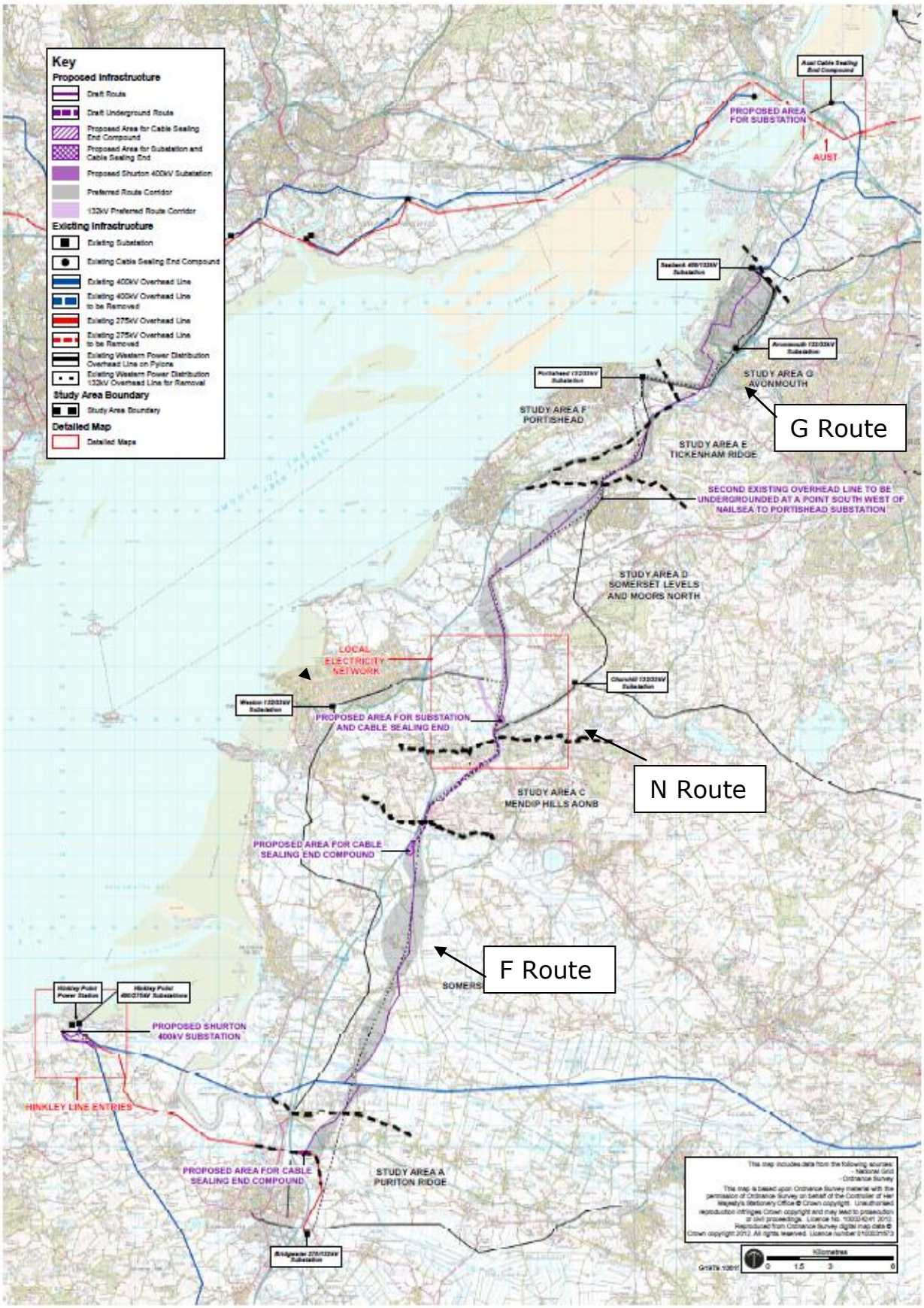
1.3 To accommodate the connection of a new nuclear power station at Hinkley Point, Somerset, a new 400kV transmission connection is proposed between Bridgwater, Somerset and Seabank GSP, near Avonmouth. Information on the project can be found at www.hinkleyconnection.co.uk

1.4 The preferred route for this new transmission connection broadly follows the route of an existing 132kV overhead line (known as the F Route between Bridgwater and Portishead and the G Route from Portishead onwards). This 132kV overhead line is operated by WPD and is to be removed between Bridgwater and Avonmouth substations as part of the Hinkley Point C Connection project.

[1] A BSP transfers power from 132kV to voltages for onward distribution to local towns, villages etc Bulk Supply Point (BSP) substations operate at 132kV, 66kV and 33kV and provide a distribution hub where power is transformed to voltages for onward distribution to local towns, villages, farms and industry.

[2] The connection of the National Grid transmission network and local distribution networks occurs at Grid Supply Points (GSP). These are typically substations where power is transformed from 400kV or 275kV to 132kV or below for onward distribution to consumers.

Figure 1.1 Preferred Route Corridor showing existing 132 kV F and G Routes



1.5 The removal of WPD's 132kV double circuit overhead line between Bridgwater and Avonmouth substations disconnects the electricity supply to consumers in the Weston-super-Mare and Churchill areas. As a result National Grid and WPD must restore supplies to the electricity distribution system in these areas.

1.6 A Distribution System Options Report was produced by National Grid and WPD which set out the options for restoring supplies[3]. The preferred option required a new GSP substation in the vicinity of Sandford and, amongst other works, connection of an existing 132kV overhead line that supplies Churchill BSP, referred to in this report as the 132kV N Route, to the new GSP.

1.7 This report considers options for the infrastructure modifications required in the vicinity of the new Sandford GSP to connect it with the existing overhead line, N Route. This will create a connection between the proposed Sandford GSP and the existing Churchill BSP.

1.8 The structure of this document is as follows**:**

- Section 1 provides an introduction;
- Section 2 identifies the duties of National Grid and WPD;
- Section 3 outlines the need for infrastructure modifications on the N route
- Section 4 outlines options to connect the existing N Route to the proposed GSP;
- Section 5 provides details of the scope of appraisal of options;
- Section 6 provides a summary of the appraisals;
- Section 7 confirms the preferred connection option.

[3] Hinkley Point C Connection Project: Distribution System Options Report

2. Duties of National Grid and Western Power Distribution

2.1 Section 9 of the Electricity Act 1989 (known as the "Electricity Act") requires National Grid and WPD to develop the transmission and distribution systems in an efficient, coordinated and economical manner.

2.2 In order to meet this statutory obligation, National Grid and WPD seek to make the most efficient use of its existing infrastructure by measures such as managing power flows and investing in upgrading existing connections and substations, before considering investment in new infrastructure. They then consider the implications for efficiency, coordination and cost effectiveness in evaluating a range of options in its strategic decision making. The lowest cost solutions are not always adopted, as other considerations, such as environmental impacts, may favour alternative solutions therefore a balance needs to be struck.

2.3 Under section 38 of the Electricity Act, both National Grid and WPD have a duty, when putting forward proposals for new development, to consider the preservation of amenity, including the natural environment, cultural heritage, landscape and visual quality. Appendix A of this report includes the Western Power Distribution and National Grid Roles and Obligations' which are to be followed when considering the siting and installation of new infrastructure.

2.4 In producing this report National Grid and WPD have balanced technical, socio-economic, environmental and cost considerations in selecting project options. The technical and environmental appraisal process is explained in Chapter 5.

2.5 In developing its plans, National Grid and WPD have also taken into account the guidance contained in National Policy Statements, the National Planning Policy Framework and the Development Plan for the area. Further information on this policy background can be found in Appendix B.

2.6 The Holford Rules

2.6.1 National planning policy requires developers when proposing new projects to have regard to potential environmental impacts which include consideration of effects on (amongst others) the historic environment, landscape and visual amenity and biodiversity. Paragraph 2.8.7 of the National Policy Statement for Electricity Networks (EN5) at also requires developers to take

into account the principles included in the Holford Rules when siting new overhead lines.

2.6.2 The Holford Rules provide specific guidance for routeing overhead lines and were applied to the identification of route alignments. Further details on these can be found in Appendix A.

3. The need for infrastructure modifications on the N Route

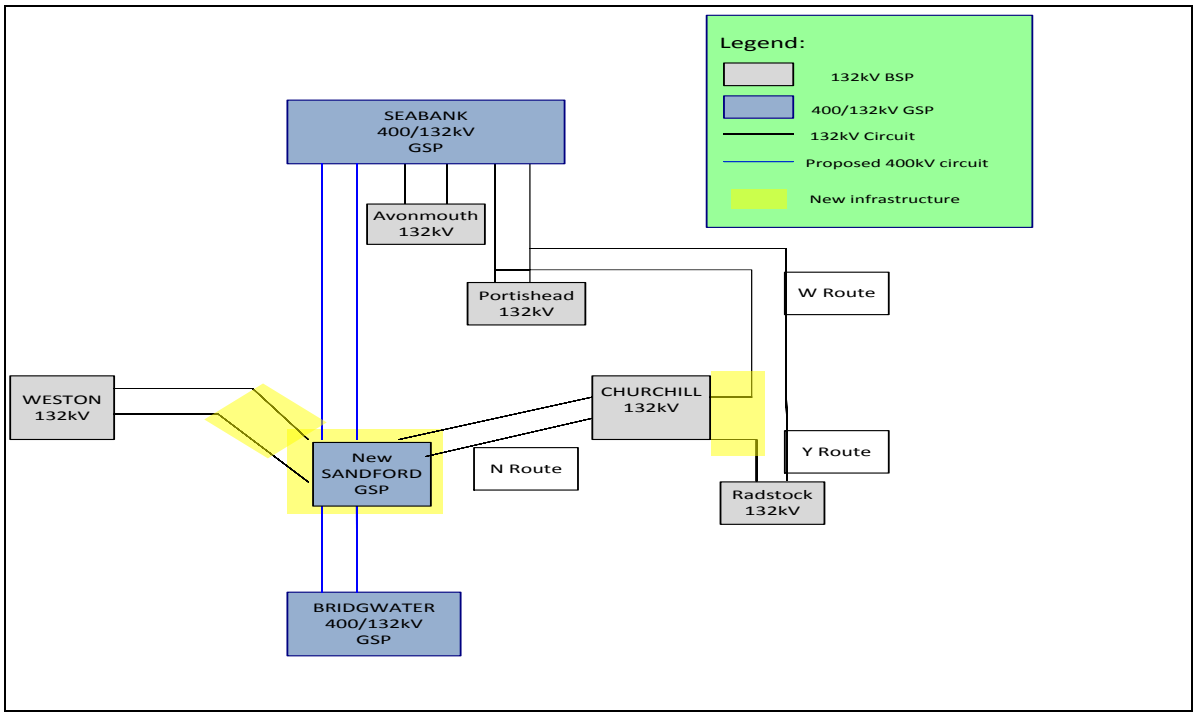
3.1 The removal of the existing WPD 132kV double circuit overhead line which runs between Bridgwater and Avonmouth Substations means that the distribution supply to Churchill and Weston-super-Mare Substations will be lost. As a result a new connection must be established.

3.2 To achieve this it is planned that a new 400/132kV GSP substation is developed near to the proposed Bridgwater to Seabank 400kV connection at Sandford (see Figure 3.1 below). Connection from the proposed Sandford GSP to Churchill BSP would be via an existing 132kV double circuit overhead line, the 132kV N Route.

3.3 The 132kV N Route currently connects with the F Route overhead line (which will be removed) at pylon F-77. To enable connection of the existing 132kV N Route overhead line to the new Sandford GSP a new short connection must be made.

3.4 This report considers options available to connect the 132kV N Route overhead line to the proposed Sandford GSP. The report outlines the appraisal that has been completed to identify the preferred technical and environmental option.

Figure 3.1 – Schematic of proposed changes to Local Distribution Network in the Sandford area



4. Options to connect the existing N Route to Sandford GSP

4.1 Routeing Information

4.1.1 Three technically compliant options have been considered to connect the existing 132kV N Route to the proposed Sandford GSP.

4.1.2 At the closest point the existing 132kV N Route is approximately 250 metres from the proposed GSP.

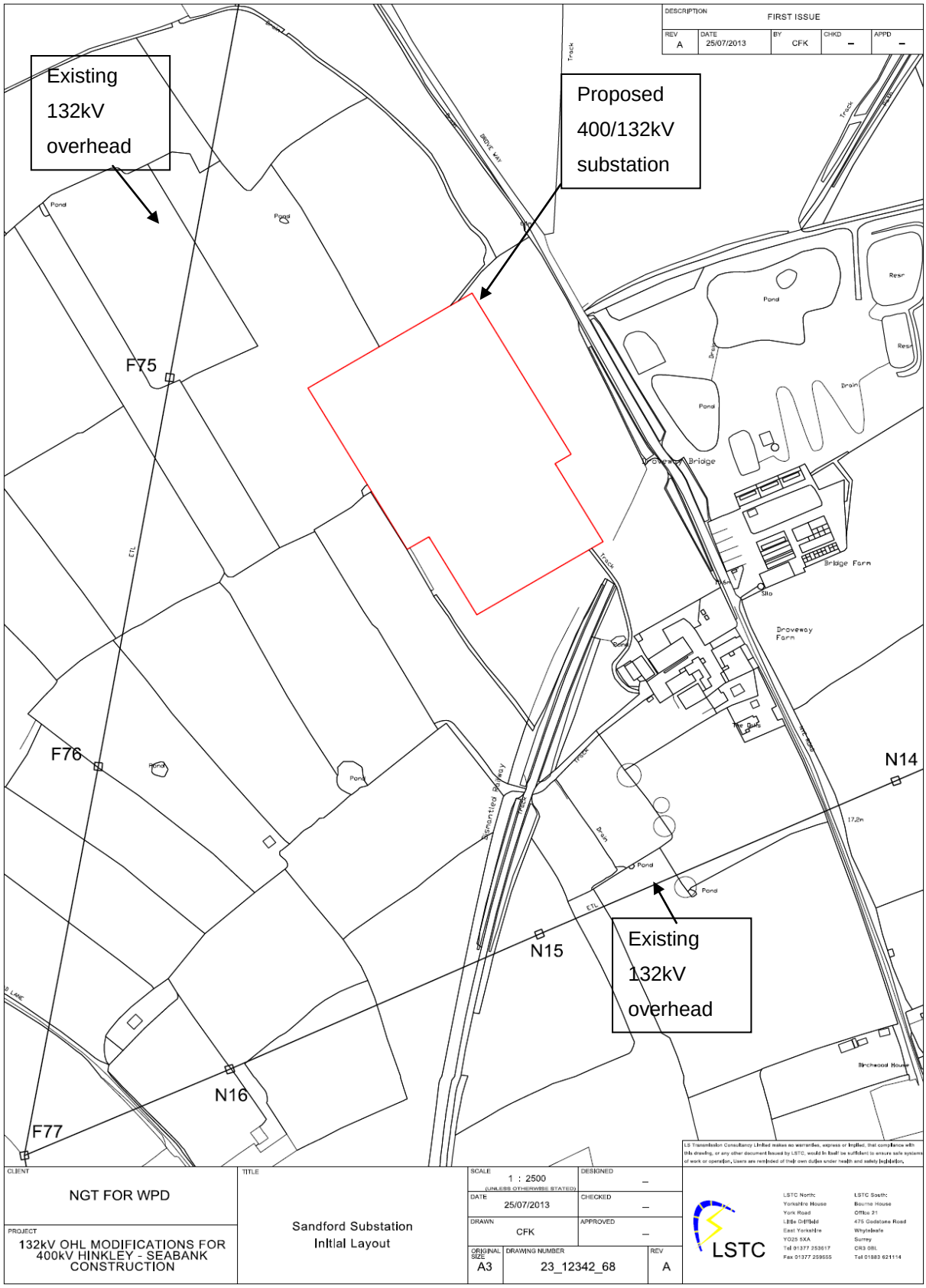
4.1.3 Figure 4.1 below shows the proposed location of the Sandford GSP.

4.2 Types of Technology

4.2.1 The following 132kV overhead line technology options are assessed:

- 132kV steel lattice pylons;
- Two circuits of wood H pole with underslung earthwire
- 132kV double circuit underground cable

Figure 4.1: Proposed Sandford Substation Location



4.3 **132kV Steel Lattice Pylons**

4.3.1.1 A double circuit 132kV overhead line could be carried on a single line of steel lattice pylons approximately 29m high. The span between each pylon would be approximately 250m.

4.3.1.2 With steel lattice, if the overhead line needs to change direction a stronger pylon is required to accommodate the increased structural strain. (These pylons are referred to respectively as "angle" pylons and "terminal pylons"; please see Appendix D for details of these pylons). These types of pylon have heavier steelwork and larger footprints compared to standard steel "suspension" lattice pylons (which are typically pylons located in a straight-line). However, they could be smaller in height than the suspension pylon at approximately 26m and 29m respectively.

4.3.1.3 If the overhead line is transferred to an underground connection, stronger pylons are required to accommodate the increased structural strain. These pylons are referred to respectively as "cable sealing end platform pylons" (CSEPP) (see Appendix D for a picture of this pylon). These types of pylon have heavier steelwork and larger footprints.

4.3.1.4 Steel lattice pylons need steel tube pile foundations and, in most cases are driven in the ground to a depth of approximately 15m. Angle pylons and terminal pylons are likely to require numerous piles per leg with a pile cap. Suspension pylons would require one pile per leg without a pile cap.

4.3.2 **132kV wood H pole with underslung earthwire**

4.3.2.1 A double circuit 132kV overhead line could be carried on two lines of single circuit wood pole structures, each comprising an H formation of 2 wood poles connected at the top with a steel lattice crossarm frame. These wood pole structures are approximately 14 metres tall, and the spans between each wood pole structure would be approximately 90m.

4.3.2.2 With wood pole, if the overhead line needs to change direction or terminate at the end of the line, stayed tension structures are required to accommodate the increased structural strain (these structures are referred to respectively as "angle" poles and "terminal poles"; please see Appendix E for details of these structures). These types of structure have

larger footprints compared to standard "suspension" wood pole structure (which are located in a straight-line).

4.3.2.3 Foundations for the wood pole structures are designed to suit the ground conditions encountered at each location. In poor soils, the foundations typically comprise a small pile group, possibly of screw type steel piles, connected below ground level to a steel frame into which the wood pole would sit.

4.3.3 Generic Access Issues Associated with the Construction of Overhead Lines

4.3.3.1 For the construction of an overhead line for both overhead line support types, temporary access roads (or a trackway) and working areas would need to be installed at each pylon/wood pole location. A temporary access road may provide access to one or all of the pylon locations. To minimise lorry movements and material handling, the steel pylon material would be delivered directly to site. Delivery of conductors (wires) is usually initially taken to a centralised storage facility before being transported to its pulling position. Normal construction traffic routes will be agreed in advance with the Highway Authority.

4.3.4 132kV Underground Cable Design

4.3.4.1 A number of technical constraints were also considered in devising cable alignments. For example, the ability of the cable to deviate sharply is restricted by its maximum bending radius. For the purposes of the appraisals, it has been assumed that the cable installation for a double circuit will require two sets of three cables generally laid in open trenches. The cables will be insulated with Cross Linked Polythene (XLPE) cables as opposed to fluid filled cables.

4.3.4.2 The area of land required for the construction of the double circuit underground cables would be up to 30 metres wide (see Appendix C). The trenches are separated by a temporary haul road which would run along the entire route and serve as a traffic route for construction vehicles.

4.3.4.3 It has been assumed that, exceptionally, horizontal directional drilling (HDD) would be used to cross areas of engineering difficulty, for example, to cross the drove way road as there is a steep change in

gradient and the cables need to be kept to the same depth. HDD is a steerable trenchless method of installing underground cables by using a surface launched drilling rig, with minimal impact on the surrounding area which allows vegetation to be retained. For underground cable installations, a number of pipes are installed using the HDD method and the cables are then pulled through the pipes during the cable installation phase. Once the cables have been installed the pipes are filled with bentonite to maintain the cable rating.

4.4 Route options

4.4.1 Option 1 – Underground Cable

4.4.1.1 Option 1 outlined in Figure 4.2 below is to make the connection by underground cable. This would require the introduction of a new CSEPP in order to make the transition from overhead line to underground cable. In this option it is proposed to replace existing pylon N14 with a new CSEPP. The underground cables would be routed in the fields adjacent to Nye Road as indicated by the solid red line in Figure 4.2., and then cross the railway bridge to join the proposed Sandford substation (A schematic of a typical 132kV underground cable section and an example of a CSEPP can be seen in Appendix D).

4.4.1.2 The two existing pylons (N15 & N16) and overhead lines between the new CSEPP and pylon F77 would be removed.

4.4.2 Option 2 – Steel Lattice Pylons

4.4.2.1 Option 2, outlined in Figure 4.3 below, proposes a new double circuit overhead line on steel lattice pylons that includes a new angle pylon to the west of existing pylon N14.

4.4.2.2 The new connection would cross the disused railway line before turning into the southern end of the substation. An additional angle pylon would be required on the northern side of the disused railway and a terminal pylon to the south of the substation.

4.4.2.3 The existing pylons (N15 & N16) and overhead lines between the new angle pylon and pylon F77 would be removed.

4.4.3 Option 3 – Horizontal H wood pole

4.4.3.1 Option 3 outlined in Figure 4.4 below proposes a new double circuit overhead line on wood pole structures. This will include two lines of single circuit wood poles. A new terminal pylon is proposed to the west of existing pylon N14 to facilitate connections between the existing steel lattice pylons on the 132kV N Route and the wood pole structures. An additional wood pole angle pylon would also be required on the northern side of the disused railway.

4.4.3.2 The existing pylons (N15 & N16) and overhead lines between the new angle pylon and pylon F77 would be removed.

Figure 4.2: Option 1 Underground Cable

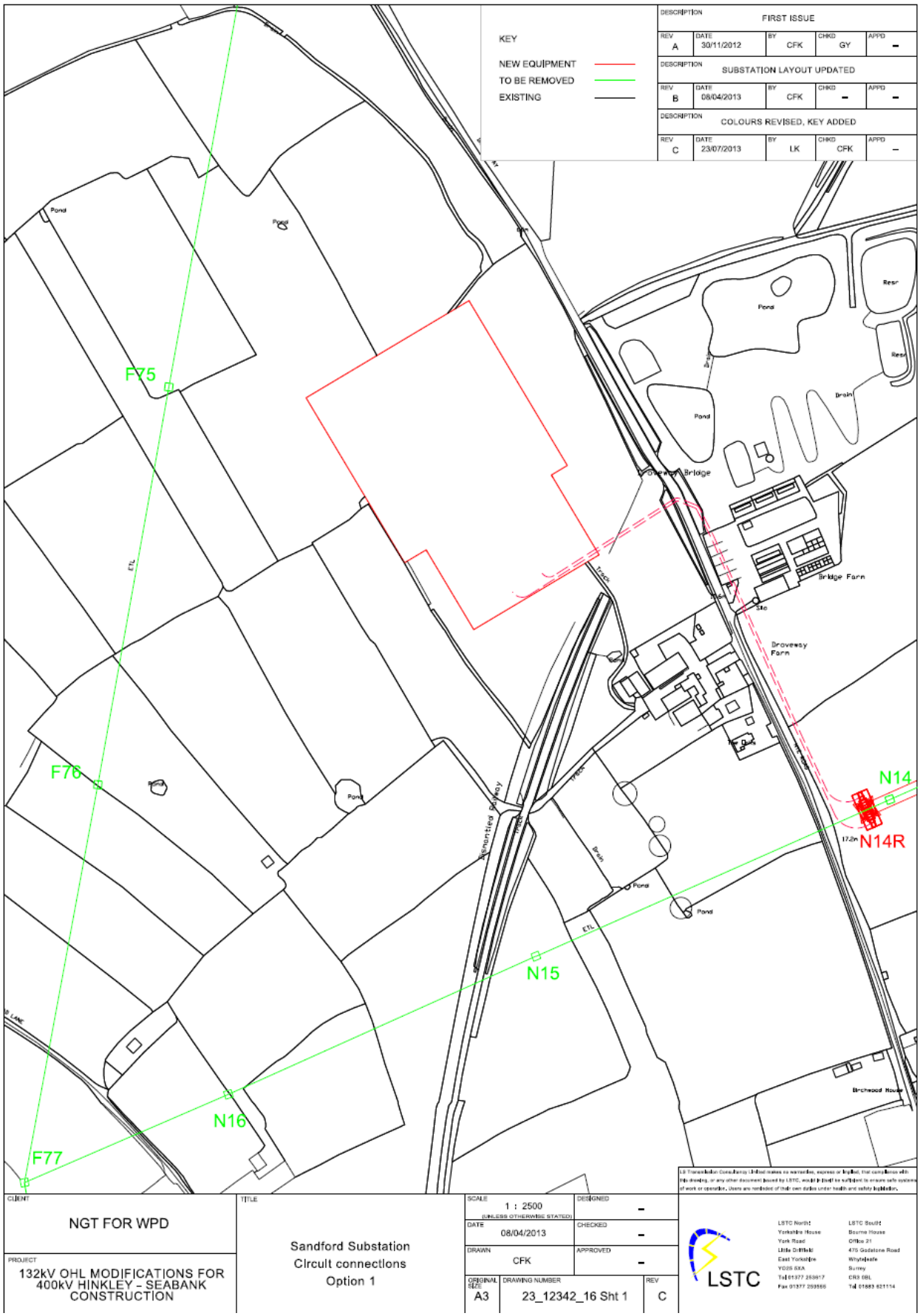


Figure 4.3: Option 2 – Steel Lattice Pylon

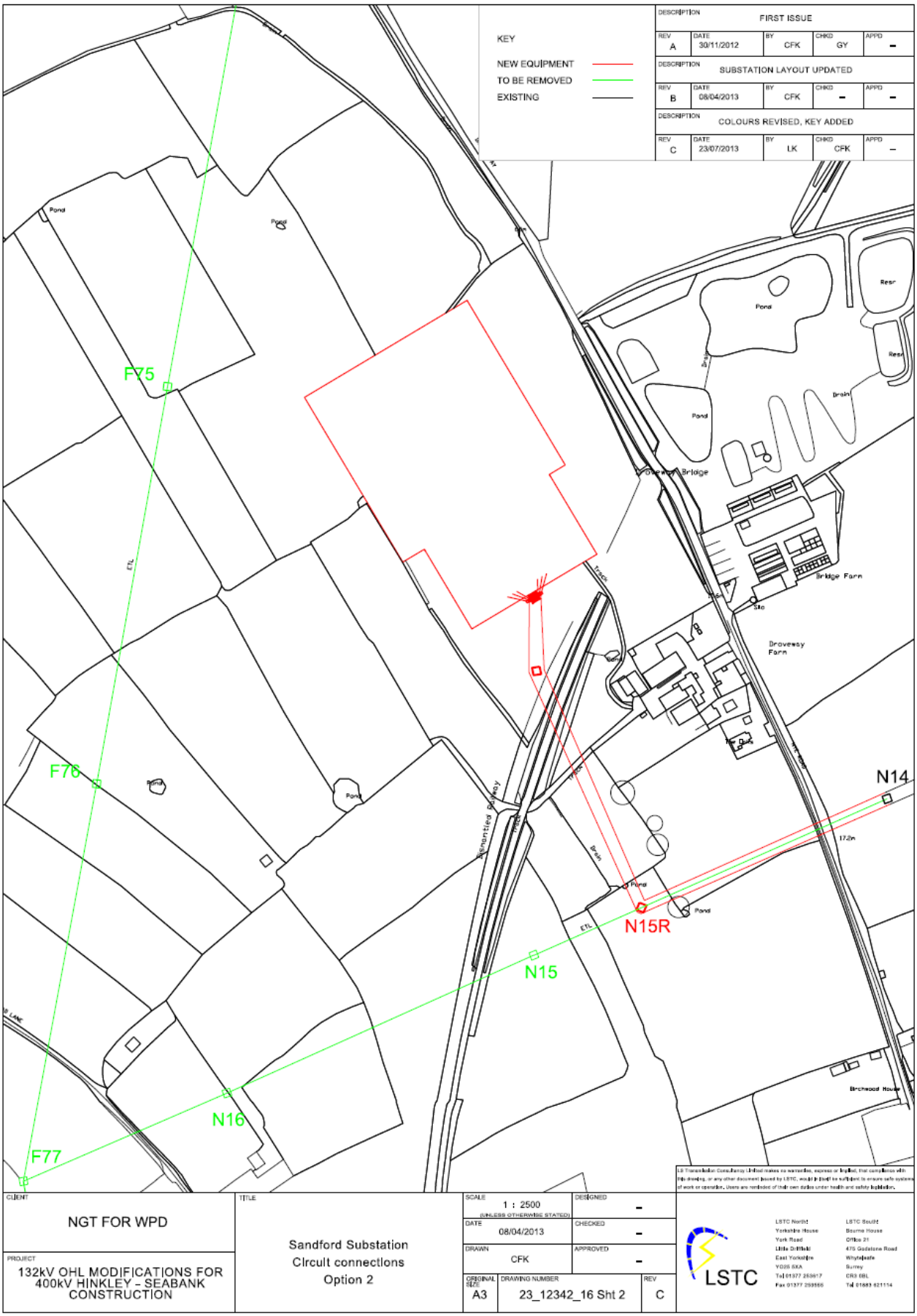
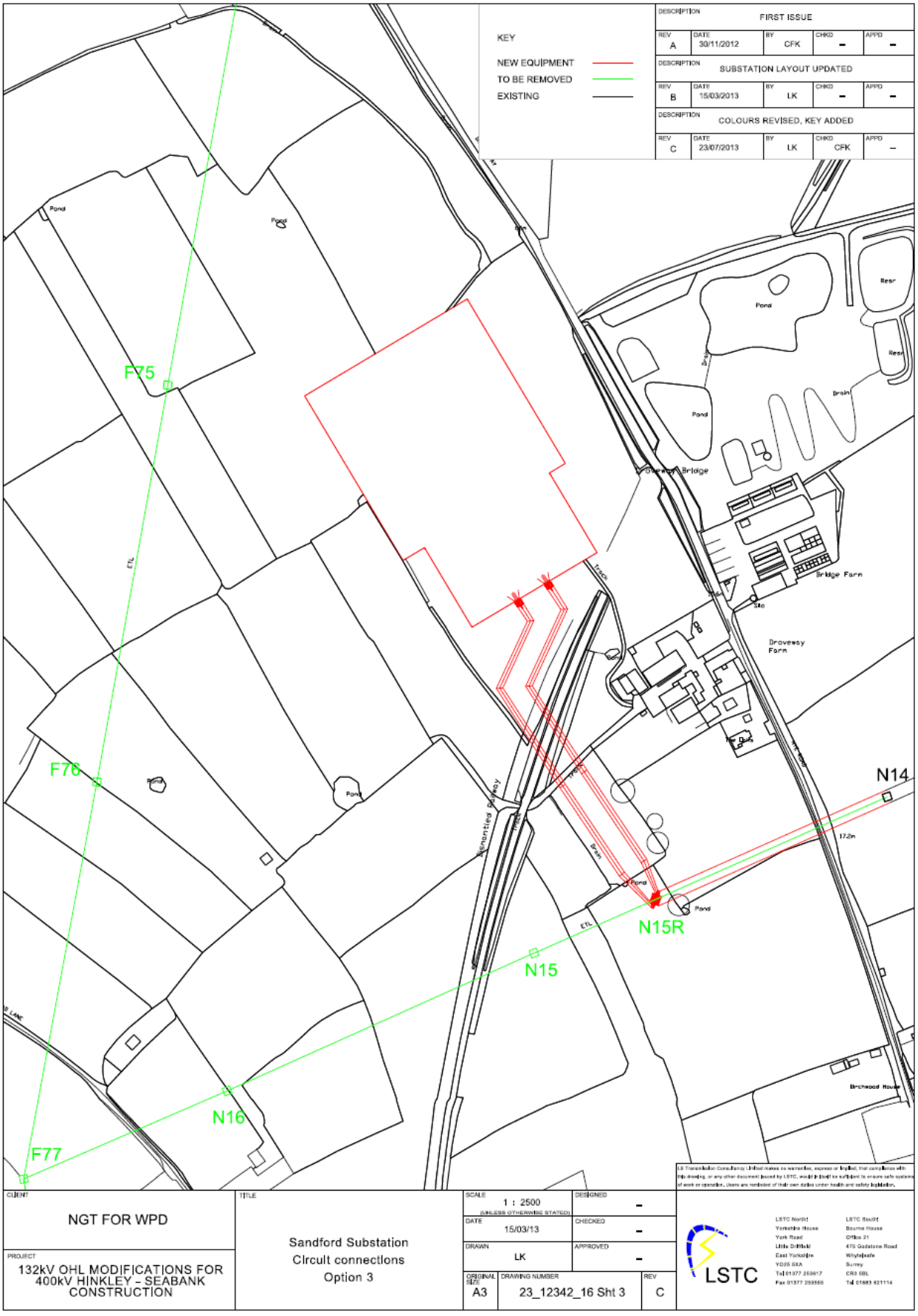


Figure 4.4 Option 3 – Horizontal H Wood Pole



5. Scope of Appraisal of Options

5.1 This appraisal is an analysis which considers relevant technical, environmental and economic issues associated with each technology option. Analysis of these factors allows the assessment of which option best meets National Grid and WPD's statutory and licence obligations (see Appendix A).

5.2 Technical Appraisal

5.2.1 Each option has been assessed initially to ensure that it would comply with the standards set out in P2/6[4]. This means that the implications on both the local and wider distribution network are fully assessed before connection options are appraised.

5.3 Economic Appraisal

5.3.1 Once the scope of works associated with each connection option is identified, an estimate of the Capital and Lifetime cost is made.

5.3.2 Capital cost is an estimate of the cost of equipment and installation costs. These costs are provided in current financial year prices applicable at the time of publication of this Report. For the purposes of reviewing technical options, the cost estimates are based on generalised unit costs for the key elements of the option, reflecting recent contract values or manufacturers' or consultants' budget estimates.

5.3.3 Lifetime cost is an estimate of the capital cost plus the distribution losses and maintenance costs for the specific overhead line, underground cable elements of the connection options over a 40 year lifetime. The lifetime cost estimate methodology is explained in Appendix F.

5.4 Environmental Appraisal

5.4.1 A high level planning and environmental appraisal, has been undertaken to consider environmental constraints of national and international importance for the potential route options. The high level environmental constraints present in the local area are illustrated at Appendix G.

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[4] P2/6 can be purchased from www.energynetworks.org

5.4.2 Effects on **landscape and visual amenity** are recognised as important factors in determining the merits of different options. This was confirmed by responses during all stages of consultation to date for the Bridgwater to Seabank Connection and is recognised by the establishment of a Landscape and Views Thematic Group. The effects of underground cable options on landscape and visual amenity are generally considerably less than the effect of overhead line options.

5.4.3 The importance of assessing effects on **ecology** is recognised by the establishment of an Ecology and Biodiversity Thematic Group. Underground cable options have the potential for greater effects on ecology than overhead line options because of the extent of land affected during cable installation and associated habitat disturbance.

5.4.4 The importance of assessing effects on the **historic environment** is recognised by the establishment of a Historic Environment Thematic Group. Underground cable options have the potential for greater effects on unknown archaeology than overhead line options because of the greater extent of ground disturbance.

5.4.5 Consideration of electro-magnetic fields is excluded from the assessment because both National Grid and WPD design their system to be compliant with ICNIRP guidelines[5] on exposure to electric and magnetic fields. An assessment of the potential impact of electric and magnetic fields will be included in the Environmental Impact Assessment (EIA).

[5] International Commission on Non-Ionising Radiation Protection : Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields : 1998

6. Consideration of Options

6.1 This chapter presents the assessment of Options 1,2 and 3.

6.2 **Technical & Economic**

6.2.1 All the options are technically compliant.

6.2.2 The Capital and Lifetime cost estimates for each option are provided in the table 6.1 below.

6.2.3 The cost of undergrounding a double circuit 132kV underground cable is £2M per kilometre.

Table 6.1: Capital and Lifetime Cost Estimates for each Option

Option	Detail	Capital Cost	Lifetime Cost
1: Underground Cable	• 2 circuits approximately 280 metres underground cable • Remove two pylons	£560k £40k **Total estimated capital cost =** **£600k**	**£616k**
2: Steel Lattice Pylons	• 3 new steel lattice pylons & approximately 250m new overhead line • Remove two pylons	£175k £40k **Total estimated capital cost =** **£215k**	**£231k**
3: Horizontal H wood pole	9 new wood pole structures & approximately 250m new overhead line • Remove two pylons	£110k £40k **Total estimated capital cost =** **£150k**	**£166k**

6.3 **Environment**

6.4 There are a number of issues that are common to each option under the environmental topics as explained below. An assessment is then given on each individual option for each environmental topic.

6.4.1 **Historic Environment**

6.4.1.1 There are no designated historic features in the vicinity of the proposed routes that could be affected by any of the three options. There are listed buildings in the local area but these are typically in settlements, are enclosed by other buildings and their setting is unlikely to be affected as a result of installing these options.

6.4.1.2 The closest designated asset is the former Sandford Station and a Sunday School, both Grade II listed, approximately 500m to the south. The setting of these buildings includes other development in the immediate surroundings. The area around them is generally enclosed by other buildings and there are significant groups of trees including orchards on the intervening land to the north which provide screening in that direction toward the substation.

6.4.1.3 Two non-designated built heritage receptors of low sensistivity are located adjacent to the and have settings that would be affected by it. These are Droveway Farm, constructed in the 18th or 19th century and the former railway. In addition the development would take place in an historic landscape character zone of late Medieval enclosed open fields, which is of moderate sensitivity. Effects resulting from changes to setting and effects on historic landscape character would result from construction of new overhead line, as well as the temporary construction and decommissioning works.

6.4.1.4 The proposals are in an area of moderate potential to contain buried archaeological remains of low or moderate sensitivity. No archaeological remains have been located within the footprint of the proposals; however, prehistoric and Roman remains have been located along Nye Drove approximately 1km to the north, and Nye Farm is a scheduled medieval moated site. In addition, Nye Road is a driveway that probably dates from the Medieval period or earlier, and Droveway Farm is post-medieval in date but may have earlier origins. There is potential for agricultural features, roadside ditches or other activity dating from the

Post-medieval, Medieval or earlier periods to be present in this area. Borrow pits associated with the railway construction are known to be in the vicinity of Bridge Farm, but these are of negligible sensitivity as heritage receptors.

6.4.2 **Ecology**

6.4.2.1 There are no nationally designated sites in the area immediately surrounding the substation. The nearest Sites of Special Scientific Interest (SSSI) (Puxton Moor and Banwell Ochre Caves) lie approximately 1.2km to the north and south west of the substation site respectively. The overhead line and underground cables routes are within the 5km consultation zone for the North Somerset and Mendip Bats Special Area of Conservation (SAC).

6.4.2.2 Potential effects to European sites could include impacts on bat species, through hedgerow and/or tree removal, which are associated with the North Somerset and Mendip Bats SAC and/or the Mendip Limestone Grasslands SAC.

6.4.2.3 In addition to internationally and nationally designated sites, there are several locally designated nature conservation sites, of county importance, which may be adversely impacted by the proposed works. These include the Cheddar Valley Railway Walk Local Nature Reserve (LNR) (which includes a range of habitats supporting birds, amphibians and reptiles) and Towerhead Brook Site of Nature Conservation Importance (SNCI) which supports diverse invertebrate and botanical communities.

6.4.3 **Landscape and Visual Assessments**

6.4.3.1 Baseline views include existing overhead lines and development. There are significant blocks of trees and hedges in the local area which provide screening in views. The wooded slopes of the Mendip Hills Area of Outstanding Natural Beauty AONB provide a backdrop to views south.

6.4.3.2 The substation site and immediate surroundings are not in a designated area of landscape importance. The Mendip Hills AONB is approximately 1km to the south of the substation. There are wide panoramic views from the high ground in the AONB and this area around Sandford forms part of those views.

6.5 **Option 1 (Underground Cables)**

6.6 This option is described at 4.4.1 above.

6.6.1 **Historic Environment**

6.6.1.1 The removal of a short section of overhead line and the new CSEPP will result in changes to the settings of two non-designated heritage receptors and on the historic landscape character, such that they would experience an overall neutral or negligible beneficial effect.

6.6.1.2 The cable construction works may disturb as-yet unknown buried archaeological remains. Should this option be taken forward further investigation into the potential risks to buried archaeology and consideration of appropriate feasible mitigation would need to be undertaken in the EIA.

6.6.2 **Ecology**

6.6.2.1 The installation of underground cables and a new CSEPP could affect features such as drainage ditches, trees and hedges on the route and in working areas. There may be effects on protected species associated with affected habitats and potential effects on qualifying features of the SAC (e.g. horseshoe bats), caused through hedgerow removal for example that would need to be considered in accordance with the Conservation of Habitats and Species Regulations 2010(as amended).

6.6.2.2 Effects are likely to be a combination of temporary and permanent however the extent and significance of effects including Habitat Regulations Assessment (if necessary), and appropriate mitigation would need to be appraised should this option be taken forward. Standard good working practice, careful routeing and inclusion of mitigation measures could minimise overall potential effects.

6.6.3 **Landscape and Views**

6.6.3.1 The substation site and immediate surroundings are not in a designated area of landscape importance. The Mendip Hills Area of Outstanding Natural Beauty (AONB) is approximately 1km to the south of the proposed GSP and would form part of some wide panoramic views from the high ground in this area. Underground cables to the substation would not be visible and would therefore have no significant effects on views to

and from the AONB. The CSEPP would form a very small part of wide long-distance views from the AONB and the change from the existing N14 pylon is unlikely to be a discernible in those views.

6.6.3.2 The proposed underground cables would be routed adjacent to an existing road. Resultant effects on landscape character and views would be temporary and land would be restored on completion. There would be some permanent adverse effects on landscape character and visual amenity as a result of installing a new CSEPP although this would be a replacement for an existing pylon and overall effects would not be significant.

6.6.3.3 There would be some positive permanent effects on landscape character and visual amenity as a section of existing overhead line would be removed.

6.6.3.4 There could be some minor negative localised effects associated with the removal of hedges and trees during construction of the underground cables and the CSEPP. These effects can be mitigated by careful routeing to retain trees where possible, replanting hedges and, or planting of new trees and shrubs. Tree planting on land above underground cables is restricted but where practical and with landowner permission trees could be planted on land close by.

6.7 **Option 2 (Steel Lattice Pylons)**

6.8 This option is described at 4.4.2 above.

6.8.1 **Historic Environment**

6.8.1.1 The new overhead line would result in changes to the settings of two non-designated built heritage receptors and on the historic landscape character, such that they would experience minor adverse effects.

6.8.1.2 There is a potential for disturbance of buried archaeological remains in the works areas for the new pylons, due to the need for creation of access tracks and working area. Should this option be taken forward, further investigation into the potential risks to buried archaeological remains and the consideration of feasible mitigation would need to be undertaken in the Environmental Impact Assessment (EIA).

6.8.2 **Ecology**

6.8.2.1 Construction of a new overhead line using steel lattice pylons could affect habitats and features such as drainage ditches and trees and hedges on the route and in working areas. There may be effects on protected species associated with affected habitats. For example, the ditch habitat may support otter, water vole and amphibians. Whereas the hedgerow habitat may provide suitable opportunities for farmland birds and foraging and commuting bats. Effects are likely to be a combination of temporary and permanent. Should this option be taken forward appropriate mitigation for any temporary and permanent effects would be appraised including Habitat Regulations Assessment (if necessary).

6.8.2.2 There may be effects on protected species associated with affected habitats and potential effects on the SAC and qualifying features would also need to be considered as required by the Conservation of Habitats and Species Regulations 2010(as amended).

6.8.2.3 An overhead line option may also present a collision risk to bird species which are a qualifying feature of the Severn Estuary SPA and Ramsar site. However, the increase in the extent of overhead line would not be significant, compared to the existing situation. Ornithological assessments undertaken have not highlighted any areas of importance for birds in the vicinity of the site.

6.8.2.4 An overhead line would typically oversail features such as ditches and effects on hedges could be restricted to cutting back of small sections to enable oversail and safety clearances. Standard good working practice, careful routeing and inclusion of mitigation measures could minimise overall effects.

6.8.3 **Landscape Character**

6.8.3.1 The baseline character of the area concerned is already affected by existing overhead lines including N Route 132kV overhead line with lattice pylons which would limit overall effects on the landscape of installing a new overhead line. Effects on landscape character would be restricted to a localised area around the route of the new overhead line and could be minimised by avoidance and reinstatement of affected features such as hedges and trees. A section of existing overhead line (pylons N15 and

N16) would be removed and replaced by another in the locality resulting in an overall neutral effect on character.

6.8.3.2 There would be some permanent adverse effects on landscape character and visual amenity as a result of installing a new 132kV steel lattice pylon overhead line.

6.8.4 **Effects on Views**

6.8.4.1 Effects on views would mainly affect the closest visual receptors such as residents of nearby houses at Nye Road and Mead Lane and users of public rights of way. The overhead line would be visible from high ground in the AONB as a small part of panoramic long distance views. Steel lattice pylons are taller structures and generally visible over long distances. When viewed from above on higher ground, they would typically be seen against a background of the surrounding landscape which limits their prominence on such views.

6.8.4.2 A section of existing 132kV N Route overhead line to the west of the proposed overhead line turn-in would be removed and as a result there would a limited change from baseline conditions by introducing a new short section of overhead line to the substation as it would replace an existing feature of views.

