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Bramford to Twinstead Reinforcement

Volume 6: Environmental Information

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10. Geology and Hydrogeology

10.1 Introduction

10.1.1 This Environmental Statement (ES) chapter details the likely significant effects of the project in relation to geology and hydrogeology during construction and operation. The receptors considered within this chapter comprise those that could be affected by contaminants in the soil (e.g. people), those that could be affected by changes in groundwater quality, levels and flow (e.g. groundwater abstractions including private water supplies), and those directly affected by the project (e.g. mineral resources).

10.1.2 During construction, the project has the potential for effects relating to geology and hydrogeology, such as through excavation or disturbance of soil that could be contaminated and through the installation of features, such as foundations, that could disrupt natural groundwater movements or impact groundwater quality. The project could also affect mineral resources by limiting the future potential for these to be extracted.

10.1.3 This chapter has links with other topic chapters, in particular: ES Chapter 9: Water Environment (**application document 6.2.9**), which assesses the effects of the project on flood risk; ES Chapter 7: Biodiversity (**application document 6.2.7**), which assesses the effects on groundwater dependent terrestrial ecosystems (GWDTE); and ES Chapter 11: Agriculture and Soils (**application document 6.2.11**), which considers the effects of the project on soil.

10.1.4 Cumulative effects between the project and other proposed developments as well as receptors affected by more than one source of direct environmental impact resulting from the same development are considered in ES Chapter 15: Cumulative Effects Assessment (**application document 6.2.15**).

10.1.5 This chapter is supported by the following appendices:

- Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**);
- Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**); and
- Appendix 10.3: Minerals Resource Assessment (**application document 6.3.10.3**).

10.1.6 This chapter is also supported by the following figures, which can be found in ES Volume 6.4: Figures (**application document 6.4**):

- Figure 10.1: Superficial Geology;
- Figure 10.2: Bedrock Geology;
- Figure 10.3: Mineral Reserves;
- Figure 10.4: Hydrogeology;
- Figure 10.5: Land with a Potentially Contaminative Former Use;
- Figure 10.6: Cross Section of the River Box;

- Figure 10.7: Cross Section of the River Stour and Sudbury Branch Railway Line; and
- Figure 10.8: Cross Section to the South of Ansell's Grove.

10.2 Regulatory and Planning Policy Context

National Policy Statement

10.2.1 ES Chapter 2: Regulatory and Planning Policy Context (**application document 6.2.2**) sets out the overarching policy relevant to the project including the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a). This is supported by NPS for Electricity Networks (EN-5) (DECC, 2011b).

10.2.2 EN-1 states that energy projects could have adverse effects on geology and hydrogeology which has been considered within this chapter. Paragraph 5.3.7 of EN-1 states that '*development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives, where significant harm cannot be avoided, then appropriate compensation measures should be sought*'.

10.2.3 EN-1, in paragraph 5.15.3, states that the ES should in particular describe '*any impacts of the proposed project on… source protection zones (SPZ) around potable groundwater abstractions*'. EN-5 (DECC, 2011b) has limited references to geology and hydrogeology.

10.2.4 Paragraph 5.10.9 of EN-1 states, '*Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place'*. In addition, paragraph 2.8.9 of EN-5 states that electricity infrastructure, particularly underground cables, can have an impact on geology.

10.2.5 The consultation draft EN-1 (Department for Business, Energy and Industrial Strategy (BEIS), 2021a) and EN-5 (BEIS, 2021b) has similar text to that noted above.

10.2.6 Full consideration of the NPS can be found in the Planning Statement (**application document 7.1**).

Other Relevant Policy and Guidance

10.2.7 ES Appendix 2.1: Legislation, Policy and Guidance (**application document 6.3.2.1**) includes legislation and national policy relevant to geology and hydrogeology. It also outlines key guidance documents that have been referenced when writing this chapter.

10.2.8 ES Appendix 2.2: Local Planning Policy (**application document 6.3.2.2**) lists the local policy relevant to geology and hydrogeology. The emerging Babergh and Mid Suffolk Joint Local Plan (2021) Policy LP18 gives a level of protection to local sites of geodiversity value.

10.2.9 The Suffolk Minerals and Waste Local Plan (Suffolk County Council, 2020), Policy MP10, and the Essex Minerals Local Plan Review (Essex County Council, 2014), Policy S8 define Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA). They also set out the approach to safeguarding minerals that are potentially viable to extract. The Order Limits also cross Layham Quarry, which is subject to Policy MS5 in the Suffolk Minerals and Waste Local Plan.

10.2.10 The Babergh and Mid Suffolk Joint Local Plan (2021) Policy LP17 and Braintree District Council Local Plan to 2033 (2022) Policy LPP 70, advocates that developments should take a precautionary approach where contamination is suspected and that there should be no unacceptable risk from contamination.

10.3 Scope of the Assessment

10.3.1 ES Appendix 5.1: Scope of the Assessment (**application document 6.3.5.1**) outlines the scope of the assessment for geology and hydrogeology. This has been informed by the Scoping Opinion provided by the Planning Inspectorate (**application document 6.6**) on behalf of the Secretary of State, following the submission of the Scoping Report (**application document 6.5.1**).

10.3.2 The scope has also been informed through engagement with relevant consultees as summarised in ES Appendix 5.2: Response to Consultation Feedback (**application document 6.3.5.2**).

10.3.3 The Scoping Report (**application document 6.5.1**) proposed scoping out spills or accidents involving plant and affecting groundwater quality due to the good practice measures set out in the Construction Environmental Management Plan (CEMP) (**application document 7.5**). The Planning Inspectorate agreed that this could be scoped out of the assessment as noted in ID 4.5.4 in the Scoping Opinion (**application document 6.6**).

10.3.4 Changes to groundwater flows due to below ground infrastructure and the impacts on infiltration and drainage from the addition of new hard standing has been scoped out of the construction phase. The Planning Inspectorate agreed that this could be scoped out in ID 4.5.7 in the Scoping Opinion (**application document 6.6**).

10.3.5 The specific aspects that are scoped into the geology and hydrogeology assessment are:

- Geology including:
  - Impacts on mineral reserves; and
  - Impacts from exposure and mobilisation of contaminated land.
- Hydrogeology including:
  - Creation of new pathways;
  - Connection of multiple aquifer units;
  - Changes to groundwater levels and flow pathways; and
  - Impacts on infiltration and recharge.