6.8.4.3 For steel lattice pylons there would likely be some minor negative effects associated with removal of hedges and trees during construction. It could be possible to minimise long term effects by providing replacement planting although this may be restricted for safety reasons close to and beneath the line. Should this option be taken forward to formal consultation proposals will be considered for appropriate mitigation for any temporary and permanent effects including screen planting and replacement planting. Mitigation planting could be included where practical and with landowner permission.

6.9 **Option 3 (Wood Pole)**

6.10 This option is described at 4.4.3 above.

6.10.1 **Historic Environment**

6.10.1.1 The new wood pole structures would result in changes to the settings of two non-designated built heritage receptors and on the historic landscape

character, such that they would experience neutral or minor beneficial effects.

6.10.1.2 There is potential for disturbance of buried archaeological remains during installation of the wooden poles. If the wooden poles are driven the sub-surface disturbance is likely to be insufficient to result in significant adverse effects. If screw piles are required, a working area would be constructed for each pole. Should this option be taken forward, further investigation into the potential risks to buried archaeological remains and consideration of appropriate mitigation would need to be undertaken in the EIA.

6.10.2 **Ecology**

6.10.2.1 Construction of a new overhead line using wood pole structures could adversely affect habitats and features such as drainage ditches and trees and hedges on the route and in working areas. There may be effects on protected species associated with affected habitats. For example, the ditch habitat may support otter, water vole and amphibians. Whereas the hedgerow habitat may provide suitable opportunities for farmland birds and foraging and commuting bats. Effects are likely to be a combination of temporary and permanent. Should this option be taken forward appropriate mitigation for any temporary and permanent effects would be appraised including Habitat Regulations Assessment (if necessary).

6.10.2.2 There may be effects on protected species associated with affected habitats. These and potential effects on the SAC and qualifying features would also need to be considered as required by the Conservation of Habitats and Species Regulations 2010(as amended).

6.10.2.3 An overhead line option may also present a collision risk to bird species which are a qualifying feature of the Severn Estuary SPA and Ramsar site. However, the increase in the extent of overhead line would not be significant, compared to the existing situation. Ornithological assessments undertaken have not highlighted any areas of importance for birds in the vicinity of the site.

6.10.2.4 An overhead line would typically oversail features such as ditches. Effects on hedges could be restricted to cutting back of small sections to enable oversail and safety clearances. Standard good working practice, careful

routeing and inclusion of mitigation measures could minimise overall effects.

6.10.3 **Landscape Character**

6.10.3.1 The baseline character of the area concerned is already affected by existing overhead lines including N Route 132kV line with lattice pylons which would limit overall effects on the landscape of installing a new overhead line. Effects on landscape character would be restricted to a localised area around the route of the new overhead line and could be minimised by avoidance and reinstatement of affected features such as hedges and trees. A section of existing overhead line (pylon N15 and N16) would be removed and replaced by another in the locality resulting in an overall neutral effect on character.

6.10.3.2 There would be some permanent adverse effects on landscape character and visual amenity as a result of installing a new double circuit wood pole overhead line.

6.10.4 **Effects on Views**

6.10.4.1 Wood poles would be lower in height than steel lattice pylons and would integrate well into the background in views. It is unlikely that a wood pole overhead line would be perceptible in views over longer distances such as from the AONB.

6.10.4.2 As outlined above for the steel lattice pylon option, there would be limited change from baseline conditions by introducing a new short section of overhead line to the substation as it would replace an existing feature of views. Wood poles are lower in height and made from a natural material which means that they can be screened by trees and hedges in some views and they typically merge in views where there is a background of trees.

6.10.4.3 For wood poles there would likely be some minor negative effects associated with removal of hedges and trees during construction. It could be possible to minimise long term effects by providing replacement planting although this would be restricted for safety reasons close to and beneath the line. Should this option be taken to consultation proposals will be considered for appropriate mitigation for any temporary and permanent effects including screen planting and replacement planting.

Mitigation planting could be included where practical and with landowner permission.

6.11 Comparison of Options

6.11.1 Historic Environment

6.11.1.1 From a historic environment perspective, given that Option 1 has the potential for greater effects on as-yet unknown buried archaeological receptors, the preference is for an overhead line option. Given the greater adverse effect on built heritage and historic landscape character that would result from steel lattice pylons compared to the wooden pole structures, Options 3 is preferred over Option 2.

6.11.1.2 From an historic environment perspective, the potential in combination effects of the other proposed developments in this area: new 400/132kV substation in Sandford and 400kV connections[6], and the new connection between the substation and the existing AT Route[7], would not make a difference to which option should be taken forward for consultation. While there are differences between options, the degree to which in combination effects would alter the significance of overall effects, they would not be of a sufficient degree to alter the assessment outlined above.

6.11.1.3 The potential in combination effects of the other Proposed Developments in conjunction with the new N Route connection would be greater on any buried archaeological remains that may be present if Option 1 was chosen. This is because any remains (particularly if they date to Roman or earlier periods) are likely to be present on both sides of the droveway (Nye Road) and therefore would be affected both by works for the N Route and the construction of Sandford substation. The combination of works at Sandford substation and other elements of the Proposed Development with Option 1 for the N Route may therefore cause complete or almost complete truncation of any remains that straddle the road. This is particularly the case as any such remains are unlikely to extend north due to the presence of a former borrow pit for the railway's construction.

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[6] Hinkley Point C Connection Project Connection Options Report

[7] WPD, AT Route Connection Options Report

6.11.1.4 The potential in combination effects of the other Proposed Developments in conjunction with the new N Route connection would be greater with regard to Droveway Farm and the railway, and to the historic landscape character. This is due to the increasing dominance in their settings of the new substation and other overhead lines. This increase in effect would take place for all options, although it would be greater if Option 2 were chosen than if Option 1 or 3 were chosen.

6.11.2 **Ecology**

6.11.2.1 Option 1 would involve trenching and ground disturbance to install the underground cables which could be damaging to existing habitats, including features of local value such as ditches and hedges.

6.11.2.2 Options 2 and 3 would largely oversail existing features such as ditches without adversely affecting them and pylons may be carefully sited to avoid conflict with species and habitats and therefore at this stage this would present no significant constraints to routeing or differentiate between the overhead line options.

6.11.2.3 The potential in combination ecological effects of the other proposed developments in conjunction with the new N Route connection would not be a significant factor in determining which connection option should be taken forward for consultation.

6.11.2.4 We have reached this view on the basis that if an underground route is selected the impact on ecological receptors would be a direct result of the undergrounding works and in combination effects of the other Proposed Developments would be minor. If one of the overhead line options is taken forward, they would avoid substantial impacts on ecology, as the amount of habitat removal would be minimised. This would outweigh any in combination negative ecology effects that may arise from constructing an overhead line in the vicinity of the other Proposed Developments

6.11.3 **Landscape Character and Visual Effects**

6.11.3.1 Overall effects would be limited for each option because the character is already affected by the existing overhead lines and as a result this landscape is not highly sensitive to changes that would include installing

similar features to those existing. Landscape character is not a significant factor in determining a preference between options.

6.11.3.2 Option 1 would involve burying cables and would be preferable option for minimising effects as it would limit overall effects on landscape character and views. It would also enable a slightly longer section of the existing N Route overhead line to be removed. There would be some small-scale visual effects associated with the installation of a replacement CSEPP.

6.11.3.3 Options 2 and 3 would result in the installation of a short section of new overhead line and the removal of a short section of existing line. This would introduce an overhead line on a different alignment that would potentially affect different receptors and would oversail the Strawberry Line. The use of wood poles (Option 3) would have a lower effect on views overall than steel lattice pylons as they are smaller, less prominent in views over long distances and there would be greater opportunity to screen or background them using new and/or existing trees and hedges.

6.11.3.4 The potential in combination landscape and visual effects of the other Proposed Developments in conjunction with the new N Route connection is not a sufficiently differentiating factor between options to be taken forward for consultation.

6.11.3.5 This is concluded on the basis that if an underground route is selected the visual effects on the landscape would be minimised as a result of burying the cables. If one of the overhead line options is taken forward, the overall effects would be minor and any effects would be localised. The selection of an overhead option would mean that a section of existing overhead line to the west would be removed thereby minimising the overall scale of change from baseline conditions.

7. Identification of the Preferred Connection Option

7.1 This Technical and Environmental appraisal has summarised the need for a new GSP substation in the Sandford area and considered the technical alternatives, environmental impact and estimated capital costs of three options for connecting the existing 132kV N Route to the proposed Sandford GSP; to create a connection between the new proposed Sandford GSP and the existing Churchill BSP.

7.2 Each of the options considered is compliant with technical standards.

7.3 Overall the appraisal has shown that due to the short length of the connection environmental effects would generally be low and that there are few high level environmental constraints in this area that would help distinguish a preference between the options. All options could be taken forward whilst having due regard to environmental effects and there are feasible mitigation measures that could be put in place to minimise resultant effects.

7.4 The Historic Environment and Ecology appraisal had a preference for an overhead line option of either technology over the underground cable option, as there would be fewer effects to unknown buried archaeology and habitats.

7.5 The landscape and visual amenity assessment expressed a preference for underground cables. However, the assessment stated that although there would be some permanent adverse effects on the landscape character with an overhead line option, this could be mitigated through careful routeing and landscaping. The wood pole option would be less prominent in views as it is lower in height and can be screened by the background.

7.6 Having regard to statutory duties and all the factors considered as part of the appraisal process, WPD and National Grid consider that Option 3 is the preferred technical and environmental option. Under this option the existing N Route will be connected to the proposed Sandford GSP by two circuits of 132kV horizontal H wood pole structures.

7.7 Option 3 is the lowest capital and lifetime cost option. It is almost £500k cheaper than the cost to underground this section. Whilst this option will introduce more structures to the landscape, the landscape and visual assessment states that as they are lower in height they are easier to

screen/background. This balances the information and Government guidance available to us at this time.

7.8 This view will be reviewed throughout the development of the project and following consultation with statutory consultees and local communities who will have the opportunity to comment on all the options considered in this Report as part of the formal consultation.

8. Glossary

AONB	Area of Outstanding Natural Beauty
BSP	Bulk Supply Point
CSEPP	Cable Sealing End Platform Pylon
EIA	Environmental Impact Assessment
GSP	Grid Supply Point
HDD	Horizontal Directional Drill
Km	Kilometre
kV	Kilovolt
LNR	Local Nature Reserve
M	Metre
SAC	Special Area of Conservation
SNCI	Site of Nature Conservation Importance
WPD	Western Power Distribution
XLPE	Cross Linked Polythene

Appendix A **Western Power Distribution Schedule 9 Statement**

A.1 Both the distribution and transmission of electricity in Great Britain requires permission by a licence granted under Section 6(1)(b) and (c) of the Electricity Act 1989 ("the Electricity Act").

A.2 The legislative and regulatory framework is designed to ensure coordination and efficient investment by the distribution and transmission companies. These principles are central to the respective licences and industry codes.

A.3 **WPD Role and Obligations**

A.3.1 WPD has been granted a distribution licence and is therefore bound by the legal obligations set out in the Electricity Act and their distribution licence.

A.3.2 WPD owns and operates the distribution system in the South West, South Wales and the Midlands.

A.3.3 WPD has statutory duties to develop and maintain an efficient, coordinated and economical system of electricity distribution under Section 9 of the Electricity Act. These duties, which are documented in Standard Licence Conditions[8], are summarised in the following paragraphs.

A.3.4 Standard Condition C24 (Distribution System planning standard and quality of performance reporting) of WPD's distribution licence requires WPD to plan and develop its distribution system in accordance with standards set out in Engineering Recommendation P2/6[9].

A.3.5 P2/6 is a document that defines the minimum standards that WPD must apply when planning and operating the distribution system. The criteria include the type of faults (or breakdowns) and combinations of faults that the distribution system must be able to withstand, the impact on customers in terms of maximum level of supply interruptions, and the impacts on supply quality that are permissible.

[8] http://epr.ofgem.gov.uk/document_fetch.php?documentid=15184

[9] P2/6 can be purchased from www.energynetworks.org

A.3.6 P2/6 is open to industry and public scrutiny, is subject to periodic review and consultation and any changes are implemented by a change to the licence Standard Conditions and approved by the industry regulator, Ofgem[10].

A.3.7 As well as the technical standards described above, Section 38 and Schedule 9 of the Electricity Act 1989 requires WPD, when formulating proposals for new lines and other works, to:

A.3.8 "…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"[11]

A.3.9 WPD's Schedule 9 statement[12] (the "Statement") sets out how the company will meet the duty to the environment placed upon it. These commitments include:

- minimise the impact of its activities on communities and the historic and natural environment;
- only seeking to build new lines along new routes, or substations in new locations where the existing distribution system infrastructure cannot be economically upgraded to meet distribution security standards;
- where new infrastructure is required seek to avoid, where reasonably practicable, areas which are nationally or internationally designated for their landscape, wildlife or cultural significance;
- site overhead lines with care and consider both the visual impact and the impact on nature conservation as far as possible; and
- continually work with partners to selectively underground lines in appropriate sensitive locations to improve the appearance of countryside, towns or

[10] http://www.ofgem.gov.uk/Pages/OfgemHome.aspx
[11] Schedule 9 of the Electricity Act (http://www.legislation.gov.uk/ukpga/1989/29/contents).

[12] WPD Schedule 9 Statement: http://www.westernpower.co.uk/getdoc/c4856406-1794-4e34-81a0-9f2b593cdd4a/schedule9.aspx

villages, whilst taking account of sites of particular archaeological or nature conservation interest.

A.3.10 Effective consultation with stakeholders and the public is also promoted by the Statement.

A.4 **Holford Rules**

A.4.1 The Holford Rules[13] provide specific guidance for routeing overhead lines and were applied to the identification of route alignments. They comprise of seven Rules and related explanatory and supplementary notes that primarily relate to minimising the effects on landscapes. Whilst the Rules were written to apply to overhead lines, they are also appropriate to consider when routeing underground cables. National Policy Statement EN-5[14] highlights that the Rules should be followed by developers when designing their proposals.

A.4.2 The 7 Rules on minimising landscape effects when routeing overhead lines are summarised below:

- Avoid altogether, if possible, the major areas of highest amenity value;
- Avoid smaller areas of high amenity value or scientific interest by deviation where this can be done without using too many angle pylons;
- Other things being equal, choose the most direct line, with no sharp changes of direction to minimise use of angle pylons**;**
- Choose tree and hill backgrounds in preference to sky backgrounds, wherever possible;
- Prefer moderately open valleys with woods where the apparent height of pylons will be reduced and views of the line will be broken by trees;
- 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'; and
- Approach urban areas through industrial zones, where they exist

[13] National Grid: The National Grid Company plc and new high voltage transmission lines – guidelines for line routeing (the Holford Rules) and undergrounding

[14] Paragraph 2.8.5, National Policy Statement for Electricity Networks Infrastructure (EN-5), July 2011

Appendix B **Policy Background**

B.1 **National Policy Statements**

B.1.1 The context for any options appraisal relating to energy infrastructure is provided by the Overarching National Policy Statement for Energy (EN-1). This states that in considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the Infrastructure Planning Commission (IPC)[15] should take into account:

B.1.2 its potential benefits including its contribution to meeting the need for energy infrastructure, job creation and any long term or wider benefits; and

B.1.3 its potential adverse impacts, including any long term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.

B.1.4 It goes on to note that, in this context, the IPC should take into account environmental, social and economic benefits and adverse impacts, at national, regional and local levels. EN-1 provides guidance on assessment on a topic basis relevant to all energy projects which is supplemented by guidance specific to the project type. EN-1 recognises that "in most cases, there will be more than one technological approach by which it is possible to make such a connection or reinforce the network (for example, by overhead line or underground cable) and the costs and benefits of these alternatives should be properly considered as set out in EN-5 (in particular section 2.8) before any overhead line proposal is consented." (EN-1 paragraph 3.7.10).

B.1.5 In the case of the Hinkley Point C Connection, the relevant guidance for electricity transmission connections is to be found in the National Policy Statement for Electricity Networks Infrastructure (EN-5). Paragraph 2.8.2 of the Electricity Networks National Policy Statement (EN-5) states that:

B.1.6 "Government does not believe that development of overhead lines is generally incompatible in principle with developers' statutory duty under section 9 of the Electricity Act to have regard to amenity and to mitigate impacts. In practice new above ground electricity lines, whether supported by lattice steel pylons or wooden poles, can give rise to adverse landscape and visual impacts, dependent upon their scale, siting, degree of screening and the nature of the

[15] The functions of the IPC were transferred to the Planning Inspectorate in April 2012

landscape and local environment through which they are routed. For the most part these impacts can be mitigated, however at particularly sensitive locations the potential adverse landscape and visual impacts of an overhead line proposal may make it unacceptable in planning terms, taking account of the specific local environment and context."

B.1.7 EN-5 also says that although Government expects that overhead lines will often be appropriate and their effects can often be mitigated:

B.1.8 "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)".

B.1.9 EN-5 states that consent should only be refused for overhead line proposals in favour of an underground line if "…the benefits from the non-overhead line alternative will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable". In this context it should consider:

- the landscape in which the proposed line will be set, (in particular, the impact on residential areas, and those of natural beauty or historic importance such as National Parks, AONBs and the Broads);
- the additional cost of any undergrounding; and
- the environmental and archaeological consequences of undergrounding.

B.1.10 The options appraisal that has been undertaken for the AT Route includes consideration of these particular factors in reaching a recommendation on where undergrounding can be justified.

B.1.11 EN-5 does not seek to define "particularly sensitive locations". However, in proximity to Corridor B, the only area which might clearly be considered to be particularly sensitive is the Mendip Hills AONB, which is nationally designated and lies some 0.5km to the south of the proposed substation and the start of the route corridor.

B.2 National Planning Policy Framework

B.2.1 The National Planning Policy Framework[16] (NPPF) may be considered as an "important and relevant"[17] matter in decision making for Nationally Significant Infrastructure Projects (NSIPs). Paragraph 6 of the NPPF states that "the purpose of the planning system is to contribute to the achievement of sustainable development". It goes on to note that planning has a key role to play in "supporting the delivery of renewable and low carbon energy and associated infrastructure".

B.2.2 The Hinkley Point C Connection is intended to provide additional transmission capacity to permit the connection of wind and nuclear powered generation and thereby assist the UK to meet its renewable energy targets. While the NPPF does not include policies specifically related to electricity transmission infrastructure, it does include policies for conserving and enhancing the natural and historic environment which have been taken into account in planning and assessing potential alignments.

B.2.3 Paragraph 115 states that "great weight should be given to conserving landscape and scenic beauty in National Parks and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to landscape and scenic beauty. The conservation of wildlife and cultural heritage are important considerations in all these areas…."

B.2.4 Paragraph 116 states that "planning permission should be refused for major developments in these designated areas except in exceptional circumstances and where it can be demonstrated that they are in the public interest." It goes on to state that applications for such development should be accompanied by assessments of the need for the development; the scope for meeting the need outside the designated area; and the effects of the development on landscape and recreational opportunities and the extent to which these could be mitigated.

B.2.5 Paragraph 118 calls on local planning authorities to aim to conserve and enhance biodiversity in determining planning applications by protecting nationally and internationally designated sites from development which would have an adverse effects upon them and, in all locations, by refusing development which could result in significant harm to biodiversity and which

[16] Department for Communities and Local Government : National Planning Policy Framework : March 2012

[17] National Planning Policy Framework paragraph 3

cannot be avoided or adequately mitigated or compensated. Specific mention is made of the need to protect irreplaceable habitats, including ancient woodland and veteran trees.

B.2.6 Paragraph 128 states that in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. Paragraph 132 states that "when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be given during the decision making process. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting."

B.3 Development Plans

B.4 Regional Policy

B.4.1 The Government revoked the Regional Strategy for the South West on 20th May 2013. As a result, the strategy no longer forms part of the Development Plan.

B.5 Structure Plan Policy

B.5.1 The Government also revoked Structure Plans on 20th May 2013, and as such they no longer form part of the Development Plan.

B.6 North Somerset Replacement Local Plan

B.6.1 Whilst the North Somerset Core Strategy was adopted in April 2012, a number of policies of the North Somerset Replacement Local Plan[18] are yet to be replaced. The intention is that such policies will be incorporated into the Sites & Polices Development Plan Document which is scheduled for adoption in summer 2014. The policies that remain in force, and are relevant to the proposals, include the following.

B.6.2 Policy ECH/4 seeks to achieve development that preserves a listed building's special architectural and historic interest and its setting.

B.6.3 Policy ECH/6 seeks to prevent development from causing damage to nationally important archaeological remains or their settings.

B.6.4 Policy ECH/7 aims to ensure that development does not adversely affect the particular character of a landscape.

B.6.5 Policy ECH/11 seeks to prevent development that could harm nationally or internationally protected species of flora or fauna or the habitats used by such species, unless that harm could be avoided or mitigated and the species protected by use of planning conditions or planning obligations.

B.6.6 Policy ECH/12 explains that development that is likely to have adverse effects on a Special Protection Area (SPA), Special Area of Conservation (SAC) or a Ramsar Site will not be permitted, unless adverse impacts on the integrity of the site can be avoided or there is no alternative solution and there are imperative reasons of overriding interest that enable the project to proceed.

B.6.7 Policy ECH/13 aims to protect Sites of Special Scientific Interest (SSSI) and National Nature Reserves from development that would have an adverse effect, unless other material considerations outweigh the loss of biodiversity.

B.6.8 Policy ECH/14 aims to protect wildlife and geological sites from development that would have an adverse effect, unless the importance of the development outweighs the value of the substantive interest present.

[18] North Somerset Council : North Somerset Replacement Local Plan (March 2007)

B.7 **North Somerset Core Strategy**

B.7.1 The North Somerset Core Strategy[19] was adopted in April 2012. The document contains a number of environmental protection policies and draws attention to the particular characteristics of the North Somerset environment.

B.7.2 Policy CS4 aims to protect and enhance biodiversity, including seeking to protect, connect and enhance important habitats, particularly designated sites, ancient woodlands and veteran trees.

B.7.3 Policy CS5 aims to protect landscape character and the historic environment.

B.7.4 Policy CS6 confirms that the boundaries of the Green Belt will remain unchanged for the plan period.

B.7.5 Policy CS9 seeks to safeguard and enhance areas of green infrastructure and, in this context, draws attention to a number of specific areas including :

- the promotion of the north slopes of the Mendip Hills AONB as sub-regional corridors for biodiversity, recreation and landscape retention;
- the promotion of the Congresbury Yeo, River Banwell, North Somerset Levels and Moors, and Grumblepill Rhyne as local corridors for biodiversity and landscape enhancement

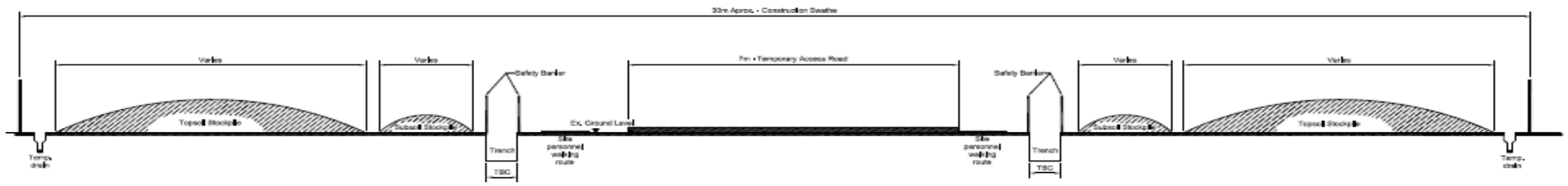
B.8 The Proposals Map highlights the range of environmental constraints in the vicinity of the corridor including protected rhynes at Puxton Moor.

[19] North Somerset Council : Local Development Framework – Core Strategy Corrected Version : April 2012

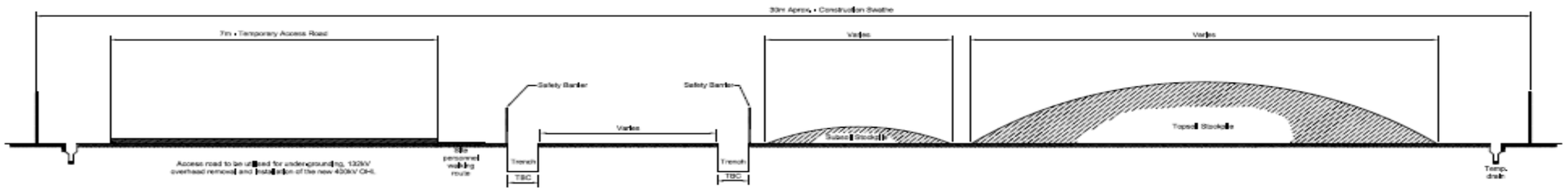
Appendix C **132kV Underground Cable Installation - Rural Cross Section**

C.1 The underground cables would typically be installed in a cable trench with a depth of 1150 mm (see Figure). During construction an easement width of around 30m would be required to allow for access, trench construction and soil displacement.

NATIONAL GRID (HINKLEY POINT C CONNECTION) ORDER
DETAILED DESIGN DRAWINGS
(REGULATION 5(2)(o))
SHEET 7 OF 53



Typical Construction Swathe for 132kV Cabling Works



Typical Construction Swathe for 132kV Cabling Works
With Access Road to be Utilised for Cabling and OHL Works

Notes:
1. Proposed arrangement shown for indicative purposes only. Dimensions and design may vary depending on site and installation conditions.
2. Dimensions and overall width could increase or decrease

PRELIMINARY DESIGN NOT TO BE USED FOR CONSTRUCTION

MMD-322069-E-DR-WPD-XX-0600

Issue	Date	Comments	Drawn	Chkd	Appd
A	Sept 13	FOR CONSULTATION	GJB	JB	PB

TITLE
TYPICAL GENERAL ARRANGEMENT OF CONSTRUCTION SWATHE FOR 132kV UNDERGROUND CABLE INSTALLATION

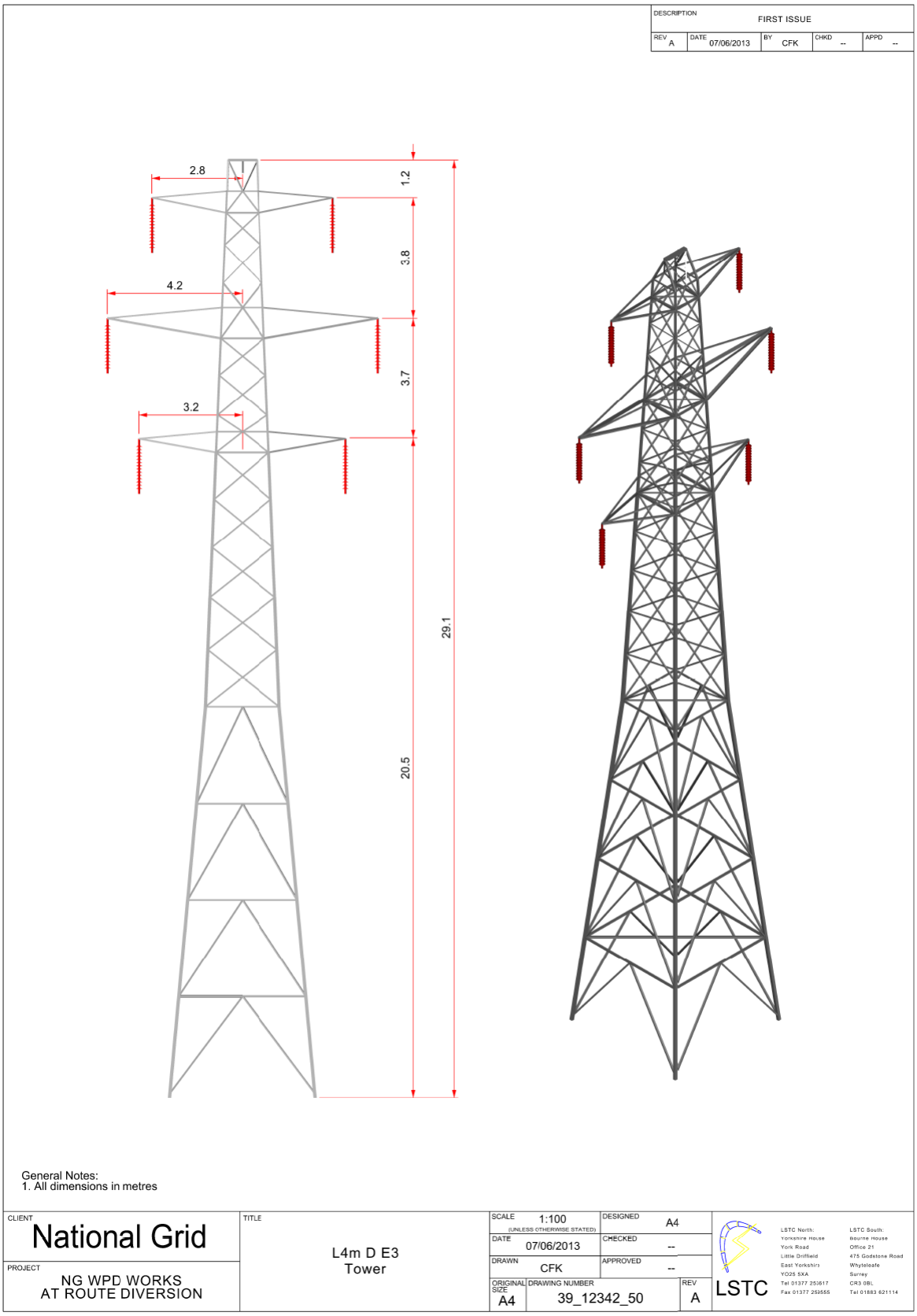
nationalgrid

Drawing No. 20897	Project No.	CAD A1
Document No. 13/NG/0211	Drawn by	Scale NTS
	SHEET 7 OF 53	Issue A

Appendix D **Example of a Steel Lattice Pylons and Cable Sealing End Platform Pylon**

Cable Sealing End Platform Pylon below

Example of a Steel Lattice Pylon



Appendix E **Example of Wood Horizontal H Pole Structures**

Appendix F **Lifetime Cost Methodology**

F.1 The lifetime valuation for each of the connection options and applicable technology includes the lifetime cost of energy losses and lifetime operation and maintenance costs.

F.2 The following formula was used to assess the lifetime cost of each type of connection.

F.3 Total Cost, CTot = CDC + CL + COM

F.4 Where

CDC = The capital cost of the equipment, delivered, installed and commissioned

CL = The net present value of the cost of losses over the lifetime (40years) of the assets

COM = "The net present value of the typical cost of operation and maintenance over the lifetime (40 years) of the assets

F.5 The discount rate used in the net present value calculations, 3.5%, being the figure recommended in Her Majesty's Treasury's Green Book for discounting future benefits and costs in project appraisal.

F.6 For the purposes of the losses calculations the average load of circuits and SGTs has been assumed to be 65% of the peak group demand of 149MVA.

F.7 **Costs**

F.8 The cost used to assess losses on the system is the price of £60 per MWh as assumed by Ofgem in the Project Discovery documents.

F.9 The available distribution technologies, as explained in Section 3 are:

a. Overhead Lines;

b. AC Underground Cables.

F.10 For each technology, costs comprise:

a. the capital cost of procuring, installing and commissioning the distribution lines, or substation assets;

b. the on-going costs of the electrical energy lost in overcoming the electrical resistance in the conductors; and

c. the on-going other costs of operations and maintenance.

F.11 Decommissioning and reinstatement costs are not included in the lifetime costs.

F.12 **Overhead Lines**

F.13 Overhead line designs vary by the number and cross-sectional area of the conductors used for each phase of each circuit. The requirements for 400kV and 132kV lines in this case are:

a. 400kV double-circuit 2 x 850mm^2 (resistance = 0.0184Ω/km), and

b. 132kV double-circuit 1 x 300mm^2 (resistance = 0.1Ω/km).

F.14 Operations and maintenance costs consist principally of the cost of repainting the distribution pylons, which is scheduled to happen every 18 years, and the costs of regular inspection both from the ground and by helicopter. The annual costs are estimated to £0.80k/km at both 400kV and 132kV.

F.15 **AC Underground Cables**

F.16 AC underground cables installations vary principally by how the cables are laid. The principal methods employed by Western Power Distribution are direct burial and deep bore tunnels.

a. The Cable requirement for a Bridgwater – Seabank connection is for two cores per phase 2500mm^2 cables, 12 cables in total for two circuits (resistance = 0.0065Ω/km).

b. However with each circuit generating 20MVAr per km of capacitive gain, each circuit would require 2 x 200MVAr reactors (4 in total for two circuits). Each Reactor has 0.4MW of losses associated with it (1.6MW for 4 reactors).

c. At 132kV, 650mm2 cables are required (resistance = 0.05Ω/km)

F.17 O&M costs have an approximate annual cost of £2.80 k/km for 400kV and £1.5 k/km at 132kV.

F.18 **Sample Calculation of the Cost of Transmission or Distribution Circuit Losses**

F.19 The cost of transmission or distribution circuit losses are calculated as follows:

Step 1: Calculate the Average Circuit Loading

- Peak Circuit Power Flow * Average Circuit Utilisation (34%)
- Generic Example: 3100MW x 0.34% peak load would be 1054MW Average Loading

Step 2: Calculate the Average Loading per Circuit in KW:

- Average Loading per Circuit kW =

  (Average Loading (MW) / number of circuits) * 1000 (to convert to kW)

  There are 2 circuits in most cases.

  Example: (1054MW / 2) x 1000 = 527,000 kW

Step 3: Calculate the Average Current per Circuit in Amps:

- I = Average Loading Per Circuit kW / (√3 X Operating Voltage in kV)

  Operating Voltage 400kV, 275kV or 132kV

  Example: 527,000/ (√3 x 400) = 760.7 Amps

Step 4: Calculate the Resistance per Circuit:

- R = resistance/km * circuit length kms

Example: 2 x 850mm Overhead Line = 0.0184Ω/km x 60km = 1.104 Ω

Step 5: Calculate the Three Phase Lost Power per Circuit in MW:

- Three Phase Lost Power per circuit = $3 \times I^2 \times R$

  Example: $3 \times 760.7^2 \times 1.104 = 1.9MW$

Step 6: Calculate the Lost Power in a 2 Circuit Route:

- This is multiplied by 2 to get the losses in a two circuit route

  Example: $1.9 \times 2 = 3.8MW$

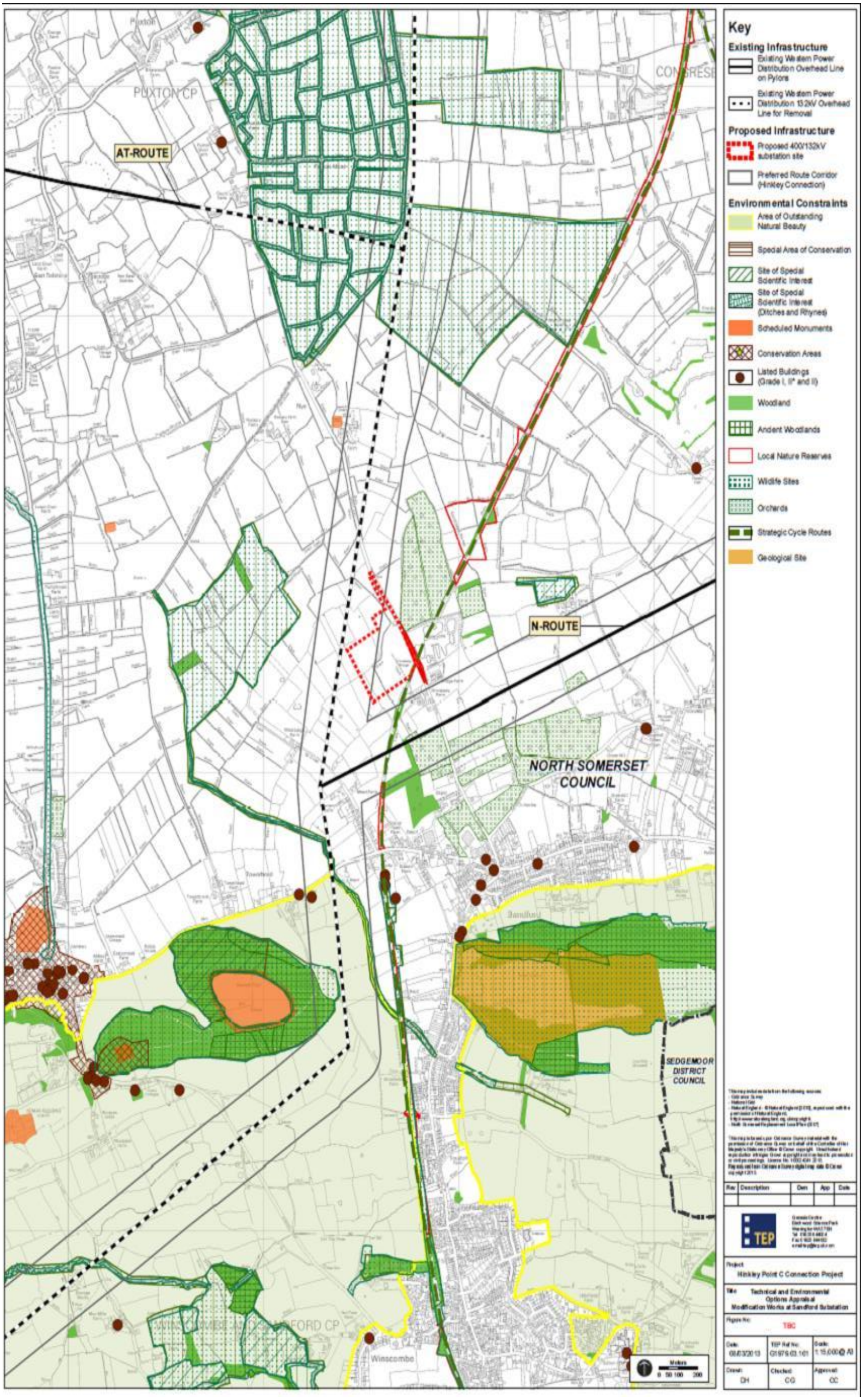
Step 7: Calculate the Annual Cost of Losses:

- Annual Loss Cost = Lost Power x Cost per MWh x 24hrs x 365 days a year

  Example: 3.8 x £60 per MWh x 24hrs x 365 days a year = £2m per annum

Step 8: Calculate the Average Loading per Circuit in KW:

- The net present value of transmission or distribution losses is then derived by applying a discount rate of 3.5% to the annual cost over 40 years.


Key
Existing Infrastructure
Existing Western Power Distribution Overhead Line on Pylons
Existing Western Power Distribution 132kV Overhead Line for Removal
Proposed Infrastructure
Proposed 400/132kV substation site
Preferred Route Corridor (Hinkley Connection)
Environmental Constraints
Area of Outstanding Natural Beauty
Special Area of Conservation
Site of Special Scientific Interest
Site of Special Scientific Interest (Ditches and Rhynes)
Scheduled Monuments
Conservation Areas
Listed Buildings (Grade I, II* and II)
Woodland
Ancient Woodlands
Local Nature Reserves
Wildlife Sites
Orchards
Strategic Cycle Routes
Geological Site
PUXTON CP
AT-ROUTE
N-ROUTE
NORTH SOMERSET COUNCIL
SEDGEMOOR DISTRICT COUNCIL
Winscombe
Hinkley Point C Connection Project
Technical and Environmental Options Appraisal
Modification Works at Sandford Substation
TBC

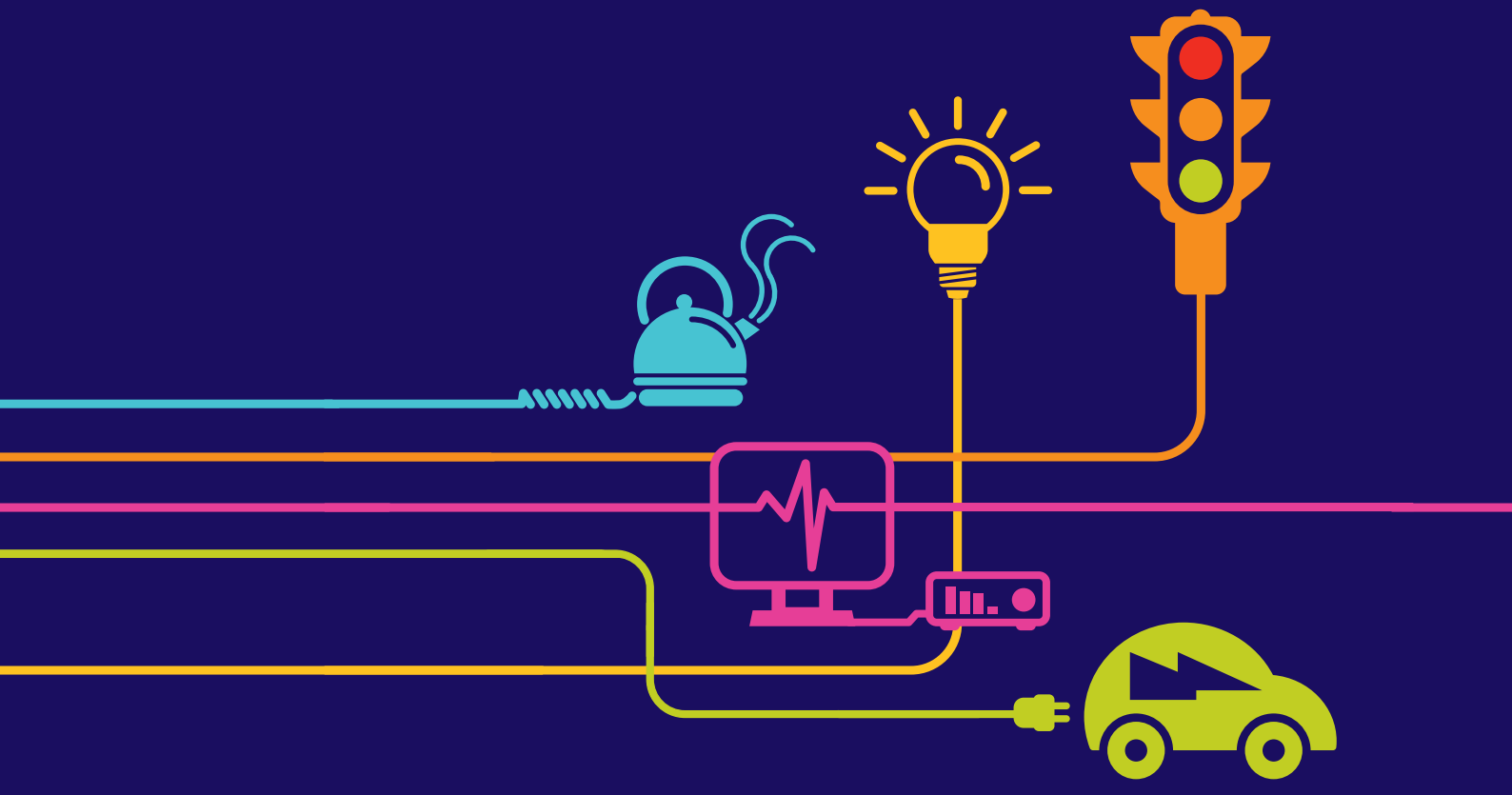
Appendix 2T – Western Power Distribution 132kV W Route Undergrounding Options Report (2013)

Document 5.2

nationalgrid

Western Power Distribution 132kV W Route Undergrounding Options Report

Hinkley Point C Connection Project



August 2013

Hinkley Point C Connection Project
Western Power Distribution
132kV W Route
Undergrounding Connection Options Report

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August 2013

Table of Contents

FIGURES

APPENDICES

1 INTRODUCTION

1.1 Introduction

1.1.1 This report has been prepared jointly by Western Power Distribution (South West) PLC (WPD) and National Grid Electricity Transmission Limited (National Grid).

1.1.2 To accommodate the connection of a new nuclear power station at Hinkley Point, Somerset, a new 400kV transmission connection is required between Bridgwater, Somerset and Seabank substation, near Avonmouth. Information on the project can be found at http://www.hinkleyconnection.co.uk/

1.1.3 The preferred route for this new transmission connection broadly follows the route of an existing 132kV overhead line between Bridgwater and Avonmouth. This 132kV overhead line is operated by WPD and is to be removed as part of the Hinkley Point C Connection Project. In the northern part of the proposed route the existing 132kV overhead line runs parallel to a second 132kV overhead line (the W Route).

1.2 Purpose of the Report

1.2.1 In November 2012, National Grid announced its draft route for the 400kV Hinkley Point C Connection Project. Due to the proximity of development at Stone-edge Batch and Tickenham and blocks of ancient woodland on Tickenham Ridge, National Grid identified that sections of the WPD 132kV W Route overhead line would need to be undergrounded to facilitate the construction of the 400kV overhead line. To further minimise the effects of the proposed connection in this area it was concluded that the W Route should be undergrounded from a point south west of Nailsea to Portishead substation (a distance of approximately 8 km).

1.2.2 The purpose of this report is to inform statutory consultees and other stakeholders of the range of undergrounding options considered by WPD and National Grid for maintaining supplies on the W Route between Nailsea and Portishead.

1.2.3 To assess the effects of different underground route options, it was first necessary to develop technically feasible underground cable routes. These routes were then assessed against a range of factors as set out in Chapter 4 of this report. A plan of the routes that were assessed is presented at Figure 1.

1.2.4 The undergrounding will start at a Cable Sealing End Platform Pylon (CSEPP). This is a pylon which has two platforms approximately 6 metres above ground level. The platform contains cable terminations (the "cable sealing ends") and associated electrical equipment. Downleads, extending from the arms of the pylon, feed each overhead circuit into the cable sealing ends, which facilitate the conversion from overhead lines into cables. The cables then run from the base of the platform into the ground to begin the underground cable section of the route. A drawing of the CSEPP is presented at Figure 2. The CSEPP Report[1] provides more details on where the CSEPP will be sited. The location of the CSEPP is the subject of separate environmental and technical study

1.3 Structure of the Report

1.3.1 The remainder of this report is structured as follows:

- Chapter 2 – sets out the background to the proposal

[1] National Grid and Western Power Distribution: Hinkley Point C Connection Project. Cable Sealing End Pylon Location Technical and Environmental Appraisal

- Chapter 3 – describes the study area and outlines the factors/principles adopted in defining underground cable routes and the reasons why other options were discounted.
- Chapter 4 – provides details of the options appraisal topics.
- Chapter 5 – presents the options appraisal findings; and
- Chapter 6 – sets out the conclusions and recommendations.

2 BACKGROUND TO THE PROPOSAL

2.1 Background

2.1.1 In November 2012 National Grid announced the draft route alignment for the proposed 400kV connection. This route is based largely on the route of an existing 132kV WPD overhead line, known as the F route, which will be removed as part of this project between Bridgwater and Avonmouth substations.

2.2 The Duties of Western Power Distribution and National Grid

2.2.1 Section 9 of the Electricity Act 1989 requires National Grid and WPD to develop the transmission and distribution systems in an efficient, coordinated and economical manner.

2.2.2 In order to meet this statutory obligation, National Grid and WPD seek to make the most efficient use of its existing infrastructure by measures such as managing power flows and investing in upgrading existing connections and substations, before considering investment in new connections. They then consider the implications for efficiency, co-ordination and cost effectiveness in evaluating a range of options in its strategic decision making. The lowest cost solutions are not always adopted, as other considerations, such as environmental impacts, may favour alternative solutions therefore a balance needs to be struck.

2.2.3 Under section 38 of the Electricity Act 1989, both National Grid and WPD have a duty, when putting forward proposals for new development, to consider the preservation of amenity, including the natural environment, cultural heritage, landscape and visual quality. Appendix A of this report includes the Western Power Distribution and National Grid Role and Obligations which are to be followed when considering the siting and installation of new infrastructure.

2.2.4 In producing this report National Grid and WPD have balanced technical, socio-economic, environmental and cost considerations in selecting project options. The detailed appraisal process is explained in Chapter 4.

2.3 Planning Policy and Guidance

2.3.1 National Grid and WPD have also taken into account the guidance contained in National Policy Statements, the National Planning Policy Framework and the Development Plan for the area. Further information on policy background can be found in Appendix B.

3 STUDY AREA AND OPTIONS

3.1 Definition of Study Area

3.1.1 The study area (see Figure 1) extends between an area southwest of the town of Nailsea and the existing 132kV Portishead substation to the east of the Portbury Ashlands development adjacent to the Severn Estuary.

3.1.2 The location of the CSEPP, which will form the start of the undergrounding route, is the subject of separate environmental and technical study.

3.1.3 The study area falls entirely within the administrative control of North Somerset Council (NSC).

3.2 Study Assumptions

The Holford Rules

3.2.1 Specific guidance on routeing overhead lines is provided by the 'Holford Rules', presented in Appendix C. This guidance is primarily related to minimising effects on landscape and includes 'rules', explanatory and supplementary notes. National Policy Statement EN5[2] highlights that the guidelines should be followed by developers when designing their proposals.

3.2.2 Whilst the Rules were written to apply to overhead lines, the factors highlighted as features to avoid are also appropriate to consider when routeing underground cables.

3.3 132kV Underground Cable Design

3.3.1 The higher cost of underground cables, compared to overhead lines, suggests that the most direct route should be adopted where possible.

3.3.2 Underground cables affect areas of environmental value differently to overhead lines. For example, hedges are oversailed by an overhead line and the most sensitive habitats or areas of high archaeological potential may be avoided when siting pylons. For underground cables, the hedgerows may be removed to make way for the cable trenches and the installation of a temporary haul road which is used to construct the underground connection. Archaeology, if present, is recorded before being removed to make way for the cables.

3.3.3 In rural locations and on undeveloped land, the area of land required for the construction and installation of the cables would be up to 30 metres wide. In urban environments, where the routes pass along highways, both lanes of the carriageway would typically be shut down for 1,000 metres (that being the length of one 'section' of cable). The cables would then be installed in one lane with the other lane used for construction vehicles, construction equipment and staff.

3.3.4 Potential locations for cable joint bays (required approximately every 1km for a 132kV connection) were also considered although these were assumed to be contained in the overall cable swathe. For the purposes of the appraisal it has been assumed that the cable installation will require three cables installed in an open trench for each circuit, i.e. six cables in two trenches for the double circuit route. A plan showing a typical construction swathe in a rural location is contained at Figure 3 (the cable swathe in a highway would be

[2] Paragraph 2.8.5, National Policy Statement for Electricity Networks Infrastructure (EN-5), July 2011

limited to the width of the road). The cables will be insulated by Cross Linked Polythene (XLPE) as insulation.

3.3.5 Typically, in a rural location, underground cables are installed with one circuit either side of a temporary construction haul road. The haul road would run along the entire route and serve as a traffic route for construction vehicles. The use of a haul road for the duration of the construction activities will limit the impact on local transport infrastructure. In urban environments, the lane that is not being used to accommodate the cables will become the equivalent of a haul road.

3.3.6 When installing underground cables in a highway, if the carriageways are too narrow to accommodate a double circuit and working swathe then the circuits will be split and routed along different roads.

3.3.7 It has been assumed that, in exceptional cases, horizontal directional drilling (HDD) would be used to cross, for example, water bodies. HDD is a steerable trenchless method of installing underground cables by using a surface launched drilling rig, with minimal impact on the surrounding area which allows vegetation to be retained. For underground cable installations, a number of ducts are installed using the HDD method and the cables are then pulled through the pipes during the cable installation phase. Once the cables have been installed the pipes are filled with bentonite to maintain the cable rating.

3.3.8 For road crossings (and some limited sections of any route that involves laying cables in highways) ducts are used for cable installation. With the aid of traffic management, a carriageway is closed to traffic and a trench is excavated to install the ducts resulting in vegetation removal (if present). Once the trench has been reinstated it is opened to traffic and then works repeated for the other carriageway. When the ducts have been installed, the underground cables are pulled through during the installation phase.

Generic Access Issues Associated with the Construction of Underground Cables

3.3.9 The construction of the underground cable route would require specific temporary site access locations to be established at the ends and along the route of the cables. They would be chosen on the basis of proximity to a highway of an appropriate standard. Access to the construction sites therefore needs to be suitable for large loads. There would be a requirement to import construction materials and export waste materials using HGVs whose size can be accommodated by local vehicular routes. Normal construction traffic routes will be agreed with the highway authorities. Some minor works to adopted highways may be required to improve the alignment, clearances and standard of roadbed in order to facilitate access for construction traffic.

3.3.10 Further studies and discussions with landowners and other parties will be required to finalise the details of any cable routes which are selected to be taken forward.

3.4 Description of the Route Options

3.4.1 This section of the report provides a short description of the two technically feasible routes that were identified.

Green Route

3.4.2 The premise for the route (shown in Figure 1 is to achieve the shortest most direct route that at the same time keeps both circuits in the same working swathe. The only exception to this is when circuits need to be separated to avoid or minimise effects on areas of constraint. For example this occurs in north west Nailsea where the cables have to be split

to be routed through the roads along Blackfriars road and North street. The majority of this route passes through rural land, except for the short section in north west Nailsea.

3.4.3 The route heads east from a point southwest of the built up area of Nailsea. The exact starting point will depend on the preferred location selected for a Cable Sealing End Platform Pylon (CSEPP)[3].

3.4.4 Due to the narrow width of the highway and therefore its inability to accommodate both 132kV circuits, one of the circuits is routed along Blackfrairs Road whilst the other is routed along North Street. The circuits converge along Hanham Way to reach the edge of Tickenham, Nailsea and Kenn Moors Site of Special Scientific Interest (SSSI), which is designated due to the ecological habitats and species contained within the ditches and rhynes. The fields between the ditches and rhynes, which comprise low lying pastoral farmland, do not form part of the SSSI designation but are designated as local wildlife sites under Policy ECH/14 of the North Somerset Replacement Local Plan 2007 (a policy which has not been superseded following the adoption of the Core Strategy in April 2012).

3.4.5 To cross the Tickenham, Nailsea and Kenn Moors SSSI, the circuits converge in the same swathe to reach Stone-edge Batch.

3.4.6 Once north of Stone-edge Batch, the route broadly follows the path of the existing 132kV overhead line on Tickenham Ridge. To minimise the effect on woodland, the route passes between the narrowest section of the Tickenham Hill/Cadbury Camp/Chummock Wood complex near Cuckoo Lane.

3.4.7 The route then travels in a northeast direction passing through farmland before running parallel with the western edge of Priors Wood.

3.4.8 The route crosses the M5 motorway through the existing underpass on Caswell Lane. Once north of the M5 the route passes through farmland and a Site of Nature Conservation Interest (SNCI) to the south of The Portbury Hundred (A369).

3.4.9 North of the A369, the route travels northwest under a disused railway line between Portishead and Bristol before crossing the Portbury Wharf Nature Reserve to the east of the Ashlands residential area in Portishead and entering Portishead substation from the south.

3.4.10 The Green Route would measure approximately 10 km.

Blue Route

3.4.11 The premise of the Blue Route (shown in Figure 1) is to utilise existing highways to establish a technically feasible route. It therefore passes through a greater extent of urban area compared to the Green Route.

3.4.12 Due to the width of the highways in the area and the requirement to maintain access to properties and land, the circuits are separated and utilise different highways to achieve a connection.

3.4.13 One circuit (known as the Blue Route A, see Figure 1) passes through the roads in the west, north-west of Nailsea (North Street, Kingshill and Pound). It then travels along Clevedon Road and Tickenham Hill. It reconverges with the other circuit for a short distance along Waterhouse Lane before descending Tickenham Ridge via Naish Hill and passing through Clapton-in-Gordano along Clapton Lane. On entering Portishead, a route

[3] Western Power Distribution. Cable Sealing End Platform Pylon Location Technical and Environmental Appraisal. August 2013.

through to Portishead substation is achieved via residential streets in the eastern part of the town.

3.4.14 The other circuit (known as Blue Route B, see Figure 1) travels in an easterly direction through Nailsea, avoiding the centre of the town where the bulk of facilities and services are concentrated. It then passes through the residential area of Nailsea known as "East End" before rising along a combination of Clevedon Road, Wraxall Hill and Waterhouse Lane, where the circuits reconverge for a short distance. The circuits then separate again, with Blue Route B travelling down Caswell Hill to cross the M5 via the existing underpass on Caswell Lane. It then passes through farmland before following the "Portbury Hundred" highway (A369) to achieve a connection through to Portishead substation via the residential streets of Portishead.

3.4.15 Blue Route A measures 14.7km and Blue Route B measures 12.9 km.

3.5 Other Options Considered but not Taken Forward

A Route to the South and East of Nailsea

3.5.1 Consideration was given to an alternative double circuit route that passed to the south and east of Nailsea before climbing Tickenham Ridge and passing to the east of Noah's Ark zoo and the west of Priors Wood. This route would pass through Backwell Lake Local Nature Reserve and very close to a deserted medieval settlement which is designated as a Scheduled Monument. The route is also constrained by the topography of the land in this location which is particularly steep and which would have presented technical difficulties for cables installation. This route would have been significantly longer than the Green Route which would have resulted in greater disturbance during construction, greater levels of environmental effect and higher capital and lifetime costs.

Discounted Green Route Options to Cross the Tickenham, Nailsea & Kenn Moors SSSI

3.5.2 In an attempt to identify the option which best minimised effects on the Tickenham, Nailsea and Kenn Moors SSSI a number of single circuit options were considered. These involved either crossing the SSSI or avoiding it by passing to the east of the designation. The following paragraphs explain why these options were not taken forward.

3.5.3 The eastern single circuit option avoided the SSSI by passing to the east of the designation. However, once past the SSSI, this route could not travel in a northerly direction through Stone-edge Batch settlement due to insufficient space to accommodate a single circuit between residential properties and their associated gardens. This route would also have passed through a locally valued wildlife area known as Moorend Spout.

3.5.4 A single circuit option to the west of the above route was investigated but discounted from a technical perspective as the construction swathe that would be required for the underground cables is already being used by a Government Pipeline and Storage System.

3.5.5 A third single circuit option sought to use the Causeway highway between the north western edge of Nailsea and Tickenham Court for the cables. The highway in this location was too narrow to accommodate a double circuit and would have still required another circuit to achieve a connection therefore spreading the effects of the construction works across a wider area.

3.5.6 As a result of the above, the double circuit route across Tickenham, Nailsea and Kenn Moors SSSI was selected because it was technically feasible, could achieve a connection through the settlement of Stone-edge Batch and because it limited the construction effects to one area rather than spreading it across two locations.

Alternative Options Discounted in the Portbury Wharf Area

3.5.7 Alternatives that were considered in the vicinity of Portbury Wharf Nature Reserve involved:

- Laying cables through the landscape bund abutting the western perimeter of the Portbury Wharf Nature Reserve. This was not possible as the southern section of the bund acts a strategic flood defence to the houses in the Fennel Road area. It is National Grid and WPD's approach to avoid strategic defences to ensure the integrity and function of the flood bund is not compromised.
- Laying of cables to the east of the reserve in the area known as "The Park". This was discounted for two reasons. Firstly, because it would still require an eventual connection in the residential streets of the Ashland Housing Estate, which as set out above, is not possible without diverting existing lower voltage cables. Secondly, to avoid the roads it would have involved attempting to lay cables within the northern section of the landscape bund, which although not a strategic flood defence, is too narrow to accommodate a double circuit.

4 OPTIONS APPRAISAL TOPICS

4.1 Explanation of the Topics Scoped In and Scoped Out of the Appraisal

4.1.1 The options appraisal process considers the technical and economic, planning and environmental constraints, and socio-economic issues associated with each potential connection option. These criteria are consistent with National Grid and WPD's statutory and licence obligations (Appendix A).

4.1.2 The options appraisal is not an Environmental Statement (ES) reporting on an Environmental Impact Assessment (EIA). Such an assessment will be applied to the detailed scheme design at a later stage in the process and an ES will be submitted to accompany the application for an Order granting Development Consent for the Hinkley Point C Connection Project, which includes works to the existing WPD local electricity network. The scope of the EIA has been separately agreed with the Planning Inspectorate by way of a scoping opinion.

4.1.3 Where the consideration of certain topics is not likely to assist in determining which of the options under consideration should be taken forward, these topics may be "scoped out".

4.2 Topics 'Scoped In'

4.2.1 The following topics have been addressed in the appraisal of the W Route options:

Environment

- Landscape and Visual Amenity
- Historic Environment
- Ecology

Socio-economic

- Local economic impact

Cost

- Capital cost
- Lifetime cost

4.2.2 Effects on **landscape and visual amenity** are recognised as important factors in determining the merits of different options. This was confirmed by responses during the consultation to date and is recognised by the establishment of a Landscape and Views Thematic Group. The effects of underground cable options on landscape and visual amenity are considerably less than the effect of overhead line options. These effects are related mainly to temporary construction activities and the temporary or permanent loss of hedgerows or trees from a landscape.

4.2.3 The importance of assessing effects on the **historic environment** is recognised by the establishment of a Historic Environment Thematic Group. Underground cable options have the potential for greater effects on unknown archaeology than overhead line options because of the greater extent of ground disturbance.

4.2.4 The importance of assessing effects on **ecology** is recognised by the establishment of an Ecology and Biodiversity Thematic Group. In general, underground cable options have the potential for greater effects on ecology than overhead line options because of the extent of land affected during cable installation and associated habitat disturbance.

4.2.5 Consultation to date has emphasised the importance of assessing the effects of the scheme on the **local economy**, including tourism. The potential for local economic effects will vary depending on the proximity of options to local businesses and tourism facilities and the degree of potential temporary disturbance during construction or longer term effects on business premises and operations or visitor attractions.

4.2.6 **Capital cost** is an estimate of the cost of equipment and installation costs. The cost estimates are based on generalised unit costs for the key elements of the option, reflecting recent contract values or manufacturers/consultant budget estimates. This is sufficient to allow a broad order of relative costs to be established for the options and is not intended to provide a detailed cost for each option which can only be obtained at the detailed design stage.

4.2.7 The **lifetime cost** is an estimate of the capital cost plus the distribution losses and maintenance costs for the specific elements of the connection options over a 40 year lifetime. The lifetime cost estimate methodology is explained in Appendix D.

4.3 Topics 'Scoped Out'

4.3.1 Underground cables would have no effects on **local air quality** during the operational phase. During construction, there is the potential to generate dust and emissions from plant and traffic movements. However these effects would be temporary and dust and other emissions are capable of mitigation using well established techniques. There is therefore unlikely to be a significant difference between the effects of different options on air quality and therefore this criterion cannot be used to distinguish between options.

4.3.2 Underground cables would not give rise to **noise and vibration** during the operational phase. Construction activities have the potential to generate noise and vibration. However these effects would be temporary and are capable of mitigation using well established techniques. There is therefore unlikely to be a significant difference between the effects of different options on noise and vibration and therefore these criteria cannot be used to distinguish between options.

4.3.3 There are no sites designated for their geological/geomorphological interest in the study area and the local soils and geology pose no particular constraint to underground cable installation.

4.3.4 Once operational, underground cables are not expected to have significant effects on the water environment. During construction there is the potential for different effects on the water environment, depending on the nature and extent of construction activity, however acknowledged mitigation measures are available and any residual differences would be insufficient for them to be material differentiators in options selection. The effects on aquatic ecology will be addressed under the ecology topic heading.

4.3.5 Once operational, the effects on **traffic and transport** will be negligible for all options. During the construction phase, the Blue Route would lead to more disruption compared to the Green Route because it utilises existing roads within the built up areas of Nailsea and Portishead and parts of the rural highway network. However, construction works would be phased and standard traffic management measures would be implemented during the construction phase to minimise effects. The transport network in the vicinity of both routes will also have different characteristics which may be more or less able to cope with the traffic flows associated with construction activities. Initial studies have shown that it should be possible to provide access to the whole of the study area being considered and that this topic would not be a material differentiator in options selection.

4.3.6 Through the consultations to-date, no **aviation or defence** interests have been identified or brought to the attention of the project team which would be adversely affected by development in the study area.

4.3.7 The **technical** topic area covers a range of issues mainly relating to the buildability of the option, for example its technical complexity, construction delivery risk, use of resources, programme implications and outage requirements. While each may vary from option to option, as will ease of maintenance, these issues will not be a material differentiator in options selection.

4.3.8 Consideration of **electro-magnetic** fields is excluded from the options appraisal because both National Grid and WPD design their system to be compliant with ICNIRP guidelines[4] on exposure to electric and magnetic fields. An assessment of the potential impact of electric and magnetic fields will be included in the EIA.

4.4 Assessing In-combination Effects

4.4.1 The appraisals have considered the potential in combination effects of the following Proposed Development components in the vicinity of the W Route:

- The installation of a CSEPP on the W Route;
- dismantling of the section of existing 132kV W Route from the CSEPP travelling north
- dismantling of the existing 132kV F Route; and
- a new 400kV overhead line connection from Bridgwater to Seabank.

[4] International Commission on Non-Ionising Radiation Protection : Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields : 1998

5 APPRAISALS

5.1 Environment – Landscape and Visual Assessment

Landscape Character Baseline Conditions

5.1.1 There are no landscape designations where the existing 132kV W route pylons run or in the surrounding area. The landscape of the existing 132kV W route and surrounding area are considered to be of local importance and would generally be of low sensitivity.

5.1.2 The routes would cross the same area at the south west edge of Nailsea and there is little differentiation in the character of the proposed routes and immediate surroundings. Further north the Blue Route option would predominantly follow roads and would pass though the towns of Nailsea and Portishead meaning that potential, temporary effects would in the main relate to urban areas and townscape.

5.1.3 The Green Route option would predominantly cross undeveloped land north of Nailsea toward Portishead and would have temporary and permanent effects on the landscape.

5.1.4 The land through which the proposed options pass falls in two national landscape character areas as defined by Countryside Character Volume 8: South West published by Natural England, these are:

- Bristol, Avon Valleys and Ridges; and
- Somerset Levels and Moors.

5.1.5 The Bristol, Avon Valleys and Ridges Landscape Character Area is adjacent to the Somerset Levels and Moors character area and lies to the east and north of Nailsea. It includes Tickenham Ridge which rises steeply from the Somerset Levels and Moors. The Bristol, Avon Valleys and Ridges character area is described as a landscape of very mixed landform, geology and settlement pattern with low-lying, shallow valleys that contrast with the limestone ridges and scarps.

5.1.6 The character area includes wooded scarps, much of which is ancient woodland, and downland ridges which are high and open. This character area is gently undulating and generally enclosed. Agricultural land is a mix of arable and pasture with a variable hedgerow pattern. Settlement comprises frequent large villages, small towns and major conurbations.

5.1.7 The Somerset Levels and Moors Character Area is described as a flat open landscape of wet grassland, arable and wetland divided up by wet ditches or deep, wide, wet 'rhynes' which have a strong unity and distinctive character. The Levels are closer to the coast and comprise a belt of clay that restricts the drainage of the Moors which are further inland. The Levels are a more irregular and older landscape with a slightly denser population, whereas the Moors comprise a rectilinear planned landscape with a long history of management comprising enclosures, historic track-ways, and peat workings. The Moors are more sparsely populated.

5.1.8 The Levels and Moors are further noted to be a highly managed yet wild and tranquil landscape. Tranquillity is at its lowest level near the M5 motorway. Woodland is relatively sparse within this landscape although pollarded willows are widespread along the 'rhynes' and there are occasional shelterbelts around farms. The majority of the land is pasture supporting dairy cattle. There are few properties on the lower-lying land with nucleated settlements on the higher ridges and islands.

5.1.9 The North Somerset Landscape Character Assessment sub-divides these two national character areas into local landscape character areas. From south to north the character areas that the proposed Green Route would cross include:

- K1 - Nailsea farmed coal measures
- A3 – Kenn and Tickenham moors

- E5 – Tickenham Ridge
- G2 – Failand settled limestone plateau
- F1 – Abbots Leigh sandstone uplands
- A2 – Clapton moor

5.1.10 This assessment focuses on the potential effects that the proposed Green Route would have on the landscape as the Blue Route is routed through existing roads between Nailsea and Portishead and would therefore not affect landscape character. However, the effects of the Green Route on landscape character are anticipated to be limited because the works would be temporary relating to construction, and permanent effects would be minimal affecting landscape features in localised areas.

5.1.11 Further information about the character areas referred to above is included in the character assessment documents as noted and the National Grid document 'Hinkley C Connection Project, Connection Options Report'[5].

Assessment of Potential Effects on Landscape Character of Both Options (Blue Route and Green Route)

5.1.12 The undergrounding of the W Route between Nailsea and Portishead on either the Blue Route or Green Route would remove a section of overhead line as a feature of the landscape in this area. When considered alone, the removal of the overhead line would have a generally positive effect on landscape and views.

5.1.13 This proposal to underground a section of the W Route forms part of the National Grid Hinkley Point C Connection Project which involves building a new 400kV overhead line to the west of Nailsea. The proposed 400kV overhead line would be present in future views at the northwest edge of Nailsea.

5.1.14 The W Route is currently close to the settlement edge and would be removed from views experienced by receptors in this area including residents of houses on Causeway View and Watery Lane. In future views, the W Route would be removed and the proposed 400kV overhead line would appear in views although it would be further away than the existing W Route, appearing in the middle distance of views and filtered by existing trees and hedges.

5.1.15 There would be a greater beneficial change to views further south where the W Route would be removed from the foreground in views from the western edge of Nailsea and the proposed 400kV overhead line would be at a distance of approximately 700 metres (680m at the closest point from pylon W34) and therefore would be less visible. From the southwest edge of Nailsea, the W Route would be removed from views and the proposed 400kV overhead line would be further to the west and likely to be partly visible in the background of views extending above tree canopies.

Landscape sensitivity

5.1.16 This area contains overhead lines (including the W Route) as part of its existing character and consequently it is less sensitive to change than other areas where overhead lines are not present. The new 400kV overhead line proposed by National Grid would form part of its overall character if this section of W Route was buried underground using either of the options.

<u>Blue Route</u>

[5] Hinkley Point C Connection Project, Connection Options Report, www.hinkleyconnection.co.uk

5.1.17 The Blue Route would utilise existing roads therefore restricting effects to areas that are already developed and would not affect landscape character. The Blue Route would follow existing roads and tracks through the settlements of Nailsea and Portishead. Effects would be negative although localised and for short periods of time as construction work is sequentially carried out on the route.

5.1.18 Roads would be reinstated to their former condition on completion of the works and there would be no significant permanent effects on landscape or townscape character. Townscapes would be of low sensitivity to the proposed undergrounding works. The effects on the townscape would be of negligible magnitude and would result in an effect of very minor adverse significance.

Green Route

5.1.19 This route would follow a combination of existing roads and tracks and cross undeveloped land. A significant part of the route would be across undeveloped land comprising fields outside settlements.

5.1.20 The effect on roads and townscape through the installation of cables on this route would be limited as for the Blue Route above.

5.1.21 Ditches and rhynes are characteristic landscape features of this area particularly in the Somerset Levels and Moors National Landscape Character Area which covers land at the west and north western edge of Nailsea. It is anticipated that several ditches would need to be crossed to install cables. Works may involve temporary works to maintain its function including culverting, diverting sections and pumping water away from the working area dependent on the flow of the water. The work would be undertaken sequentially along the route affecting localised areas at any one time. No long term effects on the ditches and the overall character of the affected ditches would be anticipated. Any temporary installations would be removed on completion and ditches reinstated to their former condition.

5.1.22 The Green Route is close to trees at Mogg's Wood and the western and northern edges of Prior's Wood. The guidance in BS 5837 2012[6] would be observed to ensure that the cable route and working area would be sufficiently distant from the trees on the edge of this woodland to prevent damage.

5.1.23 There may be some permanent effects associated with tree and hedgerow removal where the route crosses fields and land outside settlements as it may not be possible to re-plant some areas directly above cables. However, replanting may be possible on adjacent land (subject to landowner agreement) which could reduce adverse permanent effects. The need for tree and hedge removal would be kept to a minimum and where necessary would affect relatively small areas.

5.1.24 The baseline character of the landscape where the Green Route is proposed (crossing each of the character areas noted above) is affected to some extent by development including existing overhead lines, including existing wood pole mounted overhead lines. The character is also affected by features such as the M5 motorway. As such the landscape along the Green Route is of low sensitivity to the proposals which would remove a section of existing line, but in which other wood pole lines and development would remain a feature. The removal of the section of W Route would result in an effect of low magnitude and overall minor positive overall scale of effect.

[6] BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations

Visual Amenity Baseline Conditions

5.1.25 The existing 132kV W Route overhead line forms part of baseline conditions, in the area to the west of Nailsea. The W Route is in the middle distance and background of views crossing fields from the western edge of Nailsea. Views of it are generally filtered by trees and hedges although the upper parts of the pylons are typically present in most views extending above tree canopies. Underground route options (green and blue) would follow the same alignment in this area and similar views would be affected by the undergrounding works and removal of the W Route.

5.1.26 The 132kV W Route extends north of Nailsea crossing relatively low-lying level ground between hills at Tickenham and Cadbury Hill toward the M5. Views of the line are generally enclosed and/or restricted by the landform. The line is typically seen against a wooded background or partly screened by woodland which reduces its visibility, except in views along the valley and where there is less benefit from backgrounding by the hills. The Green Route would follow a largely parallel route to the existing overhead line northwards toward Portishead, crossing the M5 at Caswell Lane and continuing on a relatively straight route to the substation at Portishead. Land north of the M5 is flatter and views are generally more open. Views of the W Route are typically partly screened by field hedges and groups of trees. The upper part of the line is generally visible above tree canopies in views.

Assessment of Potential Visual Effects

5.1.27 The proposed undergrounding of a section of the W Route using either the Blue or Green route would remove pylons and overhead line conductors (wires) from views and would have a general overall beneficial effect on those views where overhead lines are currently present.

5.1.28 There could be negative effects on some views resulting from the installation of the CSEPP. Further information is presented in the Cable Sealing End Platform Pylon Environmental and Technical Appraisal which describes potential effects of a CSEPP at a number of possible locations.

5.1.29 The effects on views of removing part of the existing W Route overhead line would vary depending on different factors such as location. For example the removal of existing pylons on higher ground could have a greater positive magnitude of effect than removal of the overhead line in less prominent locations such as where there are benefits from screening and or backgrounding.

Sensitivity of Receptors

5.1.30 Sensitivity of visual receptors would vary depending on factors including:

- location and direction of views;
- perception and expectations of views;
- the activity that they are undertaking; and
- duration and nature of effects on views.

5.1.31 Receptors of high sensitivity are generally anticipated to be users of public rights of way (PRoW) for recreational purposes and residents experiencing views from lower storeys of their property.

5.1.32 Receptors of low sensitivity would include motorists and workers in the work place who are typically occupied by tasks and are not focused on views of the surroundings.

5.1.33 The proposed routes would affect receptors of varying sensitivity and for the purposes of this assessment the assumption is made that receptors are of high sensitivity to represent

a 'worse case' and to enable a general overall judgement to be made. A full visual assessment would be undertaken as part of EIA for the Hinkley Point C Connection Project.

Blue Route

5.1.34 This option would follow existing roads and tracks through Nailsea and Portishead. Effects on views would be temporary during the construction phase of works and limited to the immediate surroundings some of which are in urban areas.

5.1.35 Visual receptors potentially affected by works to install underground cables on the route would not typically experience a change in views from the removal of a section of the existing W Route overhead line. This is because the majority of the route is through settlements and away from the existing overhead line. There would potentially be higher numbers of visual receptors experiencing views of the construction works than on the Green Route. However, this would be experienced largely in an urban context where construction work is often undertaken.

5.1.36 The W Route oversails Cuckoo Lane approximately 1.5km north of Nailsea and again further north adjacent to the M5 motorway at Caswell Cross. Visual receptors close to these sections of road would experience temporary views of construction works and the removal of this section of W Route from views resulting in long-term positive effects on views.

5.1.37 Overall the effect on views of installing cables on the Blue Route and removal of W Route would be of low magnitude resulting in an overall positive minor to moderate positive scale of effect.

Green Route

5.1.38 This route would predominantly pass through fields and undeveloped land, except for a limited section in roads in the northwest of Nailsea. It is routed west out of Nailsea along Hanham Way. Views from the southwest edge of Nailsea would be temporarily affected during construction.

5.1.39 Baseline views include the W Route as a feature in this part of Nailsea and the same receptors would experience views of construction activities but a long term positive change in views from the removal of W route.

5.1.40 The route would cross land north of Nailsea across Tickenham, Nailsea and Kenn Moor through to Stone-edge Batch. However these would affect a relatively small area and have a low magnitude of effect on views. Receptors are likely to experience some views of construction activities and the removal of W route.

5.1.41 North of Tickenham Ridge, the route extends northwest across fields parallel with the existing W Route. This is on lower lying ground than the surrounding areas north and south and views are generally restricted in those directions by landform and woodland. The route would cross fields and would be away from residential properties. Receptors would typically be users of public footpaths and roads in this area. There would be short term views of construction works, which would be unrestricted from some close viewpoints. For short periods during construction this would represent a low to moderate scale of effect. There would be an overall long term low to moderate positive effect on views in this area as a result of undergrounding the W Route which would balance temporary negative effects on views.

5.1.42 Further northwest the route crosses farmland between Prior's Wood and the M5 to Caswell Cross. From here it continues in a northwesterly direction across farmland toward Portishead substation. It crosses roads at The Portbury Hundred and Sheepway.

5.1.43 There are footpaths and bridleways in the vicinity of the Green Route between Caswell Road and Prior's Wood. There are few houses in this area. Receptors are likely to be users of public footpaths who would experience open views of construction works and changes as a result of removing the W Route. The effect on views would be similar to those described above for the area to the southwest. There would be views of construction works associated with cable installation, which would be unrestricted from some close viewpoints for short periods during construction.

5.1.44 Overall the effects on views of installing cables on the Green Route and removal of the W Route would be of low magnitude and resulting in a minor to moderate positive overall scale of effect.

Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.1.45 The in combination effects of the other Proposed Developments will be considered in more detail as part of the EIA for the Hinkley Point C Connection Project. Notwithstanding this, the in combination landscape and visual effects of the Proposed Developments, including the Alternative Route[7] for the 400kV Bridgwater to Seabank overhead line near Portishead,would not be significant or be a differentiating factor between options that could be taken forward for consultation. The potential effects of undergrounding using any of the proposed routes would be low and temporary in nature being limited to the construction period. As a result, there would be few opportunities for long term combined effects to occur. Post construction, the proposals would not negatively change the landscape from baseline conditions as to identify a preferable route.

Potential for Mitigation

5.1.46 The visual effects of the underground cable route would largely be temporary. Loss of some trees and hedgerow would be minimised through careful routeing and replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement.

5.1.47 It would also be possible to minimise permanent negative effects on views through careful planning of accesses to avoid the need for road improvements to the local lane network, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term and permanent negative visual effects would be unavoidable until re-establishment.

Landscape and Visual Assessment Conclusion

5.1.48 For all options, there would be temporary and permanent effects on landscape character and visual amenity as a result of undergrounding of a section of the W Route overhead line. Overall effects on landscape character and visual amenity would be positive which ever option is taken forward as the line would be removed from this area. There would generally be very few permanent negative effects associated with the route options and there is little to differentiate between them in terms of landscape and visual effects.

5.1.49 There would be slightly greater effects on landscape character as a result of using the Green Route because this crosses undeveloped land beyond settlements. The Blue Route follows existing roads and would minimise effects on landscape character.

[7] National Grid: Hinkley Point C Connection Project. Stage 3 Consultation on Draft Route and Associated Development. Feedback Report (April 2013)

5.1.50 Long term effects on views would be similar and beneficial for all route options and is not a significant determining factor in selecting which route to take forward to consultation.

5.1.51 Overall, there is a slight preference for choosing the Blue Route as this would minimise effects on landscape character.

5.2 Environment – Ecology

Baseline Conditions

5.2.1 The study area was the Green and Blue route corridors with a 1km buffer.

5.2.2 There are a number of statutory and non-statutory designations along and adjacent to the route options. These are marked on the plan presented in Figure 1. The Severn Estuary Special Protection Area (SPA)/Ramsar/Special Area of Conservation (SAC) and SSSI lies just over 200m to the north of the existing 132kV Portishead Substation. The range of coastal and intertidal habitats present within the Estuary support nationally and internationally important populations of waders and wildfowl; it is therefore valued at the international level.

5.2.3 The southern part of each of the proposed routes falls within the 5km consultation zone for the North Somerset and Mendip Bats SAC, which extends to the north of Nailsea. The closest component site is King's Wood and Urchin Wood SSSI which lies approximately 4.2km to the south. Within this consultation zone development proposals are subject to particular scrutiny with regards to their potential effects on the SAC.

5.2.4 Tickenham, Nailsea and Kenn Moors SSSI is to the west of Nailsea and is crossed by the Green Route. The site comprises a network of large rhynes and smaller field ditches which support diverse botanical and invertebrate communities. The site is valued at the national level.

5.2.5 There are various SNCIs which fall within, and adjacent to, the study area. These sites are valued at the County level. A brief description of the sites and their location in relation to the proposed routes is provided in Table 1 below:

Table 1. SNCIs within Study Area

Site Name	Description	Distance from Green Route	Distance from Blue Route
Nursebatch Farm Fields	Unimproved and semi-improved grassland which supports a diverse flora.	400m to south west	400m to south west
Batch Farm Meadows	Semi-improved neutral grassland and marshy grassland which supports a diverse flora.	480m to south west	480m to south west
West End Meadows	Wet acidic grassland which is botanically diverse.	295m to south east	295m to south east

Site Name	Description	Distance from Green Route	Distance from Blue Route
Fields along Youngwood Lane	Area of marshy grassland and standing water.	645m to south east	645m to south east
Nailsea and Tickenham Moors	Marshy and semi-improved neutral grassland which supports diverse botanical and invertebrate communities. The SNCI includes Tickenham, Nailsea and Kenn Moors SSSI.	Route, and alternative routes, pass through the eastern section of the site	85m to north west at nearest point
Lodge Lane (pond and adjacent fields)	Unimproved and semi-improved neutral grassland and standing water.	1.8km to south east	360m west of Blue Route B
Towerhouse Wood and adjacent fields	Ancient semi-natural broadleaved woodland, containing species-rich damp woodland with small-leaved lime and a diverse ground flora.	365m to south	30m to south of Blue Route A
Summerhouse Wood	Ancient semi-natural woodland comprising predominantly of ash and small-leaved lime with a diverse ground flora.	170m to south of Double Circuit, 100m to the east of the easternmost single circuit Green Route option	15m north of Blue Route A
Tickenham Hill-Cadbury Camp-Chummock Wood Complex	Mosaic of ancient semi-natural and semi-natural broadleaved woodland, unimproved and semi-improved calcareous grassland with semi-improved neutral grassland and dense scrub.	Passes through eastern section of site (Mogg's Wood) and adjacent to woodland complex, passing within 15m of Chummock Wood.	Runs directly adjacent to a section of Mogg's Wood

Site Name	Description	Distance from Green Route	Distance from Blue Route
Abbots Horn	Semi-natural broadleaved woodland, mainly comprising of ash and hazel coppice, with dog's mercury and wood anemone present amongst the ground flora.	90m to north	465m to north
The Sidelands, Wraxall	Ancient semi-natural woodland, comprising mainly of beech and sycamore, with stands of yew. Diverse understorey and ground flora also present.	1.3km south east	Blue Route B passes directly adjacent to western boundary of site
Cockheap Wood-Dunhill Wood-Parsonage Wood Complex	Ancient semi-natural and semi-natural broadleaved woodland. The woodland canopies are dominated by oak and ash and a diverse ground flora is present. The woods are also important for invertebrates.	350m to west	400m to west
Breach Wood (Wraxall and Failand)	Ancient semi-natural oak/ash/beech woodland to the north with mixed larch/pine and beech to the south. The wood has a diverse canopy and shrub layer.	620m to east	400m to north of Blue Route B
Birch Wood and Prior's Wood	Predominantly ancient semi-natural woodland, with an area of diverse neutral grassland present. The site is botanically diverse and supports important populations of breeding birds and invertebrates.	Passes directly through northern tip of site and runs adjacent to eastern boundary, touching a part of the site boundary in one area.	Blue Route B passes directly adjacent to a stretch of the site's northern boundary

Site Name	Description	Distance from Green Route	Distance from Blue Route
Gordano Valley, Clapton Moor, Middle Bridge and Rhynes	Unimproved and semi-improved grassland, marshy grassland and associated marginal habitats, with semi-natural broadleaved woodland (including carr).	1.3km to the west	Blue Route A crosses site in two locations, but from within the road network.
Fields north of Upper Caswell Farm	Marshy grassland with range of flora including wild angelica.	275m to west	170m south of Blue Route B
Fields west of Lower Caswell House	Diverse marshy grassland. Wide range of flora including southern marsh orchid.	625m to west	245m south of Blue Route B
Fields on Caswell Moor	Botanically diverse marshy grassland and reedbed habitat, which supports populations of breeding warblers / buntings and water voles.	Passes 40m to the west of the site boundary.	Blue Route B passes through western section of site
Portbury Wharf	Marshy grassland, open water and associated habitats. Supports dragonflies and overwintering and migrating water fowl and had water voles reintroduced in 2003.	80m to the east	275m to the east
Portbury Wharf Nature Reserve	Marshy grassland and open water, along with associated habitats, which support overwintering and migrating waders and dragonfly populations.	Passes directly through site	25m to west at its nearest point
Land adjacent to Severn Estuary SSSI (Portbury)	Marshy grassland and coastal habitats which support overwintering and migrating waders and wildfowl.	295m to north	275m to north

5.2.6 Habitat that would be directly impacted by the potential underground cable options is comprised predominantly of semi-improved neutral grassland, improved grassland and

areas of arable land. These grassland habitats have a low intrinsic value, however their value would increase through association with other faunal species. For example, during breeding bird surveys, several pairs of breeding skylarks (a species of conservation concern on the red list) were observed in fields to the west of Priors Wood[8].

5.2.7 A variety of wetland habitats exist in the Study Area including open water, swamp, marshy grassland, field drains and rhynes. A number of species have been recorded in the wider area which may use these habitats and they include great crested newt[9], otter and water vole[10] and good assemblages of wetland breeding and wintering birds[11]. Wetland habitats of high nature conservation value, are present within the Tickenham, Nailsea and Kenn Moors SSSI and the Portbury Wharf Nature Reserve and Fields on Caswell Moor SNCIs. The wetland habitats within the SSSI would be valued at the national level, whereas wetlands within the SNCIs are of County importance. Outside of the designated areas the wetland habitats are currently considered to be of local value.

5.2.8 Overwintering bird surveys at the Portbury Wharf Nature Reserve found that the site supports high to moderate numbers of wildfowl, including teal, widgeon and mallard on a regular basis and moderate numbers of wading birds[12]. Portbury Wharf was not found to be of any particular note for breeding birds, although species of interest which were recorded there include Cetti's warbler, which is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). This area is of County value for birds.

5.2.9 Overwintering bird surveys of the Tickenham, Nailsea and Kenn Moors SSSI area that have been undertaken to date indicate that it is used by low numbers of wildfowl and wading birds[13] Breeding bird surveys, identified breeding reed buntings (a bird species of conservation concern on the amber list) using ditches within the Fields on Caswell Moor SNCI Whitethroat and dunnock (both bird species of conservation concern on the amber list) were recorded as breeding amongst hedgerows to the north of Nailsea. All of these areas are of local value for birds.

5.2.10 Woodlands are a common feature in the landscape in the area between Nailsea and the M5 motorway[14]. The majority of these are ancient woodlands that have been designated as SNCIs. The ancient woodlands are valued at the County level. Within the Study Area, these include Towerhouse Wood, Summerhouse Wood and part of the Tickenham Hill–Cadbury Camp–Chummock Wood complex. Protected species associated with these woodlands include badger crossbill (a bird species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)) and dormice[15].

[8] Breeding Bird Survey Data presented on TEP drawings G1979.1431 to G1979.1433.

[9] Amphibian desktop records illustrated on TEP drawings G1979.1090 to G1979.1106

[10] Otter and water vole records illustrated on TEP drawings G1979.1124 to G1979.1142

[11] TEP Report Ref: 1979.097r04 Proposed 400kV Overhead Line Connection – Hinkley C Ornithological Assessment

[12] TEP Report Ref: 1979.097r04 Proposed 400kV Overhead Line Connection – Hinkley C Ornithological Assessment

[13] TEP Report Ref: 1979.097r04 Proposed 400kV Overhead Line Connection – Hinkley C Ornithological Assessment

[14] Phase 1 Habitat Survey data illustrated on drawings G1979.619b to G1979.598b and on G1979.878a and G1979.879a (data from Phase 1 Habitat Survey is currently under review).

[15] Dormouse desktop records illustrated on TEP drawings G1979.1144 to G1979.1148

5.2.11 In addition to the woodland habitat, there are individual mature trees present along and adjacent to the routes, which may provide potential opportunities for protected species including roosting bats and breeding birds. Scattered mature trees are of local value.

5.2.12 The hedgerows range from species-poor to species-rich and are likely to provide foraging and commuting opportunities for a range of species, including bats, dormice and breeding birds. The network of hedgerows is valued at the district level, but the value of individual hedgerows, would vary depending upon their species-richness and association with other species.

Assessment of Effects

Blue Route (Blue Route A and Blue Route B)

5.2.13 The Blue Route would achieve a connection largely through the use of two single circuits (Blue Route A and Blue Route B) routed predominantly along the existing road network.

5.2.14 The Blue Route would leave the CSEPP as a double circuit and passes through agricultural fields before entering Nailsea. It is considered that undergrounding through the grassland habitat would lead to a low negative, temporary magnitude of effect. This effect would rise to moderate negative if field surveys later revealed the presence of notable species or habitats in the affected area. Overall loss of grassland habitats would be relatively small with the adoption of the Blue Route option.

5.2.15 On entering Nailsea, Blue Route A heads northwards along North Street and Blue Route B travels east through the West End Trading Estate. The routeing of both single circuits through developed areas, and the subsequent restriction of the construction swathe to the highway, would result in negligible ecological impacts.

5.2.16 Outside of the urban areas of Nailsea and Portishead, the highways along which the proposed single and double circuits travel are often lined with hedgerows which are interspersed with mature trees. Disturbance to hedgerows would increase during the construction period. Impacts on tree roots and direct removal of hedgerow habitat may occur in sections where the construction swathe is not constrained by residential properties. This would result in a moderate negative, medium-term magnitude of effect.

5.2.17 Blue Route B would travel immediately adjacent to a section of The Sidelands, Wraxall SNCI which contains ancient woodland habitat. In addition to designated woodland, there are various small woodland compartments which are present immediately adjacent to affected highways. The construction of Blue Route B would result in increased levels of disturbance to the woodland and SNCI (such as increased noise and vibration) and there would also be the possibility of construction-related pollutants being transferred into the woodland and SNCI during the works. This would result in a moderate negative, short-term magnitude of effect.