Project Engagement

10.3.6 National Grid has held a number of meetings with relevant organisations, including the Environment Agency, Essex County Council and Suffolk County Council. Discussions have covered the proposed scope and methodologies of the assessments and good practice measures to be implemented to reduce potential significant effects on geology and hydrogeology included within the Code of Construction Practice (CoCP) (**application document 7.5.1**). Discussions have also informed the development of the preliminary

groundwater assessment within ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**).

10.3.7 Further details on how consultation responses have informed the assessment can be found in ES Appendix 5.2: Response to Consultation Feedback (**application document 6.3.5.2**).

10.4 Approach and Methods

10.4.1 This section describes the methodology used to establish the baseline environment and the adopted approach to assessing the significance of potential effects on geology and hydrogeology. A desk study has been undertaken to establish the baseline and inform the assessment of significant effects. This has been supported by the results of ground investigation undertaken across the Order Limits, which provide further information in relation to geological strata and groundwater levels.

Data Sources

10.4.2 The baseline has been informed by a desk study which has drawn on the following key information sources:

- British Geological Survey (BGS) online mapping for bedrock and superficial geology (BGS, 2022);
- BGS Geological bedrock and superficial deposits, 1 to 50,000 scale maps, Sheet 223 Braintree (BGS, 1982), Sheet 206 Sudbury (BGS, 1991) and Sheet 207 Ipswich (BGS, 2006);
- BGS Hydrogeological Map of southern East Anglia (BGS,1981);
- The Physical Properties of Minor Aquifers in England and Wales (BGS, 2000);
- The Physical Properties of Major Aquifers in England and Wales (BGS, 1997);
- Department for Environment, Food and Rural Affairs (Defra) mapped information, via Magic.gov.uk (Defra, 2022b) for SPZ, aquifer designations, hydrological features, groundwater vulnerability, drinking water safeguard zones and statutory designated sites;
- Landfill site locations for historical and active landfill sites (Environment Agency, 2020a; 2020b);
- Local Minerals Plan (Suffolk County Council, 2020) (Essex County Council, 2014) for mineral reserves;
- National Library of Scotland historical maps accessed online (2022); and
- Ground investigations reports (Cat Surveys Limited, 2013a and b; Card Geotechnics Limited, 2022; Jacobs, 2021; and, Structural Soils Ltd, 2022).

10.4.3 In addition, data was initially requested in 2021, with a further update requested in summer 2022 from the Environment Agency, Braintree District Council and Babergh and Mid Suffolk District Council to provide information on the following to support the assessment:

- Groundwater abstraction licences; and

- Records of land with a potentially contaminative former use, private water supplies and sites of local geological interest (Babergh and Mid Suffolk District Council, 2022 and Braintree District Council, 2022).

10.4.4 All of the information received has been incorporated into the baseline environment description presented in Section 10.5.

Study Area

Geology

10.4.5 The study area for identifying geology, designated geological sites and mineral resource receptors is the area directly affected by the project, which is the Order Limits, shown on ES Figure 10.1: Superficial Geology, ES Figure 10.2: Bedrock Geology and ES Figure 10.3: Mineral Reserves (**application document 6.4**).

10.4.6 The study area for identifying land contamination comprises the Order Limits plus a buffer zone of 250m. The extent of the study area needs to consider the fate and transport of the potential contaminants of concern in the environment (how the nature of contaminants might change and where they go as they move through the environment), and the potential connectivity of these contaminants via pathways (migration/exposure) to the identified receptors, and also the sensitivity of those receptors.

10.4.7 A 250m buffer is referenced in the Guidance for the Safe Development of Housing on Land Affected by Contamination (National House Building Council, 2008). This guidance is not considered entirely relevant to this project; however, it is considered to be a conservative but proportionate approach. The study area is shown on ES Figure 10.5: Land with a Potentially Contaminative Former Use (**application document 6.4**).

Hydrogeology (Groundwater)

10.4.8 Groundwater receptors have been identified within a study area defined as the Order Limits plus a 1km buffer shown on ES Figure 10.4: Hydrogeology (**application document 6.4**). This is considered an appropriate study area based on experience of similar projects using professional judgement, the nature of the project and environmental context. This buffer allows for the identification of receptors outside the Order Limits (where the physical works would be undertaken), that could be affected by impacts such as change in groundwater flow or quality. Given the scale and nature of the project this is considered a robust yet proportionate approach and reflects general best practice.

Site Survey

10.4.9 Ground investigations were undertaken in summer 2013, within the underground cable sections of the project (Section E: Dedham Vale Area of Outstanding Natural Beauty and Section G: Stour Valley), focusing within areas of the proposed river crossings. Further ground investigation was undertaken in winter 2021 (Card Geotechnics Limited, 2022) within Section AB: Bramford Substation/Hintlesham, Section D: Polstead, Section E: Dedham Vale Area of Outstanding Natural Beauty, Section F: Leavenheath/Assington and Section G: Stour Valley. Additional ground investigation was also undertaken at the proposed grid supply point (GSP) substation (Jacobs, 2021) and within the area of the proposed trenchless crossings at the River Stour and Ansell's Grove (Structural Soils Ltd, 2022).

10.4.10 ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**) contains a summary of the ground investigation undertaken to date.

Assessment Methodology

10.4.11 This section sets out the methodology used for assessing the effects on geology and hydrogeology for those aspects scoped into the assessment, as set out within Chapter 10 of the Scoping Report (**application document 6.5.1**).

Value/Sensitivity

10.4.12 Receptors specific to geology and hydrogeology have been identified within the study area and have been characterised using the baseline data collected during the desk study and habitat survey with more detailed definitions of the significance criteria appropriate to this topic provided below.

10.4.13 This information has been used to assign to receptors one of the value (sensitivity) categories defined in ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**). The criteria used to determine the value and sensitivity of receptors are based on guidance as set out in the Design Manual for Roads and Bridges (DMRB), LA 109: Geology and Soils (Highways England, 2019a) and DMRB, LA 113: Road drainage and the water environment (Highways England, 2020g), together with professional judgement.

Geology

Designated Geological Sites

10.4.14 A desk study has been undertaken to determine if there are any Sites of Special Scientific Interest (SSSI) designated for geology, Geological Conservation Review and notified or potential Local Geological Sites within the defined study area. The desk study information has been used to inform the assessment in this chapter relating to geology. There is no equivalent published assessment methodology that relates to impacts relating to geology (e.g. geo-conservation). For consistency, a similar approach has been adopted to the contamination assessment, to assess these effects (i.e. combination of receptor identification and associated sensitivity and magnitude of potential impacts).

Mineral Deposits

10.4.15 A Minerals Resource Assessment (MRA) in ES Appendix 10.3: MRA (**application document 6.3.10.3**) has been completed, in accordance with the requirements of the planning policy for Essex and Suffolk, and with regard to Minerals Safeguarding Practice Guidance (Mineral Product Association and the Planning Officers Society, 2019). The MRA informs the assessment of effects in this chapter in relation to minerals.

Contaminated Land

10.4.16 The approach to assessing risks in relation to land with a potentially contaminative former use has been undertaken following a staged approach as recommended within the guidance on Land Contamination Risk Management (Environment Agency, 2021b). Further description of the methodology is provided in ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**).

10.4.17 The Stage 1 risk assessment is undertaken in a phased manner comprising three tiers:

- Tier 1: Preliminary risk assessment – a qualitative assessment of historical and published information, together with a site reconnaissance, undertaken in order to develop a preliminary conceptual site model and inform a preliminary risk assessment;
- Tier 2: Generic quantitative risk assessment – an assessment of ground condition data using published generic assessment criteria to screen the site and establish whether there are actual, or potential, unacceptable risks; and
- Tier 3: Detailed quantitative risk assessment – detailed quantitative assessment involving the generation of site-specific assessment criteria.

10.4.18 A Tier 1 Preliminary Risk Assessment has been undertaken and is presented within ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**) which forms the baseline conditions and informs the assessment of effects within this chapter.

10.4.19 In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences, a source-pathway-receptor methodology has been adopted, with the underlying principle that the identification of pollutant linkages consists of the following three elements:

- A source/hazard (a substance or situation that has the potential to cause harm or pollution);
- A pathway (a means by which the hazard moves along / generates exposure); and
- A receptor/target (an entity that is vulnerable to the potential adverse effects of the hazard).

10.4.20 Whilst the contamination may be a hazard it would not constitute a risk unless all other elements are present, and a pollutant linkage can be determined. Therefore, in assessing the potential for contamination to cause a significant effect: the extent and nature of the potential source or sources of contamination must be assessed; any pathways present must be identified; and sensitive receptors or resources identified and appraised to determine their value and sensitivity to contamination related impacts.

10.4.21 The methodology adopted in this chapter is qualitative with a progression from factual information (stated with reasonable certainty) regarding the baseline conditions, to appraisal informed by professional judgement and expression of opinions on the relative significance.

10.4.22 Based on the findings of the Tier 1 Preliminary Risk Assessment, the worst case risk estimation is low, for all pollutant linkages at all the sites taken forward for further assessment, and therefore Tier 2 (generic quantitative risk assessment) is not considered necessary, in accordance with the risk based staged approach.

10.4.23 This assessment and further details of the specific methodology is included within ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**).

10.4.24 The risk assessment approach proposed in this methodology is transposed into Environmental Impact Assessment (EIA) classification by assigning receptor sensitivity and impact magnitude (significance criteria) to each potential effect using the criteria provided in ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**).

These are then combined to determine the significance of effect, as described in 'Significance Criteria'.

Hydrogeology

10.4.25 The baseline assessment is informed by a desk study of available information, including hydrogeological maps, groundwater vulnerability maps, geological data, data collected from historical ground investigations and publicly available data such as abstractions and discharges and private water supplies.

10.4.26 The baseline information uses a source-pathway-receptor linkage approach, as described in the contamination methodology, to assess the potential impacts on groundwater quality and levels that may result in significant effects on identified receptors, in accordance with the policy guidance outlined.

10.4.27 Geological cross sections have also been produced within areas of proposed trenchless crossings to facilitate the identification of any potential pathway creation by the penetration of low-permeability strata. As it has been determined that low permeability strata are not anticipated to be breached, further groundwater flow calculations are not required.

10.4.28 The need for dewatering to facilitate construction has been identified and where there is the potential for this to be required a Hydrogeological Risk Assessment has been undertaken for those locations. The results of the specific hydrogeological risk assessments are presented in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**).

Impact Magnitude

10.4.29 The criteria for assigning impact magnitude, defined in ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**). These consider the scale/extent of the predicted change and the nature and duration of the impact.

Significance

10.4.30 Likely significant effects have been assessed using professional judgement considering the sensitivity (or value) of the receptors within the study area, and the magnitude of change (impact) likely to be caused by project activities. These factors are combined to give an overall significance of effect.

10.4.31 Significance has been derived using the matrix set out in Illustration 5.1 in ES Chapter 5: EIA Approach and Method (**application document 6.2.5**). This has been supplemented by professional judgement, which where applicable, has been explained to give the rationale behind the values assigned. Likely significant effects, in the context of the Infrastructure Planning (EIA) Regulations 2017, are effects of moderate or greater significance.

Limitations of Assessment

10.4.32 As with all types of assessment of geology and hydrogeology effects, the assessment depends on the accuracy of data provided by third parties. It has therefore been assumed that data provided by third parties is accurate. Historical maps and aerial photographs provide a snapshot in time and cannot be relied upon as indicators of events or activities that may have taken place at other times.