5.2.18 After crossing the M5, Blue Route B would pass through Fields on Caswell Moor SNCI before travelling westwards along the Portbury Hundred. The SNCI would experience high negative, long-term magnitude of effect from ground disturbance during construction works and as a result of operational drainage requirements.

5.2.19 To the north of Clapton in Gordano, Blue Route A would require the crossing of two drains which form a part of the Gordano Valley, Clapton Moor, Middle Bridge and Rhynes SNCI and a hydrologically-linked drain to the north. This may lead to reductions in water quality during the construction period, disturbance to protected species and impacts upon

botanical communities. These impacts would lead to a moderate negative, medium-term magnitude of effect.

5.2.20 As with Nailsea, when Blue Routes A and B enter the Portishead urban area the resulting ecological impacts would predominantly be negligible. However, adverse impacts of low magnitude and temporary duration may occur, where both single circuits cross the disused railway line which supports scrub habitat.

5.2.21 The connection from the urban area into Portishead Substation for both Blue Route A and B, would be unlikely to result in adverse ecological effects. The area has already been highly disturbed as a result of new housing development.

5.2.22 In combination, the low to high magnitudes of effect on receptors of local to national value would lead to an overall major negative effect on ecology as a result of the Blue Route option prior to mitigation.

Green Route

5.2.23 In the south of the Study Area, the Green Route crosses the Tickenham and Nailsea Moors area, which is covered by both SSSI and SNCI designations.

5.2.24 The proposed double circuit Green Route would pass directly through Tickenham and Nailsea Moors and would involve the crossing of at least three ditches which are covered by SSSI designation. Crossing the protected ditches using open-cut methods would result in temporary fragmentation effects and a reduction in water quality during construction along with losses of bankside habitat and the important botanical and invertebrate communities which are associated with these habitats. Furthermore, drainage requirements across pasture fields that are covered by the SNCI designation may result in the drying out of these habitats along the permanent easement of the cables. These impacts would lead to a high negative, medium to long-term magnitude of effect without mitigation (details of mitigation measures are set out below under the subtitle Potential for Mitigation).

5.2.25 The Green Route would result in losses of up to 30m of predominantly species-poor hedgerows at hedgerow crossings. Due to the length of the route, and the prevalence of hedgerows in the Study Area, habitat losses would be relatively large. These losses of hedgerow would likely impact on protected species, including bats, dormice and breeding birds (if present). The resulting habitat fragmentation would weaken the wildlife corridor function of the hedgerow habitat. This would therefore result in a high negative, long-term magnitude of effect unless mitigation measures are implemented.

5.2.26 The Green Route and its construction swathe would result in the loss of SNCI woodland habitat in Prior's Wood, Mogg's Wood and Chummock Wood respectively. The loss of, and disturbance to, irreplaceable ancient woodland habitats, would lead to a high negative, permanent magnitude of effect.

5.2.27 The Green Route would also cross a stream which flows through Prior's Wood. This would likely experience temporary fragmentation effects and a reduction in water quality during construction, leading to a moderate negative, medium-term magnitude of effect.

5.2.28 The Green Route would travel adjacent to the Fields on Caswell Moor SNCI, affecting drains which are hydrologically linked to those present within the SNCI designation. This would therefore result in a reduction in the water quality of ditches within the SNCI and the drying-out and loss of adjacent wetland habitats, outside the SNCI, along the permanent easement of the cable route. These changes in habitat would impact upon on the protected species known to occur in the vicinity, including water voles and breeding reed bunting. The SNCI would therefore experience moderate negative, medium-term magnitude of effect as a result of the proposals.

5.2.29 Outside of the SNCI designations, grassland habitats and their associated flora and fauna are likely to experience a moderate, temporary magnitude of effect during construction from ground disturbance and construction activities.

5.2.30 To achieve a connection through to Portishead substation, the Green Route would pass directly through the Portbury Wharf Nature Reserve SNCI. The open-cut construction methodology used to install the cables, and its associated drainage requirements, may result in the loss of several standing water bodies within the SNCI and ditch habitats depending on the precise route of the cables. Without mitigation there would also be a reduction in water quality (as a result of run-off and pollution events) to retained areas of wetland habitat, which are hydrologically linked. (Details of mitigation measures are set out below under the subtitle Potential for Mitigation).

5.2.31 Disturbance to waders and overwintering bird species that are associated with the Severn Estuary SPA/Ramsar would occur as a result of undergrounding through Portbury Wharf. Disturbance effects during construction may affect the ability of the birds to forage and, as a result, they may not be able to gain sufficient weight in order to survive migration.

5.2.32 The W Route undergrounding is not directly connected with, nor is it necessary for the management of the SPA/Ramsar. Therefore, the routing of an underground cable through the nature reserve would require a Habitats Regulations Assessment (HRA) in accordance with Article 6(3) of the Habitats Directive. The purpose of this would be to enable the Secretary of State (as the 'competent authority') to determine if there would be likely significant effects on the European site and to carry out an appropriate assessment before a consenting decision is made.

5.2.33 For proposals which would adversely affect the integrity of the SPA/Ramsar site, development consent would only be granted if the impact could not be mitigated, there were no alternative solutions (which would not impact upon the SPA/Ramsar) and there were imperative reasons of over-riding public interest for which the development should go ahead. (Mitigation measures are discussed below under the subtitle Potential for Mitigation).

5.2.34 In addition to birds, other protected species would adversely be impacted as a result of construction works in Portbury Wharf, including great crested newt and water vole.

5.2.35 With the adoption of the Green Route, Portbury Wharf Nature Reserve SNCI and the associated flora and fauna (including species for which the Severn Estuary SPA/Ramsar site was designated) would experience a high negative, permanent magnitude of effect prior to mitigation.

5.2.36 In combination, the moderate to high magnitudes of effect on receptors of local to international value would lead to an overall major negative effect on ecology as a result of the Green Route option prior to mitigation.

Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.2.37 From an ecology perspective the potential in combination effects of the other Proposed Developments, including the Alternative Route[16] for the 400kV Bridgwater to Seabank overhead line near Portishead, in conjunction with the proposed W Route undergrounding works would not influence which option to take forward for consultation. It is acknowledged that in certain locations the undergrounding routes would pass under the new 400kV Bridgwater to Seabank overhead line. If the footings of the pylons were close to the

[16] National Grid: Hinkley Point C Connection Project. Stage 3 Consultation on Draft Route and Associated Development. Feedback Report (April 2013)

underground routes, adverse in combination effects on ecological receptors could increase. However, with careful pylon siting the effects could be minimised and would be limited to a localised area. As a result, the potential in combination effects would be similar for each of the route options proposed.

Potential for Mitigation

5.2.38 For all options, existing field access points and watercourse crossings would be used for works traffic wherever possible and standard environmental protection measures implemented including the timing of works to avoid sensitive periods, the prevention of encroachment of traffic onto retained habitats and the implementation of pollution control methods. This is particularly important for construction works within the SNCI and SSSI designations, but also for any works affecting habitats that are hydrologically linked to those sites.

5.2.39 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species such as water vole, otter or great crested newt, if present.

5.2.40 Working areas would be minimised when crossing valued habitat features to avoid or reduce impacts. Habitats within the permanent easement would be reinstated on completion of works (with the exception of trees), although varying establishment periods will apply and the loss of mature trees cannot be mitigated within a reasonable timeframe.

5.2.41 Horizontal directional drilling (HDD) would be used to cross ditches within the SSSI. Where the cable route travels through SNCI wetland habitats, replacement habitat could be created outside the permanent easement. However, due to the uncertainty of securing landowner agreement for works outside the easement, this form of mitigation has not been taken into account.

5.2.42 Measures would be taken to ensure that drainage conditions outside the permanent easement are unaltered, which would be particularly important where the route runs within and adjacent to the SNCI and SSSI designations.

5.2.43 A reduction in disturbance/displacement of SPA/Ramsar bird species during construction works at Portbury Wharf could be achieved by ensuring that construction works in that area are undertaken outside of the most sensitive season and are kept to the shortest timescale. The proposals would seek to minimise impacts by adopting careful and bespoke working practices and ensuring that all construction works within, and adjacent to, Portbury Wharf take place outside of the wintering bird season, between the months of April and September inclusive.

5.2.44 Temporary fragmentation impacts caused by hedgerow removal could be mitigated by placing structures across hedgerow gaps at night (across short distances). Alternatively ducting could be used to install the underground cables which could minimise disruption to hedgerows.

Ecology Conclusion

5.2.45 The Green Route would have substantial impacts on statutory and non-statutory designated sites and the species which they support.

5.2.46 Significant adverse impacts to protected wetland habitats would occur, particularly at Portbury Wharf Nature Reserve which supports Severn Estuary SPA/Ramsar bird species. Even using habitat reinstatement and methods to protect water quality during works, residual impacts would be likely to remain in the medium-term.

5.2.47 The Green Route would impact upon Nailsea and Tickenham Moor which is covered by SSSI and SNCI designations

5.2.48 In addition to this, in the area between Nailsea and the M5, direct losses and disturbance to ancient woodland habitat would occur which could not be adequately mitigated.

5.2.49 The adoption of the Green Route would require hedgerow removal at route crossings, which could have effects on protected species (such as bats and possibly dormice) as a result of habitat fragmentation. Depending on the age and structure of the hedgerow, it may not be possible to mitigate (within a reasonable timeframe) hedgerow losses associated with an underground option. Although, temporary measures and hedgerow planting would be used to reduce these impacts, a reduction in quality of these habitats would be experienced while the new hedgerows matured.

5.2.50 Following mitigation effects on ecology for the Green Route would be reduced, but a moderate scale of effects would remain with this option. Whereas following mitigation along the Blue Route, effects on ecology would be reduced to a minor scale of effect. Therefore the Blue Route is preferable on ecological grounds.

5.3 Environment – Historic Environment

Baseline Conditions

5.3.1 In appraising the effects on the historic environment, we have gathered baseline data from study areas that vary in size according to the sensitivity of the receptors. Data regarding Scheduled Monuments, Grade I and II* Listed Buildings, and Grade I Registered Parks and Gardens has been gathered from within 10km of the route options. Data regarding Grade II Listed Buildings, Grade II* and II Registered Parks and Gardens, Conservation Areas, and Registered Battlefields has been gathered from within 2km of the route options. Data regarding non-designated heritage receptors has been gathered from within 100m of the route options. Data regarding non-designated receptors of equivalent sensitivity to designated receptors has been collected, primarily through consultation, from the same study areas as apply to the designated receptors. This area will be referred to as the 'historic environment appraisal area'.

5.3.2 No Listed Buildings would receive effects on their fabric or permanent effects on their setting as a result of the proposals.

5.3.3 Twenty-five Listed Buildings could receive temporary effects on their setting during the construction works. Two Grade I, one Grade II* and 22 Grade II Listed Buildings include proposed route options in their setting.

Blue Route A and B and Green Route

5.3.4 Grade II Listed 'The Lodge' on Naish Hill is adjacent to the Blue Route (all options).

5.3.5 The Blue Route A is also adjacent to 'The Cottage' and a 'guidestone' in Portishead, six buildings on North Street, Nailsea, three buildings in Stone-edge Batch and a Grade II Listed farmhouse and milepost further south along Clevedon Road, all 13 of which are Grade II Listed.

5.3.6 The Blue Route B is adjacent to Grade I Listed All Saints Church, the Grade II* Listed churchyard and three Grade II Listed buildings/structures in Wraxall, Grade II Listed Wraxall House, on the B3130, and Grade II Listed North Street House, Nailsea. Grade I and II* Listed Buildings are of very high sensitivity, and Grade II Listed Buildings are of high sensitivity.

5.3.7 In the north western corner of Nailsea, the Green Route single circuit option in North Street passes adjacent to Grade II Listed North Street House, Nailsea, although the other Green Route single circuit option via Blackfriars Road does not.

5.3.8 No Scheduled Monuments would receive physical effects or permanent effects on their setting as a result of the proposals. One Scheduled Monument (a Deserted Medieval

Settlement (DMV) 300m east of Wraxall House, Nailsea) includes the B3130 within its setting, along which the Blue Route B is proposed, approximately 250m away. This Scheduled Monument is of very high sensitivity.

5.3.9 No Conservation Areas would receive permanent effects on their setting as a result of the proposals. One Conservation Area (Nailsea Kingshill) is crossed by the Blue Route A. This is an urban area, centred on the junction of North Street and Union Street. The Conservation Area is a medium sensitivity receptor.

5.3.10 There are no Registered Parks and Gardens or Registered Battlefields within 250m of the route options and none would be affected by the proposals.

5.3.11 No non-designated receptors have been identified within the historic environment appraisal area as being possibly of equivalent sensitivity to designated heritage assets (i.e. potentially of Listable, Schedulable, or non-statutorily designatable quality).

5.3.12 The historic environment appraisal area around the Blue and Green Routes contains 104 known non-designated heritage receptors. These are discussed below in Sections 5.3.13 to 6.3.23.

Non-designated Heritage Receptors

Blue Route A and B and Green Route

5.3.13 There is moderate potential for previously unknown archaeological remains to be present around Nailsea, and throughout most of the historic environment appraisal area north of Tickenham Ridge. There is high potential for previously unknown archaeological remains to be present throughout Tickenham Ridge, and at Sheepway Gate Farm, near Portishead.

5.3.14 Southwest of Nailsea the North Somerset Historic Landscape Characterisation notes the area as containing irregular fields, predominately derived from the enclosure of anciently reclaimed inland moors during the post-medieval period (15th - 17th century). With the exception of the Conservation Area, Nailsea is a zone predominately of 20th century urban development. North of Nailsea, the route crosses the complex historic landscape of Tickenham Ridge, which includes zones of medieval and late medieval enclosed fields, created by 'local arrangement and exchange', assart, or 'organised clearance'. Tickenham Ridge also has small zones of pre-C18th woodland, 'C18- 19th parliamentary enclosure', and 'post-medieval designed ornamental landscape' at Naish. A late medieval landscape ('enclosed fields created by local arrangement and exchange') covers most of the land from Tickenham Ridge to Portishead, although in lower-lying zones, inland moorland was arranged into organised enclosure during the 15th - 17th century. The medieval enclosed fields and the woodlands are of moderate sensitivity; all other historic landscape zones within this appraisal area are of low sensitivity.

Hedgerows associated with the Scheduled Monument near Wraxall House, Nailsea Kingshill Conservation Area, the historic cores of Tickenham and Stone-edge Batch, parish boundaries, or any archaeological sites described in the HER, may all be regarded as 'important' (cf. Hedgerow Act, 1997). 'Important' hedgerows are receptors of low sensitivity

Blue Route

5.3.15 In the southern part of Nailsea, all route options run near to the sites of a kiln, colliery, two engine houses, a 19th century farm and a group of World War Two Nissen Huts.

5.3.16 In Nailsea, the Blue Route A crosses Kings Hill 'historic core settlement' (i.e. recorded in the North Somerset Historic Environment Record (HER) as being identifiable on late 18th or early 19th century maps, and possibly preserving medieval or earlier outlines and post-medieval building fabric), and runs near to a bridge, a pound, and two public houses. The Blue Route A then runs near to Hale Farm historic core settlement (north of Stone-edge Batch), two boundary stones and a quarry.

5.3.17 The Blue Route B runs through the southern and then western sides of Nailsea, passing near 22 post-medieval coal mining sites, a Victorian school, Victorian rifle butts site, four post-medieval houses, a post-medieval public house, a holloway, a deserted post-medieval settlement ('Nowhere'), a milepost, and a 20th century brewery. North of Nailsea, in Wraxall the Blue Route B passes near two possible medieval watermill sites, two World War Two sites and (in Wraxall historic core settlement) a medieval cross, a post-medieval stocks site and a post-medieval public house site. Between Wraxall and Whitehouse Lane, the Blue Route B passes a Neolithic/Bronze Age flint scatter, late prehistoric field system, supposed medieval earthwork, historic core settlement, post-medieval quarry and World War Two site all at Moat Cottages.

5.3.18 At Whitehouse Lane, the Blue Route (both options) pass near to a possible Bronze Age round barrow, an Iron Age enclosure with adjacent Roman settlement, a DMV from which a 'Dark Age' brooch was found (possible evidence of a cemetery) and other earthworks. The Blue Route B passes through the middle of the Iron Age enclosure.

5.3.19 From Whitehouse Lane, the Blue Route A runs north, near to five historic core settlements in Clapton in Gordano: Stratton and Cherry Orchard Farms, Morgans Buildings, Woodbine Cottage (17th century), Brook Farm, and Sperring's Farm. Clapton in Gordano is also the location of a quarry, coal mine, and polished stone axe findspot. The Blue Route A then runs north through the outskirts of Portishead, near to the historic core settlement, which contained a medieval moat, barn and enclosure (a common), a Victorian public house, 17th century dwelling. The Blue Route A then passes near to a historic railway station, pound site, and post-medieval bridge before reaching Portishead Substation.

5.3.20 From Whitehouse Lane, the Blue Route B runs west along the M5 corridor, passing adjacent to a late prehistoric field system at Caswell Hill (which includes 2m high earthworks) and approximately 150m from the medieval settlement of Caswell. The Blue Route B then runs north to the road 'The Portbury Hundred', where it turns west to Portishead and then north through the town's outskirts, passing Moor Farm historic core settlement.

Green Route

5.3.21 The Green Route runs from Nailsea (near two post-medieval mines and a boundary stone on its outskirts) to Tickenham. It passes within 100m of the historic core settlement of Tickenham (including one Grade I, one Grade II* and three Grade II Listed Buildings, and archaeological remains of medieval settlement), crossing the site of a Roman building next to the Victorian bridge on Church Lane. The Green Route also crosses a medieval mill leat before running north-west, across a second Roman site (on Old Lane) and near to the historic core settlement of Stone-edge Batch.

5.3.22 From Stone-edge Batch, the Green Route runs along the narrow valley up Tickenham Ridge, near a flint scatter site and a former lime kiln, and adjacent to the DMV at Whitehouse Lane.

5.3.23 The Green Route follows a similar route to Blue Route B from Whitehouse Lane to the M5, although it runs straight across the late prehistoric field system at Caswell Hill, while passing the same distance from Caswell medieval settlement. From the M5, the Green Route runs north past the historic core settlement at Sheepway Gate Farm, next to the road 'Sheepway'. The route travels north, past Wathpins historic core settlement, an undated enclosure, a Neolithic axe find-spot, and two World War Two sites..

Assessment of Effects

5.3.24 All route options would result in no effect on the fabric of Listed Buildings, Scheduled Monuments or Conservation Areas, and would result in no permanent effects on the settings of these receptors. There may be temporary negative effects on the settings of these receptors during construction works. The magnitude of these effects would be negligible on receptors of very high - medium sensitivity.

5.3.25 All route options would have moderate potential to encounter previously unknown archaeological remains in the open fields southwest of Nailsea; the magnitude of effect of which would be high - negligible on receptors of moderate - negligible sensitivity.

5.3.26 Where the proposed route options are constructed along roads, it is expected that significant modern disturbance will have drastically reduced the potential for the proposed development to encounter previously unknown archaeological remains. In all such areas, all route options would result in a negligible magnitude of effect on any archaeological receptors that have survived road construction, which would be of moderate - negligible sensitivity.

5.3.27 For all route options, improvements to the road network necessary for construction activities and construction working width could cause negative effects to historic landscape elements such as 'important' hedgerows and historic lanes. The magnitude of these effects would be low on receptors of low sensitivity.

Blue Route

5.3.28 The Blue Route B has moderate potential to encounter previously unknown archaeological remains where it crosses open fields between the M5 and Portbury Hundred. The magnitude of effect would be high - negligible on receptors of moderate - negligible sensitivity.

Green Route

5.3.29 The Green Route would result in a negative effect on buried archaeological remains. The Green Route would result in a negative effect on a medieval mill leat and two sites where Roman remains have been found. The Green Route also has high potential to encounter previously unknown archaeological remains associated with medieval settlements at Tickenham and Stone-edge Batch. The Green Route would have a negative effect on a late prehistoric field system at Caswell Hill. The Green Route also has high potential to encounter previously unknown archaeological remains throughout Tickenham Ridge, including near the multi-period group of remains at Whitehouse Lane, and associated with medieval settlement at Sheep Gate Farm. In addition, the Green Route has moderate potential to encounter previously unknown archaeological remains between the M5 and Portishead substation. The magnitude of effect would be high - negligible on receptors of medium - low sensitivity.

Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.3.30 In certain locations the undergrounding routes would pass adjacent to the pylon working areas for the new 400kV Bridgwater to Seabank overhead line. For the Green Route, this would include a pylon on Tickenham Moor. Crossing Tickenham Ridge, this would include 12 pylons for the Green Route, and one pylon for the Blue Route. The Green Route and the Blue Route B would pass adjacent to a further five pylons if the Alternative Route[17] for the 400kV Bridgwater to Seabank overhead line near Portishead were adopted. In these areas, the negative effects on any buried archaeological remains that are present could increase. As a result, the in combination effects indicate an increased preference in favour of the Blue Route against the Green Route.

[17] National Grid: Hinkley Point C Connection Project. Stage 3 Consultation on Draft Route and Associated Development. Feedback Report (April 2013)

Potential Mitigation

5.3.31 Scope to mitigate effects on the setting of heritage receptors is limited. The feasibility of measures to reduce visual effects cannot be guaranteed at this stage of the assessment. The scale of effect does not therefore take mitigation into account.

5.3.32 For all route options, a programme of archaeological monitoring and investigation would be required to mitigate effects on buried archaeological remains. The programme would be proportionate to the level of ground disturbance and the archaeological potential of the areas where work is taking place.

5.3.33 For all route options, physical effects on historic landscape elements (i.e. physical features) could be avoided, or mitigated through archaeological recording, careful reinstatement and, in the case of some hedgerow loss, translocation or replanting (note that some hedgerow loss may not be capable of being mitigated, because certain species cannot be replanted over underground cables).

Historic Environment Conclusion

5.3.34 All options would have no permanent effects on Listed Buildings, Conservation Areas or Scheduled Monuments. There would be temporary negative effects on the settings of one Grade I, one Grade II* and 18 Grade II Listed Buildings, two Scheduled Monuments and one Conservation Area, as a result of construction works and traffic. The scale of these effects would be negligible.

5.3.35 All route options could result in direct, physical effects on the historic landscape through the removal of sections of historic hedgerow. This would be an overall minor negative scale of effect on the Green Route, or negligible negative scale of effect for the Blue Route A. Mitigation is available for most of these effects, in which case no long-term effects would remain.

5.3.36 Negative effects on buried archaeological remains would be direct and permanent, and could lead to total loss or substantial harm in relation to multiple non-designated heritage receptors. The negative effect on buried archaeological remains is due primarily to their loss of value in terms of their potential to contribute to people's understanding of the past (i.e. evidential value). This effect can be reduced, although not completely, through archaeological investigation and recording; however, because archaeological remains are a finite and non-renewable resource preservation in situ is preferred, where possible.

5.3.37 The Blue Route would result in lower negative effects on the historic environment than the Green Route. This is due to the Blue Route being almost entirely constructed within disturbed ground along roads. Therefore the Blue Route is preferable from an historic environment perspective.

5.4 Socio-economic – Economic Activity

Baseline Conditions

Both Cable Routes

5.4.1 Both routes pass through the West End Trading Estate which has been safeguarded for employment within the North Somerset emerging proposals map.

5.4.2 Where visible, construction activities are likely to reduce the amenity value of recreational and tourism receptors, but this would be limited to the period when they are taking place. However, this specific element of work is not anticipated to affect the area's overall popularity for recreation and tourism and is considered to be of low to negligible magnitude. Both routes would cross the Nailsea and Backwell rugby club junior training ground and for the period of construction the facility is unlikely to not be usable. This would be a high magnitude temporary effect on a local recreational resource.

5.4.3 Construction activities may have temporary low magnitude negative impacts on local amenity value from elevated noise and dust levels and disrupted access to business activities, tourism resources and local amenities. The magnitude of these likely impacts is dependent on the specific cable route and is described in greater detail below. Once operational, monitoring is likely to be required once every three years and ad hoc works could be required should unexpected faults occur.

5.4.4 Both routes require the M5 to be crossed in the area between Clapton in Gordano and Portbury. It is assumed that the use of existing crossing infrastructure or the construction techniques selected, such as HDD will ensure that traffic flow along the M5 is not affected by either route, during or post-construction. Construction activities may result in a need to temporarily divert a section of National and Regional cycle routes, the Gordano Round Long Distance Footpath and local PRoWs to maintain access to construction swathes, and visual connections between users of the routes and construction activities are possible. Assuming good construction practice, these potential temporary low magnitude effects are not anticipated to adversely affect the PRoW routes' popularity. This is due to the short section of the overall walking/cycle routes which are proximal to the cable routes, the proximity of other electricity infrastructure and the local landscape context, with trees and hedgerows along sections of the highway network.

5.4.5 Any agricultural land, and in particular Best and Most Versatile (BMV) land, temporarily used during construction will be restored to the same quality as pre-construction, enabling agricultural activities to be resumed. The undergrounding will not require the permanent loss of agricultural land and the removal and restoration of the land under the existing 132kV W Route pylons could result in a low magnitude positive impact.

5.4.6 Post-construction, visual connections between the existing 132kV W Route and local socio-economic receptors will be removed, regardless of route selected. This is likely to have a low magnitude positive impact on the visual amenity value of the study area.

Blue Route

5.4.7 The Blue Route seeks to locate the underground cable in existing highways with the double circuit split to follow two single circuit routes in some locations, depending on the confines of the highway. The Blue Route passes around the eastern and western fringes of Nailsea, across Tickenham Ridge and through the eastern fringes of Portishead. The Blue Route passes alongside a range of sites allocated within the North Somerset emerging proposals map and although this is not anticipated to affect the future development of these sites, their access routes may be affected during construction of the cable route. The Blue Route passes along Quay's Avenue in Portishead which is included within the emerging proposals map as a Major Highway Scheme and a site safeguarded for Portishead Railway Station terminus and car park. The route also passes through an area on the eastern fringe of Portishead which is proposed for new residential development. If selected, the Blue Route would need to consider the requirements of each allocation to minimise the risk to future development. For example, the route should be progressed in consultation with the Council and/or the developer to maximise the routing through the highway network, car parks or other acceptable land uses.

5.4.8 The route passes the accesses to many residential properties and may influence access to businesses in Nailsea Town Centre from the west/southwest. The route also passes in close proximity to Noah's Ark Farm and a range of locally important socio-economic features including schools, restaurants and holiday accommodation. Access to these features and general traffic circulation within the study area during construction will be disrupted. However, the disruption will be temporary and good construction management should reduce these impacts to a low magnitude.

5.4.9 The construction period is anticipated to be up to 2 years and 3 months based on construction activities taking place within a five day working week. During construction, four teams of engineers in different locations will each construct a 1km section of underground

cable, resulting in four sections being constructed at any one time if possible. It is anticipated that construction would require full road closures for these 1km sections, diversion routes put in place as appropriate and access for the disabled and emergency vehicles maintained. This has the potential to result in temporary moderate to major negative socio-economic effects, dependent on the location and sequencing of the road closures. This would require detailed analysis if this option is progressed. The basis of the effects is the clear reduction in accessibility to residential, employment/business and community premises within the project area. During the closure period, functionality of businesses and community premises could be markedly reduced. However, the construction period could be shortened if longer working days or more working days per week were undertaken. Construction will require direct employment of approximately 60 construction contractors, with associated low magnitude positive impacts from local expenditure by contractors during the construction period.

5.4.10 Post construction, the urban setting of the route means the routine maintenance and any ad hoc repairs required to ensure continued operation may necessitate temporary closure/disruption of the road network, with potential associated impacts on access to local socio-economic features. This would be managed at the time and impacts are anticipated to be of negligible magnitude.

Green Route

5.4.11 The Green Route seeks to avoid built up areas and takes a relatively direct route from Nailsea to Portishead Substation, principally through agricultural land. The route passes along a short stretch of existing highway in the south west of Nailsea, and crosses a number of highways. The route passes through an area to the north west of Nailsea, allocated for mixed use development within the North Somerset emerging Local Development Framework, Sites and Policies Document.

5.4.12 The Green Route passes directly through or very close to a number of local socio-economic resources including the DMX Motocross Track off Caswell Hill, Portbury Wharf Nature Reserve, Moorend Spout Local Nature Reserve and the recreational resources to the west of Nailsea. Temporary impacts on these features from construction activities are likely, from direct impacts to their use or disrupted access to the features. Construction management would seek to minimise these impacts and given their temporary nature these are considered to be low to moderate magnitude.

5.4.13 The construction period for the Green Route is anticipated to be 1 year and 11 months, based on a five day working week, and to require direct employment of approximately 40 construction contractors with associated low magnitude positive impacts from local expenditure by contractors during the construction period.

5.4.14 Post construction impacts on these features are not anticipated and an underground cable should not affect their continued use. The exception could be the DMX Motocross which could be operationally constrained by the presence of an underground cable restricting earth movement on the site.

Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.4.15 Taking into account the potential in combination effects of the other Proposed Developments, including the Alternative Route[18] for the 400kV Bridgwater to Seabank overhead line near Portishead, in conjunction with the proposed W route works would not

[18] National Grid: Hinkley Point C Connection Project. Stage 3 Consultation on Draft Route and Associated Development. Feedback Report (April 2013)

further differentiate the overall effects identified and which option should be taken forward for consultation from a socio economic perspective. However, it is noted that the Alternative Route in combination with the Green Route would increase the temporary effects on the Portbury Wharf Nature Reserve.

Potential for Mitigation

5.4.16 Careful implementation of mitigation measures could avoid or reduce conflicts with residential, recreational and business access, North Somerset's tourism strategy and policies relating to the preservation of the Somerset Levels and Moors and BMV agricultural land. WPD has a mechanism to appropriately compensate individuals for direct impacts of its infrastructure, including temporary loss of crops and for permanent easements for its infrastructure and it is anticipated that this would appropriately mitigate the loss of BMV and direct disruption to agricultural activities and socio-economic features.

5.4.17 There are a number of measures that could be put into place to mitigate the temporary construction impacts on socio-economic receptors in the area. These include:

- Programming construction activities to minimise effects.
- Routeing construction traffic to minimise disruption to local business, tourism and recreation resources.
- Construction traffic management plans to minimise disruption to the road network, minimise diversion routes and maximise the maintenance of access to property and businesses.
- Where construction disrupts PROWs and National Cycle Network Route, alternative/ diversionary routes should be provided and clearly signed.
- Adopting good construction practice to minimise noise and dust generation.
- Maximising socio-economic benefits by seeking to appoint local contractors and source materials locally.

5.4.18 Planting vegetative screening should reduce the opportunities for visual connections between users of local tourism and recreation resources and proposed electricity infrastructure. Restoration and mitigation techniques should ensure that, post construction, the land along the cable route is restored to the same quality as prior to construction.

Socio-economic Conclusions

5.4.19 The socio-economic appraisal has identified that the Blue Route is likely to cause greater disruption, over a longer duration, to socio-economic receptors, particularly the large number of local businesses and residential properties in Nailsea and Portishead. These temporary moderate to major magnitude negative effects are notably reduced with the Green Route. It is noted that both routes have potential for a high magnitude temporary effect on a local recreational resource. Both routes will result in construction expenditure in the area and whilst this will be greater with the Blue Route as a result of the longer construction period, this is not considered to outweigh the potential disruption of the Blue Route.

5.4.20 The Green Route is considered the most preferable from a socio-economic perspective owing to the notably lower level of disruption anticipated during construction. These construction effects are a differentiator between the two options and should be considered by National Grid and WPD when deciding which option to progress.

5.5 Cost Analysis

5.5.1 The cost per km for a single circuit of 132kV underground cable is approximately £1 million. Both capital and lifetime costs are calculated (Appendix D). Both figures also include the preliminary costs of additional engineering operations such as crossing rhynes and former railway tracks.

Route	Length (km)	Capital Cost (M)	Lifetime Cost (M)
Green	10	£21.7	£22
Blue (A + B)	27.6	£29.7	£30.8

5.5.2 On the basis of Capital and Lifetime costs, the Green Route is the most economical. The Blue Route would incur costs of approximately £8 million higher in capital terms and £8.8 million higher in lifetime terms compared to the Green Route. This represents a 37% increase in cost for the Blue Route over the Green Route in capital terms and 40% in lifetime terms.

6 CONCLUSIONS

6.1 Landscape and Views

6.1.1 The effects on landscape character and visual amenity would be beneficial whichever option is taken forward as the existing overhead line would be removed from this area. Overall, there is a slight preference for choosing the Blue Route as this would minimise effects on landscape character by following existing roads.

6.2 Ecology

6.2.1 The Green Route would have greater effects on ecology due to the impacts on designated sites and species and the requirement for hedgerow removal.

6.2.2 Following mitigation effects on ecology for the Green Route would be reduced, but a moderate scale of effects would still remain with this option. Following mitigation, the Blue Route would have a minor scale of effect. Therefore the Blue Route is preferable on ecological grounds.

6.3 Historic Environment

6.3.1 Both route options would result in no effect on the fabric of Listed Buildings, Scheduled Monuments or Conservation Areas, with only negligible effects to settings of these assets.

6.3.2 The Green Route has higher potential to encounter archaeological remains, whereas, the prospect of encountering buried archaeology is significantly reduced for the Blue Route as modern disturbance within the highways will have drastically reduced the potential to encounter previously unknown remains. The Blue Route would also lead to less potential for in combination effects. Therefore the Blue Route is preferred from an historic environment perspective.

6.4 Socio-economic

The Green Route is considered preferable from a socio-economic perspective as it avoids the levels of disruption that would be caused to local businesses and residential properties by adopting the Blue Route.

6.5 In Combination Effects

6.5.1 The historic environment appraisal indentifies that the Blue Route would be preferred when in combination effects are taken into account. For all other appraisals, the potential in combination effects are not so differentiating that they would influence the conclusion as to which route option should be taken forward.

6.6 Cost

6.6.1 The costs of each option are given below.

Capital Cost

- Green Route £21.7 million; and
- Blue Route £29.7 million.

Lifetime Cost

- Green Route £22 million; and
- Blue Route: £30.8 million.

6.7 Overall conclusion

6.7.1 In conclusion, in accordance with National Grid and WPD's statutory obligations to operate in an efficient, coordinated and economical manner it is recommended that the Green Route should be adopted from Nailsea to the substation at Portishead. Whilst this route would have greater effects on ecology and would be more likely to encounter unknown buried archaeology, these are not considered to be factors that would rule out the Green Route as they can be mitigated against.

6.7.2 Adopting the Green Route will also avoid the greater levels of disruption to socio-economic receptors, particularly the large number of local businesses and residential properties in Nailsea and Portishead that would be affected by the Blue Route because of installing cables in roads.

6.7.3 In terms of costs, the Blue Route would incur capital and lifetime costs of approximately £8 to £8.8 million above that of the Green Route. This represents a substantial 37% and 40% increase in cost for the Blue Route compared to the Green Route.

6.7.4 In order to minimise effects on sites designated for their ecological value and disturbance/displacement to ecology, construction activities would be undertaken outside of the most sensitive season and kept to the shortest timescale. In the case of Portbury Wharf Nature Reserve, this would involve ensuring that all construction works within, and adjacent to the reserve take place outside of the wintering bird season, between the months of April and September inclusive.

6.7.5 To minimise the effects on hedgerows during construction, particularly temporary fragmentation impacts caused by hedgerow removal, structures could be placed across hedgerow gaps at night (across short distances). Alternatively, where hedgerows are identified that fulfil a particularly important wildlife function ducting could be used to minimise disruption. Post construction, hedgerow planting would be used to reduce impacts, albeit a reduction in quality of these habitats would be experienced while the new hedgerows matured. WPD and National Grid will liaise closely with Natural England, North Somerset Council and the Avon Wildlife Trust in order to ensure that appropriate construction methods are implemented and effects on the

6.7.6 In order to minimise effects on archaeology, a programme of archaeological monitoring and investigation would be required. Physical effects on historic landscape elements (i.e. physical features) could be avoided, or mitigated through archaeological recording, careful reinstatement and, in the case of some hedgerow loss, translocation or appropriate replanting could be used.

6.8 Next Steps

6.8.1 Having regard to statutory duties and all the factors considered as part of the appraisal process, WPD and National Grid consider that the Green Route is the preferred technical and environmental option.

6.8.2 This will be reviewed throughout the development of the project and following consultation with statutory consultees and local communities who will have the opportunity to comment on all the options considered in this Report as part of the formal consultation.

FIGURE 1

STUDY AREA PLANS SHOWING THE UNDERGROUND ROUTES

SEE DETAIL INSET

DETAIL INSET

The following environmental constraints considered do not occur:
- World Heritage Site
- National Park
- Area of Outstanding Natural Beauty
- Ramsar
- Special Protection Areas
- Special Area of Conservation
- Heritage Coast
- Protected Wreck
- Registered Battlefield
- Airfield/Airport
- Public Safety Zone

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- Local Constraints captured from North Somerset Replacement local plan (Adoted 2007)

Metres
0 250 500 1,000

Key

Proposed Infrastructure

- Blue Route (Double Circuit)
- Blue Route A (Single Circuit)
- Blue Route B (Single Circuit)
- Green Route (Double Circuit)
- Green Route Alternative (Single Circuit)
- Special Engineering Difficulties
- Compound / Laydown Area

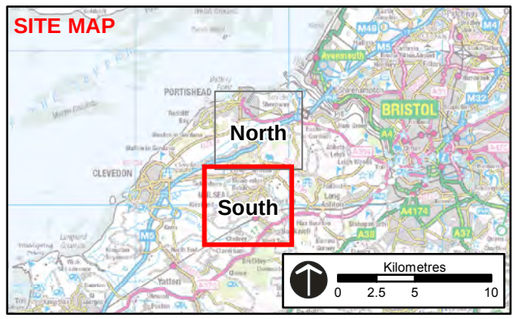
Existing Infrastructure

- Existing Western Power Distribution Overhead Line on Pylons
- Existing Western Power Distribution 132kV Overhead Line for removal
- Existing Substation

Environmental Constraints

- Site of Special Scientific Interest
- Site of Special Scientific Interest (Ditches and Rhynes)
- Registered Park and Garden
- Scheduled Monument
- Woodland
- Local Nature Reserve
- Listed Building (Grade I, II* and II)
- Conservation Area
- Site of Nature Conservation Interest (SNCI) / Wildlife Site

SITE MAP



TEP
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email tep@tep.uk.com

Project: **Western Power Distribution 132kV Diversions**

Title: **Nailsea to Portishead - Draft Underground Alignments - South Inset**

Drawing No: G1979.03.102c

Date: 01-05-2013

TEP Ref No: G1979.03.102c

Drawn:	Checked:	Approved:
CB	CC	CC

Key

Proposed Infrastructure

- Blue Route (Double Circuit)
- Blue Route A (Single Circuit)
- Blue Route B (Single Circuit)
- Green Route (Double Circuit)
- Green Route Alternative (Single Circuit)
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- Site of Special Scientific Interest (Ditches and Rhynes)
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- Woodland
- Local Nature Reserve
- Listed Building (Grade I, II* and II)
- Conservation Area
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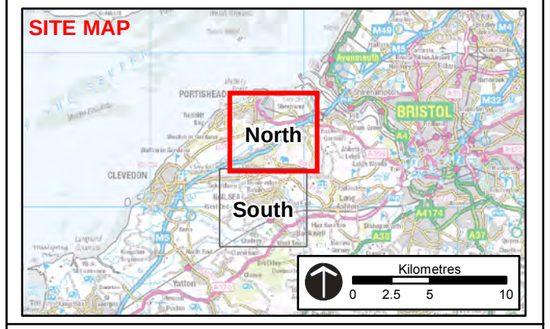
SITE MAP



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- National Park
- Area of Outstanding Natural Beauty
- Heritage Coast
- Protected Wreck
- Registered Battlefield
- Airfield/Airport
- Public Safety Zone

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- Local Constraints captured from North Somerset Replacement local plan (Adopted 2007)

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Metres
0 250 500 1,000

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Project:	**Western Power Distribution 132kV Diversions**
Title:	**Nailsea to Portishead - Draft Underground Alignments - North Inset**
Drawing No:	G1979.03.103c
Date:	23-07-2013
TEP Ref No:	G1979.03.103c
Drawn:	CB
Checked:	CC
Approved:	CC

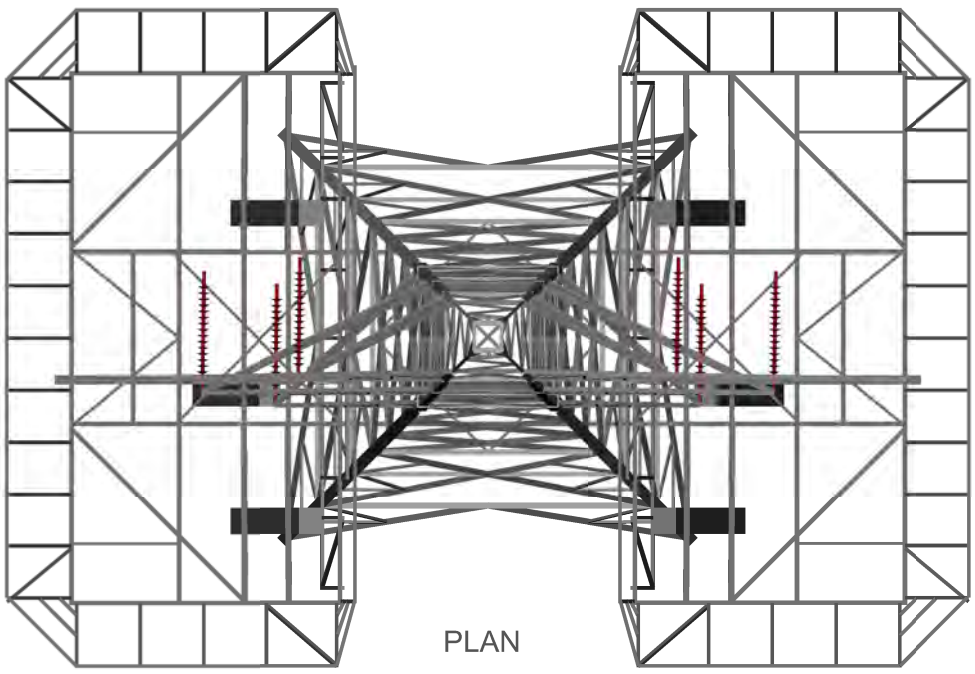
FIGURE 2

PLAN OF A STEEL LATTICE CABLE SEALING END PLATFORM PYLON

DESCRIPTION				
	FIRST ISSUE			
REV	DATE	BY	CHKD	APPD
A	19/06/2013	LK	CFK	--

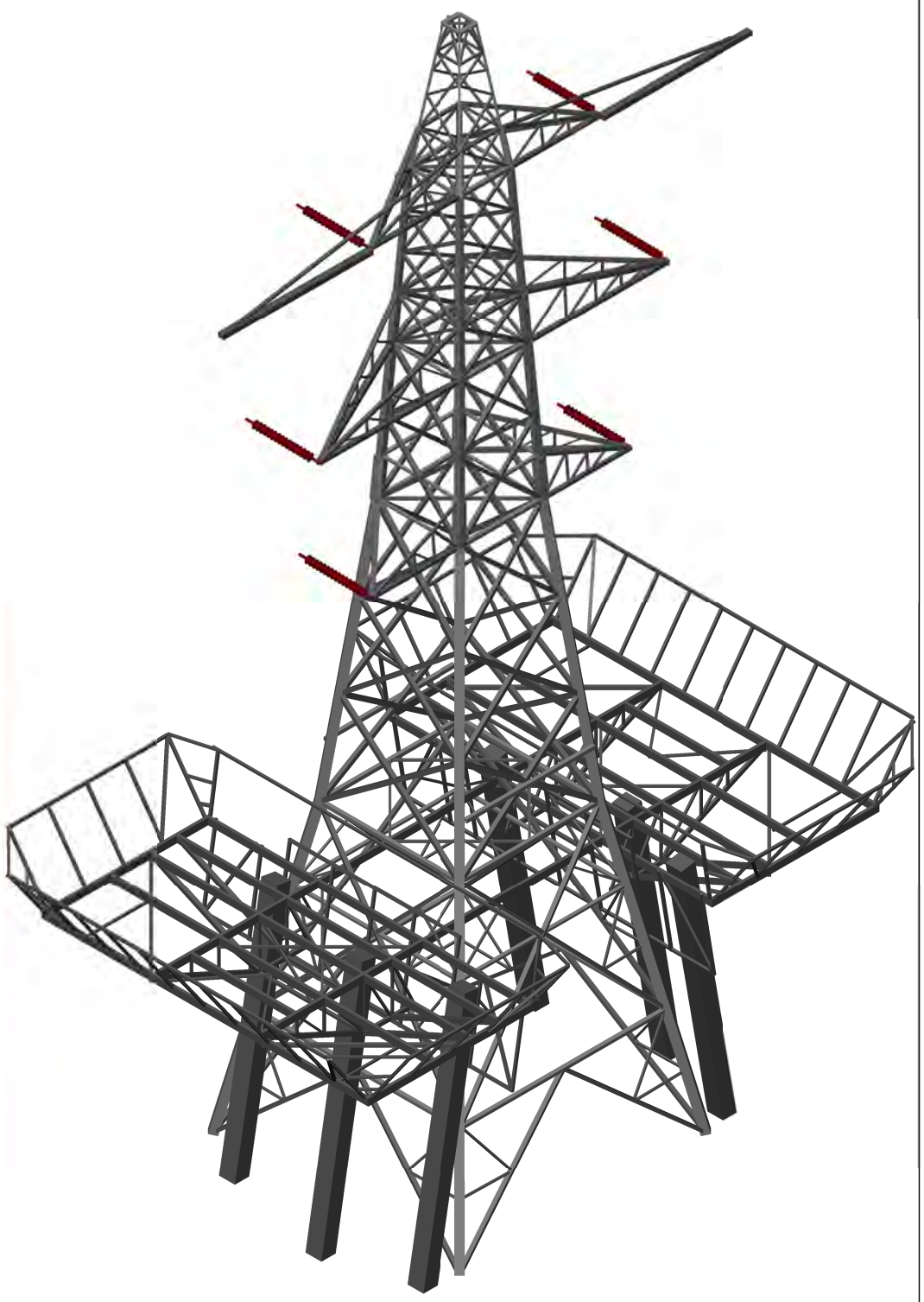
General Notes:

1. All dimensions in metres



PLAN

ELEVATION



ISOMETRIC VIEW

LSTC

LSTC North:
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Tel 01377 253617
Fax 01377 259555

LSTC South:
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475 Godstone Road
Whyteleafe
Surrey
CR3 0BL
Tel 01883 621114

CLIENT

National Grid

PROJECT

NG WPD WORKS
AT ROUTE DIVERSION

TITLE

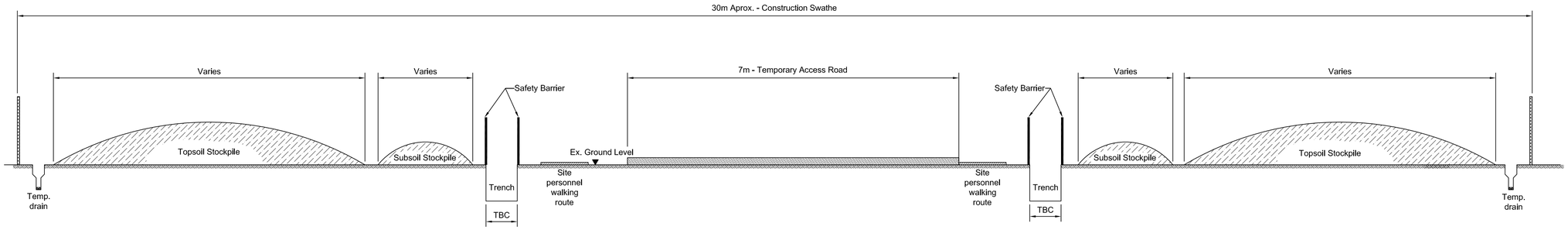
L7c DT STD Tower
with SEP

SCALE	DESIGNED
1:125 (UNLESS OTHERWISE STATED)	--
DATE: 19/06/2013	CHECKED: CFK
DRAWN: LK	APPROVED: --

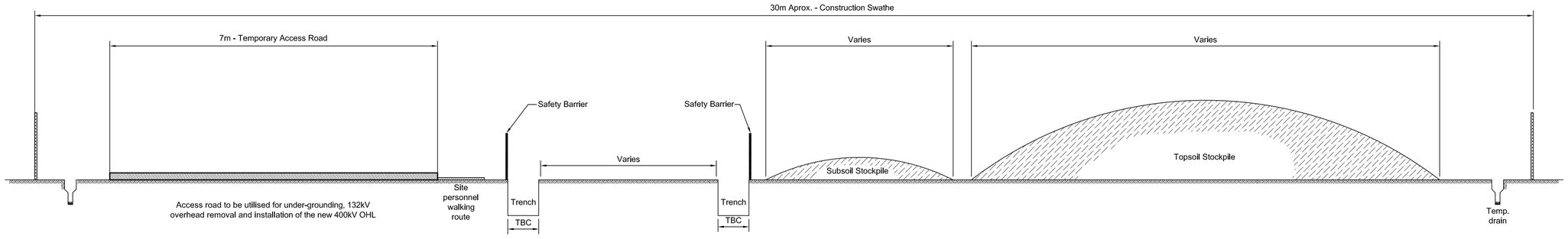
ORIGINAL SIZE	DRAWING NUMBER	REV
A4	39_12342_58	A

FIGURE 3

PLAN SHOWING A CROSS SECTION OF A TYPICAL 132KV CABLE SWATHE



Typical Construction Swathe for 132kV Cabling Works



Typical Construction Swathe for 132kV Cabling Works
With Access Road to be Utilised for Cabling and OHL Works

Notes

1. Proposed arrangement shown for indicative purpose only. Dimensions and design may vary depending on site and installation conditions.
2. Dimensions and overall width could increase or decrease

PRELIMINARY DESIGN NOT TO BE USED FOR CONSTRUCTION

MMD DRAWING No.
MMD-322069-E-DR-WPD-XX-0600

ISSUE	DATE	COMMENTS	DRAWN	CHK'D	APP'D
A	Sept' 13	FOR CONSULTATION	GJB	JB	PB

TITLE:

TYPICAL GENERAL ARRANGEMENT OF CONSTRUCTION SWATHE FOR 132kV UNDERGROUND CABLE INSTALLATION

nationalgrid

NG INVESTMENT No.	APPLICATION No.	CAD
20897		A1
NG DRAWING No.	DRAWING No.	SCALE
13/NG/0211		NTS
	SHEET 7 OF 53	ISSUE A

APPENDIX A

DUTIES OF WESTERN POWER DISTRIBUTION AND NATIONAL GRID

Appendix A THE DUTIES OF WESTERN POWER DISTRIBUTION AND NATIONAL GRID

A.1 Western Power Distribution and National Grid Role and Obligations

A.1.1. Both the distribution and transmission of electricity in Great Britain requires permission by a licence granted under Section 6(1)(b) and (c) of the Electricity Act 1989 ("the Electricity Act").