10.4.33 There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.

Key Parameters for Assessment and Assumptions

10.4.34 This section describes the key parameters and assumptions that have been used when undertaking the assessment presented within this ES Chapter. The assumptions are based on information presented within ES Chapter 4: Project Description (**application document 6.2.4**) and include:

- Piling assumptions: Percussive piling may be required at some pylon locations and for the foundations of the cable sealing end (CSE) compounds and GSP substation, depending on ground conditions. The assessment set out in this chapter assumes that piling is required at all pylon locations and at the CSE compounds and GSP substation (as a reasonable worst-case scenario);
- Limits of Deviation (LoD): The LoD for the standard opencut trenches are based on depths from 0.9m and up to 2m below ground level (bgl) and the trenchless crossings are considered to be a minimum of 0.9m and up to 10m bgl. Further details are presented within ES Chapter 4: Project Description (**application document 6.2.4**);
- Trenchless crossing construction methodology: The project has committed to undertaking trenchless crossings at the River Box, River Stour, Sudbury Branch Railway Line and to the south of Ansell's Grove. For the purposes of the assessment, it has been assumed that:
  - The proposed technique would be horizontal directional drilling (HDD), which requires launch and receiving pits on either side of a drilled section;
  - The assumption for the drilling direction of the trenchless crossings are provided in Table 4.7 of ES Chapter 4: Project Description (**application document 6.2.4**), but the assessment presented in this chapter considers both potential drilling directions as a worst-case; and
  - The water used to facilitate the drilling technique would be brought to site in tankers to facilitate drilling.
- Abstractions: It is assumed that no new consumptive groundwater abstractions are required to facilitate construction of the project or required during operation; and
- Discharges: Discharges from dewatering of opencut trenches to remove rainwater and minor groundwater seepages would be made to ground. At deeper excavations, such as the pits for the trenchless crossings, it is assumed that discharges would be subject to treatment to settle sediments, prior to discharge to ground. Discharge to watercourses is not anticipated.

Embedded and Good Practice Measures

10.4.35 This section outlines the relevant embedded and good practice measures that have been embedded into the design of the project and therefore the assessment has been undertaken on the assumption that these measures would be carried out. All assessment work has applied a precautionary principle, in that where limited information is available (in terms of the project design), a realistic worst-case scenario is assessed.

Relevant Embedded Measures

10.4.36 Embedded measures relevant to geology and hydrogeology have included avoiding sensitive features such as groundwater SPZ 1 and potential sources of significant contamination, such as landfills where practicable to do so, through the options appraisal process, as described in ES Chapter 3: Alternatives Considered (**application document 6.2.3**). No specific measures relevant to geology and hydrogeology have otherwise been embedded into the design of the project.

Good Practice Measures

10.4.37 The CoCP (**application document 7.5.1**) sets out the standard good practice measures that would be undertaken during construction of the project if it is granted consent. The relevant good practice measures relating to geology and hydrogeology include:

- GH01: For areas where potential contamination is known (excluding Layham quarry), or anticipated to be present, ground investigation will be undertaken to identify the specific ground conditions and obtain samples for laboratory testing to determine the presence and level of any contamination. This will inform the assessment of the risks to receptors, and good practice measures and working methods to control those risks will be developed. The results will be discussed with the Environment Agency and/or relevant planning authority, as appropriate. Made ground and/or materials known or strongly suspected of being contaminated will be segregated from natural and uncontaminated materials and will be sampled and appropriately tested to determine the presence and level of any contamination. Material deemed unsuitable for reuse within the project will be removed from site and either disposed of to appropriate landfill or treated at a soil treatment centre to facilitate re-use (where appropriate);
- GH06: A Foundation Works Risk Assessment will be undertaken by the Contractor at pylons, the CSE compounds, GSP substation and temporary bridges where pilled foundations are proposed. The Foundation Works Risk Assessment will assess the risk of the piling creating new contamination pathways and will identify any additional measures required to protect groundwater and prevent aquifer mixing. This would be prepared in accordance with 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination' (Environment Agency, 2001). Pylon foundations will also be designed with suitable corrosion and pH resistant concrete formulas to reduce the risk of leaching harmful compound into soil and groundwater; and
- GH07: A hydrogeological risk assessment will be undertaken once the trenchless crossing method has been confirmed. This will assess the risks on groundwater or surface water quality associated with the construction method including considering the potential for breakout during drilling and the use of bentonite or other agents proposed. Where the assessment identifies an unacceptable risk to groundwater or surface water quality, then alternative methods and/or additives shall be proposed, assessed and used. The hydrogeological risk assessment will be submitted to the Environment Agency for information prior to construction.

10.4.38 In addition to the above, a protocol for encountering unexpected contamination is also included within the CEMP (**application document 7.5**). Good practice measures W09 and W10 are also of key relevance to geology and hydrogeology as they relate to the protection of private water supplies during construction.

10.5 Baseline Environment

Existing Baseline

Geology

Designated Geological Sites

10.5.1 There are no statutory designated sites for geological importance within the study area (e.g. SSSIs designated for their geological importance). There are no potential Local Geological Sites or notified Local Geological Sites within the study area, therefore there are no designated geological receptors that could be affected by the project.

Ground Conditions

10.5.2 The geology of the study area comprises superficial Glacial Till deposits (Lowestoft Formation Diamicton) overlying undifferentiated Glacial and Fluvial Sands and Gravels, Lowestoft Formation Sands and Gravels and the sands and gravels of the Kesgrave Catchment Subgroup (BGS, 2022). Where river valleys cross the Order Limits, Alluvium, River Terrace Deposits and Head Deposits are present, occasionally underlain by Glacial Till deposits or underlain by the local bedrock.

10.5.3 Beneath the superficial deposits, the bedrock comprises either Red Crag deposits or the underlying London Clay Formation, dependent on the local topography. Where large river valleys are present, these are generally incised through the near-surface bedrock deposits into the underlying Woolwich and Reading Formations (Lambeth Group) and, in two locations (River Stour and River Brett valley), into the underlying White Chalk subgroup with recent superficial deposits, such as those described in paragraph 10.5.2 on top of these incisions into the bedrock

10.5.4 Further details on the published geology and ground investigation data undertaken for the project to date can be found in ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**). The ground investigation data shows that the geological strata encountered was found to be in general agreement with the regional geological mapping.

Mineral Deposits

10.5.5 The Suffolk Minerals and Waste Local Plan indicates that large parts of the Order Limits are located within the Suffolk County Council MCA (medium sensitivity), as shown on Figure 10.3: Mineral Reserves (**application document 6.4**), and also shows that the project crosses the following site allocated for sand and gravel extraction:

- Layham Quarry operated by Brett Aggregates – site allocation M5 and IL4/NHL3. Allocation M5 is for an extension to the existing sand and gravel operations at Rands Hall Pit in Layham (very high sensitivity). A planning application to extend the timescales for extraction and restoration at Layham Quarry to April 2032 and October 2033, respectively, was approved in October 2019 (Planning Ref: SCC/0018/19B/VOC).

10.5.6 The policies map within the adopted Essex Minerals Local Plan and the Minerals Local Plan 2014: Draft Amendments – 2021 document confirms that parts of the project are located within a MSA for sand and gravel (medium sensitivity), as shown on ES Figure

10.3: Mineral Reserves (**application document 6.4**). No allocated sites have been identified in close proximity or within the Order Limits within Essex.

10.5.7 Furthers details regarding mineral resources can be found in ES Appendix 10.3: MRA (**application document 6.3.10.3**).

Contaminated Land

10.5.8 ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**) outlines the methodology and results of the assessment identifying land that is at risk of contamination. The first stage screening identified the following sites as having a moderate or higher potential for significant contamination based on the historical and/or current land uses:

- Layham Quarry (and landfill);
- Bramford Substation;
- Pond Hall Industrial Estate;
- Hadleigh Railway Walk (former Great Eastern Railway);
- Assington scrapyard; and
- Great Eastern Railway.

10.5.9 A preliminary desk study and qualitative risk assessment has been completed for each of these sites and is presented in Annex B of ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**). Potential receptors have been identified for each of the sites and include:

- Construction Workers (high sensitivity);
- Maintenance Workers (high sensitivity); and
- Groundwater:
  - Principal Aquifers (high sensitivity); and
  - Secondary Aquifers (medium/low sensitivity).

10.5.10 The risk evaluation in the individual qualitative risk assessments for the sites identified a ‘low risk’ from potential contamination for all of the sites.

Hydrogeology

10.5.11 The Order Limits cross four groundwater bodies, which are described in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**). The groundwater bodies are all classified as having an overall poor status by the Environment Agency (2022), either because of their poor chemical quality based on exceedances of certain chemical compounds (due to rural land management practices), or because of detrimental change to the resource flow or quantity.

10.5.12 The hydrogeology is classified by the Environment Agency (Defra, 2021b) as follows:

- Principal aquifers (very high/high sensitivity): Red Crag and underlying White Chalk subgroup;

- Secondary A aquifers (medium sensitivity): The Thanet sands and Woolwich and Reading Formations; Alluvium, River Terrace Deposits and Glacial and Fluvial Sands and Gravels, Lowestoft Formation Sands and Gravels; and
- Unproductive strata (negligible sensitivity): Lowestoft Formation (Diamicton) and the London Clay Formation.

10.5.13 The Order Limits are located within a groundwater SPZ 3 (low sensitivity) and also cross two SPZ 2 (medium sensitivity) in Section C: Brett Valley near Upper Layham and in the Stour Valley near Lamarsh as shown on ES Figure 10.1: Superficial Geology (**application document 6.4**). A small part of the Order Limits is located within a SPZ 1 (very high sensitivity) within Section G: Stour Valley although penetrative ground works are not anticipated in this area.

10.5.14 The Order Limits are not located within a Drinking Water Safeguard zone for groundwater.

10.5.15 A number of GWDTE have been identified within the study area, and a list of these sites, together with their groundwater dependency score, can be found in ES Appendix 7.1: Habitats Baseline Report (**application document 6.3.7.1**). All GWDTE were identified as having a low or moderate groundwater dependency and have been given a medium sensitivity.

10.5.16 There are a small number of licensed groundwater abstractions, deregulated abstractions and private water supplies within the study area. Details are provided in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) and shown on ES Figure 10.4: Hydrogeology (**application document 6.4**). These are identified as high sensitivity for public water supplies and medium sensitivity for abstractions and private water supplies.

10.5.17 Details of the groundwater levels encountered during the ground investigations are shown in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**). This shows that, even within low-lying valley areas, a trench depth of c.1m is unlikely to encounter groundwater.

Future Baseline

10.5.18 There are no anticipated changes to the baseline expected over the design life of the project in relation to geology (contamination, geological conservation and minerals) and hydrogeology (quality and flows). In relation to mineral resources, there are currently no known planning applications for new mineral extraction or sites allocated for mineral extraction within the Local Plans within the Order Limits, with the exception of Layham Quarry which has already been discussed in paragraph 10.5.5.

10.6 Likely Significant Effects During Construction (Without Mitigation)

Introduction

10.6.1 This section sets out the likely significant effects of the project on geology and hydrogeology during construction. The assessment assumes that the relevant good practice measures in the CoCP (**application document 7.5.1**) are in place, and the results of the assessment then inform the need for any additional mitigation requirements during construction (see Section 10.8).

10.6.2 As described in ES Chapter 4: Project Description (**application document 6.2.4**), the assessment presented within this chapter is split into the 'main project' and the 'GSP substation. The main project includes the 132kV overhead line removal, proposed overhead line and underground cables (including the CSE compounds). The GSP substation includes works at the substation where this connects into the network and the minor works to the existing overhead lines.

Main Project

Geology

Mineral Deposits

10.6.3 Layham Quarry is currently crossed by both the existing 132kV overhead line and the existing 400kV overhead line where mineral extraction is understood to have been undertaken beneath the existing overhead lines. The quarry is currently dormant and has not been operational since prior to 2013, although the mineral extraction period at the quarry has been extended and therefore could recommence.

10.6.4 The quarry would be crossed by the proposed overhead line, and the Proposed Alignment currently follows roughly the same line as the 132kV overhead line which would be removed. Based on a review of historical aerial imagery (Google Earth, 2000-2021) and consultation with the quarry owners, it appears that the part of the quarry the Order Limits crosses has previously been worked and at least partly restored. Therefore, the project would not sterilise any mineral at the quarry and is unlikely to impact quarry operations should they recommence. Therefore, the temporary construction impacts on Layham Quarry (very high value) would be negligible. For Layham Quarry, this would result in a short-term **minor** effect which would be **not significant**.

10.6.5 The effects on the sterilisation of minerals within the wider MSA and MCA is described in Section 10.7 to avoid double counting of effects.