A.1.2. The legislative and regulatory framework is designed to ensure coordination and efficient investment by the distribution and transmission companies. These principles are central to the respective licences and industry codes.

A.2 WPD Role and Obligations

A.2.1. WPD has been granted a distribution licence and is therefore bound by the legal obligations set out in the Electricity Act and their distribution licence.

A.2.2. WPD owns and operates the distribution system in the South West, South Wales and the Midlands.

A.2.3. WPD has statutory duties to develop and maintain an efficient, coordinated and economical system of electricity distribution under Section 9 of the Electricity Act. These duties, which are documented in Standard Licence Conditions[19], are summarised in the following paragraphs.

A.2.4. Standard Condition C24 (Distribution System planning standard and quality of performance reporting) of WPD's distribution licence requires WPD to plan and develop its distribution system in accordance with standards set out in Engineering Recommendation P2/6[20].

A.2.5. P2/6 is a document that defines the minimum standards that WPD must apply when planning and operating the distribution system. The criteria include the type of faults (or breakdowns) and combinations of faults that the distribution system must be able to withstand, the impact on customers in terms of maximum level of supply interruptions, and the impacts on supply quality that are permissible.

A.2.6. P2/6 is open to industry and public scrutiny, is subject to periodic review and consultation and any changes are implemented by a change to the licence Standard Conditions and approved by the industry regulator, Ofgem[21].

A.2.7. As well as the technical standards described above, Section 38 and Schedule 9 of the Electricity Act 1989 requires WPD, 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*

[19] http://epr.ofgem.gov.uk/document_fetch.php?documentid=15184

[20] P2/6 can be purchased from www.energynetworks.org

[21] http://www.ofgem.gov.uk/Pages/OfgemHome.aspx

on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects"[22]

A.2.8. A1.10 WPD's Schedule 9 statement23 (the "Statement") sets out how the company will meet the duty to the environment placed upon it. These commitments include:

- minimise the impact of its activities on communities and the historic and natural environment;
- only seeking to build new lines along new routes, or substations in new locations where the existing distribution system infrastructure cannot be economically upgraded to meet distribution security standards;
- where new infrastructure is required seek to avoid, where reasonably practicable, areas which are nationally or internationally designated for their landscape, wildlife or cultural significance;
- site overhead lines with care and consider both the visual impact and the impact on nature conservation as far as possible; and
- continually work with partners to selectively underground lines in appropriate sensitive locations to improve the appearance of countryside, towns or villages, whilst taking account of sites of particular archaeological or nature conservation interest.

A.2.9. Effective consultation with stakeholders and the public is also promoted by the Statement

[22] Schedule 9 of the Electricity Act (http://www.legislation.gov.uk/ukpga/1989/29/contents).

[23] WPD Schedule 9 Statement: http://www.westernpower.co.uk/getdoc/c4856406-1794-4e34-81a0-9f2b593cdd4a/schedule9.aspx

APPENDIX B

POLICY BACKGROUND

Appendix B **POLICY BACKGROUND**

B.1 **National Policy Statements**

B.1.1. The context for any options appraisal relating to energy infrastructure is provided by the Overarching National Policy Statement for Energy (EN-1). This states that in considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the Infrastructure Planning Commission (IPC)24 should take into account:

- its potential benefits including its contribution to meeting the need for energy infrastructure, job creation and any long term or wider benefits; and
- its potential adverse impacts, including any long term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.

B.1.2. It goes on to note that, in this context, the IPC should take into account environmental, social and economic benefits and adverse impacts, at national, regional and local levels. EN-1 provides guidance on assessment on a topic basis relevant to all energy projects which is supplemented by guidance specific to the project type. EN-1 recognises that "in most cases, there will be more than one technological approach by which it is possible to make such a connection or reinforce the network (for example, by overhead line or underground cable) and the costs and benefits of these alternatives should be properly considered as set out in EN-5 (in particular section 2.8) before any overhead line proposal is consented." (EN-1 paragraph 3.7.10).

B.1.3. In the case of the Hinkley Point C Connection, the relevant guidance for electricity transmission connections is to be found in the National Policy Statement for Electricity Networks Infrastructure (EN-5). Paragraph 2.8.2 of the Electricity Networks National Policy Statement (EN-5) states that:

> *"Government does not believe that development of overhead lines is generally incompatible in principle with developers' statutory duty under section 9 of the Electricity Act to have regard to amenity and to mitigate impacts. In practice new above ground electricity lines, whether supported by lattice steel towers/pylons or wooden poles, can give rise to adverse landscape and visual impacts, dependent upon their scale, siting, degree of screening and the nature of the landscape and local environment through which they are routed. For the most part these impacts can be mitigated, however at particularly sensitive locations the potential adverse landscape and visual impacts of an overhead line proposal may make it unacceptable in planning terms, taking account of the specific local environment and context."*

B.1.4. EN-5 also says that although Government expects that overhead lines will often be appropriate and their effects can often be mitigated:

> *"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)".*

[24] The functions of the IPC were transferred to the Planning Inspectorate in April 2012

B.1.5. EN-5 states that consent should only be refused for overhead line proposals in favour of an underground line if "…the benefits from the non-overhead line alternative will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable". In this context it should consider:

- the landscape in which the proposed line will be set, (in particular, the impact on residential areas, and those of natural beauty or historic importance such as National Parks, AONBs and the Broads);
- the additional cost of any undergrounding; and
- the environmental and archaeological consequences of undergrounding.

B.1.6. The options appraisal that has been undertaken for the W Route includes consideration of these particular factors in reaching a recommendation on where undergrounding can be justified.

B.1.7. EN-5 does not seek to define "particularly sensitive locations". However, in proximity to Corridor B, the only area which might clearly be considered to be particularly sensitive is the Mendip Hills AONB, which is nationally designated and lies some 0.5km to the south of the proposed substation and the start of the route corridor.

B.2 National Planning Policy Framework

B.2.1. The National Planning Policy Framework25 (NPPF) may be considered as an "important and relevant"26 matter in decision making for Nationally Significant Infrastructure Projects (NSIPs). Paragraph 6 of the NPPF states that "the purpose of the planning system is to contribute to the achievement of sustainable development". It goes on to note that planning has a key role to play in "supporting the delivery of renewable and low carbon energy and associated infrastructure".

B.2.2. The Hinkley Point C Connection is intended to provide additional transmission capacity to permit the connection of wind and nuclear powered generation and thereby assist the UK to meet its renewable energy targets. While the NPPF does not include policies specifically related to electricity transmission infrastructure, it does include policies for conserving and enhancing the natural and historic environment which have been taken into account in planning and assessing potential alignments.

B.2.3. Paragraph 115 states that "great weight should be given to conserving landscape and scenic beauty in National Parks and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to landscape and scenic beauty. The conservation of wildlife and cultural heritage are important considerations in all these areas…."

B.2.4. Paragraph 116 states that "planning permission should be refused for major developments in these designated areas except in exceptional circumstances and where it can be demonstrated that they are in the public interest." It goes on to state that applications for such development should be accompanied by assessments of the need for the development; the scope for meeting the need outside the designated area; and the effects of the development on landscape and recreational opportunities and the extent to which these could be mitigated.

[25] Department for Communities and Local Government : National Planning Policy Framework : March 2012

[26] National Planning Policy Framework paragraph 3

B.2.5. Paragraph 118 calls on local planning authorities to aim to conserve and enhance biodiversity in determining planning applications by protecting nationally and internationally designated sites from development which would have an adverse effects upon them and, in all locations, by refusing development which could result in significant harm to biodiversity and which cannot be avoided or adequately mitigated or compensated. Specific mention is made of the need to protect irreplaceable habitats, including ancient woodland and veteran trees.

B.2.6. Paragraph 128 states that in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. Paragraph 132 states that "when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be given during the decision making process. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting."

B.3 Development Plans

Regional Policy

B.3.1. The Government revoked the Regional Strategy for the South West on 20th May 2013. As a result, the strategy no longer forms part of the Development Plan.

Structure Plan Policy

B.3.2. The Government also revoked Structure Plans on 20th May 2013, and as such they no longer form part of the Development Plan.

North Somerset Replacement Local Plan

B.3.3. Whilst the North Somerset Core Strategy was adopted in April 2012, a number of policies of the North Somerset Replacement Local Plan27 are yet to be replaced. The intention is that such policies will be incorporated into the Sites & Polices Development Plan Document which is scheduled for adoption in summer 2014. The policies that remain in force, and are relevant to the proposals, include the following.

B.3.4. Policy ECH/4 seeks to achieve development that preserves a listed building's special architectural and historic interest and its setting.

B.3.5. Policy ECH/6 seeks to prevent development from causing damage to nationally important archaeological remains or their settings.

B.3.6. Policy ECH/7 aims to ensure that development does not adversely affect the particular character of a landscape.

B.3.7. Policy ECH/11 seeks to prevent development that could harm nationally or internationally protected species of flora or fauna or the habitats used by such species, unless that harm could be avoided or mitigated and the species protected by use of planning conditions or planning obligations.

[27] North Somerset Council : North Somerset Replacement Local Plan (March 2007)

B.3.8. Policy ECH/12 explains that development that is likely to have adverse effects on a Special Protection Area (SPA), Special Area of Conservation (SAC) or a Ramsar Site will not be permitted, unless adverse impacts on the integrity of the site can be avoided or there is no alternative solution and there are imperative reasons of overriding interest that enable the project to proceed.

B.3.9. Policy ECH/13 aims to protect Sites of Special Scientific Interest (SSSI) and National Nature Reserves from development that would have an adverse effect, unless other material considerations outweigh the loss of biodiversity.

B.3.10. Policy ECH/14 aims to protect wildlife and geological sites from development that would have an adverse effect, unless the importance of the development outweighs the value of the substantive interest present.

North Somerset Core Strategy

B.3.11. The North Somerset Core Strategy28 was adopted in April 2012. The document contains a number of environmental protection policies and draws attention to the particular characteristics of the North Somerset environment.

B.3.12. Policy CS4 aims to protect and enhance biodiversity, including seeking to protect, connect and enhance important habitats, particularly designated sites, ancient woodlands and veteran trees.

B.3.13. Policy CS5 aims to protect landscape character and the historic environment.

B.3.14. Policy CS6 confirms that the boundaries of the Green Belt will remain unchanged for the plan period.

B.3.15. Policy CS9 seeks to safeguard and enhance areas of green infrastructure and, in this context, draws attention to a number of specific areas including :

- the promotion of the Congresbury Yeo, River Banwell, North Somerset Levels and Moors.

B.3.16. The Proposals Map highlights the range of environmental constraints in the vicinity of the study area.

[28] North Somerset Council : Local Development Framework – Core Strategy Corrected Version : April 2012

APPENDIX C

HOLFORD RULES

Appendix C **HOLFORD RULES**

C.1 **The Holford Rules**

C.1.1. The Holford Rules[29] provide specific guidance for routeing overhead lines and were applied to the identification of route alignments. They comprise of seven Rules and related explanatory and supplementary notes that primarily relate to minimising the effects on landscapes. Whilst the Rules were written to apply to overhead lines, they are also appropriate to consider when routeing underground cables. National Policy Statement EN-5[30] highlights that the Rules should be followed by developers when designing their proposals.

C.1.2. The 7 Rules on minimising landscape effects when routeing overhead lines are summarised below:

- Avoid altogether, if possible, the major areas of highest amenity value.
- Avoid smaller areas of high amenity value or scientific interest by deviation where this can be done without using too many angle towers.
- Other things being equal, choose the most direct line, with no sharp changes of direction to minimise use of angle towers.
- Choose tree and hill backgrounds in preference to sky backgrounds, wherever possible.
- 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.
- 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'.
- Approach urban areas through industrial zones, where they exist.

[29] National Grid: The National Grid Company plc and new high voltage transmission lines – guidelines for line routeing (the Holford Rules) and undergrounding

[30] Paragraph h 2.8.5, National Policy Statement for Electricity Networks Infrastructure (EN-5), July 2011

APPENDIX D

LIFETIME COST METHODOLOGY

Appendix D **LIFETIME COST METHODOLOGY**

D.1 **Lifetime Costs**

D.1.1. The lifetime valuation for each of the connection options and applicable technology includes the lifetime cost of energy losses and lifetime operation and maintenance costs.

D.1.2. The following formula was used to assess the lifetime cost of each type of connection.

Total Cost, CTot = CDC + CL + COM

Where

CDC = The capital cost of the equipment, delivered, installed and commissioned

CL = The net present value of the cost of losses over the lifetime (40years) of the assets

COM = "The net present value of the typical cost of operation and maintenance over the lifetime (40 years) of the assets

D.1.3. The discount rate used in the net present value calculations, 3.5%, being the figure recommended in Her Majesty's Treasury's Green Book for discounting future benefits and costs in project appraisal.

D.1.4. For the purposes of the losses calculations the average load of circuits and SGTs has been assumed to be 65% of the peak group demand of 149MVA.

D.2 **Costs**

D.2.1. The cost used to assess losses on the system is the price of £60 per MWh as assumed by Ofgem in the Project Discovery documents.

D.2.2. The available transmission technologies, as explained in Section 3 are:

a. Overhead Lines;

b. AC Underground Cables, and

c. Gas Insulated Lines.

D.2.3. For each technology, costs comprise:

a. the capital cost of procuring, installing and commissioning the transmission or distribution lines, or substation assets;

b. the on-going costs of the electrical energy lost in overcoming the electrical resistance in the conductors; and

c. the on-going other costs of operations and maintenance.

D.2.4. Decommissioning and reinstatement costs are not included in the lifetime costs.

D.3 **Overhead Lines**

D.3.1. Overhead line designs vary by the number and cross-sectional area of the conductors used for each phase of each circuit. The requirements for 400kV and 132kV lines in this case are:

b. 400kV double-circuit 2 x 850mm^2 (resistance = 0.0184Ω/km), and

c. 132kV double-circuit 1 x 300mm^2 (resistance = 0.1Ω/km).

D.3.2. Operations and maintenance costs consist principally of the cost of repainting the transmission pylons, which is scheduled to happen every 18 years, and the costs of regular inspection both from the ground and by helicopter. The annual costs are estimated to £0.80k/km at both 400kV and 132kV.

D.4 AC Underground Cables

D.4.1. AC underground cables installations vary principally by how the cables are laid. The principal methods employed by National Grid are direct burial and deep bore tunnels.

D.4.2. The Cable requirement for a Bridgwater – Seabank connection is for two cores per phase 2500mm2 cables, 12 cables in total for two circuits (resistance = 0.0065Ω/km).

D.4.3. However with each circuit generating 20MVAr per km of capacitive gain, each circuit would require 2 x 200MVAr reactors (4 in total for two circuits). Each Reactor has 0.4MW of losses associated with it (1.6MW for 4 reactors).

D.4.4. At 132kV, 650mm2 cables are required (resistance = 0.05Ω/km)

D.4.5. O&M costs have an approximate annual cost of £2.80 k/km for 400kV and £1.5 k/km at 132kV.

D.5 Gas Insulated Lines

D.5.1. Like underground cables, gas insulated lines may be direct-buried or installed in tunnels. As with cables, tunnel installation is used where direct burial is impracticable.

a. The GIL requirement for the Bridgwater - Seabank connection is for 4000A, 2400MVA rated equipment (resistance = 0.0086Ω/km).

D.5.2. The annual maintenance costs for gas insulated lines are estimated to be £1k per km.

D.6 Supergrid Transformers

D.6.1. Losses in transformers are split into two types:

D.6.2. No load losses which are fixed and due to magnetic losses in the transformer core, and

D.6.3. Load related losses which are variable with current and due to the resistance of the copper and effect of eddy currents.

D.6.4. The annual maintenance costs for transformers are estimated to be £5k per transformer.

D.7 Substations (GSP)

D.7.1. Substations form the hubs at which transmission circuits and supergrid transformers meet. They are installations which are generally compact. Transmission losses in substations are assumed to be negligible but annual maintenance costs are estimated to be £50k per GSP.

D.8 Calculation of the Cost of Transmission Circuit Losses

D.8.1. The cost of transmission losses are calculated as follows:

Step 1: Calculate the Average Circuit Loading

Peak Circuit Power Flow * Average Circuit Utilisation (34%)

Generic Example: 3100MW x 0.34% peak load would be 1054MW Average Loading

Step 2: Calculate the Average Loading per Circuit in KW:

Average Loading per Circuit kW =

(Average Loading (MW) / number of circuits) * 1000 (to convert to kW)

There are 2 circuits in most cases.

Example: (1054MW / 2) x 1000 = 527,000 kW

Step 3: Calculate the Average Current per Circuit in Amps:

I = Average Loading Per Circuit kW / (√3 X Operating Voltage in kV)

Operating Voltage 400kV or 275kV

Example: 527,000/ (√3 x 400) = 760.7 Amps

Step 4: Calculate the Resistance per Circuit:

R = resistance/km * circuit length kms

Example: 2 x 850mm Overhead Line = 0.0184Ω/km x 60km = 1.104 Ω

Step 5: Calculate the Three Phase Lost Power per Circuit in MW:

Three Phase Lost Power per circuit = $3 \times I^2 \times R$

Example: $3 \times 760.7^2 \times 1.104 = 1.9$MW

Step 6: Calculate the Lost Power in a 2 Circuit Route:

This is multiplied by 2 to get the losses in a two circuit route

Example: 1.9 x 2 = 3.8MW

Step 7: Calculate the Annual Cost of Losses:

Annual Loss Cost = Lost Power x Cost per MWh x 24hrs x 365 days a year

Example: 3.8 x £60 per MWh x 24hrs x 365 days a year = £2m per annum

Step 8: Calculate the Average Loading per Circuit in KW:

The net present value of transmission losses is then derived by applying a discount rate of 3.5% to the annual cost over 40 years.

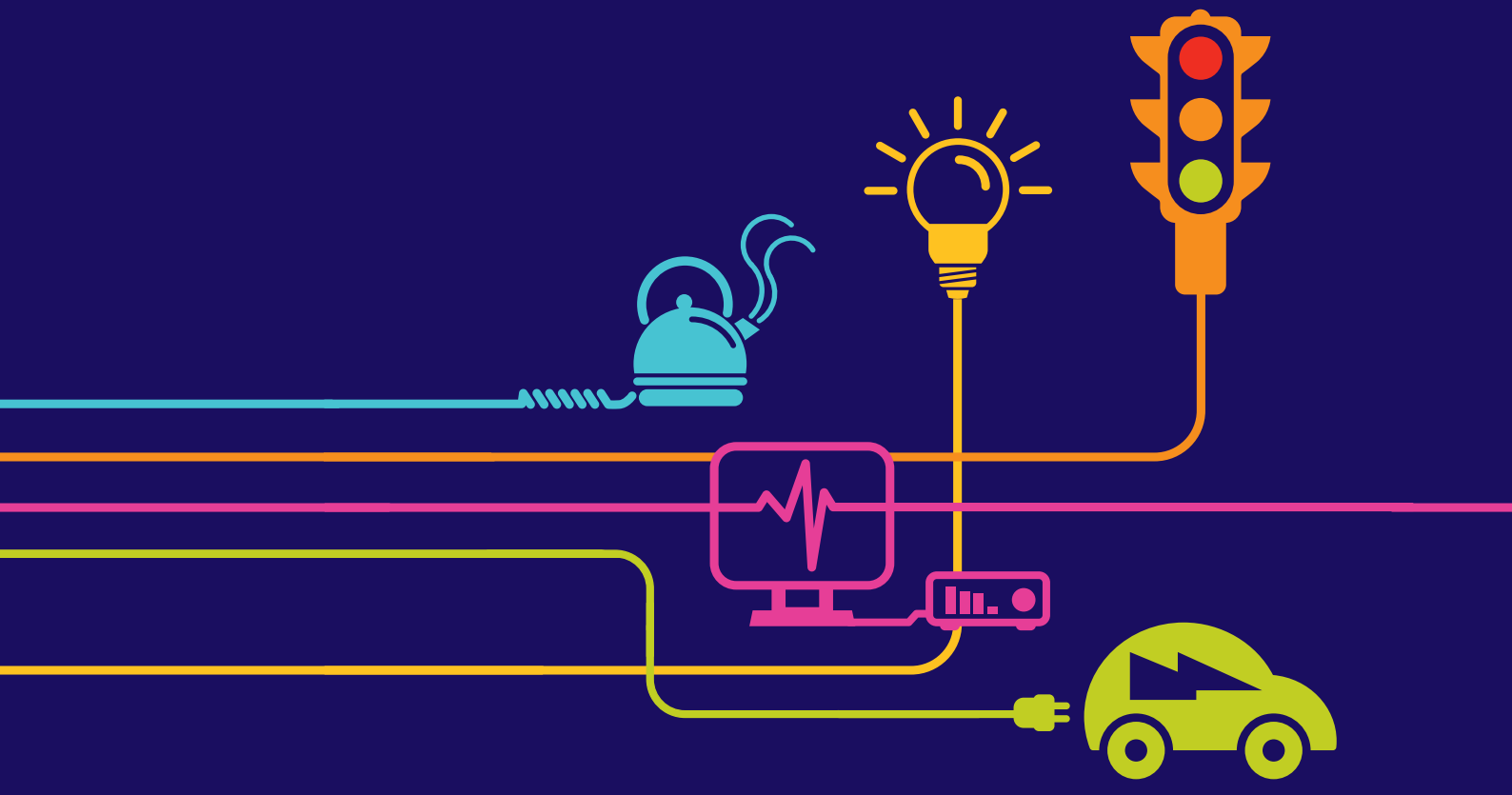
Appendix 2U – Western Power Distribution Undergrounding Cable Sealing End Platform Pylon Location Technical and Environmental Appraisal (2013)

Document 5.3

nationalgrid

Western Power Distribution Undergrounding Cable Sealing End Platform Pylon Location Technical and Environmental Appraisal

Hinkley Point C Connection Project



August 2013

Hinkley Point C Connection Project

Western Power Distribution

Undergrounding Cable Sealing End Platform Pylon Location

Technical and Environmental Appraisal

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Warwick Technology Park
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August 2013

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APPENDICES

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

1.1.1 This report has been prepared jointly by Western Power Distribution (South West) plc (WPD) and National Grid Electricity Transmission Limited (National Grid).

1.1.2 The purpose of this report is to inform statutory consultees and other stakeholders of the locations considered by WPD and National Grid for siting a Cable Sealing End Platform Pylon (CSEPP) at the start of the undergrounding section of the 132kV W Route between Nailsea and Portishead Substation.

1.1.3 A plan showing the study area is presented at Figure 1. The CSEPP would be sited at an existing pylon or failing that on the route of the existing 132kV W Route overhead line. (Further detail on the reason for this approach is set out in Chapter 2 of this report). The study area is therefore confined to the route of the existing 132kV W Route overhead line south west of Nailsea.

1.2 Background

1.2.1 In November 2012 as part of its announcement of a draft route for the Hinkley Point C Connection Project, National Grid announced that due to the proximity of development at Stone-Edge Batch and Tickenham and blocks of ancient woodland on Tickenham Ridge sections of the existing W Route overhead line would need to be undergrounded to facilitate the construction of the 400kV overhead line. To further minimise the effects of the proposed connection in this area it was concluded that the W Route should be undergrounded from a point south west of Nailsea to Portishead substation (a distance of approximately 8km). A separate document titled Western Power Distribution 132kV W Route Undergrounding Connection Options Report[1] provides further details on the undergrounding options considered by WPD and National Grid for maintaining supplies on the W Route between Nailsea and Portishead.

1.2.2 To achieve the transition from overhead line to underground cables, a platform mounted on a 132kV pylon, known as a CSEPP, is required. A plan of a 132kV CSEPP (model reference: L7c) is provided at Figure 2.

1.2.3 Use of a cable sealing end "compound", instead of a CSEPP, to transfer from an overhead line to underground cable has been considered but has been discounted as the transition of 132kV (as opposed to 400kV) overhead lines to underground cables can be achieved without the need for ground level equipment (associated with a cable sealing end compound) which has a greater land take and greater cost than the CSEPP. As such, neither WPD nor National Grid believes that a cable sealing end compound is an option that should be pursued.

1.3 Objectives of Study

1.3.1 This study has been prepared with the following objectives:

- To examine the available technical options for locating a new CSEPP to the south west of Nailsea;
- To describe the environmental and planning constraints affecting these options; and

[1] National Grid and Western Power Distribution: Hinkley Point C Connection Project. 132kV W Route Undergrounding Connection Options Report.

- To appraise the options in terms of these technical, environmental and socio-economic factors and make a recommendation on which location should be taken forward for consultation as the preferred location for a CSEPP.

1.4 Structure of the Report

1.4.1 The remainder of this report is structured as follows:

- Chapter 2 – sets out the assumptions of the study;
- Chapter 3 – describes the approach and method adopted to identify potential locations;
- Chapter 4 – identifies the potential CSEPP locations;
- Chapter 5 – contains the appraisals which describe the environmental, socio-economic and cost related matters that have been considered in the identification of CSEPP locations; and
- Chapter 6 – sets out the conclusions.

2 STUDY ASSUMPTIONS

2.1 Introduction

2.1.1 This technical and environmental appraisal has been based on the anticipated works required for the construction of a 132kV CSEPP. The following paragraphs summarise the general siting, design and layout parameters for a new CSEPP.

2.2 Technical and Design Parameters

Design

2.2.1 A CSEPP is required at the interface between a 132kV overhead line and underground cables. A CSEPP has two platforms on opposite sides of the pylon approximately 6m above ground level. The platform contains cable terminations (the "cable sealing ends") and associated electrical equipment. Downleads, extending from the arms of the pylon, feed each overhead circuit into the cable sealing ends, which facilitate the conversion from overhead lines into cables. The cables then run from the base of the platform into the ground to begin the underground cable section of the route.

Dimensions

2.2.2 For the purposes of this assessment we have assumed that the steel lattice CSEPP (as shown in Figure 2) would be approximately 26m high and 17m wide (at its widest point). Each platform would measure 4.5m by 9m. The footprint of the pylon would be approximately 8m by 8m. In comparison, the existing pylons on the W Route are on average 26m high, 9m wide (at the widest point) and have a footprint of 7m by 7m.

2.2.3 Land in the vicinity of the pylon may be required for landscape mitigation works. During construction additional land is also likely to be needed, on a temporary basis, such as laydown areas.

Siting

2.2.4 The study area for the appraisal is confined to the path of the existing W Route overhead line between the Bristol to Weston-super-Mare railway line in the south and West End Lane on the outskirts of Nailsea in the north (as shown in Figure 1). More details about how the study area was identified are provided at paragraph 2.2.10.

Topography

2.2.5 Whilst it would be possible to design a CSEPP to accommodate sloping ground, level ground is preferred.

Flooding

2.2.6 WPD and National Grid consider flood risk very carefully when siting new installations including CSEPP. This study has sought to identify potential CSEPP sites in areas with the lowest probability of flooding (Flood Zone 1) in accordance with the National Planning Policy Framework (NPPF). However, the presence of a CSEPP in areas of flood risk has a negligible effect on the risk or displacement of water as the infrastructure poses no material changes to surface water flow. Moreover, as the majority of equipment will be sited above ground, flooding is unlikely to affect the function of the equipment to be installed.

Drainage

2.2.7 If possible, the CSEPP sites should avoid the need to divert any watercourses.

Access

2.2.8 To construct the CSEPP a temporary vehicular access road to the site is required. Post construction, no permanent vehicular access is required for maintenance purposes; however, having an access route close to the tower is a benefit for maintenance access. For this reason, a pylon or location that has an existing vehicular access is preferred to a pylon or location that would require the construction of a new temporary access track.

Electrical connections to the 132kV Network

2.2.9 It is not possible to retrofit the cable sealing end platforms to the existing pylons in the study area (please see Figure 1) as they are not designed to withstand the additional weight and associated structural impact of two platforms whilst also supporting the tension of the downleads from the existing overhead line.

2.2.10 To minimise the need to divert the existing W Route the optimal location for a new CSEPP would be immediately adjacent to an existing pylon on the route of the existing overhead line. Failing this, a location in line to the existing 132kV W Route overhead line would be acceptable. If neither of these options were practicable, it would be possible to site the CSEPP away from the existing overhead line. However this would require a diversion to the route of the existing overhead line which could introduce additional environmental and amenity effects. Therefore no sites away from the existing overhead line have been identified.

2.2.11 For the above reasons, the most cost effective and least environmentally disruptive approach is to site a CSEPP at the location of an existing pylon or failing that on the route of the existing W Route overhead line.

Land Ownership

2.2.12 WPD does not hold any land in the locality which could be used to site a CSEPP. Agreement with individual landowners to site a CSEPP will be required. An easement for CSEPP and underground cable connections would also be required.

'Brownfield' land and contamination

2.2.13 The NPPF encourages the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value. If available, such sites may be contaminated by former uses and remediation may be required prior to their use.

3 APPROACH AND METHOD

3.1 Introduction

3.1.1 The study has been undertaken using desk-based information supplemented by site visits. The main sources of information were:

- www.magic.gov.uk – internet based interactive map showing geographic information on key environmental designations;
- Google Earth;
- Environment Agency Flood Risk Maps (internet based);
- Ordnance Survey Explorer and Landranger 1:25,000 mapping; and
- North Somerset Council Core Strategy (2012) and North Somerset Council Replacement Local Plan (2007).
- In choosing the CSEPP location, the following relevant policies and guidance have been taken into account. Details of these policies and guidance are set out in Appendix A:

  - National Policy Statements (NPS);
  - National Planning Policy Framework (NPPF);
  - The Holford rules and Horlock rules;
  - The adopted development plan allocations for the study area and emerging Local Development Framework;
  - Environmental designations in the study area; and
  - Other environmental and planning related matters that affect siting such as landscape character, flood risk, proximity to settlements etc.

3.1.2 This report also notes other local issues where relevant to siting, such as site access and land ownership where information is known.

4 POTENTIAL CSEPP LOCATIONS

4.1 Introduction

4.1.1 This chapter identifies and describes potential CSEPP locations to the southwest of Nailsea.

4.2 CSEPP Study Area and Potential CSEPP Locations

4.2.1 As outlined in section 2.2 of this report, the most cost effective and least environmentally disruptive approach is to site a CSEPP at the location of an existing pylon or failing that on the route of the existing 132kV W Route overhead line. This avoids introducing a new structure into the landscape where there presently is not a pylon.

4.2.2 The study area is therefore confined to the route of the existing W Route overhead line between the Bristol to Weston-super-Mare rail line in the south and West End Lane on the outskirts of Nailsea in the north (as shown in Figure 1).

4.2.3 Figure 1 also shows the unique codes that WPD use to identify each pylon. For example, pylon "W34" is currently positioned close to Nailsea Rugby Club and pylon "W42" is north of the Bristol to Weston-super-Mare rail line. Installing a CSEPP to the south of the rail line was not considered because this would have involved works which would have resulted in significant construction activity and associated costs.

4.2.4 For the purposes of this Report the study area has been broken down into three sections:

- The southern section – the railway to Netherton Wood Lane;
- The central section – from Netherton Wood Lane north to the bridleway between the settlements of West End and Nailsea;
- The northern section – north of the bridleway to West End Lane on the north west outskirts of Nailsea.

4.2.5 The southern section consists of sloping agricultural land rising from the River Kenn and the railway up to Netherton Wood Lane. Pylons W42 to W40 fall within this section. There are several belts of trees between the railway and pylon W41 with large woodland running parallel to the railway to the east of W42. Nailsea Court, a Grade I Listed Building is approximately 280m to the east of the study area. A cluster of agricultural buildings and residential properties are approximately 60m and 150m (respectively) to the north west of W40. Pylon W42 abuts the boundary of the Nailsea and Tickenham Moors Site of Nature Conservation Interest (SNCI).

4.2.6 The central section is primarily agricultural fields. Pylons W39 to W37 fall within this section. The land rises gently from Netherton Wood Lane up to the highest point in the study area just north of Pylon W38. A small copse exists between W39 and W38 which forms part of the Nursebatch Farm Fields SNCI. Pylon W37 is immediately adjacent to a cluster of large agricultural buildings. Approximately 220m to the east of pylon W39 is a Grade II Listed Building called "South Common Farm", and approximately 300m to the west is another Grade II Listed Building called Nursebatch Farmhouse.

4.2.7 Pylons W36 to W34 fall within the northern section. This section again comprises primarily agricultural fields, albeit W34 is within the grounds of Nailsea & Backwell RFC Ground. The land drops in a northerly direction from W36 to W34. There a small number of trees clustered close to W35. There are no ecological designations within this section and the closest listed building (the Grade II "Tower House Farm") is 400m west of pylon W35.

4.3 Discounted CSEPP Locations – Pylon W37

4.3.1 A new CSEPP could be accommodated at all of the pylons in the study area except at W37. This pylon is immediately adjacent to a cluster of large agricultural buildings. There is insufficient space to accommodate the necessary working area to construct a CSEPP at this location.

4.3.2 In an attempt to overcome this constraint and to avoid introducing a new structure into the landscape where there is currently not a pylon, National Grid and WPD investigated building a CSEPP 10m to the west of pylon W37. However, this would result in extra cost and environmental effects as a new angle tower would have to be built at the next pylon to the south (W38) to accommodate the change in direction of the overhead line. It is not possible to use the existing pylons in the study area to accommodate the change in direction as they were not designed to accommodate a change in direction of the overhead line.

4.3.3 As a result, pylon W37 was not assessed as part of the options appraisal process.

4.4 Development Plan

4.4.1 Appendix A sets out the planning policy background of relevance to the installation of a CSEPP. For the avoidance of doubt, the study area is outside the Green Belt and classed as countryside in the North Somerset Proposals Map (which reflects “adopted” plans).

4.5 Flood Zone

4.5.1 The study area is in Flood Zone 1, except for the first pylon in southern section (W42), which falls within Flood Zone 3. As explained in section 2.2, the presence of a CSEPP in areas of flood risk has a negligible effect on the risk or displacement of water as the infrastructure poses no material changes to surface water flow. Moreover, as the majority of the equipment will be sited above ground, flooding is unlikely to affect the function of the equipment to be installed.

4.6 Drainage

4.6.1 It is unlikely that any watercourses will need to be diverted to build a CSEPP at any of the pylon locations in the study area.

5 APPRAISALS

5.1 Introduction

5.1.1 This chapter sets out the constraints and influences that affect where a CSEPP could be sited.

5.1.2 This chapter also considers the potential in combination effects of the following Proposed Development components in the vicinity of the CSEPP:

- the undergrounding of the W Route from the CSEPP travelling north;
- dismantling of the 132kV W Route overhead line from the CSEPP travelling north;
- dismantling of the existing 132kV F Route overhead line between Bridgwater and Seabank; and
- a new 400kV overhead line connection from Bridgwater to Seabank.

5.2 Environment – Landscape and Visual Assessment

5.2.1 For the purposes of this report, the study area for the landscape and views appraisal extended 1km from the pylons in study area (as shown in Figure 1). .

Baseline Landscape Character

5.2.2 There are no landscape designations in the study area or in the surrounding area. The study area and surrounding area are considered to be of local importance and of low sensitivity.

5.2.3 The landscape in the study area falls in the same landscape character areas as defined in local and national level landscape character assessments (LCA), Somerset Levels and Moors (national LCA) and Nailsea farmed coal measures (North Somerset LCA). The character changes to North Somerset LCA Land Yeo and Kenn river floodplain where the landform slopes down towards to the River Kenn at the southern tip of the study area. Landform in the remainder of the study area is relatively flat.

Assessment of Potential Effects on Landscape Character

<u>Effects on Landscape Character</u>

5.2.4 There is little differentiation in landscape character across the majority of the study area and immediate surroundings. Effects on landscape character are not a significant differentiating factor between potential locations for siting a CSEPP where locations fall in that same character area. Pylons W34-W39 are in the same character area, Nailsea farmed coal measures and W40-W42 are in Land Yeo and Kenn river floodplain character area.

5.2.5 Overhead lines and development are features of the baseline character in each of the landscape character areas which reduces sensitivity to change. There would be minimal effects on landscape features such as hedges and trees to gain access to install a CSEPP at any of the pylon locations, albeit a CSEPP at W35 may result in the removal of some mature trees in close proximity to the existing pylon.

5.2.6 Such effects could be minimised through replacement planting and careful siting of access points and temporary roads.

5.2.7 Installing a CSEPP at any of the pylon locations would result in an effect of low magnitude. A section of overhead line would be removed which would have an overall positive effect on landscape character. The overall significance of effect from installing a CSEPP at any location would be of minor positive (due to removal of the existing overhead line).

Visual Amenity Baseline

5.2.8 The existing W Route overhead line forms part of baseline conditions, particularly in views from West End Lane and Netherton Wood Lane.

5.2.9 Within the study area, the existing overhead line is in the middle distance and background of views crossing fields from the western edge of Nailsea. Views of it are generally filtered by trees and hedges although the upper part of the pylons is typically present in most views extending above tree canopies. Some views are unrestricted such as from upper storey windows of properties facing west and southwest toward the overhead line.

Assessment of Potential Effects on Visual Amenity

General Overview All Sections

5.2.10 Receptors are assumed to be of high sensitivity. The extent of visibility of pylons at each location varies depending on the receptor location. An overall judgement is made based on typical views from the surrounding area.

5.2.11 In general, a CSEPP could have a negative effect on views as it has additional steelwork and equipment on the platform. Effects would principally relate to views from the closest receptor locations. However, this needs to be considered in context with the existing environment and in relation to the positive visual effects that would result from undergrounding a section of existing overhead line from that point.

5.2.12 Existing pylons on the 132kV W Route are present in the majority of baseline views from the area surrounding area. Pylons W34-W39 are often a prominent part of views and views are unrestricted because they are in open field locations on slightly raised ground where there is limited screening from trees and hedges and they are seen against the sky.

5.2.13 The pylons in the northern section are typically viewed together with the central section of the line from most directions in the surrounding area. The southern section of the existing line is distant and mostly obscured in views from the north.

5.2.14 Existing pylons are relatively close to properties on the western edge of Nailsea and residents currently experience views which contain the 132kV W Route as a component part, the prominence varies depending on the viewpoint. Views of pylons W34, W35 and W36 from the residential area at the western edge of Nailsea are typically filtered by features such buildings, trees and hedges on land at the edge of the town. The upper parts of pylons generally remain visible above trees in views. The 132kV W Route is a prominent feature of the foreground in views from public rights of way. Three footpaths (LA13/2, LA13/5 and LA13/7), a bridleway (LA13/4) and the Avon cycleway which follows Netherton Wood Lane are oversailed by the 132kV W Route. Pylons W35 and W36 are close to footpaths LA13/4 and LA13/2 and the pylons are prominent and openly viewed from these paths. There are typically unrestricted views of pylons from some sections of the paths in the locality.

Northern Section

5.2.15 A CSEPP at the northern end of the study area (at pylons W36, W35 and W34) would be present in views from the western edge of Nailsea together with the existing overhead line to the south.

5.2.16 Pylon W34 is sited on land adjacent to a rugby club and is closest to the edge of Nailsea and potentially could be viewed by greater numbers of receptors. Views of this pylon tend to be partly screened and filtered as would a CSEPP in this location. The platform and upper part of the pylon would be generally seen in views from the edge of Nailsea.

5.2.17 Pylons W35 and W36 are in fields and a CSEPP at these sites would be openly viewed from Public Rights of Way (PRoWs). The pylons are prominent in views from the footpaths and there is limited screening surrounding them in close views. Further to the east, hedges and trees are present on land between the overhead line and the edge of Nailsea which would provide a filtering effect in views of a CSEPP at either location

Central Section

5.2.18 A CSEPP on land north of Netherton Wood Lane (at pylons W39 and W38) would be openly viewed from roads and the surrounding area including the western edge of Nailsea. Pylon W38 occupies a high point in the study area with the land dropping away to the north and south, albeit very gradually.