Contaminated Land

10.6.6 The baseline assessment completed and presented in ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**) has identified a worst case 'low' risk of potential significant contamination within small discrete sections of the Order Limits. For the majority of the Order Limits the risk has been evaluated as 'very low'. Therefore, with the good practice measures contained within the CoCP (**application document 7.5.1**) in place, the temporary construction impacts from contamination would be negligible. For groundwater receptors with a very high to negligible sensitivity and construction workers with a high sensitivity, this would result in a **neutral** effect which would be **not significant**.

Hydrogeology

10.6.7 The groundwater risk assessment presented in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) has assessed the potential effects of the project on all groundwater receptors and informs the impact assessment presented within this chapter. This has assessed the potential impacts on groundwater quality and flow from ground disturbance, such as the removal of existing foundations/pylon bases and the installation of new pylons and their foundations (such as piles) creating new flow pathways.

10.6.8 The assessment considers that there is a low to very low risk of ground disturbance impacting on groundwater quality or flow. Therefore, this would result in a negligible magnitude, and for groundwater receptors with a very high to negligible sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.6.9 For new overhead line and pylon bases, the combination of the good practice measures (e.g. GH06) contained within the CoCP (**application document 7.5.1**) and the low risk of contamination identified within ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**) means the temporary construction impacts on groundwater flow and quality from ground disturbance would result in a negligible magnitude. For groundwater receptors with a high to negligible sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.6.10 ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) has assessed the potential impacts in relation to changes to groundwater levels and flow pathways due to construction dewatering. Dewatering during construction is not anticipated along the majority of the route. Therefore, groundwater levels and flow would not be affected and there would be no requirement for any pumped discharge.

10.6.11 There are, however, underground sections of cable where there could be localised dewatering requirements. One location has been identified between the River Stour and the Sudbury Branch Railway Line, where the underground cables would be installed using a trenchless crossing technique (assumed to be HDD). Whilst the HDD itself would not require dewatering, any launch and reception pits may require dewatering depending on specific construction depths and groundwater depths. Therefore, an assessment of the potential dewatering impacts has been undertaken and is presented in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**). This concluded that there would be no effect on groundwater receptors within the vicinity of the dewatering.

10.6.12 On that basis, it is assessed that the temporary construction impacts from dewatering activities would be negligible. For groundwater receptors with a very high to negligible sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.6.13 In the shallow opencut trenches, groundwater level is anticipated to be below the base of the excavation, and as such groundwater would not be intercepted and new flow pathways would not be created. Therefore, the temporary construction impacts related to new flow pathways in the opencut trench sections would be negligible. On groundwater receptors with a very high to negligible sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.6.14 The trenchless crossing beneath the River Stour may intercept the Chalk bedrock which could result in a potential significant effect on water quality, depending on the specific construction methods. Further work is needed, once specific construction details are available, to determine any potential risks and therefore the nature and level of any impacts and effects on the Principal Aquifer (high/very high sensitivity).

10.6.15 The additional work would comprise a hydrogeological risk assessment once the trenchless crossing construction methods and associated details have been determined. This would assess the risk to groundwater and surface water quality associated with the construction of the trenchless crossings at each location and would identify any further measures required to avoid significant effects. This would be undertaken once the final design details of the trenchless crossings are known, and in accordance with good

practice measure GH07 contained within the CoCP (**application document 7.5.1**). Therefore, with the implementation of GH07, it has been assessed that the temporary construction impacts in relation to the trenchless crossings would be negligible. For groundwater receptors with a medium sensitivity, this would result in a **neutral** effect, and on groundwater receptors with a very high and high sensitivity, this would result in a **minor** short-term effect, which would be **not significant**.

10.6.16 ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) has also assessed the potential impacts on groundwater quality from connecting different aquifer units that are currently separated by aquiclude or aquitard units, at trenchless crossings. Based on the assessment undertaken in Chapter 3 of ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**), it has been assessed that there would be no connection of aquifer units at trenchless crossings. Therefore, the temporary construction impacts would be negligible. For groundwater receptors with a very high to medium sensitivity, this would result in a **neutral** effect which would be **not significant**.

GSP Substation

Geology

Mineral Deposits

10.6.17 There are no active mineral extraction sites within the vicinity of the GSP substation and the associated works to connect this into the existing electricity network and therefore there are not anticipated to be any impacts during construction. Therefore, there are no likely significant effects on minerals during construction.

10.6.18 The effects on the sterilisation of minerals within the wider MSA and MCA is described in Section 10.7 to avoid double counting of effects.

Contaminated Land

10.6.19 The baseline assessment completed and presented in ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**) has not identified any potential significant contamination within the study area. Therefore, the temporary construction impacts from contamination would be negligible. For groundwater receptors with a high and medium sensitivity and construction workers with a high sensitivity, this would result in a **neutral** effect which would be **not significant**.

Hydrogeology

10.6.20 It is assumed that dewatering is not required at the GSP substation during construction and therefore groundwater levels and flow would not be affected, and there would be no requirement for any pumped discharge. On that basis, it is assessed that the temporary construction impacts from dewatering activities would be negligible. For groundwater receptors with a medium to negligible sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.6.21 ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) has assessed the potential impacts on groundwater quality and flow from ground disturbance such as piling and the introduction of new flow pathways. The combination of good practice measures contained within the CoCP (**application document 7.5.1**) e.g. GH06, and absence of a source of contamination at the GSP

substation, this would result in a negligible impact from ground disturbance and new flow pathways. For groundwater receptors with a medium to negligible sensitivity, this would result in a **neutral** effect which would be **not significant**.

Summary of Construction Effects

10.6.22 Geology and hydrogeology effects during construction have been avoided through design, by avoiding, where possible known potential sources of contamination (e.g. landfills), and sensitive hydrogeological features (such as SPZ 1). In addition, with the good practice measures described in the CoCP (**application document 7.5.1**) there are **no likely significant effects** expected in relation to the geology and hydrogeology during construction.

10.7 Likely Significant Effects During Operation (Without Mitigation)

Introduction

10.7.1 This section sets out the likely significant effects of the project on geology and hydrogeology during operation.

10.7.2 As described in ES Chapter 4: Project Description (**application document 6.2.4**), the assessment presented within this chapter is split into the 'main project' and the 'GSP substation. The main project includes the 132kV overhead line removal, proposed overhead line and underground cables (including the CSE compounds). The GSP substation includes works at the substation where this connects into the network and the minor works to the existing overhead lines.