Southern Section

5.2.19 Pylons W40, W41 and W42 are generally screened or are obscured in most views from the surrounding area and there are fewer opportunities to view the pylons in close proximity due to an absence of PRoWs in this area. There would be a greater positive effect on views if a CSEPP was located in the southern section south of Netherton Wood Lane where woodland and landform could be used for screening and backgrounding. The existing pylon adjacent to the railway W42 is on lower ground and is less visible than pylons to the north. Other pylons north of this are on slightly higher ground and are seen as a prominent part of views from the roads. A CSEPP at the southern end of the study area would be partly screened and would remove pylons further north in the study area from views which would have a positive effect.

Landscape and Visual Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.2.20 There is the potential for negative in combination effects resulting from the CSEPP and the proposed 400kV overhead line between Bridgwater and Seabank substations. Potential in combination effects with other development components (described at the start of this chapter) would be significantly reduced in relation to landscape and visual amenity because of the removal of existing 132kV overhead lines in the locality. The new 400kV overhead line would be visible from properties and locations close to the CSEPP study area. However, it would be approximately 700m north of the CSEPP study area (approximately 680m from pylon W34 at its closest point) and would be seen in the middle distance.

5.2.21 National Grid and WPD consider that the landscape and visual effect of the 400kV overhead line would not have an effect on views sufficient to indicate a preference for a particular pylon location to accommodate a CSEPP. Furthermore, the proposed 400kV overhead line would roughly follow the route of the existing 132kV F Route which would limit the scale of change in views and not be a significant factor in the selection of a CSEPP location to take forward for consultation. Moreover, the CSEPP would be sited approximately at an existing pylon location, meaning that the scale of change in views could be minimised.

5.2.22 Taking into account the potential in combination effects of the other Proposed Developments in conjunction with the proposed CSEPP works, it is concluded that the potential effects on landscape character and visual amenity is not a sufficiently differentiating factor between any of the pylon locations.

Potential for Mitigation

5.2.23 The visual effects of the underground cable route would largely be temporary. Loss of some trees and hedgerow would be minimised through careful routeing and

replacement hedgerow planting within the cable swathe and compensatory tree planting outside the cable swathe, subject to landowner agreement.

5.2.24 It would also be possible to minimise permanent negative effects on views through careful planning of accesses to avoid the need for road improvements to the local lane network, by utilising existing gaps in hedgerows and by reinstating roads to their original condition once construction is complete. Some short term and permanent negative visual effects would be unavoidable until re-establishment.

Landscape & Visual Amenity Conclusion

5.2.25 A CSEPP at the northern and central sections of the study area (at pylons W34-W39) would be present and prominent in views from the western edge of Nailsea together with the existing overhead line to the south. There is some filtering in views of the line from existing trees and hedges although views of pylons are typically seen against the sky as there is limited benefit from backgrounding in this area. There are several PROW in the area from where the overhead line and pylons can be seen in close proximity. The overhead line oversails PRoW at 4 locations. The northern section of the study area is also closest to the edge of Nailsea and greater numbers of visual receptors.

5.2.26 A CSEPP in the southern section of the study area (pylons W42 to W40) would be preferable to one in the central or northern sections because existing pylons are less visible and they benefit from screening from sloping landform to the River Kenn valley and backgrounding in addition to greater amounts of tree cover. A CSEPP in the southern section would maximise the amount of undergrounding possible as part of the proposals and would have a greater positive effect on both landscape character and views than if a CSEPP were sited at one of the pylon locations further north.

5.2.27 There are few PRoW in the area around the southern section of overhead line meaning that there would be very limited opportunities to experience a view of a CSEPP in close proximity except from private land. South of pylon W40 the overhead line does not oversail any roads or PROW.

5.2.28 In respect of landscape character it would be beneficial to extend the undergrounding of the existing 132kV W Route overhead line for as far as possible south of Nailsea as this would remove it as a feature in the local landscape. Effects from a CSEPP would be localised and overall would not have a significant negative effect on the landscape character of the study area or wider surroundings.

5.3 Environment – Ecology

Baseline Conditions

5.3.1 The area considered under this appraisal is approximately 2km long and runs along the route of the existing 132kV W Route overhead line. From pylon W34 in the north (adjacent to West End Lane on the southwest edge of Nailsea) to pylon W42 in the south (adjacent to Kenn River). This area of study will be referred to as the '132kV W Route' for the remainder of this section.

5.3.2 There are no internationally designated wildlife sites crossed by or adjacent to this section of the 132kV W Route.

5.3.3 There is a single nationally designated site within a 1km radius of the 132kV W Route (approximately 235m away at its nearest point), which is valued at the national level:

- Tickenham, Nailsea and Kenn Moors Site of Special Scientific Interest (SSSI). The SSSI supports a wide range of aquatic communities and a wide diversity of aquatic plants and invertebrates.

5.3.4 The 132kV W Route falls within the 5km consultation zone for the North Somerset and Mendip Bats SAC, which extends to the north of Nailsea. Within this consultation zone development proposals are subject to particular scrutiny with regards to their potential effects on the SAC.

5.3.5 There are two SNCI crossed by the 132kV W Route:

- Nursebatch Farm Fields SNCI is unimproved and semi-improved neutral grassland, with marshy grassland areas, which support a diverse flora; and
- Nailsea and Tickenham Moors SNCI is marshy and semi-improved neutral grassland which supports diverse and rare aquatic plants and invertebrates. This site includes Tickenham, Nailsea and Kenn Moors SSSI.

5.3.6 There are several SNCIs within a 1km radius of the 132kV W Route. These include:

- Batch Farm Meadow SNCI which is semi-improved neutral grassland and marshy grassland which supports a diverse botanical community (approximately 385m west);
- West End Meadows, Nailsea SNCI which is wet acidic grassland, with a diverse flora (approximately 210m east); and
- Fields along Youngwood Lane SNCI which consist of marshy grassland and standing water (approximately 985m east).

5.3.7 SNCIs are valued at the County level.

5.3.8 Aerial imagery indicates that the land along the 132kV W Route is mainly comprised of pastoral land, which is likely to be of low intrinsic value.

5.3.9 The majority of the fields are bounded by hedgerows, although the nature conservation value of these is yet to be determined.

5.3.10 The River Kenn passes to the south of pylon W42. Here, the River Kenn forms part of the Nailsea and Tickenham Moors SNCI and is hydrologically linked to the statutorily protected ditches within the adjacent SSSI. Ponds and ditches are found along or adjacent to the 132kV route.

5.3.11 Woodland is generally rare in the locality, although several small areas of scattered trees are adjacent to the 132kV W Route.

Assessment of Effects

General Overview

5.3.12 The construction of a CSEPP along the 132kV W Route would be unlikely to result in significant adverse ecological impacts. However, the following should be considered when options for locating the CSEPP are being finalised.

5.3.13 Locating the CSEPP in the northern section of the Study Area would require less undergrounding, in comparison to locations in the central and southern sections, and would therefore have less of an impact, in terms of habitat loss, disturbance and potential residual impacts. In addition, a CSEPP located at W39 or south of this point would require underground cabling across Nursebatch Farm Fields SNCI (unless there was a deviation east of the existing route to avoid it). Similarly, a CSEPP at the most southern pylon (W42) would introduce works adjacent to the River Keen (designated as Nailsea and Tickenham Moors SNCI) which flows to the nearby Nailsea, Tickenham and Kenn Moor SSSI.

5.3.14 Nailsea, Tickenham and Kenn Moors SSSI is present to the north and west of this part of the 132kV W Route. The nearest pylon location is approximately 280m from the SSSI. The closer to the statutory protected site the platform is located, the greater the potential risk, albeit small, of adverse impacts to the site that could arise from

construction activities, such as disturbance (e.g. increased noise and vibration) and pollutions events. The risk of impact is greatest with works at pylon W42 in the south because of the hydrological links. Although pylon W34 in the north is also close, the existing development (housing, farm buildings, road) between this location and the designation reduces the potential for effects on the SSSI.

5.3.15 The CSEPP should be sited so as to avoid impacts to hedgerows and boundary features. It should also be constructed in a location that can make good use of existing roads and tracks, minimising the requirement for new access routes to be created.

Northern section

W34

5.3.16 Pylon W34 is the northernmost pylon along the 132kV W Route, located approximately 300m from the Tickenham, Nailsea and Kenn Moors SSSI. Aerial imagery indicates that the pylon is currently on an area of hardstanding which forms the access road and parking area associated with the Nailsea and Backwell Rugby Club. Improved agricultural grassland and the rugby ground are present in the adjacent areas.

5.3.17 The extent of habitat removal and/or disturbance required to create the CSEPP would therefore be minimal. There would be no requirement for any hedgerow or tree removal and there are no waterbodies in the vicinity which would likely be impacted.

5.3.18 Access already exists to the pylon and the construction of the CSEPP at pylon W34 would require the installation of less underground cabling in comparison to any of the other potential locations within the Study Area, therefore minimising the amount of habitat that will be disturbed or affected by the undergrounding works.

5.3.19 Pylon W34 is situated in closer proximity to the SSSI, however it is separated from the statutory protected site by West End Lane and there is no habitat connectivity linking the pylon W34 to the SSSI. Therefore any adverse impacts to the SSSI as a result of the construction of a CSEPP at W34 would be unlikely.

5.3.20 Overall, ecological impacts of the construction of a CSEPP at pylon W34 would be neutral.

W35

5.3.21 Pylon W35 is situated close to the northern boundary of a pastoral field and is approximately 480m from the Tickenham, Nailsea and Kenn Moors SSSI.

5.3.22 A hedgerow and mature tree lie immediately adjacent to pylon W35 to the north and aerial imagery indicates that a small cluster of mature trees is present to the south.

5.3.23 In addition to impacting upon grassland habitat, the construction of the CSEPP would necessitate the removal of the mature tree and section of hedgerow to the north. The adjacent trees to the south may also be directly impacted. The hedgerow may provide suitable habitat for protected species including breeding birds, dormice and foraging/commuting bats. The mature trees may also potentially support protected species, including roosting bats.

5.3.24 A drain is present approximately 35m to the west of pylon W35 which is hydrologically linked to statutory protected ditches within the SSSI. The construction of the CSEPP at that location would therefore present the risk of construction related pollutants entering the SSSI.

5.3.25 There are access gates within the field boundaries to the east and west of pylon W35. However, road access onto the site from the adjacent road network is poor and the creation of a temporary trackway to the site would be required for the construction of the

CSEPP at that location. This would lead to further disturbance to grassland habitats during construction and post-construction when the trackway is removed.

5.3.26 The low to moderate magnitude of effects on receptors of local to national importance would lead to an overall moderate negative scale of effect prior to mitigation.

W36

5.3.27 Pylon W36 is situated close to the southern boundary of a field comprising of improved agricultural grassland. There is a hedgerow in close proximity to the south. The Tickenham, Nailsea and Kenn Moors SSSI is approximately 675m away, with Nursebatch Farm Fields SNCI and West End Meadows SNCI approximately 370m to the south west and 310m to the south east respectively.

5.3.28 The construction of the CSEPP at pylon W36 would likely lead to the loss and disturbance of hedgerow habitat, which may provide potential habitat for protected species, such as breeding birds and dormice. However, there are no individual trees, woodlands or aquatic habitats which would be impacted.

5.3.29 It is also unlikely any statutory and non-statutory designated nature conservation sites would be impacted.

5.3.30 There is an existing trackway which passes to the immediate south of pylon W36 which could potentially be used for construction vehicles in the event of the CSEPP being constructed there.

5.3.31 The low magnitude of effects on receptors of local importance as a result of the construction of a CSEPP at pylon W36 would lead to an overall minor negative scale of effect prior to mitigation.

Central section

W38

5.3.32 Aerial imagery indicates that pylon W38 is situated within an area of improved agricultural grassland. The field is bounded by hedgerows, although these are approximately 50m away and are unlikely to be directly impacted by the construction of a CSEPP.

5.3.33 Furthermore, there are no woodland or aquatic habitats in the vicinity which would be impacted by the construction of the CSEPP.

5.3.34 Tickenham, Nailsea and Kenn Moors SSSI is approximately 975m away. Nursebatch Farm Fields SNCI is to the south and west of the W38 (approximately 150m away at its nearest point). West End Meadows SNCI is approximately 250m away to the east. It is therefore unlikely that any designated nature conservation sites would be impacted.

5.3.35 However, a CSEPP at pylon W38 would require the creation of a new access route as there are currently no trackways in the vicinity. This may potentially lead to losses and disturbance of improved agricultural grassland habitats.

5.3.36 The low magnitude of effects on receptors of local importance as a result of the construction of a CSEPP at W38 would lead to an overall minor negative, scale of effect prior to mitigation.

W39

5.3.37 Pylon W39 is also situated within a field comprising improved agricultural grassland. The field is bounded by hedgerows, however there is no hedgerow habitat present within a 60m radius.

5.3.38 There are no ecologically valuable habitats, such as woodland or waterbodies, in the locality which would be adversely impacted by the construction of a CSEPP.

5.3.39 The creation of a new access route to pylon W39 would be required, leading to disturbance and losses to grassland habitats. However, the site is only 90m north of Netherton Wood Lane and it is therefore unlikely that significant access works would be required.

5.3.40 Tickenham, Nailsea and Kenn Moors SSSI lies approximately 800m to the south west and 1.25km to the north of the W39. Due to the distance between the pylon and the statutory protected site, it is therefore considered that any adverse impacts to the SSSI would be unlikely.

5.3.41 Nursebatch Farm Fields SNCI lies approximately 185m to the north of the W39 and, again, due to the distance separating the sites, any adverse impacts from construction of the CSEPP to the SNCI would be considered unlikely. However, the resultant new underground cable would (if following the route of the existing 132kV overhead line route) cross the SNCI and result in disturbance or loss of grassland habitats described in the designation.

5.3.42 The low to moderate magnitude of effects on receptors of local to County importance as a result of the construction of a CSEPP at pylon W39 and onward underground cable connection would lead to an overall moderate negative, scale of effect prior to mitigation.

Southern section

W40

5.3.43 Pylon W40 is situated within an area of improved agricultural grassland, with no hedgerows, woodlands, individual trees or aquatic habitats present in the immediate vicinity.

5.3.44 Tickenham, Nailsea and Kenn Moors SSSI is located approximately 650m to the west. Due to the distance separating W40 from the SSSI, it is not considered that any adverse impacts to the statutory protected site would be likely. There are no local wildlife sites within a 250m radius of W40. However, the resultant new underground cable would (if following the route of the existing 132kV overhead line route) cross the Nursebatch Farm Fields SNCI and result in disturbance or loss of grassland habitats described in the designation.

5.3.45 There is currently no existing access route to pylon W40. However, an existing track is present approximately 50m away, so the extent of new access works, and subsequent losses/disturbance to grassland habitats as a result of this, would not be significant.

5.3.46 The low to moderate magnitude of effects on receptors of local to County importance as a result of the construction of a CSEPP at W40 and onward underground cable connection would lead to an overall moderate negative, scale of effect prior to mitigation.

W41

5.3.47 Pylon W41 is situated within an area of improved agricultural grassland. A pond is present approximately 40m to the south east, however it is unlikely that this would be directly impacted and, furthermore, there are no other areas of ecologically valuable semi-natural habitat present in close proximity.

5.3.48 Tickenham, Nailsea and Kenn Moors SSSI is located approximately 545m to the west. The southern section of the Nailsea and Tickenham Moors SNCI is present approximately 280m to the south. Any adverse impacts to the designated sites are considered unlikely due to the distance which separates them from W41. However, the resultant new underground cable would (if following the route of the existing 132kV

overhead line route) cross the Nursebatch Farm Fields SNCI and result in disturbance or loss of grassland habitats described in the designation.

5.3.49 The construction of a CSEPP at pylon W41 would require the creation of a new access route. There is an existing track approximately 145m to the west and new access could potentially join onto this. It would however result in loss/disturbance of grassland habitats.

5.3.50 The low to moderate magnitude of effects on receptors of local to County importance as a result of the construction of a CSEPP at pylon W41 and onward underground cable connection would lead to an overall moderate negative, scale of effect prior to mitigation.

W42

5.3.51 Pylon W42 is situated immediately adjacent to the boundary of the Nailsea and Tickenham Moors SNCI. Construction works would therefore be required within the SNCI, likely leading to the loss and/degradation of protected habitats.

5.3.52 The River Kenn is situated 35m away at its nearest point. The river is within the Nailsea and Tickenham Moors SNCI at this location and is hydrologically linked to the Tickenham, Nailsea and Kenn Moors SSSI, which is approximately 460m away to the west.

5.3.53 There are no formal access tracks or roads in proximity to pylon W42, the formation of new access routes would therefore be required if the CSEPP was to be located here. Resulting in the loss and degradation of grassland habitats and potentially hedgerow habitats.

5.3.54 However, the resultant new underground cable would (if following the route of the existing 132kV overhead line route) cross the Nursebatch Farm Fields SNCI and result in disturbance or loss of grassland habitats described in the designation.

5.3.55 The moderate magnitude of effects on receptors of local to County importance as a result of the construction of a CSEPP at pylon W42 and onward underground cable connection would lead to an overall moderate negative scale of effect prior to mitigation.

Ecology Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.3.56 An assessment of in combination effects with the other Proposed Developments would not make a difference to which CSEPP option should be taken forward for consultation from an ecological perspective.

5.3.57 This view has been reached on the basis that the ecology appraisal takes into account the effects of potential W Route undergrounding works. In terms of the 400kV overhead line between Bridgwater and Seabank, at its closest point it would be 1 km from the northernmost pylon in the CSEPP study area (W34). The separation between the proposed developments means that the proposal for a new 400kV line would be unlikely to have any notable in combination effects and a bearing on which pylon location to take forward as a CSEPP for consultation.

Potential for Mitigation

5.3.58 For all of the options, existing field access points and watercourse crossings would be used for construction-related traffic wherever possible and standard environmental protection measures implemented including the timing of works to avoid sensitive periods, the prevention of encroachment of works activities onto retained habitats and implementation of pollution control methods.

5.3.59 Working areas would be minimised in order to ensure that disturbance to, and loss of, habitat is kept to a minimum during the construction period.

5.3.60 Where appropriate, prior to habitat clearance works, licensed temporary exclusion methods would be used to prevent death or injury to protected species, such as bats and great crested newts.

5.3.61 Where tree loss would be required either to facilitate access or for the construction of the CSEPP, replacement tree planting could be undertaken, subject to the agreement of the relevant landowners.

5.3.62 For locations at or south of pylon W39, impacts from the resultant new underground cable route on Nursebatch Farm Fields SNCI could be avoided by routing slightly east of the 132kV route, or using HDD or similar methods to install, or through retention of turfs and habitat reinstatement post-construction. This would reduce impact on the SNCI for these options to minor negative or neutral.

Ecology Conclusions

5.3.63 All options are likely to have no more than a minor ecological effect post mitigation and would therefore be acceptable.

5.3.64 Distinctions can be made between the options on the basis of the hierarchy of biodiversity mitigation, which outlines a preference for avoidance over mitigation. As a result options pylons W39 to W42 are less desirable in ecology terms.

5.3.65 Locating the CSEPP at pylon W34 is the preferred option as it would have fewer ecological effects in comparison to the other alternative locations which have been proposed. Pylon W34 is located on hardstanding with good existing access from the road network. Due to this the requirement for habitat removal during construction would be minimal. It would also require less undergrounding in comparison to any of the other options within the Study Area.

5.3.66 Although pylon W34 is located within 300m of the Nailsea, Tickenham and Kenn Moors SSSI, impacts to the statutory protected site would be highly unlikely due to the scale of the proposed works, distance separating the sites and the lack of connective habitats between the site and SSSI.

5.4 Environment – Historic Environment

Baseline Conditions

Built Heritage

5.4.1 In appraising the effects on the historic environment, we have gathered baseline data from study areas that vary in size according to the sensitivity of the receptors. Data regarding Scheduled Monuments, Grade I and II* Listed Buildings, and Grade I Registered Parks and Gardens has been gathered from within 10km of the route options. Data regarding Grade II Listed Buildings, Grade II* and II Registered Parks and Gardens, Conservation Areas, and Registered Battlefields has been gathered from within 2km of the route options. Data regarding non-designated heritage receptors has been gathered from within 100m of the route options. Data regarding non-designated receptors of equivalent sensitivity to designated receptors has been collected, primarily through consultation, from the same study areas as apply to the designated receptors

5.4.2 There are no designated built heritage receptors (i.e. Listed Buildings) in the study area, but the proposals would form an element in the settings of several Listed Buildings.

5.4.3 One Grade I Listed Building, Nailsea Court, is located approximately 280m east of pylon W41, and is a very high sensitivity receptor as well as being part of a group with two Grade II Listed Buildings (a barn and the garden walls), which are high sensitivity receptors. These buildings are set within formal gardens, and their wider setting includes pylons W40 and W41 and the arable fields through which the W Route passes. It is possible that the original context of Nailsea Court extended across the surrounding fields as part of a wider estate that has since been incorporated into the modern farmland, and may have been designed to incorporate views across that landscape.

5.4.4 In addition to the three Listed Buildings described above, a further eight Listed Buildings, all of which are Grade II, have settings that include the study area and development proposals; these are described here from south to north. South Common Farmhouse and its railings (two designations) are approximately 220m east of the W Route, pylon W39, and approximately 300m from pylon W40; these receptors are screened by a stand of trees within their curtilage. 'Four Gables' is approximately 550m to the south-west of the W Route, and has views of pylons W38 and W39 beyond three field boundaries. Bizley Farmhouse is east of Four Gables, approximately 880m from the W Route, and is screened from it by a stand of mature trees but may have partial views including the overhead line. Nursebatch Farmhouse is located approximately 300m west of pylon W37 on the W Route, within a group of modern farm buildings. Batch Farmhouse is approximately 600m west of the W Route and has partial views of pylon W38, although this is screened by mature trees in the foreground of the view. Yew Tree House is located in West End, set within a garden containing mature hedges and trees but with views of the W Route pylon W35, approximately 550m to the west. Tower House Farm is adjacent to Yew Tree House, and is approximately 400m west of pylon W35. These receptors are of high sensitivity.

Historic Landscape Character

5.4.5 There are no designated historic landscape receptors in the study area, or any whose settings would be affected by the proposals. The study area is part of a historic landscape character zone of irregular fields, on slightly higher ground between Nailsea and the levels to the north-west and south-west. It is derived predominately from enclosure of anciently reclaimed inland moors during the post-medieval period (15th - 17th century), and is regarded as being a receptor of low sensitivity.

Buried Archaeological Remains

5.4.6 There are no designated archaeological receptors in the study area. The scope of this report does not include comprehensive assessment of non-designated receptors; however, the North Somerset Historic Environment Record (HER) has been appraised on-line.

5.4.7 The only non-designated site recorded on the HER within the study area is the 'historic core settlement' of Nursebatch Farm East (NSHER ref. 43326; located at the modern Batten's Farm), which the 132kV W Route oversails. This receptor is recorded as a post-medieval settlement due to its presence on 19th century maps. This receptor is of low sensitivity.

5.4.8 Within 200m of the study area, a Roman and post-medieval pottery scatter has been found at Netherton Wood (NSHER refs. 000323; 41367), on an area of raised ground; pylon W39 stands approximately 150m east of this receptor, on the same topographic contour. This receptor is of low sensitivity. Other receptors within 200m are of negligible sensitivity, including post-medieval quarries and Second World War sites.

Assessment of Effects

General Overview

5.4.9 Effects on buried archaeological remains and the physical elements of the historic landscape such as hedgerows would be direct, physical negative effects. Effects on the settings of heritage receptors (primarily Listed Buildings) and the historic landscape character would be indirect, and may be negative or positive.

5.4.10 Removal of existing 132kV W Route overhead line infrastructure would result in positive effects to historic buildings and the historic landscape; this effect would be increasingly widespread if greater amounts of the existing line are removed. The overall positive effect would therefore be greater if the CSEPP is constructed towards the south. The CSEPP itself would be slightly larger and of greater mass than the existing pylons, as a result it would be slightly more dominant in the settings of historic environment receptors; however, this increased effect is reduced with increasing distance. In particular, where there is screening or filtering this effect may be reduced entirely, as the greater bulk of the CSEPP is concentrated close to ground level.

5.4.11 Construction of an underground cable would result in negative effects on buried archaeological remains; this effect is in general more likely to increase if the length of new cabling is greater. The overall negative effect would therefore be greater if the CSEPP is constructed to the south. However, this increasing effect is not uniform as there are several areas of known potential for archaeological remains along the study area. Construction of the CSEPP north of Netherton Wood is likely to reduce the negative effect on known archaeological remains. Construction of the CSEPP north of Batten's Farm is also likely to reduce the negative effect on buried archaeological remains, although to a lesser extent, as that area is of lower sensitivity than Netherton Wood.

<u>Northern Section</u>

Pylon W34

5.4.12 A CSEPP replacing the existing pylon W34 would not comprise a more prominent element than the existing pylon in the settings of Grade II Listed Yew Tree House and Tower Farmhouse, and would therefore have no effect on them.

5.4.13 A CSEPP replacing the existing pylon W34 would have no effect on the historic landscape character.

Pylon W35

5.4.14 A CSEPP replacing the existing pylon W35 would not comprise a more prominent element than the existing pylon in the settings of Grade II Listed Yew Tree House and Tower Farmhouse, and would therefore have no effect on them.

5.4.15 Removal of the 132kV W Route overhead line from pylon W35 would result in a positive effect on the historic landscape character of negligible magnitude.

5.4.16 Undergrounding of the 132kV W Route from pylon W34 to pylon W35 would have moderate potential to affect as-yet undiscovered archaeological remains; any such effects would be more widespread than if the proposed CSEPP were located at pylon W35 due to the greater length of undergrounding required, but less widespread than if the CSEPP were constructed at pylons W36-W42. The magnitude of effect would be high - low on receptors of moderate - negligible sensitivity.

Pylon W36

5.4.17 A CSEPP replacing the existing pylon W36 would not comprise a more prominent element than the existing pylon in the settings of Grade II Listed Nursebatch Farm and Batch Farm, and would therefore have no effect on them.

5.4.18 Removal of the 132kV W Route overhead line from pylon W36 would result in positive effects on two Grade II Listed Buildings (Yew Tree House and Tower Farmhouse), due to removal of a prominent element of their settings. The magnitude of these effects would be reduced by the distance of separation and existing screening. These receptors would experience indirect positive effects of negligible magnitude.

5.4.19 Removal of the 132kV W Route overhead line from pylon W36 would result in a positive effect on the historic landscape character of negligible magnitude.

5.4.20 Undergrounding of the 132kV W Route from pylon W34 to pylon W36 would have moderate potential to affect as-yet undiscovered archaeological remains; any such effects would be more widespread than if the proposed CSEPP were located at pylons W34 or W35 due to the greater length of undergrounding required, but less widespread than if the CSEPP were constructed at pylons W38-W42. The magnitude of effect would be high - low on receptors of moderate - negligible sensitivity.

Central Section

Pylon W38

5.4.21 A CSEPP replacing the existing pylon W38 would not comprise a more prominent element than the existing pylon in the settings of Grade II Listed South Common Farmhouse and railings, and would therefore have no effect on them.

5.4.22 Removal of the W Route overhead line from pylon W34 to pylon W38 would result in positive effects on six Grade II Listed Buildings (Four Gables, Bizley Farmhouse, Nursebatch Farmhouse, Batch Farmhouse, Yew Tree House and Tower Farmhouse), due to removal of a prominent element of their settings. The magnitude of these effects would be reduced by the distance of separation and existing screening. These receptors would experience indirect positive effects of negligible magnitude.

5.4.23 Removal of the 132kV W Route overhead line from pylon W38 would result in a positive effect on the historic landscape character of negligible magnitude.

5.4.24 Undergrounding of the 132kV W Route from pylon W34 to pylon W38 would have high potential to encounter post-medieval settlement remains near pylon W37. This receptor is likely to experience a physical effect of high - low negative magnitude.

5.4.25 Undergrounding to pylon W38 would also have moderate potential to affect as-yet undiscovered archaeological remains; any such effects would be more widespread than if the proposed CSEPP were located at pylons W34-W36 due to the greater length of undergrounding required, but less widespread than if the CSEPP were constructed at pylons W39-W42. The magnitude of effect would be high - low on receptors of moderate - negligible sensitivity.

Pylon W39

5.4.26 A CSEPP replacing the existing pylon W39 would not comprise a more prominent element than the existing pylon in the settings of Grade II Listed South Common Farmhouse and railings, and would therefore have no effect on them.

5.4.27 Removal of the 132kV W Route overhead line from pylon W39 would result in positive effects on six Grade II Listed Buildings (Four Gables, Bizley Farmhouse, Nursebatch Farmhouse, Batch Farmhouse, Yew Tree House and Tower Farmhouse), due to

removal of a prominent element of their settings. The magnitude of these effects would be reduced by the distance of separation and existing screening. These receptors would experience indirect positive effects of negligible magnitude.

5.4.28 Removal of the 132kV W Route overhead line from pylon W39 would result in a positive effect on the historic landscape character of low magnitude. This effect would be more widespread compared to a CSEPP at any of pylons W34-W39.

5.4.29 Undergrounding of the 132kV W Route from pylon W34 to pylon W39 would have high potential to encounter Roman and post-medieval remains near pylon W39, and high potential to encounter post-medieval settlement remains near pylon W37. Both of these receptors are likely to experience negative physical effects of high - low magnitude.

5.4.30 Undergrounding to pylon W39 would also have moderate potential to affect as-yet undiscovered archaeological remains; any such effects would be more widespread than if the proposed CSEPP were located at pylons W34-W38 due to the greater length of undergrounding required, but less widespread than if the CSEPP were constructed at pylons W40-W42. The magnitude of effect would be high - low on receptors of moderate - negligible sensitivity.

Northern Section

Pylon W40

5.4.31 A CSEPP replacing the existing pylon W40 would result in negligible negative effects to Grade I Listed Nailsea Court and two associated Grade II Listed Buildings, and to the settings of Grade II Listed South Common Farmhouse and railings, due to the introduction of a slightly larger prominent element to their settings. However, there would also be a positive effect as a result of removal of most of the section of the 132kV W Route that is present in these receptors' settings. The overall effect would be neutral.

5.4.32 Removal of the 132kV W Route overhead line as far as pylon 40 would result in positive effects on six Grade II Listed Buildings (Four Gables, Bizley Farmhouse, Nursebatch Farmhouse, Batch Farmhouse, Yew Tree House and Tower Farmhouse), due to removal of a prominent element of their settings. The magnitude of these effects would be reduced by the distance of separation and existing screening. These receptors would experience indirect positive effects of negligible magnitude.

5.4.33 Removal of the 132kV W Route overhead line from pylon W40 would result in a positive effect on the historic landscape character of low magnitude.

5.4.34 Undergrounding of the 132kV W Route from pylon W34 to pylon W40 would have high potential to encounter Roman and post-medieval remains near pylon W39, and high potential to encounter post-medieval settlement remains near pylon W37. Both of these receptors are likely to experience negative physical effects of high - low magnitude.

5.4.35 Undergrounding to pylon W40 would also have moderate potential to affect as-yet undiscovered archaeological remains; any such effects would be more widespread than if the proposed CSEPP were located at pylons W34-W39 due to the greater length of undergrounding required, but less widespread than if the CSEPP were constructed at pylons W41 or W42. The magnitude of effect would be high - low on receptors of moderate - negligible sensitivity.

Pylon W41

5.4.36 A CSEPP replacing the existing pylon W41 would result in negative effects to Grade I Listed Nailsea Court and two associated Grade II Listed Buildings, due to the introduction of a slightly larger prominent element to their settings. However, there

would also be a positive effect as a result of removal of most of the section of the W Route that is present in these receptors' settings. The overall effect would be neutral.

5.4.37 Removal of the W Route overhead line from pylon W41 would result in positive effects on eight other Grade II Listed Buildings (South Common Farmhouse and railings, Four Gables, Bizley Farmhouse, Nursebatch Farmhouse, Batch Farmhouse, Yew Tree House and Tower Farmhouse), due to removal of a prominent element of their settings. The magnitude of these effects would be reduced by the distance of separation and existing screening. These receptors would experience indirect positive effects of negligible magnitude.

5.4.38 Removal of the 132kV W Route overhead line from pylon W34 to pylon W41 would result in a positive effect on the historic landscape character of low magnitude.

5.4.39 Undergrounding of the 132kV W Route from pylon W34 to pylon W41 would have high potential to encounter Roman and post-medieval remains near pylon W39, and high potential to encounter post-medieval settlement remains near pylon W37. Both of these receptors are likely to experience negative physical effects of high - low magnitude.

5.4.40 Undergrounding to pylon W41 would also have moderate potential to affect as-yet undiscovered archaeological remains; any such effects would be more widespread than if the proposed CSEPP were located at pylons W34-W40 due to the greater length of undergrounding required, but less widespread than if the CSEPP were constructed at pylon W42. The magnitude of effect would be high - low on receptors of moderate - negligible sensitivity.

Pylon W42

5.4.41 A CSEPP replacing the existing pylon W42 would have no effect on Grade I and II Listed Buildings at Nailsea Court, as their settings are sufficiently filtered by woodland and screened by landform that there would be no effect on their sensitivity.

5.4.42 Removal of the 132kV W Route overhead line from pylon W42 would result in indirect positive effects to one Grade I and ten Grade II Listed Buildings, due to removal of a prominent element within their settings (i.e. the pylons and overhead lines). The magnitude of these effects would be reduced by the distance of separation and existing screening. There would be a positive effect of low magnitude on Grade I Listed Nailsea Court and two associated Grade II Listed Buildings. The settings of eight Grade II Listed Buildings (South Common Farmhouse and railings, Four Gables, Bizley Farmhouse, Nursebatch Farmhouse, Batch Farmhouse, Yew Tree House and Tower Farmhouse) would experience positive effects of negligible magnitude.

5.4.43 Removal of the W Route overhead line from pylon W42 would result in a positive effect on the historic landscape character of low magnitude.

5.4.44 Undergrounding of the W Route from pylon W34 to pylon W42 would have high potential to encounter Roman and post-medieval archaeological remains near pylon W39, and high potential to encounter post-medieval remains near pylon W37. Both of these receptors are likely to experience negative physical effects of high - low magnitude.

5.4.45 Undergrounding to Pylon W42 would also have moderate potential to affect as-yet undiscovered archaeological remains, dependent on the route taken, and any such effects would be more widespread than for any other proposed CSEPP location due to the greater length of undergrounding required. The magnitude of effect would be high - low on receptors of moderate - negligible sensitivity.

Historic Environment Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.4.46 Taking into account the potential in combination effects of the other Proposed Developments in conjunction with the proposed CSEPP works would not make a difference to which option should be taken forward for consultation from an historic environment perspective. We have reached this view on the basis that the appraisal takes into account the effects of the W Route undergrounding. In terms of the 400kV overhead line between Bridgwater and Seabank substation, at its closest point it would be 1 km from the northernmost pylon in the CSEPP study area (W34). We consider that this separation distance means that the proposal for a new 400kV line would have no bearing on which pylon location to take forward as a CSEPP from an historic environment perspective.

Potential for Mitigation

5.4.47 Scope to mitigate effects on the setting of heritage receptors is limited. The feasibility of measures to reduce visual effects (off-site landscape planting being the primary measure) cannot be guaranteed at this stage of the assessment. The scale of effect does not therefore take mitigation into account.

5.4.48 For all options, a programme of archaeological monitoring and investigation would be required to mitigate effects on buried archaeological remains. The programme would be proportionate to the level of ground disturbance and the archaeological potential of the areas where work is taking place.

5.4.49 Alternative construction designs for access roads could reduce considerably or avoid some negative physical effects on buried archaeological remains. For example, if a mobile steel trackway was employed to create access roads, this is likely to reduce or avoid the compression, truncation and dewatering likely to result from stripping and stoning. The effectiveness of this mitigation by design would depend on a variety of factors including the type of steel trackway used and the existing sub-surface conditions.

5.4.50 For all options, physical effects on historic landscape elements (i.e. physical features) could be avoided, or mitigated through archaeological recording, careful reinstatement and, in the case of some hedgerow loss, translocation or replanting (note that some hedgerow loss may be not be possible to mitigate).

Historic Environment Conclusion

Overall Scale of Effect

5.4.51 The development options are summarised here in order of the most positive/least negative scale of effect on the historic environment, as follows. Siting of the CSEPP at pylon W42 would result in the largest positive overall scale of effect (moderate), due to improvements to the settings of more and higher value Listed Buildings than other sites. Siting of the CSEPP at pylon W38 would result in the second largest positive overall scale of effect (minor). Siting at pylons W39 and then W40 would result in approximately equal (minor) positive overall scales of effect (W40 having slightly higher potential to negatively affect non-designated archaeological remains). Siting at pylon W41 would result in a mixture of positive and negative effects to Listed Buildings and archaeological remains, for a minor positive overall scale of effect. Siting at pylon W36 would also result in a minor positive overall scale of effect but this would result from effects to fewer receptors. Siting at pylons W35 or W34 is likely to result in negligible or no effect on the historic environment.

Effect on Built Heritage

5.4.52 Undergrounding of a section of the 132kV W Route and siting the CSEPP at pylon W42 would result in the greatest positive effect on built heritage, by improving the settings of one Grade I and ten Grade II Listed Buildings; the overall positive scale of effect would be moderate. Siting at pylons W38, W39 and W40 would result in the next most positive effect on built heritage, since each would improve the settings of six Grade II Listed Buildings. Siting at pylon 41 would improve the setting of eight Grade II Listed Buildings but would negatively affect the settings of a further two, as well as one Grade I Listed Building. Siting at pylon W36 would result in improvements to the settings of two Grade II Listed Buildings. The overall positive scale of effect on built heritage for pylons W41-W36 would be minor positive, although pylons W38-W40 would have more widespread positive effects than W41 or W36. Siting at pylons W34 and W35 would have no effect on built heritage.

Effect on the Historic Landscape Character

5.4.53 Undergrounding of a section of the 132kV W Route would result in positive effects to the historic landscape character at a scale of effect that increases towards the south. Siting of the CSEPP at pylons W39 to W42 would result in a minor positive scale of effect. Siting at pylons W35 to W38 would result in a negligible positive scale of effect. Siting at pylon W34 would have no effect on the historic landscape character.

Effect on Buried Archaeological Remains

5.4.54 Siting the CSEPP at pylons W39-W42 would have high potential to result in negative effects on two non-designated known archaeological sites. Siting at pylon W38 would have high potential to affect one of these sites. The proposed development may also result in negative effects to as-yet unidentified non-designated archaeological remains. In all cases, the overall negative scale of effect would be minor, although the effects would be more widespread the further the CSEPP is sited to the south, due to the larger area that would be disturbed.

5.5 Socio-Economic Assessment

Baseline Conditions

5.5.1 There is a sports and recreation ground (Nailsea and Backwell RFC Rugby Ground) adjacent to the northern section of the study area close to pylon W34.

5.5.2 The study area is predominantly Grade 2, Best and Most Versatile (BMV) agricultural land, with small areas of Grade 3 and 4 to the south near the railway.

5.5.3 The Avon Cycleway utilises Netherton Wood Lane, a minor road between West End (residential properties) and Nailsea, (main town), which is currently crossed by the existing W Route overhead line.

5.5.4 A number of local Public Rights of Way (PRoW) cross the study area, notably to the north of Netherton Wood Lane.

Assessment of Effects by Section

<u>General Overview – All Sections</u>

5.5.5 From a socio-economic perspective, it is preferable to avoid siting permanent infrastructure on BMV agricultural land. Differing impacts on BMV land are likely as a result of the CSEPP options considered through this appraisal, with the more southerly pylon locations enabling the removal of a greater number of existing 132kV W route pylons and restoration of a larger area of Grade 2 land. However, the magnitude of

these impacts is not considered to offer a notable differentiation in terms of impacts between the options. Whilst the larger CSEPP footprint could require greater direct BMV land take than a standard pylon, this would be offset by the potential for the affected agricultural land within the underground cables alignment to be returned to its existing quality. There would be low magnitude negative impacts during construction due to direct disturbance; however there is likely to be a negligible to low magnitude positive impact in the long term for all options due to, the further south the CSEPP the more positive impact could be achieved.

Northern Section

5.5.6 There is an existing 132kV W Route pylon within the car park of the Nailsea and Backwell RFC Rugby Ground (W34). Increasing the footprint of this structure through locating the CSEPP at pylon W34 could affect the functionality of this facility. Construction, maintenance and refurbishment activities at pylon W34 is likely to result in temporary negative impacts on this facility through disrupted access, reduced parking provision and potentially the temporary closure of the facility. Selecting one of the CSEPP locations to the south of pylon W35 would have the low magnitude beneficial impact of removing the existing pylon from within the rugby ground car park and avoiding the need to route underground cable through the rugby ground. Disruption during construction could be reduced to a low magnitude negative socio-economic impact through timing the construction and maintenance activities. Selecting the location at pylon W36 will remove the overhead line from the PRoW north of this point, although W36 is also noted to be adjacent to a PRoW. This would benefit the visual amenity of users. This is unlikely to change the functionality and use of these PRoWs and socio-economic impacts associated with locating a CSEPP at pylon W35 or W36 are thus anticipated to be negligible.

Central Section

5.5.7 Locating the CSEPP in the first or second field north of Netherton Wood Lane would remove the overhead lines across the PRoW, which would benefit the visual amenity of users, although it is unlikely to change the functionality and use of these PRoWs. Socio-economic impacts of CSEPP at pylons W39 and W38 are therefore anticipated to be negligible.

Southern Section

5.5.8 Locating the CSEPP to the south of Netherton Wood Lane would remove the overhead lines across the Avon Cycleway, which would benefit the visual amenity of users, although it is unlikely to change the functionality and use of this route. If the CSEPP is located to the south of this lane, the underground cable route construction should seek to minimise disruption to the use of this road and cycleway. Socio-economic impacts of CSEPP at pylons W42 and W41 are therefore anticipated to be negligible. During construction, maintenance and refurbishment, disruption to the functionality of Netherton Wood Lane may result in temporary low magnitude negative impacts if the CSEPP is located at pylon W40. Permanent socio-economic effects are anticipated to be negligible.

Consideration of the Potential In Combination Effects of the Other Proposed Development Components

5.5.9 Taking into account the potential in combination effects of the other Proposed Developments in conjunction with the proposed CSEPP works would not further differentiate the effects identified and which option should be taken forward for consultation from a socio economic perspective.

Potential for Mitigation

5.5.10 There are a number of measures that may be considered to mitigate the temporary construction impacts on socio-economic receptors in the area. These include:

- Programming construction activities to avoid peak recreation use. Routeing construction traffic to minimise disruption to local business, tourism and recreation resources.
- Where construction disrupts PROWs alternative/diversionary routes should be provided and clearly signed.
- Adopting good construction practice to minimise noise and dust generation.
- Maximising socio-economic benefits by seeking to appoint local contractors and source materials locally.

5.5.11 Planting vegetative screening, by agreement, could reduce the opportunities for visual connections between users of local tourism and recreation resources and proposed and existing electricity infrastructure. Restoration and soil management techniques should ensure that, post construction, the agricultural land is restored to the same quality as prior to construction.

Socio-Economic Conclusion

5.5.12 This appraisal of possible CSEPP locations has identified that a location at the current Pylon W34 is likely to result in temporary low magnitude negative impacts on the functionality of the Nailsea and Backwell RFC Rugby Ground. Locating a CSEPP at the current Pylon W40 is likely to result in temporary low magnitude negative impacts on Netherton Wood Lane during construction, maintenance and refurbishment activities.

5.5.13 Socio-economic considerations do not provide a significant differentiating factor between the other proposed locations for a CSEPP. However, a location to the south of the study area would be preferable from a socio-economic perspective as this will minimise impacts on community recreation facilities and minimise the number of PROWs and cycleways which are oversailed by the 132kV W Route.

5.6 Costs

5.6.1 The costs for the CSEPP will be similar wherever it is located. However the costs for underground cable to connect with the CSEPP will increase the further south the CSEPP is located as a longer length of cable will be required.

5.6.2 The cost of 132kV cable is approximately £2m per double circuit/km. In the case of the 132kV W Route, a double circuit is required. To give an indication of what this would mean for the study area, a CSEPP located at either of the two pylons in the southern section would incur costs approximately £2.5 to £3.5 million more than a CSEPP in the northern section because of the extra costs of undergrounding an additional 1.25 km to 1.75 km of double circuit cable respectively.

5.6.3 All options would incur costs associated with a temporary diversion of the existing 132kV W Route overhead line to facilitate the construction of the CSEPP and connection of the underground cable and overhead line.

5.6.4 Sites close to existing tracks and roads will incur lower construction costs as temporary construction road costs will be minimised.

6 CONCLUSIONS

6.1.1 This report has assessed the potential locations available for the siting of a CSEPP to the south west of Nailsea.

6.2 Technical & Design Issues

6.2.1 Development of a CSEPP should take place adjacent to an existing pylon and in line with the existing route to minimise the requirement for any additional permanent overhead line works. There are no technical reasons why a site could not be developed in any of the sections of the study area with the exception of pylon W37.

6.2.2 The further south the CSEPP is located the greater the amount of the 132kV W Route undergrounding that is required. This adds to the potential disruption and disturbance arising from construction activities.

6.3 Environmental Factors

6.3.1 An appraisal of the environmental factors for each of the three sections in the study area is presented in chapter 5.

6.3.2 From an ecological perspective, a CSEPP at W34 is preferred as it would have fewer ecological effects than the other pylons.