Main Project

Geology

Mineral Deposits

10.7.3 The Order Limits cross through a MSA and MCA for sands and gravels (medium sensitivity). The MRA (**application document 6.3.10.3**) identified that relatively small extents of minerals would be sterilised by the project. The MRA has demonstrated that even if the full extent of the Order Limits covered by an MSA/MCA was to be considered to be economically valuable, the extent of the sterilised area is very small in comparison to the extent of the MSA/MCA. The actual footprint of the operational components of the project are significantly smaller still than the proposed Order Limits (<0.2% of the total MSA/MCA). Therefore, the quantity of mineral sterilised by the project is considered to be small in the context of the extensive occurrence of sand and gravel within both counties and their existing landbanks.

10.7.4 The MRA also explores the potential for prior extraction of the minerals, but concludes that the impacts would be disproportionate to the value gained from extracting the mineral prior to construction of the project.

10.7.5 The assessment concludes that the potential impact of sterilising the relatively small volume (<0.2% of the total MSA/MCA) of safeguarded mineral associated with the project in the context of the national need/significance of the project and the assessment

provided in the MRA, would result in a small impact and a long-term **minor** effect which is **not significant**.

10.7.6 Layham Quarry (very high sensitivity) would be crossed by the proposed overhead line and the Proposed Alignment currently follows the same line as the 132kV overhead line which would be removed. Based on a review of historical aerial imagery (Google Earth, 2000-2021) and consultation with the quarry owners, it appears that the part of Layham Quarry the Order Limits cross has previously been worked and at least partly restored. Therefore, sterilisation of mineral resources would not occur and is unlikely to impact quarry operations should they recommence during operation of the project. Therefore, the project would not impact on quarry operations should they recommence. The operational impacts on Layham Quarry (very high value) would therefore be negligible; this would result in a long term **minor** effect that would be **not significant**.

Contaminated Land

10.7.7 There are not expected to be any potential effects on maintenance workers during operation in relation to contamination. Potential effects are only likely if major works and ground disturbance are required, and there was a source of potential significant contamination. The assessment presented in ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**) has identified a worst case 'low' risk of potential significant contamination within small discrete sections of the Order Limits. For the majority of the Order Limits the risk has been evaluated as 'very low'. Therefore, the operational impacts from potential contamination would be negligible. For maintenance workers with a high sensitivity, this would result in a **neutral** effect which would be **not significant**.

Hydrogeology

10.7.8 The groundwater assessment presented in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) has assessed the potential effects of the project on groundwater receptors during the operational phase in relation to changes to groundwater flow due to below ground infrastructure.

10.7.9 Within the new overhead line sections, it is assumed that pylon bases could require a piled foundation solution, however, the relatively small diameter of any potential piles and the spatial distribution means there would be negligible change to groundwater flow pathways. On that basis, it is assessed that the operational impacts from below ground infrastructure would be negligible. For groundwater receptors with a medium and high sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.7.10 For the underground cables, once constructed, there would be no potential for new flow pathways and the cross-sectional area of both the trenched and trenchless sections would be small. Therefore, operational impacts related to underground sections would be negligible. For groundwater receptors with a medium and high sensitivity, this would result in a neutral effect which would be **not significant**.

10.7.11 Dewatering is not anticipated during operation and there would be no requirement for any pumped discharge. On that basis, it is assessed that the operational impacts would be negligible. For groundwater receptors with a medium and high sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.7.12 ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) has assessed the potential impact of changes to groundwater infiltration and

recharge during operation. Effects on infiltration and recharge of groundwater may arise if the permeability of the ground surface is changed. However, the overall footprint of any new impermeable areas would be small and be designed to meet existing drainage standards, as described in good practice measure W12 in the CoCP (**application document 7.5.1**). Therefore, the operational impacts from changes to groundwater infiltration and recharge would be negligible. On groundwater receptors with a very high to negligible sensitivity, this would result in a **neutral** effect which would be **not significant**.

GSP Substation

Geology

Mineral Deposits

10.7.13 There are no active mineral extraction sites within the vicinity of the GSP substation or the associated works to connect this into the existing electricity network and therefore there are **no likely significant effects** during operation.

10.7.14 The proposed GSP substation is located within a MSA for sands and gravels (medium sensitivity), and a MRA has been undertaken and is presented in ES Appendix 10.3: MRA (**application document 6.3.10.3**). The MRA identified that relatively small extents of minerals would be sterilised by the project and that the quantity of mineral sterilised by the project is considered to be small in the context of the extensive occurrence of sand and gravel within both counties and their existing landbanks.

10.7.15 The MRA also explores the potential for prior extraction of the minerals, but concludes that this is not viable, and that the impacts would be disproportionate to the value gained from extracting the mineral for this project. Therefore, the operational impacts would be small. For mineral resources with a medium sensitivity, this would result in a long term **minor** effect that would be **not significant**.

Contaminated Land

10.7.16 Potential effects during operation could occur if excavation and reinstatement is required, e.g. to rectify a fault with the underground cables. However, a potential significant source of contamination has not been identified in ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application document 6.3.10.1**), and the risk has been evaluated as ‘very low’. Risks to maintenance workers would also be managed through National Grid operational processes. Therefore, the operational impacts from contamination would be negligible. On maintenance workers with a high sensitivity, this would result in a **neutral** effect which would be **not significant**.

Hydrogeology

10.7.17 The groundwater assessment presented in ES Appendix 10.2: Groundwater Baseline and Assessment (**application document 6.3.10.2**) has assessed the potential effects of the project on groundwater receptors during the operational phase in relation to changes to groundwater flow due to below ground infrastructure. The GSP substation is likely to require a piled foundation solution, however, the anticipated small diameter of any potential piles means there is unlikely to be a significant impact on groundwater flow pathways. On that basis, it is assessed that the operational impacts from below ground

infrastructure would be negligible. For groundwater receptors with a medium sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.7.18 Dewatering is not anticipated at the GSP substation during operation and there would be no requirement for any pumped discharge. On that basis, it is assessed that there would be negligible impact for groundwater receptors with a medium sensitivity, this would result in a **neutral** effect which would be **not significant**.