6.3.3 However, from a landscape and visual amenity perspective and a historic environment perspective, a CSEPP in the southern section at pylon W42 to the north of River Kenn is considered to be the least environmentally constrained site as it minimises effects on landscape character and visual amenity and above ground historic environment features compared to the other pylon locations.

6.3.4 A CSEPP in the central or northern section would have similar effects on the historic environment, but a CSEPP in the central and northern sections would have greater negative effects on visual amenity and landscape character.

6.4 Socio-economic Factors

6.4.1 Socio economic considerations do not provide a differentiating factor between the proposed CSEPP locations, although a CSEPP at the Rugby Ground is likely to cause temporary negative impacts during construction and on-going impacts through reduced parking provision.

6.5 In Combination Effects

6.5.1 In combination effects are not so differentiating that they would influence the conclusion as to which pylon position should be taken forward for consultation as the preferred CSEPP location.

6.6 Capital & Lifetime Costs

6.6.1 The most economical option is to site the CSEPP in the northern section of the study area. However, this would result in a CSEPP being visible from the large number of receptors along the western edge of Nailsea. Siting a CSEPP in the southern section would have beneficial effects on landscape character and visual amenity as it could be sited on lower ground of the River Kenn valley closest to the railway and would extend the length of undergrounding improving views from receptors in Nailsea. This would however incur additional costs of between £2.5 million and £3.5 million as a result of the greater amount of undergrounding required compared to a CSEPP in the northern section.

6.7 Preferred Location for a Cable Sealing End Platform Pylon

Having regard to WPD's statutory duties to develop and maintain an efficient, co-ordinated and economical system of electricity distribution and having regard to the preservation of amenity, whilst also taking into account the potential impacts at each of the potential sites, it is considered that a CSEPP should ideally be developed adjacent to an existing pylon and in line with the existing route to minimise the requirement for any additional permanent overhead line works.

6.7.1 Regardless of which pylon is selected, it should be noted that the W Route overhead line already exists and therefore the proposals would not result in the introduction of a new overhead line into the landscape. In fact, the proposals facilitate the removal of the existing W Route overhead line (from Nailsea to Portishead), which in some cases currently oversails a number of residential gardens. This would lead to a positive effect on landscape character and visual amenity. Moreover, the CSEPP would be sited immediately adjacent to an existing pylon location to ensure that the scale of change is minimised compared to if a new overhead line was being installed.

6.7.2 A CSEPP in the northern section at pylon W36 would minimise the costs of the proposed development whilst seeking to minimise environmental effects as far as practicable. Whilst there would be environmental benefits in terms of landscape and views and the historic environment by the siting the CSEPP in the southern section at pylon W42, these benefits would not outweigh the very high additional costs associated with the installation of a greater length of underground cables. As a result, the preferred location for the CSEPP is pylon W36.

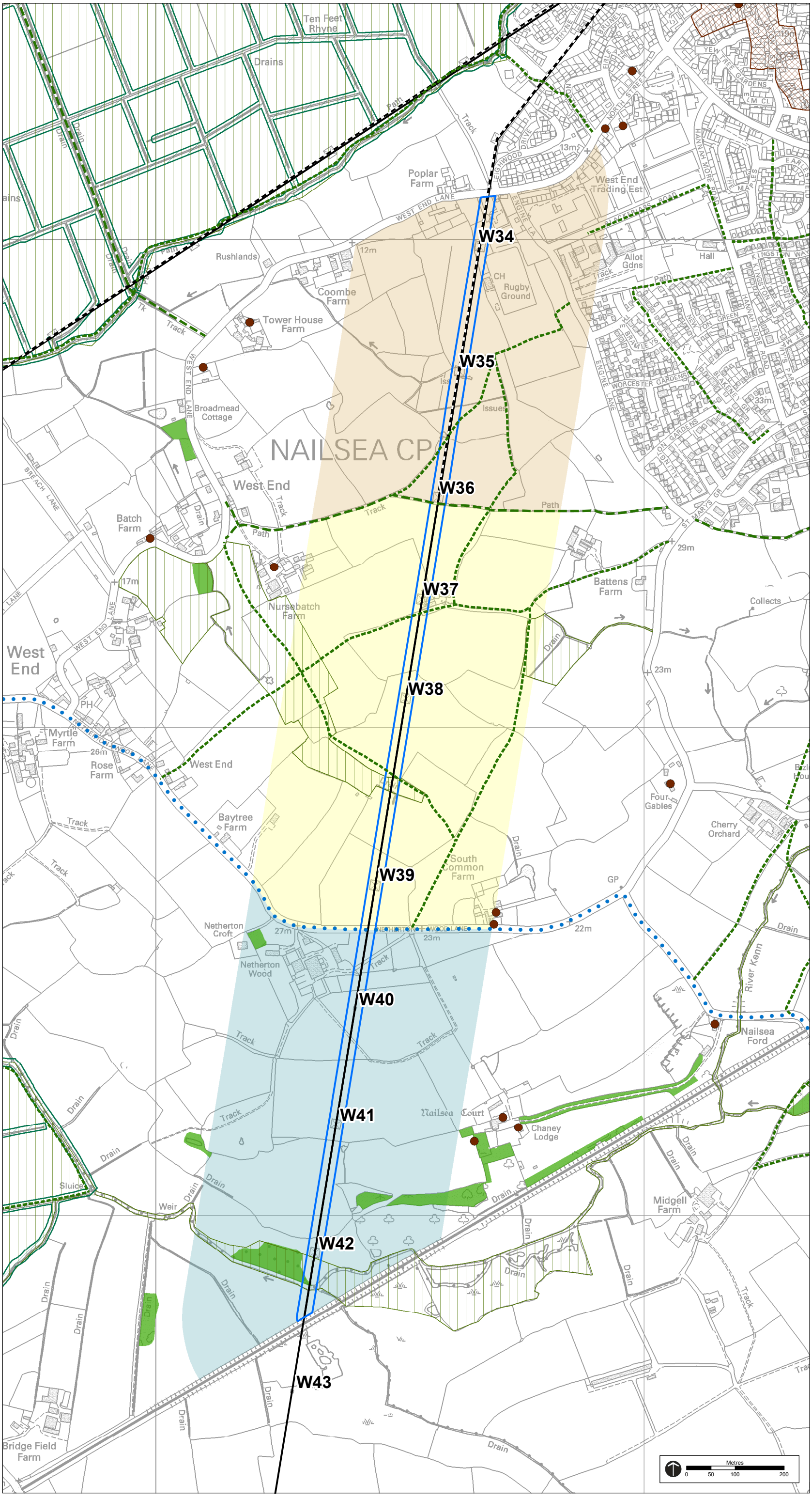
6.7.3 Development in the northern section of the study area at pylons W35 and W34 would be most visible from properties on the western edge of Nailsea, whilst development in the southern and central sections of the study area at pylons W42 to W38 would incur additional costs and impacts associated with extending the length of underground section of the W Route.

6.7.4 Having regard to statutory duties and all the factors considered as part of the appraisal process, WPD and National Grid consider that W36 is the preferred technical and environmental option.

6.7.5 This will be reviewed throughout the development of the project and following consultation with statutory consultees and local communities who will have the opportunity to comment on all the options considered in this Report as part of the formal consultation.

FIGURE 1

STUDY AREA PLAN



Key

Proposed Infrastructure

- Cable Sealing End Platform Pylon Study Area
- Cable Sealing End Platform Pylon Section - North
- Cable Sealing End Platform Pylon Section - Central
- Cable Sealing End Platform Pylon Section - South

Existing Infrastructure

- Existing Western Power Distribution Overhead Line on Pylons
- Existing Western Power Distribution 132kV Overhead Line for removal

High Level Environmental Constraints

- Site of Special Scientific Interest
- Woodland
- Conservation Area
- Listed Building (Grade I, II* and II)

Selected Local Plan Allocation

- Site Of Nature Conservation Importance

Public Right of Way

- Footpath
- Bridleway

Sustrans

- Regional Cycle Route

This map includes data from the following sources: -
- National Grid
- Ordnance Survey
- North Somerset District Council
- Sustrans
- Natural England - © Natural England [2013], reproduced with the permission of Natural England, http://www.naturalengland.org.uk/copyright/.
- English Heritage
- Local Constraints captured from North Somerset Replacement local plan (Adoted 2007)

The following environmental constraints considered do not occur:
- World Heritage Site
- National Park
- Area of Outstanding Natural Beauty
- Ramsar
- Special Protection Area
- Special Area of Conservation
- National Nature Reserve
- Local Nature Reserve
- Heritage Coast
- Registered Battlefield
- Registered Parks and Garden
- Scheduled Monument
- Protected Wreck
- Airfield/Airport

Rev	Description	Drawn	Approved	Date
D	Study Area Amendments	CB	CC	20/03/2013
C	Study Area Amendments, Legend Changes. Page size change	CB	CC	20/03/2013
B	Add PROW and Cycle Routes	CB	CC	13/02/2013
A	Add SNCI to Plan	CB	CC	08/02/2013

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Project: **Western Power Distribution 132kV Diversions**

Title: **Nailsea to Portishead – Study Area for Cable Sealing End Platform Pylon**

Drawing No: G1979.03.095d

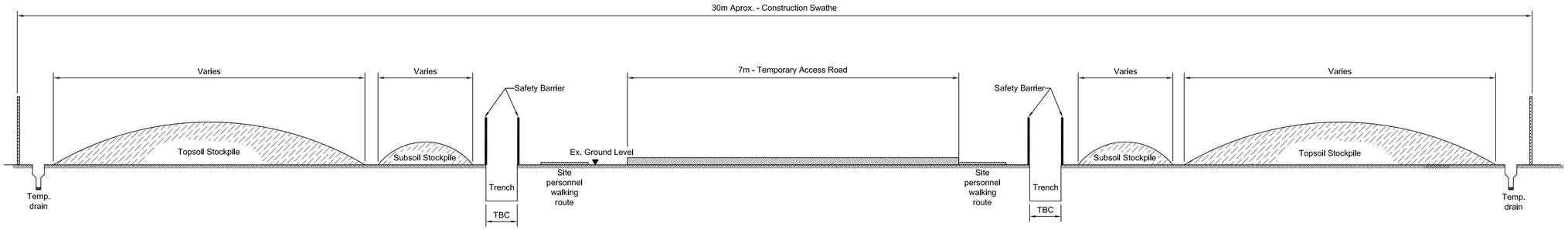
Date: 20/03/13

TEP Ref No: G1979.03.095d

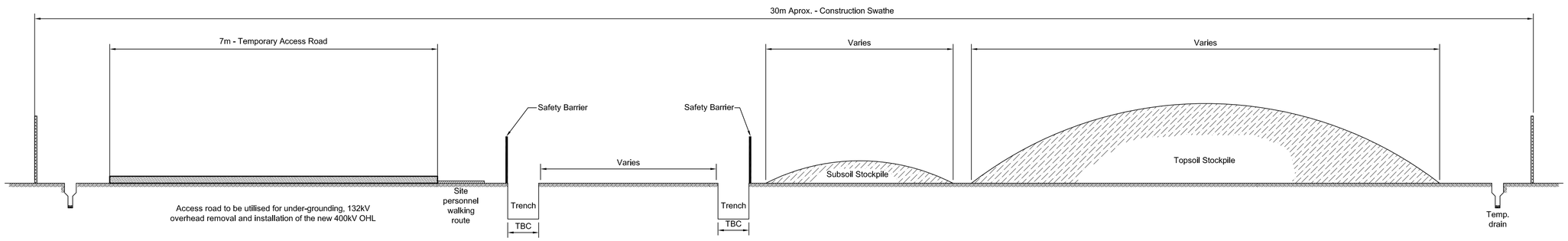
Drawn:	Checked:	Approved:
CB	CG	CC

FIGURE 2

PLAN SHOWING A CABLE SEALING END PLATFORM PYLON



Typical Construction Swathe for 132kV Cabling Works



Typical Construction Swathe for 132kV Cabling Works
With Access Road to be Utilised for Cabling and OHL Works

Notes

1. Proposed arrangement shown for indicative purpose only. Dimensions and design may vary depending on site and installation conditions.
2. Dimensions and overall width could increase or decrease

PRELIMINARY DESIGN NOT TO BE USED FOR CONSTRUCTION

MMD DRAWING No.

MMD-322069-E-DR-WPD-XX-0600

ISSUE	DATE	COMMENTS	DRAWN	CHK'D	APP'D
A	Sept' 13	FOR CONSULTATION	GJB	JB	PB

TITLE:

TYPICAL GENERAL ARRANGEMENT OF CONSTRUCTION SWATHE FOR 132kV UNDERGROUND CABLE INSTALLATION

nationalgrid

NG INVESTMENT No.	APPLICATION No.	CAD
20897		A1
NG DRAWING No.	DRAWING No.	SCALE
13/NG/0211		NTS
	SHEET 7 OF 53	ISSUE A

APPENDIX A

POLICY BACKGROUND

Appendix A **POLICY BACKGROUND**

A.1 **National Policy Statements**

A.1.1. The context for any options appraisal relating to energy infrastructure is provided by the Overarching National Policy Statement for Energy (EN-1). This states that in considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the Infrastructure Planning Commission (IPC)[2] should take into account:

- its potential benefits including its contribution to meeting the need for energy infrastructure, job creation and any long term or wider benefits; and
- its potential adverse impacts, including any long term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.

A.1.2. In this context, the IPC should take into account environmental, social and economic benefits and adverse impacts, at national, regional and local levels. EN-1 provides guidance on assessment on a topic basis relevant to all energy projects which is supplemented by guidance specific to the project type. EN-1 recognises that "in most cases, there will be more than one technological approach by which it is possible to make such a connection or reinforce the network (for example, by overhead line or underground cable) and the costs and benefits of these alternatives should be properly considered as set out in EN-5 (in particular section 2.8) before any overhead line proposal is consented." (EN-1 paragraph 3.7.10).

A.1.3. In the case of the Hinkley Point C Connection, the relevant guidance for electricity transmission connections is to be found in the National Policy Statement for Electricity Networks Infrastructure (EN-5). Paragraph 2.8.2 of the Electricity Networks National Policy Statement (EN-5) states that:

"Government does not believe that development of overhead lines is generally incompatible in principle with developers' statutory duty under section 9 of the Electricity Act to have regard to amenity and to mitigate impacts. In practice new above ground electricity lines, whether supported by lattice steel towers/pylons or wooden poles, can give rise to adverse landscape and visual impacts, dependent upon their scale, siting, degree of screening and the nature of the landscape and local environment through which they are routed. For the most part these impacts can be mitigated, however at particularly sensitive locations the potential adverse landscape and visual impacts of an overhead line proposal may make it unacceptable in planning terms, taking account of the specific local environment and context."

A.1.4. EN-5 also says that although Government expects that overhead lines will often be appropriate and their effects can often be mitigated:

"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)".

[2] The functions of the IPC were transferred to the Planning Inspectorate in April 2012

A.1.5. EN-5 states that consent should only be refused for overhead line proposals in favour of an underground line if "…the benefits from the non-overhead line alternative will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable". In this context it should consider:

- the additional cost of any undergrounding; and
- the environmental and archaeological consequences of undergrounding.

A.1.6. The options appraisal that has been undertaken for the W Route includes consideration of these particular factors in reaching a recommendation on where undergrounding can be justified.

A.2 National Planning Policy Framework

A.2.1. The National Planning Policy Framework3 (NPPF) may be considered as an "important and relevant"4 matter in decision making for Nationally Significant Infrastructure Projects (NSIPs). Paragraph 6 of the NPPF states that "the purpose of the planning system is to contribute to the achievement of sustainable development". It goes on to note that planning has a key role to play in "supporting the delivery of renewable and low carbon energy and associated infrastructure".

A.2.2. The Hinkley Point C Connection is intended to provide additional transmission capacity to permit the connection of wind and nuclear powered generation and thereby assist the UK to meet its renewable energy targets. While the NPPF does not include policies specifically related to electricity transmission infrastructure, it does include policies for conserving and enhancing the natural and historic environment which have been taken into account in planning and assessing potential alignments.

A.2.3. Paragraph 115 states that "great weight should be given to conserving landscape and scenic beauty in National Parks and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to landscape and scenic beauty. The conservation of wildlife and cultural heritage are important considerations in all these areas…."

A.2.4. Paragraph 116 states that "planning permission should be refused for major developments in these designated areas except in exceptional circumstances and where it can be demonstrated that they are in the public interest." It goes on to state that applications for such development should be accompanied by assessments of the need for the development; the scope for meeting the need outside the designated area; and the effects of the development on landscape and recreational opportunities and the extent to which these could be mitigated.

A.2.5. Paragraph 118 calls on local planning authorities to aim to conserve and enhance biodiversity in determining planning applications by protecting nationally and internationally designated sites from development which would have an adverse effects upon them and, in all locations, by refusing development which could result in significant harm to biodiversity and which cannot be avoided or adequately mitigated or

[3] Department for Communities and Local Government : National Planning Policy Framework : March 2012

[4] National Planning Policy Framework paragraph 3

compensated. Specific mention is made of the need to protect irreplaceable habitats, including ancient woodland and veteran trees.

A.2.6. Paragraph 128 states that in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. Paragraph 132 states that "when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be given during the decision making process. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting."

A.3 Development Plans

Regional Policy

A.3.1. The Government revoked the Regional Strategy for the South West on 20th May 2013. As a result, the strategy no longer forms part of the Development Plan.

Structure Plan Policy

A.3.2. The Government also revoked Structure Plans on 20th May 2013, and as such they no longer form part of the Development Plan.

North Somerset Replacement Local Plan

A.3.3. Whilst the North Somerset Core Strategy was adopted in April 2012, a number of policies of the North Somerset Replacement Local Plan5 are yet to be replaced. The intention is that such policies will be incorporated into the Sites & Polices Development Plan Document which is scheduled for adoption in summer 2014. The policies that remain in force and are relevant to the proposals include the following.

A.3.4. Policy ECH/4 seeks to achieve development that preserves a listed building's special architectural and historic interest and its setting.

A.3.5. Policy ECH/6 seeks to prevent development from causing damage to nationally important archaeological remains or their settings.

A.3.6. Policy ECH/7 aims to ensure that development does not adversely affect the particular character of a landscape.

A.3.7. Policy ECH/11 seeks to prevent development that could harm nationally or internationally protected species of flora or fauna or the habitats used by such species, unless that harm could be avoided or mitigated and the species protected by use of planning conditions or planning obligations.

A.3.8. Policy ECH/12 explains that development that is likely to have adverse effects on a Special Protection Area (SPA), Special Area of Conservation (SAC) or a Ramsar Site will not be permitted, unless adverse impacts on the integrity of the site can be avoided or there is no alternative solution and there are imperative reasons of overriding interest that enable the project to proceed.

[5] North Somerset Council : North Somerset Replacement Local Plan (March 2007)

A.3.9. Policy ECH/13 aims to protect Sites of Special Scientific Interest (SSSI) and National Nature Reserves from development that would have an adverse effect, unless other material considerations outweigh the loss of biodiversity.

A.3.10. Policy ECH/14 aims to protect wildlife and geological sites from development that would have an adverse effect, unless the importance of the development outweighs the value of the substantive interest present.

North Somerset Core Strategy

A.3.11. The North Somerset Core Strategy6 was adopted in April 2012. The document contains a number of environmental protection policies and draws attention to the particular characteristics of the North Somerset environment.

A.3.12. Policy CS4 aims to protect and enhance biodiversity, including seeking to protect, connect and enhance important habitats, particularly designated sites, ancient woodlands and veteran trees.

A.3.13. Policy CS5 aims to protect landscape character and the historic environment.

A.3.14. Policy CS6 confirms that the boundaries of the Green Belt will remain unchanged for the plan period.

A.3.15. Policy CS9 seeks to safeguard and enhance areas of green infrastructure and, in this context, draws attention to a number of specific areas including :

A.3.16. the promotion of the north slopes of the Mendip Hills AONB as sub-regional corridors for biodiversity, recreation and landscape retention;

A.3.17. the promotion of the Congresbury Yeo, River Banwell, North Somerset Levels and Moors.

A.3.18. The Proposals Map highlights the range of environmental constraints in the vicinity of the corridor including protected rhynes at Puxton Moor.

[6] North Somerset Council : Local Development Framework – Core Strategy Corrected Version : April 2012

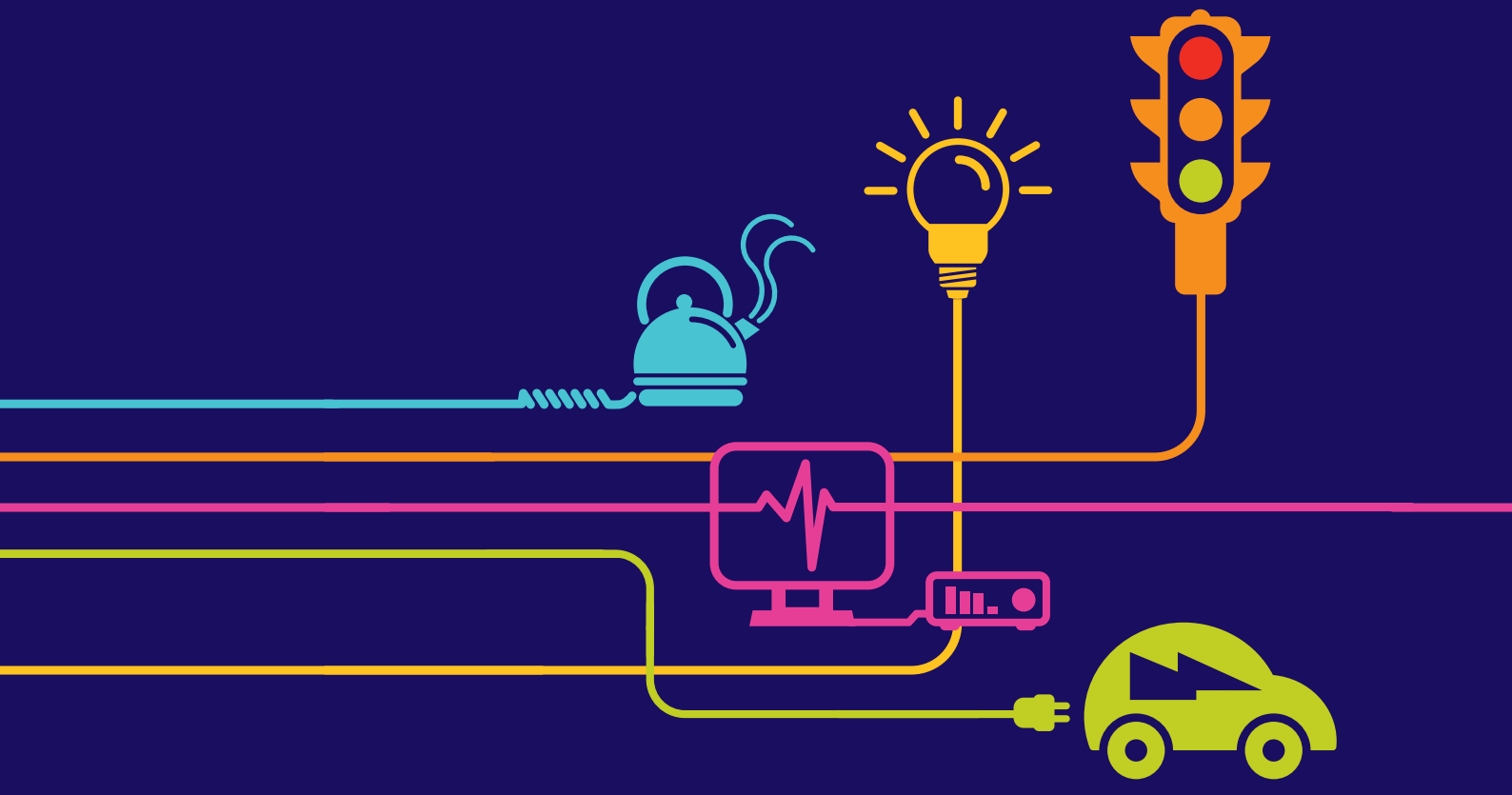
Appendix 2V – Western Power Distribution Undergrounding of Sections of 132kV Overhead Lines G, BW Route and Seabank Line Entries Technical and Environmental Appraisal (2013)

Document 5.5

nationalgrid

Western Power Distribution Undergrounding of sections of 132kV Overhead Lines G, BW Route and Seabank Line Entries Technical and Environmental Appraisal

Hinkley Point C Connection Project



August 2013

Hinkley Point C Connection Project

Western Power Distribution

Technical & Environmental Options Appraisal:

Undergrounding of sections of 132kV Overhead Line: G Route, BW Route & Seabank Line Entries

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1. Introduction

1.1 This report has been prepared jointly by National Grid Electricity Transmission Limited (National Grid) and Western Power Distribution (South West) PLC (WPD).

1.2 The purpose of this report is to inform statutory consultees and other stakeholders of the range of options considered by National Grid and WPD for ensuring local electricity supplies are maintained and to invite comments on the analysis and recommendations made within.

1.3 To accommodate the connection of a new nuclear power station at Hinkley Point, Somerset, a new 400kV transmission connection is proposed between Bridgwater, Somerset and Seabank substation, near Avonmouth. Information on the project can be found at www.hinkleyconnection.co.uk.

1.4 The proposed route for this new transmission connection broadly follows the route of an existing 132kV overhead line. This 132kV overhead line is operated by WPD and is to be removed between Bridgwater and Avonmouth substations as part of the Hinkley Point C Connection project.

1.5 The proposed route of the 400kV transmission connection encroaches the safety clearances required on a number of other existing 132kV overhead lines owned and operated by WPD. In these limited areas it is proposed to underground the affected sections of these 132kV circuits. This report explains where these works are required and where necessary alternatives have been considered.

1.6 The following sections of 132kV overhead line are proposed for undergrounding:

- BW Route: approximately 300 metres in the area between Avonmouth and Portishead (Chapter 3);
- G, BW and DA Route: approximately 250 metres at the entry to Seabank substation, near Avonmouth (Chapter 4); and
- G Route: approximately 2 kilometres north of Avonmouth substation

(Chapter 5).

1.7 Chapter 3 and 4 outline the option that will be carried out. There is a more detailed environmental, technical and economic assessment carried out on the G route as this is a much longer section of undergrounding that will be required and allows for slightly different options.

1.8 The structure of this document is as follows:

- Section 1 provides an introduction;
- Section 2 identifies the duties of National Grid and WPD;
- Section 3 provides background on the need for the modification works on the BW Route;
- Section 4 provides background on the need for the modification works on the Seabank Line Entries (G,BW and DA Routes);
- Section 5 provides background on the need for the modification works on the G Route;
- Section 6 provides details of the technical and environmental appraisal;
- Section 7 considers the G Route options
- Section 8 confirms the preferred technical and environmental option;
- Section 9 Glossary

2. **Duties of National Grid and Western Power Distribution**

2.1 To take these studies forward to the next stage of assessment, National Grid and WPD must be mindful of their duties under the Electricity Act 1989 (known as the "Electricity Act" from this point forward) and of other guidance documents. Relevant duties are explained briefly below.

2.2 Section 9 of the Electricity Act requires National Grid and WPD to develop the transmission and distribution systems in an efficient, coordinated and economical manner.

2.3 In order to meet this statutory obligation, National Grid and WPD seek to make the most efficient use of its existing infrastructure by measures such as managing power flows and investing in upgrading existing connections and substations, before considering investment in new connections. They then consider the implications for efficiency, co-ordination and cost effectiveness in evaluating a range of options in its strategic decision making. The lowest cost solutions are not always adopted, as other considerations, such as environmental impacts, may favour alternative solutions therefore a balance needs to be struck.

2.4 Under Section 38 of the Electricity Act, both National Grid and WPD have a duty, when putting forward proposals for new development, to consider the preservation of amenity, including the natural environment, cultural heritage, landscape and visual quality. Appendix A of this report includes the 'Western Power Distribution and National Grid Roles and Obligations' which are to be followed when considering the siting and installation of new infrastructure.

3. **Modification works on the BW Route**

3.1 Between September 2011 and November 2012, National Grid developed the draft route alignment for the proposed 400kV connection between Bridgwater, Somerset and Seabank substation, near Avonmouth. This is reported in the Bridgwater to Seabank Connection Options Report[1] and was subject to consultation in November and December 2012. Following this consultation, National Grid reviewed the representations received and made a number of changes to the route. This route ('the proposed route') formed the basis of a request for a scoping opinion from the Secretary of State under the Infrastructure Planning (EIA Regulations) 2009 in April 2013.

3.2 National Grid's initial technical studies could not identify a direct route alongside the M5 motorway in the Portishead / Portbury area. However, as part of the process of developing our proposals and in light of new information gathered from site surveys and assessments we continually review and back check our previous decisions. As part of this review we identified a technically feasible route (the proposed route) which crosses the M5 motorway and then runs parallel to it towards the Portbury Docks complex (See Figure 3.2). This proposed route option A is shorter and more direct than the alternative route option B identified in this area and, minimises the number of angle pylons required and means that the new proposed route option A will avoid houses in Portishead and Sheepway and the Portbury Wharf Nature Reserve.

3.3 National Grid has considered the technically feasible routes identified in light of representations received to the November consultation and still considers that the proposed route option A offers the most appropriate solution for a connection in this study area. However, recognising the issues raised by local people during the consultation, National Grid is proposing to consult on both proposed route option A and an alternative route option B which passes to the east of Portishead and utilises the previously identified preferred route corridor as part of its formal consultation under Section 42/47 of the Planning Act in September 2013.

[1] Bridgwater to Seabank Connection Options Report, October 2012

3.4 **Cumulative Impacts**

3.4.1 The potential cumulative impact of other National Grid and WPD works in the area has been considered. Indeed, these works are a result of the interaction between the National Grid 400kV overhead line and the existing WPD 132kV overhead line, resulting in a short section of undergrounding as discussed below.

Figure 3.1.The interaction between the alternative route option B 400kV overhead line alignment and the existing 132kV overhead line (BW Route)

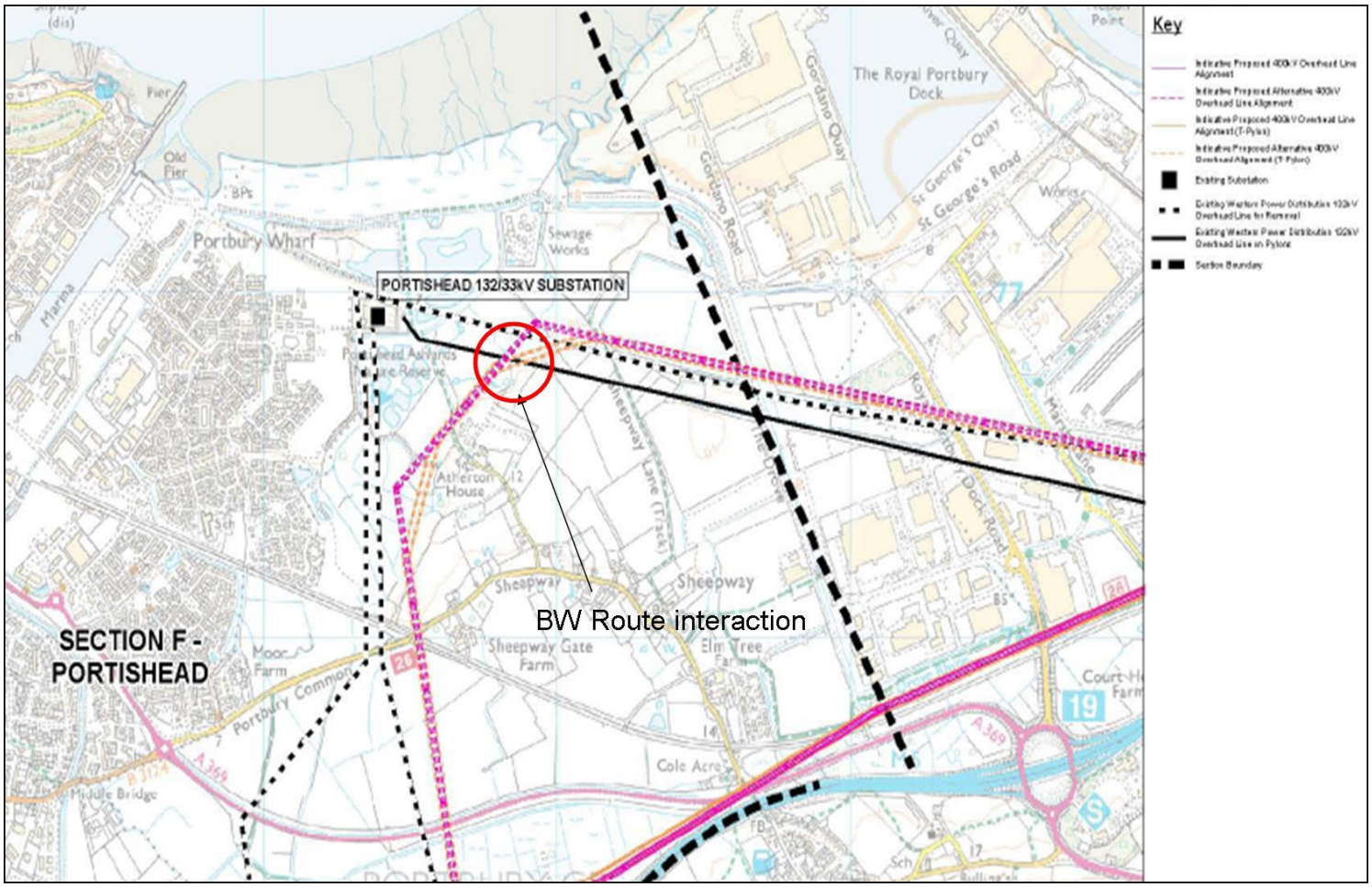
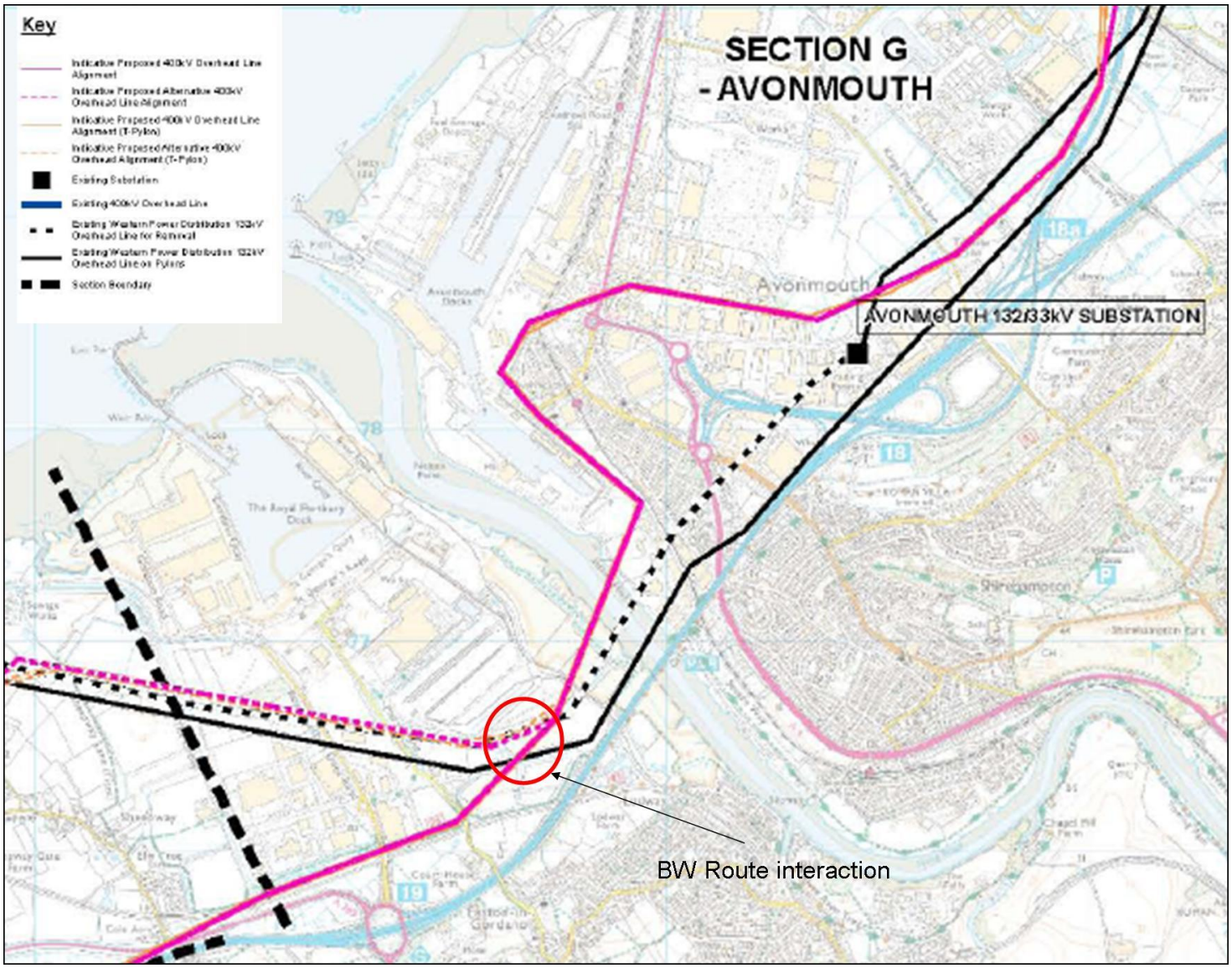


Figure 3.2.The interaction between the proposed route option A 400kV overhead line alignment and the existing 132kV overhead line (BW Route)



3.5 As there are two options for the 400kV overhead line route alignment in this area, there are two potential locations where there is a limited interaction with the existing 132kV overhead line, known as the BW Route. See Figure 3.1 and Figure 3.2.

3.6 **Undergrounding proposed route option A**

3.6.1 The interaction between the existing BW Route and the proposed route option is shown in Figure 3.2. It is proposed in this instance that approximately 161 metres of overhead line is placed underground. This would result in the removal of 2 pylons which would be replaced by 161 metres of underground cable and new Cable Sealing End Platform Pylons (CSEPP)[2] at each end of the cable. This is shown in Figure 3.3 below.

3.7 **Undergrounding alternative route option B**

3.7.1 The interaction with the alternative route option B 400kV route alignment that passes to the east of Portishead is shown in Figure 3.4 below. It is proposed in this instance that 300 metres of overhead line is placed underground. This would result in the removal of 2 pylons that would be replaced by approximately 300 metres of underground cable and new CSEPPs at each end of the cable.

3.7.2 Consultation feedback is invited on both the proposed and alternative 400kV overhead line alignments and the associated undergrounding options for the BW Route.

[2] Cable Sealing End Platform Pylons facilitate the transition from overhead line to underground cables.

Figure 3.3. Undergrounding of BW Route for proposed route option A 400kV route alignment

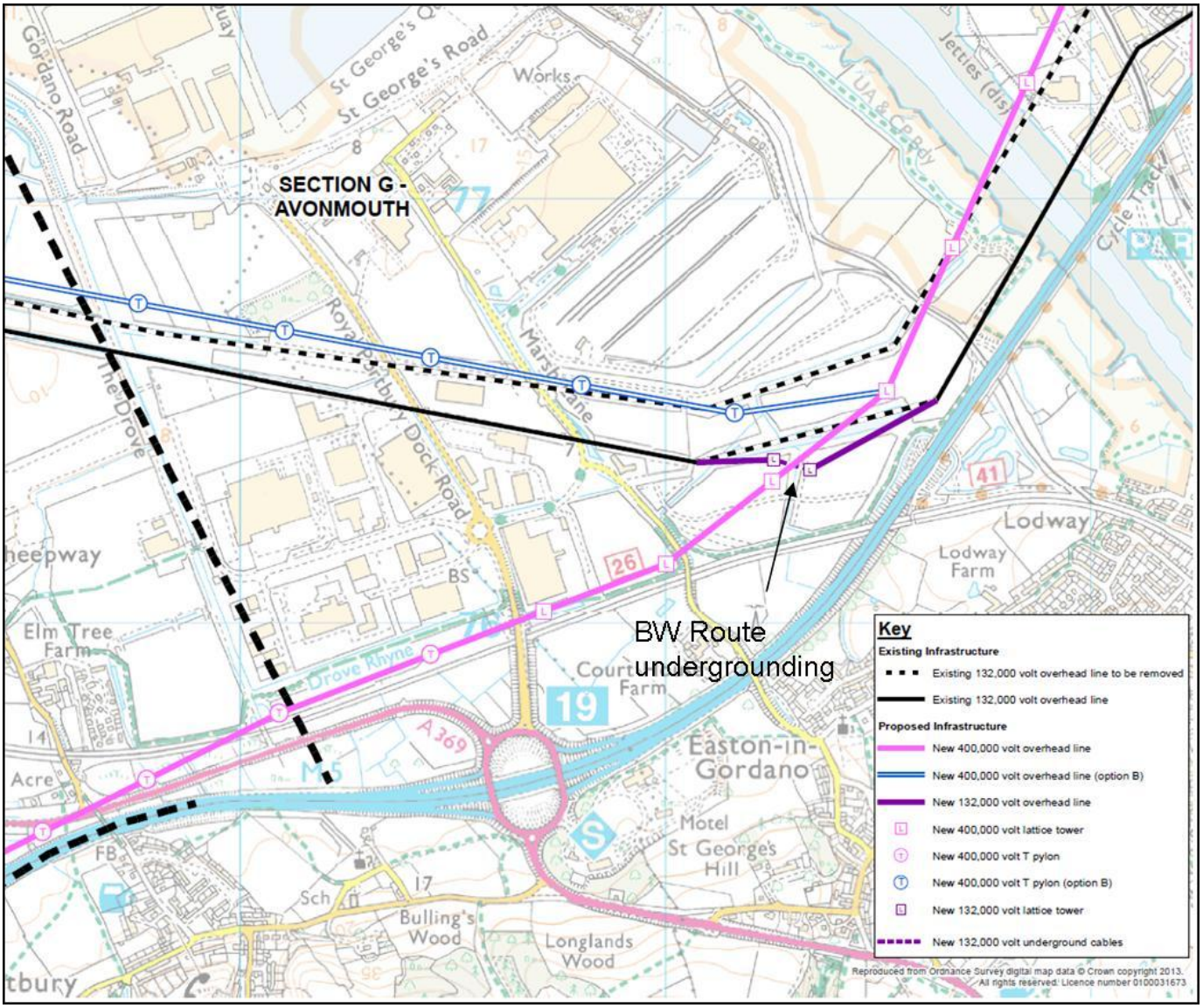
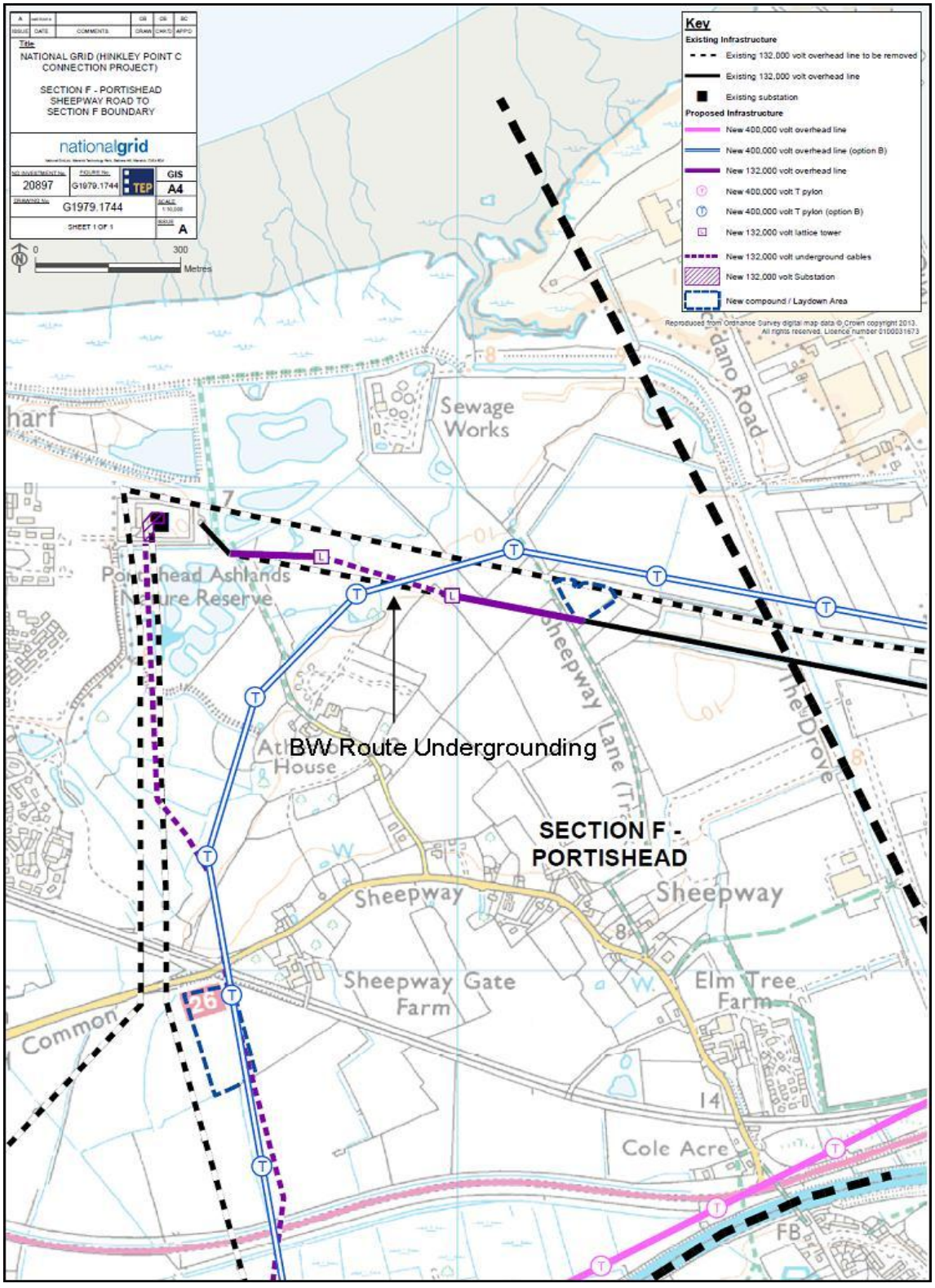


Figure 3.4. Undergrounding of the BW Route for the alternative route option B 400kV route alignment



4. **Modification works near Seabank Substation on the DA, BW and G Routes**

4.1 Between September 2011 and November 2012, National Grid developed the draft route alignment for the proposed 400kV connection between Bridgwater, Somerset and Seabank substation near Avonmouth. This is reported in the Bridgwater to Seabank Connection Options Report[3] and was subject to consultation in November and December 2012. Following this consultation, National Grid reviewed the representations received and made a number of changes to the route. This route ('the proposed route') formed the basis of a request for a scoping opinion from the Secretary of State under the Infrastructure Planning (EIA Regulations) 2009 in April 2013.