10.7.19 Effects on infiltration and recharge of groundwater may arise if the permeability of the ground surface is changed. There would only be small areas of new hardstanding at the GSP substation, and these would be designed to meet current drainage standards as described in good practice measure W12 in the CoCP (**application document 7.5.1**). Therefore, the operational impacts from changes to groundwater infiltration and recharge would be negligible. For groundwater receptors with a medium sensitivity, this would result in a **neutral** effect which would be **not significant**.

Summary of Operational Effects

10.7.20 Geology and hydrogeology effects during operation have been avoided through design, by avoiding, where possible, known potential sources of contamination (e.g. landfills), and sensitive hydrogeological features (such as SPZ 1). In addition, drainage of new hardstanding would be designed in accordance with the in good practice measures in the CoCP (**application document 7.5.1**). There are **no likely significant effects** expected in relation to geology and hydrogeology during operation.

10.8 Proposed Mitigation During Construction

10.8.1 The assessment has concluded that there are no likely significant effects in relation to geology and hydrogeology receptors during construction. Therefore, no mitigation measures have been identified beyond the good practice measures set out in the CoCP (**application document 7.5.1**).

10.9 Proposed Mitigation During Operation

10.9.1 The assessment has concluded that there are no likely significant effects in relation to geology and hydrogeology receptors during operation. Therefore, no mitigation measures have been identified.

10.10 Residual Significant Effects (With Mitigation)

10.10.1 The assessment has concluded that there are no likely significant residual effects in relation to geology and hydrogeology receptors during construction or operation.

10.11 Sensitivity Testing

Introduction

10.11.1 This section outlines alternative approaches to the assessment presented in Sections 10.6 to 10.10. It considers the alternative construction schedule, which is described in ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**) and also flexibility between the design and method set out within ES Chapter 4: Project Description (**application document 6.2.4**) and the Proposed Alignment shown on ES Figure 4.1: The Project (**application document 6.4**). Further details on the flexibility assumptions are

outlined in Section 4.2 of ES Chapter 4: Project Description (**application document 6.2.4**).

Assessment of Alternative Construction Schedule

10.11.2 This chapter assumes the baseline construction schedule described in ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**) for the purposes of the assessment. Sensitivity testing considering the alternative scenario, which has a later start date due to the GSP substation being delivered pursuant to the Development Consent Order, has shown that there would be no new or different likely significant effects to those identified in the baseline construction schedule assessed in Sections 10.6 to 10.10 of this chapter.

Flexibility in Design

Flexibility in Trenchless Crossings

10.11.3 The assessment presented within this chapter has considered a reasonable worst-case assumption in terms of drill direction at trenchless crossings and both drill directions have been assessed. As such, varying the drill direction is not likely to result in additional significant effects to those identified in Sections 10.6 to 10.10 of this chapter.

10.11.4 If a different technique to HDD was taken forward, then there is the potential for different environmental effects. For example, other techniques may require dewatering to facilitate the drilling process. This has the potential to generate impacts on groundwater levels and groundwater flows. Therefore, in accordance with good practice measure GH07 in the CoCP (**application document 7.5.1**), should a different technique be chosen further assessment would be required to understand the impacts associated with the method and depth on the groundwater levels. The change of method would be accompanied by appropriate assessment to determine potential impacts and mitigation.

10.11.5 Discussions would also be held with the Environment Agency in relation to any required consents and permits, in accordance with GG01 in the CoCP (**application document 7.5.1**), which would include the approval of any further measures required.

Flexibility in Construction Method

10.11.6 This ES has assumed a worst case that piling would be required at all pylon locations. If the ground investigations identified that piling was not required at all locations, then this is not likely to result in new or different significant effects to those identified in Sections 10.6 to 10.10 of this chapter.

Flexibility within the Order Limits

10.11.7 The assessment presented within Sections 10.6 to 10.10 has assumed the Proposed Alignment shown on ES Figure 4.1: The Project (**application document 6.4**). It should be noted that as described in ES Chapter 4: Project Description (**application document 6.2.4**), the Proposed Alignment is not fixed and could be subject to change within the defined Limits of Deviation (LoD) within the parameters shown on the Works Plans (**application document 2.5**). Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative locations within the parameters defined by the LoD be taken forward.

10.11.8 With regards to Layham Quarry, if the new overhead line did not follow the same route as the 132kV removal, there would still be only one line spanning the quarry, within a section that has already been worked, therefore the effects would be the same as assessed in Sections 10.6 to 10.10 of this chapter.

10.11.9 ES Appendix 10.1: Geology Baseline and Preliminary Risk Assessment (**application documents 6.3.10.1**) and ES Appendix 10.2: Groundwater Baseline and Assessment (**application documents 6.3.10.2**) cover the environmental risks within the Order Limits. Minor movements of the Proposed Alignment (and associated features including pylons) within the LoD would not result in additional effects in relation to geology and hydrogeology, given the good practice measures that are set out within the CoCP (**application document 7.5.1**).

10.11.10 Therefore, the sensitivity testing has shown that there would be no new or different likely significant effects as a result of the pylons being placed in a different location within the Order Limits in relation to Geology and Hydrogeology.

10.12 Conclusion

10.12.1 The assessment presented in Sections 10.6 to 10.10 has concluded that there are no likely significant effects in relation to geology and hydrogeology receptors during construction or operation. In addition, the sensitivity testing presented in Section 10.11 has shown that there would be no new or different significant effects through the application of either the alternative construction schedule scenario or through flexibility within the LoD.

10.12.2 In accordance with paragraph 5.3.7 of EN-1, areas of geological conservation have been considered within the assessment and none were identified within the Order Limits. In accordance with paragraph 5.10.9 of EN-1, a MRA has been undertaken and included as Appendix 10.3 (**application document 6.3.10.3**). This demonstrates that the project is unlikely to have a significant effect on mineral reserves. In accordance with paragraph 5.15.3 of EN-1, SPZ around potable groundwater abstractions have also been considered within and no significant effects are anticipated. As such, the requirements of the EN-1 are considered to be met.

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