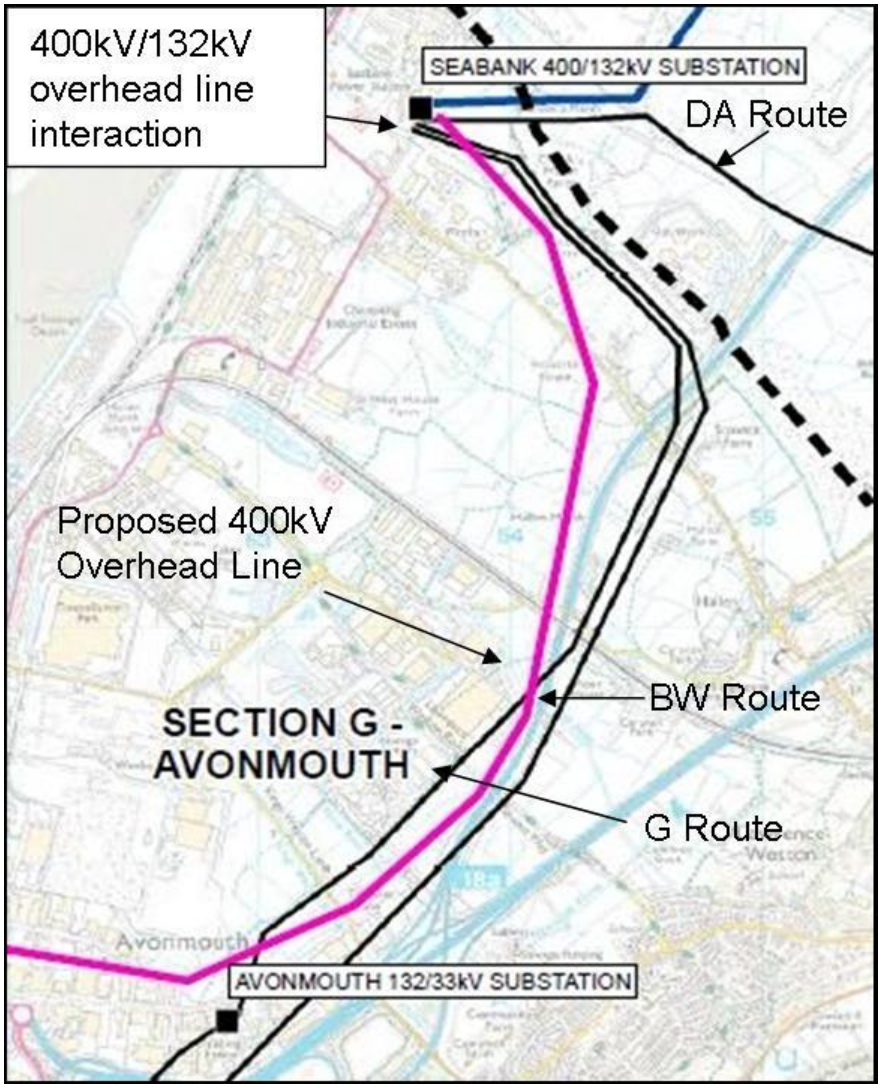
4.2 Close to Seabank substation the proposed 400kV overhead line route encroaches, in a very short section, the safety clearances of the existing WPD 132kV overhead lines that connect into Seabank 132kV substation, see Figure 4.1.

4.3 In order to achieve safe construction and operation of the 400kV overhead line it is proposed to place the affected short sections of 132kV overhead lines underground.

4.4 There is a limited interaction with three existing 132kV overhead lines: BW Route, G Route and DA Route.

[3] Bridgwater to Seabank Connection Options Report, October 2012

Figure 4.1. Map showing the interaction between the proposed 400kV route alignment and the existing 132kV connections into Seabank Substation, Avonmouth.

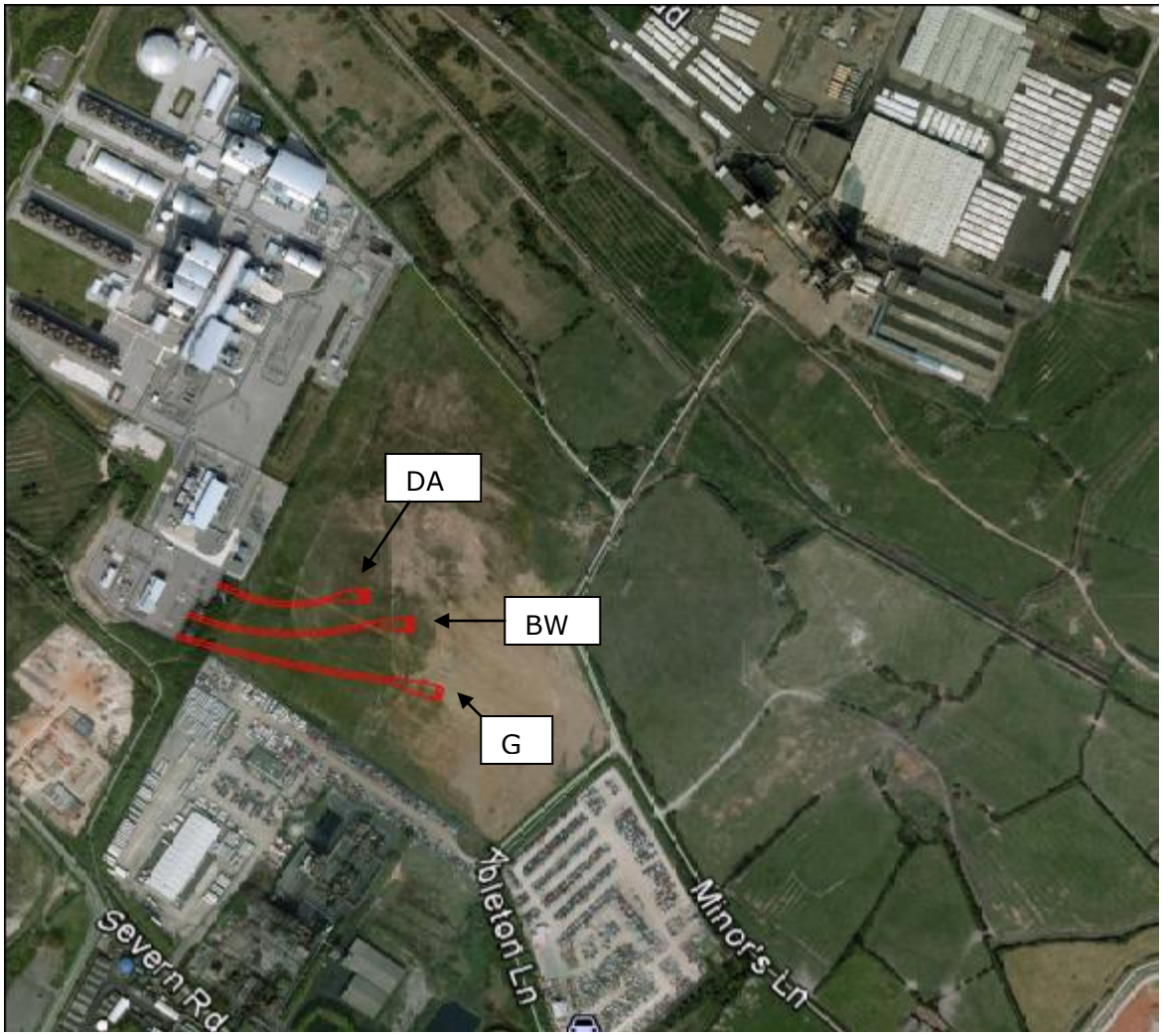


4.5 It is proposed in this instance that:

- Approximately 151 metres of the DA Route is undergrounded;
- Approximately 231 metres of the BW Route is undergrounded; and
- Approximately 274 metres of the G Route is undergrounded.

4.6 In total this would result in the removal of 6 pylons, one on each existing overhead line route, that would be replaced by 3 new CSEPP at the end of each cable on each route. The underground cables would then connect directly into the substation. This is shown in Figure 4.2.

Figure 4.2. Undergrounding routes for the Seabank Line Entries: DA Route, BW Route and G Route



4.7 The potential cumulative impact of other National Grid and WPD works in the area has been considered. Indeed, these works are a result of the interaction between the National Grid proposed 400kV overhead line and the existing WPD 132kV overhead line, resulting in the short sections of undergrounding as

discussed below.

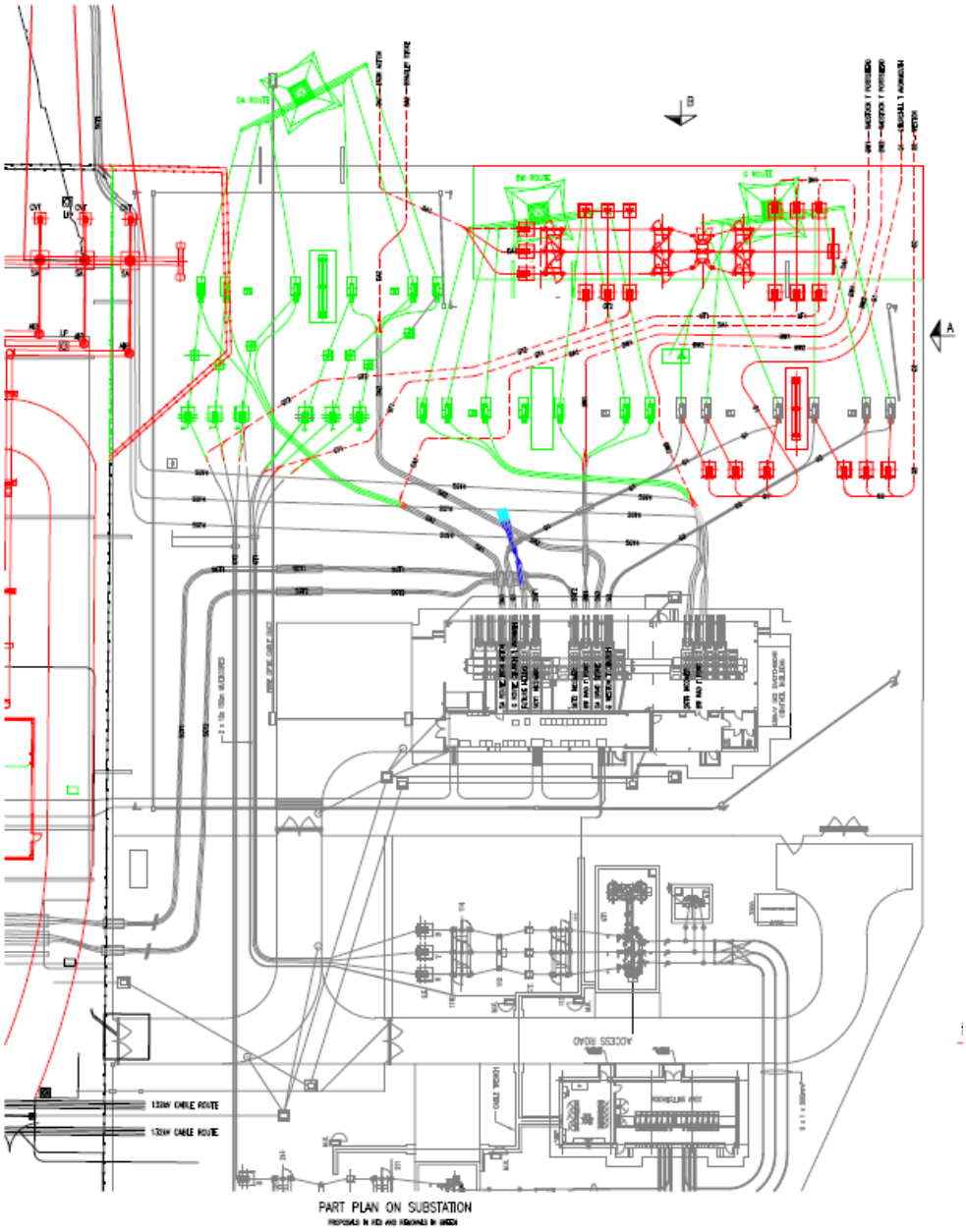
4.8 As a result of this work there will be some minor modifications to 132kV Seabank substation to allow for the underground cable entries, see Figure 4.3 below. These works are limited and will not extend outside the existing 132kV substation boundary.

4.9 Consultation feedback is invited on the undergrounding proposed.

Figure 4.3. Seabank 132kV Substation modifications

Green – infrastructure to be removed

Red– new equipment



5. The need for undergrounding on the G Route

5.1 Introduction

5.1.1 Between September 2011 and November 2012, National Grid developed the draft route alignment for the proposed 400kV connection between Bridgwater and Seabank substations. This is reported in the Bridgwater to Seabank Connection Options Report[4] and was subject to consultation in November and December 2012.

5.1.2 During consultation it was brought to National Grid's attention that the draft route in Avonmouth Docks passes close to a site that recycles metal and requires 24 hour access for the fire service due to the nature of their operations and the potential for fires and explosions. Routeing an overhead line over this site has the potential to have serious safety issues which may affect the operation of a transmission circuit.

5.1.3 Alternative route options in the vicinity of this business were considered but are not feasible due to the adjacent railway line, buildings and coal conveyor and operational restrictions associated with the Port's activities. As a result an alternative overhead line route that avoids this site by exiting the Port to the south of King Road Avenue has been developed. This route formed the basis of a request for a scoping opinion from the Secretary of State under the Infrastructure Planning (EIA Regulations) 2009 in April 2013 and will be taken forward to Section 42/47 consultation (see Figure 4.1).

5.1.4 This overhead line route uses the corridor of WPD's existing 132kV overhead line, known as the G Route, for approximately 2km. It is proposed to underground this 2km section of the G Route and options for this are developed below.

5.2 Underground Route Options

5.2.1 The following approach has been taken to identify an initial study area boundary within which underground route options can be developed. Within the study area, constraints that will influence the routeing of the

1. [4] Bridgwater to Seabank Connection Options Report, October 2012

underground cables are identified (See Appendix E for environmental constraints map).

5.2.2 The study area is focused to the north east of Avonmouth substation. The northern extent is defined by the rail line (Bristol – Didcot), beyond which there is no requirement or justification to continue the 132kV undergrounding as there will be no more conflict with the 400kV overhead line. The southern extent of the study area is defined by Avonmouth Way, Avonmouth where Avonmouth 132kV substation is situated.

5.2.3 The study area is limited to the west by the new 400kV overhead line route (see Figure 4.1.) and the densely developed and heavily industrialised urban area of Avonmouth. The east of the study area is defined by another existing 132kV overhead line, known as the BW Route.

5.2.4 The existing 132kV G Route overhead line crosses the M49 motorway from pylon G31 to pylon G32. The proposed underground cables will also need to connect to pylon G32 before the railway line, therefore the underground cables will be required to cross the M49 motorway before pylon G32 to connect with the existing 132kV overhead line.

5.2.5 The study area falls within the administrative control of Bristol City Council.

5.2.6 The study area is predominantly urban. Much of the land to the west consists of large industrial units. The study area is then intersected by the M49 motorway which connects with the M5 motorway at Junctions 18 and 18A. There are currently two 132kV overhead lines to the east of the study area that run parallel with the M49, the BW Route and the G Route.

5.2.7 The area to the east of the M49 is slightly more rural. The residential areas are largely outside of the study area, and consist of the fringes of the urban settlement Westbury on Trym.

5.3 Options proposed for the undergrounding

5.3.1 132kV Undergrounding Cable Design

5.3.2 The high cost of underground cables suggests that the most direct route should be adopted where possible.

5.3.3 Underground cables affect environmental constraints differently. For

example, hedges are oversailed by an overhead line and the most sensitive habitats or areas of high archaeological potential may be avoided when siting pylons. For underground cables, the hedgerows are removed to make way for the cable trenches and the installation of a haul road which is used to construct the underground connection. Archaeology, if present, is recorded before being removed to make way for the cables.

5.3.4 Technical constraints were also considered in devising cable alignments. For example, the ability of the cable to deviate sharply is restricted by its maximum bending radius. For the purpose of the appraisals, it has been assumed that the cable installation for a double circuit will require two sets of three cables generally laid in open trenches. The cables will be insulated by Cross Linked Polythene (XLPE) cables as opposed to fluid filled cables.

5.3.5 The area of land required for the construction of the cables would be up to 30 metres wide for a double circuit. The trenches are separated by a temporary haul road which would run along the entire route and serve as a traffic route for construction vehicles. The use of a haul road will limit the impact on local transport infrastructure.

5.3.6 It has been assumed that, in exceptional cases, horizontal directional drilling (HDD) would be used to cross, for example, other underground services. HDD is a steerable trenchless method of installing underground cables by using a surface launched drilling rig, with minimal impact on the surrounding area which allows vegetation to be retained. For underground cable installations, a number of pipes are installed using the HDD method and the cables are then pulled through the pipes during the cable installation phase. Once the cables have been installed the pipes are filled with bentonite to maintain the thermal requirement on the cable rating.

5.3.7 The construction of the underground cable route would require specific temporary site access locations to be established along the route of the cables. They would be chosen on the basis of proximity to a highway of an appropriate standard. There would be a requirement to import construction materials and export waste materials using HGVs whose size can be accommodated by local vehicular routes. Normal construction traffic routes will be agreed with the highway authorities. Some minor works to adopted highways may be required to improve the alignment, clearances and standard of roadbed in order to facilitate access for construction traffic.

5.4 Starting point for G Route undergrounding

5.4.1 The location chosen for the start of the undergrounding is Avonmouth substation or a point nearby if this proves prohibitive following more detailed engineering surveys that will be carried out to supplement the work that has already been completed.

5.5 Undergrounding Options considered

5.5.1 A number of options were considered to facilitate the undergrounding of the G Route.

5.5.2 Initially a route was considered that ran along the west side of the M49 carriageway. That would cross over the motorway by the existing overhead line pylon G31 that sits just to the west of the M49. However, this option was ruled out because the new route would not have been able to meet the safety clearances between the proposed new 400kV overhead line and the new G Route overhead line.

5.5.3 Locations for the CSEPP that were close to the existing pylon G32 were ruled out because they would have involved temporary diversions across the railway and/or double circuit outages on the G Route 132kV overhead line. These are conditions that cannot be met on the WPD network as they would place local electricity supplies at risk.

5.5.4 The following options were identified and taken forward for assessment:

5.5.5 **Option 1**

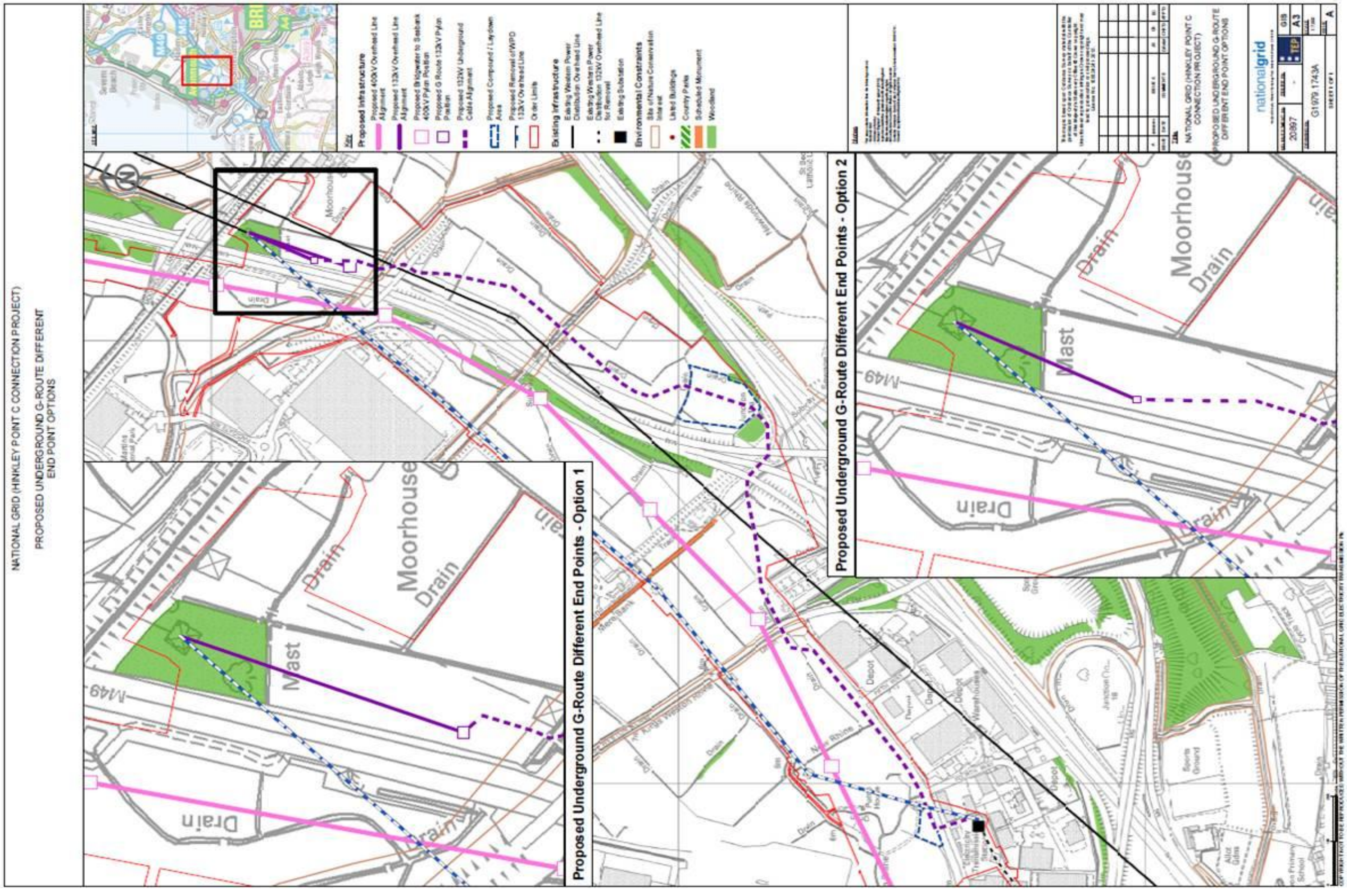
5.5.5.1 The underground cables start at Avonmouth substation and travel along Avonmouth Way road, pass through Kings Weston Lane and continue in a north easterly direction. The route passes next to Merebank Rhine.

5.5.5.2 The route then passes underneath the M49. Crossing the motorway poses a technical constraint to routeing and would be done either by using the existing infrastructure such as an existing culvert or by HDD. This will be determined through further technical assessment. The route continues north through agricultural fields parallel to the M49.

5.5.5.3 The route is then brought back onto a CSEPP just north of the unconnected M49 flyover, just north of pylon BW13. There would then be a single

overhead line span to pylon G32. The working clearance between the new CSEPP and pylon BW13 has been checked and is sufficient for construction and operational purposes.

Figure 5.1. G Route undergrounding route in Option 1 and Option 2



5.5.6 **Option 2**

5.5.6.1 The undergrounding route follows an identical route to Option 1. The route passes through the agricultural fields adjacent to the M49 and the undergrounding terminates at a CSEPP just south of a clump of ash trees by the railway line.

5.5.6.2 This route maximises the amount of undergrounding, however, there would then be a short overhead span to pylon G32 (see Figure 5.1).

6. Scope of G Route Undergrounding Appraisal

6.1 The relevant technical, economic and environmental issues associated with Options 1 & 2 will now be considered. Analysis of these factors allows National Grid and WPD to determine which option best meets its various statutory and licence obligations.

6.2 Technical Appraisal

6.2.1 Each option has been assessed initially to ensure that it would comply with the standards set out in P2/6[5]. This means that the implications on the local distribution network are fully assessed before connection options are appraised.

6.3 Economic Appraisal

6.3.1 Once the scope of works associated with each connection option is identified, an estimate of the capital and lifetime cost of that scope of works is made.

6.3.2 Capital cost is an estimate of the cost of equipment and installation costs. These costs are provided in current financial year prices applicable at the time of publication of this Report. For the purposes of reviewing technical options, the cost estimates are based on generalised unit costs for the key elements of the option, reflecting recent contract values or manufacturers' or consultants' budget estimates.

6.3.3 Lifetime cost is an estimate of the distribution losses and maintenance costs for the specific overhead line, underground cable elements of the connection options over a 40 year lifetime. The lifetime cost estimate methodology is explained in Appendix C.

6.4 Environmental Appraisal

6.4.1 A high level planning and environmental appraisal, has been undertaken to consider environmental constraints of national and international importance for the potential route options.

[5] P2/6 can be purchased from www.energynetworks.org

6.4.2 Effects on **landscape and visual amenity** are recognised as important factors in determining the merits of different options. This was confirmed by responses during all stages of consultation to date for the Bridgwater to Seabank Connection and is recognised by the establishment of a Landscape and Views Thematic Group. The effects of underground cable options on landscape and visual amenity are generally considerably less than the effect of overhead line options.

6.4.3 The importance of assessing effects on **ecology** is recognised by the establishment of an Ecology and Biodiversity Thematic Group. Underground cable options have the potential for greater effects on ecology than overhead line options because of the extent of land affected during cable installation and associated habitat disturbance.

6.4.4 The importance of assessing effects on the **historic environment** is recognised by the establishment of a Historic Environment Thematic Group. Underground cable options have the potential for greater effects on unknown archaeology than overhead line options because of the greater extent of ground disturbance.

6.5 Cumulative Impact

6.5.1 The potential cumulative impact of other National Grid and WPD works in the area has been considered. Indeed, these works are a result of the interaction between the National Grid proposed 400kV overhead line and the existing WPD 132kV overhead line, resulting in the short section of undergrounding as discussed below.

7. Consideration of Options

7.1 This chapter presents the assessment of Options 1 and 2.

7.2 Technical & Economic

7.2.1 Both Option 1 and 2 are technically compliant and include the same common works. The only difference in cost is associated with the marginal change in route length, Option 1 is approximately 170 metres different from Option 2.

7.2.2 Capital and Lifetime Cost estimates are provided in the table below.

7.2.3 A single circuit of undergrounding costs £1M per kilometre per circuit.

Table 7.1 Capital and Lifetime Costs of Option 1 and Option 2

Option	Description of Works	Capital Cost	Lifetime Cost
1	Approx 1.95 km of double circuit 132kV undergrounding 1 CSEPP	UGC = £3.9M £90k **Total estimated capital cost = £3.99M**	£4.1M
2	Approx 2.1km of double circuit 132kV undergrounding 1 CSEPP	UGC = £4.2M £90k **Total estimated capital cost = £4.29M**	£4.4M

7.3 Environment

7.4 There are a number of issues that are common to each option under the environmental topics as explained below.

7.5 Landscape and Visual Assessment

7.5.1 The landscape at this part of Avonmouth is dominated by general industrial activity and other associated infrastructure including the M5 and M49 motorways and existing 132kV overhead lines (G Route and BW Route).

7.5.2 There are no significant environmental constraints associated with potential effects on landscape or views due to all installation works being underground (with the exception of the proposed CSEPPs). The removal of a section (approximately 2km) of existing 132kV overhead line will result in localised beneficial landscape and visual effects. Landscape and visual issues associated with the two potential CSEPP options are discussed below in 7.8.

7.5.3 Temporary effects on landscape and views will result during the construction phase; however these will be of a temporary nature and are not anticipated to represent a significant constraint.

7.6 Ecology

7.6.1 The proposed underground cables routes are largely within agricultural fields and semi-improved grassland, and both routes typically pass along the edge of field boundaries. A small section of the cable routes passes through an area of unimproved neutral grassland immediately east of the M49 for approximately 350m. A number of field ditches and hedgerows are also crossed by the route.

7.6.2 The cables route crosses the Kings Weston Lane Rhine, the Lawrence Weston Road Rhines and the Salt Rhine and Moorhouse Rhine; all of these features are a Site of Nature Conservation Interest (SNCI). The Kings Weston Lane Rhine supports water vole and a diverse dragon fly population; and the Lawrence Weston Road Rhines and the Salt Rhine and Moorhouse Rhine support water vole and interesting floral and dragonfly communities.

7.6.3 Surveys undertaken in 2012 confirm that breeding birds are known to be present close to and surrounding the proposed cables route including Willow warbler, Whitethroat, Dunnock, Bullfinch, Linnet, Reed bunting, Herring gull and Song thrush. Herring gull, Dunnock and Bullfinch are Schedule 1 species. Bat surveys undertaken in 2012 confirm that a variety of bat species are also known to be present close to and surrounding the proposed

cables route including common pipistrelle, soprano pipistrelle, long-eared, noctule and myotis species.

7.6.4 These biodiversity interests would need to be considered further when refining the detailed design and construction working methods. Issues such as the timing of works (seasonal restrictions i.e. works outside of the breeding bird period), mitigation to compensate for the loss of habitats and methods of restoration following construction should be considered.

7.6.5 The route passes close to the eastern extent of the existing woodland block immediately adjacent to the M5. It is recommended that the cables route and working areas avoid this to avoid direct affects, such as tree removal. Standard good working practice, careful routeing and inclusion of mitigation measures could minimise overall potential effects.

7.6.6 Habitats could be reinstated following the completion of works. Although, tree planting would not be possible within the permanent cable easement or close to overhead lines.

7.7 Historic Environment

7.7.1 The cable route runs adjacent to the Mere Bank Scheduled Monument (a medieval flood bank) at its most eastern extent. Careful consideration should be given to the routeing in this area to ensure that cable troughs and the associated temporary working area do not directly affect the Scheduled Monument.

7.7.2 There is potential to encounter and significantly affect unknown buried archaeology in the undeveloped fields. This is relevant to underground cable installation, excavations for pylon positions and any other ground disturbance associated with construction works such as installation of temporary access and working areas.

7.8 Comparison of Cable Sealing End Platform Pylon Locations

7.8.1 At the northern extent of the study area, two potential options for the CSEPPs have been identified. An overhead line connection will be made between one of the two CSEPP and existing pylon G32.

7.8.2 Option 1

7.8.2.1 Option 1 proposes the construction of a CSEPP approximately 27m high, approximately 250m south of pylon G32 (also between the existing G Route and BW Route 132kV overhead lines).

7.8.3 **Option 2**

7.8.3.1 Option 2 proposes the construction of a CSEPP, approximately 33m high, approximately 80m south of pylon G32 (between the existing G Route and BW Route 132kV overhead lines);

7.8.4 **Landscape and Visual Assessment**

7.8.4.1 The nearest sensitive receptors are approximately 160m south east of pylon G32 at West Country Park Homes. The new section of 132kV overhead line would be relatively short ranging from 80 - 250m and would be seen in the context of the M49 which lies immediately west and the existing 132kV overhead line (BW Route) which lies immediately east. Neither option is closer to the residential receptors described above than the existing 132kV BW Route overhead line.

7.8.4.2 Due to its proximity to pylon G32, Option 2 would result in a slightly shorter length of overhead line between the new CSEPP and pylon G32 than Option 1. Despite the shorter length of overhead line required, Option 2 would result in greater visual effects than Option 1 due to the greater height of the CSEPP required (6m higher than Option 1), its marginally wider base, and its proximity to existing pylon G32. With regards to the latter, the proximity to pylon G32 would increase visual clutter and the two pylons would subsequently be viewed cumulatively which would increase visual effects.

7.8.4.3 Both options would result in localised beneficial landscape and visual effects due to the removal of the existing 132kV overhead line between pylon G32 and Avonmouth 132/33kV substation.

7.8.5 **Ecology and Historic Environment**

7.8.5.1 There are no ecology or historic environment factors to distinguish between the options for the two CSEPP locations.

8. **Identification of the Preferred Option**

8.1 This Technical and Environmental appraisal has summarised the need for the undergrounding on the existing 132kV G Route overhead line and considered two options. These options have been assessed on their environmental effects and estimated capital costs.

8.2 The environmental appraisal concluded that there was little to differentiate between the two options based on ecology and historic environment. However, from a landscape and views perspective Option 1 is considered to be the least constrained as the CSEPP required would be smaller and sited distant from the existing pylon G32.

8.3 Estimated capital and lifetime costs have been considered as part of the appraisal, but do not differentiate between the options.

8.4 Having regard to their statutory duties and all the factors considered, National Grid and WPD consider that Option 1 is the preferred option that best balances all of the information and Government guidance available to us at this time.

8.5 This will be reviewed throughout the development of the project and following consultation with statutory consultees and local communities who will have the opportunity to comment on all the options considered in this Report as part of the formal consultation.

9. **Glossary**

CSEPP	Cable Sealing End Platform Pylon
HDD	Horizontal Direction Drill
kV	Kilovolt
Km	Kilometre
MW	Megawatt
M	Metre
SNCI	Site of Nature Conservation Interest
WPD	Western Power Distribution
XLPE	Cross Linked Polythene

Appendix A WESTERN POWER DISTRIBUTION SCHEDULE 9 STATEMENT

A.1 Western Power Distribution and National Grid Roles and Obligations

A.1.1. Both the distribution and transmission of electricity in Great Britain requires permission by a licence granted under Section 6(1)(b) and (c) of the Electricity Act 1989 ("the Electricity Act").

A.1.2. The legislative and regulatory framework is designed to ensure coordination and efficient investment by the distribution and transmission companies. These principles are central to the respective licences and industry codes.

A.2 WPD Roles and Obligations

A.2.1. WPD has been granted a distribution licence and is therefore bound by the legal obligations set out in the Electricity Act 1989 and their distribution licence.

A.2.2. WPD owns and operates the distribution system in the South West, South Wales and the Midlands.

A.2.3. WPD has statutory duties to develop and maintain an efficient, coordinated and economical system of electricity distribution under Section 9 of the Electricity Act 1989. These duties, which are documented in Standard Licence Conditions[6], are summarised in the following paragraphs.

A.2.4. Standard Condition C24 (Distribution System planning standard and quality of performance reporting) of WPD's distribution licence requires WPD to plan and develop its distribution system in accordance with standards set out in Engineering Recommendation P2/6[7].

A.2.5. P2/6 is a document that defines the minimum standards that WPD must apply when planning and operating the distribution system. The criteria include the type of faults (or breakdowns) and combinations of faults that the distribution system must be able to withstand, the impact on customers in terms of maximum level of supply interruptions, and the impacts on supply quality that are permissible.

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[6] http://epr.ofgem.gov.uk/document_fetch.php?documentid=15184

[7] P2/6 can be purchased from www.energynetworks.org

A.2.6. P2/6 is open to industry and public scrutiny, is subject to periodic review and consultation and any changes are implemented by a change to the licence Standard Conditions and approved by the industry regulator, Ofgem[8].

A.2.7. As well as the technical standards described above, Section 38 and Schedule 9 of the Electricity Act 1989 requires WPD, when formulating proposals for new lines and other works, to:

A.2.8. "…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"[9]

A.2.9. WPD's Schedule 9 statement[10] (the "Statement") sets out how the company will meet the duty to the environment placed upon it. These commitments include:

- minimise the impact of its activities on communities and the historic and natural environment;
- only seeking to build new lines along new routes, or substations in new locations where the existing distribution system infrastructure cannot be economically upgraded to meet distribution security standards;
- where new infrastructure is required seek to avoid, where reasonably practicable, areas which are nationally or internationally designated for their landscape, wildlife or cultural significance;
- site overhead lines with care and consider both the visual impact and the impact on nature conservation as far as possible; and

[8] http://www.ofgem.gov.uk/Pages/OfgemHome.aspx

[9] Schedule 9 of the Electricity Act (http://www.legislation.gov.uk/ukpga/1989/29/contents).

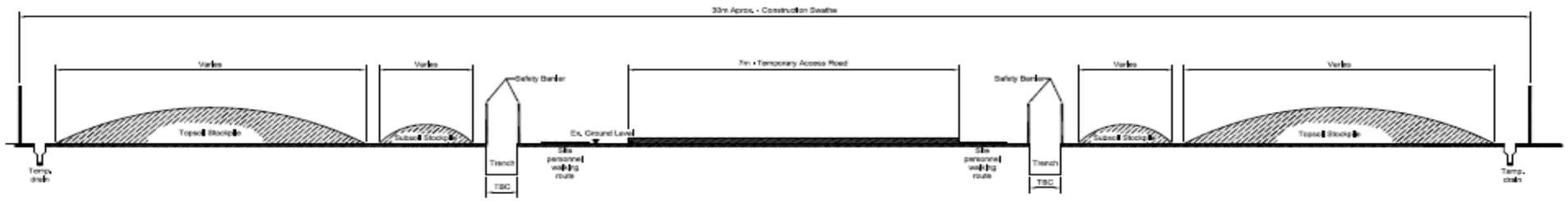
[10] WPD Schedule 9 Statement: http://www.westernpower.co.uk/getdoc/c4856406-1794-4e34-81a0-9f2b593cdd4a/schedule9.aspx

- continually work with partners to selectively underground lines in appropriate sensitive locations to improve the appearance of countryside, towns or villages, whilst taking account of sites of particular archaeological or nature conservation interest.

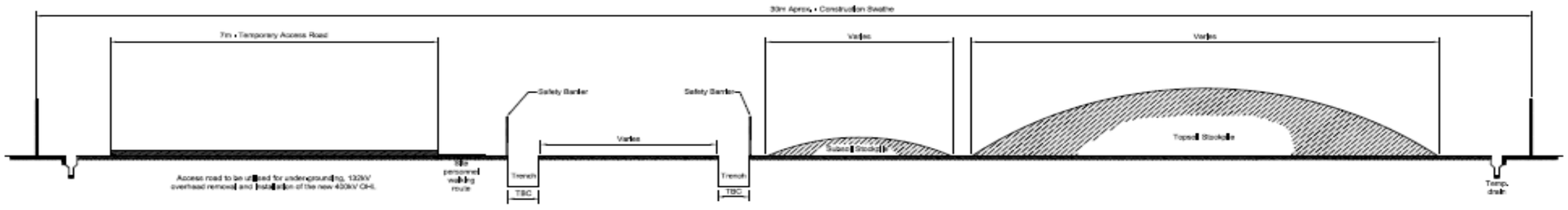
A.2.10. Effective consultation with stakeholders and the public is also promoted by the Statement.

Appendix B 132kV Underground Cable Installation - Cross Section

NATIONAL GRID (HINKLEY POINT C CONNECTION) ORDER
DETAILED DESIGN DRAWINGS
(REGULATION 5(2)(o))
SHEET 7 OF 53



Typical Construction Swathe for 132kV Cabling Works



Typical Construction Swathe for 132kV Cabling Works
With Access Road to be Utilised for Cabling and OHL Works

Notes

1. Proposed arrangement shown for indicative purpose only. Dimensions and design may vary depending on site and installation conditions.
2. Dimensions and overall width could increase or decrease

PRELIMINARY DESIGN NOT TO BE USED FOR CONSTRUCTION

MMD-322068-E-DR-WPD-XX-0600

ISSUE	DATE	COMMENTS	DRAWN	CHKD	WPD
A	Sept 13	FOR CONSULTATION	CJB	JB	PB

TITLE
TYPICAL GENERAL ARRANGEMENT OF CONSTRUCTION SWATHE FOR 132kV UNDERGROUND CABLE INSTALLATION

nationalgrid

ELECTRONIC FILE No. 20897	APPROVED BY	CAD A1
DRAWING No. 13/NG/0211	DRAWN BY	SCALE NTS
	SHEET 7 OF 53	ISSUE A

B.1 The underground cables would typically be installed in a cable trench with a depth of 750 mm (see figure above). During construction an easement width of around 30m would be required to allow for access, trench construction and soil displacement.

Appendix C Lifetime Cost

C.1 The lifetime valuation for each of the connection options and applicable technology includes the lifetime cost of energy losses and lifetime operation and maintenance costs.

C.2 The following formula was used to assess the lifetime cost of each type of connection.

C.3 Total Cost, CTot = CDC + CL + COM

Where

CDC = The capital cost of the equipment, delivered, installed and commissioned

CL = The net present value of the cost of losses over the lifetime (40years) of the assets

COM = "The net present value of the typical cost of operation and maintenance over the lifetime (40 years) of the assets

C.4 The discount rate used in the net present value calculations, 3.5%, being the figure recommended in Her Majesty's Treasury's Green Book for discounting future benefits and costs in project appraisal.

C.5 For the purposes of the losses calculations the average load of circuits and Super Grid Transformers (SGT) has been assumed to be 65% of the peak group demand of 149MVA.

C.6 **Costs**

C.7 The cost used to assess losses on the system is the price of £60 per MWh as assumed by Ofgem in the Project Discovery documents.

C.8 The available distribution technologies are:

a. Overhead Lines; and

b. AC Underground Cables.

C.9 For each technology, costs comprise:

a. the capital cost of procuring, installing and commissioning the transmission or distribution lines, or substation assets;

b. the on-going costs of the electrical energy lost in overcoming the electrical resistance in the conductors; and

c. the on-going other costs of operations and maintenance.

C.10 Decommissioning and reinstatement costs are not included in the lifetime costs.

C.11 ***Overhead Lines***

C.12 Overhead line designs vary by the number and cross-sectional area of the conductors used for each phase of each circuit. The requirements for 400kV and 132kV lines in this case are:

a. 400kV double-circuit 2 x 850mm^2 (resistance = 0.0184Ω/km), and

b. 132kV double-circuit 1 x 300mm^2 (resistance = 0.1Ω/km).

C.13 Operations and maintenance costs consist principally of the cost of repainting the distribution pylons, which is scheduled to happen every 18 years, and the costs of regular inspection both from the ground and by helicopter. The annual costs are estimated to £0.80k/km at both 400kV and 132kV.

C.14 ***AC Underground Cables***

C.15 AC underground cables installations vary principally by how the cables are laid. The principal methods employed by WPD are direct burial and deep bore tunnels.

a. The Cable requirement for a Bridgwater – Seabank connection is for two cores per phase 2500mm^2 cables, 12 cables in total for two circuits (resistance = 0.0065Ω/km).

b. However with each circuit generating 20MVAr per km of capacitive gain, each circuit would require 2 x 200MVAr reactors (4 in total for two circuits). Each Reactor has 0.4MW of losses associated with it (1.6MW for 4 reactors).

c. The Cable requirement at 132kV, 650mm2 cables are required (resistance = 0.05Ω/km)

C.16 O&M costs have an approximate annual cost of £2.80 k/km for 400kV and £1.5 k/km at 132kV.

C.17 ***Calculation of the Cost of Transmission Circuit Losses***

C.18 The cost of distribution losses are calculated as follows:

Step 1: Calculate the Average Circuit Loading

- Peak Circuit Power Flow * Average Circuit Utilisation (34%)

Generic Example: 3100MW x 0.34% peak load would be 1054MW Average Loading

Step 2: Calculate the Average Loading per Circuit in KW:

- Average Loading per Circuit kW =

  (Average Loading (MW) / number of circuits) * 1000 (to convert to kW)

  There are 2 circuits in most cases.

  Example: (1054MW / 2) x 1000 = 527,000 kW

Step 3: Calculate the Average Current per Circuit in Amps:

- I = Average Loading Per Circuit kW / (√3 X Operating Voltage in kV)

  Operating Voltage 400kV or 275kV

  Example: 527,000/ (√3 x 400) = 760.7 Amps

Step 4: Calculate the Resistance per Circuit:

- R = resistance/km * circuit length kms

Example: 2 x 850mm Overhead Line = 0.0184Ω/km x 60km = 1.104 Ω

Step 5: Calculate the Three Phase Lost Power per Circuit in MW:

- Three Phase Lost Power per circuit = $3 \times I^2 \times R$

  Example: $3 \times 760.7^2 \times 1.104 = 1.9MW$

Step 6: Calculate the Lost Power in a 2 Circuit Route:

- This is multiplied by 2 to get the losses in a two circuit route

  Example: 1.9 x 2 = 3.8MW

Step 7: Calculate the Annual Cost of Losses:

- Annual Loss Cost = Lost Power x Cost per MWh x 24hrs x 365 days a year

  Example: 3.8 x £60 per MWh x 24hrs x 365 days a year = £2m per annum

Step 8: Calculate the Average Loading per Circuit in KW:

- The net present value of distribution losses is then derived by applying a discount rate of 3.5% to the annual cost over 40 years.

Appendix D Example of Cable Sealing End Platform Pylon

Appendix E – Avonmouth Environmental Constraints Map