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Bramford to Twinstead Reinforcement

Volume 6: Environmental Information

Document 6.3.10.1: ES Appendix 10.1 – Geology Baseline and Preliminary Risk Assessment

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1. Introduction

1.1 Overview

1.1.1 National Grid Electricity Transmission plc (here on referred to as National Grid) is making an application for development consent to reinforce the transmission network between Bramford Substation in Suffolk, and Twinstead Tee in Essex. The Bramford to Twinstead Reinforcement ('the project') would be achieved by the construction and operation of a new electricity transmission line over a distance of approximately 29km (18 miles), the majority of which would follow the general alignment of the existing overhead line network.

1.1.2 This appendix has been produced to support and inform Environmental Statement (ES) Chapter 10: Geology and Hydrogeology (**application document 6.2.10**). It provides baseline information on geology and potential land contamination within the study area. This appendix also includes a preliminary land contamination risk assessment.

1.1.3 As described in ES Chapter 10: Geology and Hydrogeology (**application document 6.2.10**), the study area for land contamination comprises the maximum physical extents of the Order Limits plus a buffer zone (up to 250m), which is dependent on the feature/receptor.

1.1.4 For ease of reference and to aid description of the project, the project has been split into seven sections based on the landscape character and feedback during consultation, further details can be found in ES Chapter 4: Project Description (**application document 6.2.4**). The sections are as follows:

- Section AB: Bramford Substation/Hintlesham;
- Section C: Brett Valley;
- Section D: Polstead;
- Section E: Dedham Vale Area of Outstanding Natural Beauty (AONB);
- Section F: Leavenheath/Assington;
- Section G: Stour Valley; and
- Section H: Grid Supply Point (GSP) Substation.

1.2 Structure of this Appendix

1.2.1 The structure of this assessment is as follows:

- Chapter 2: Geology and Ground Conditions comprises a desk study of readily available information including geological maps together with ground investigation data; and
- Chapter 3: Land Contamination presents a desk study of readily available historical Ordnance Survey (OS) maps supplemented by reference to earlier maps where available and historical aerial photography. The chapter also includes a qualitative Tier 1 preliminary contamination risk assessment using a Conceptual Site Model to identify 'source-pathway-receptor' linkages to assess the potential risk and hazards, if any, associated with existing contamination in the ground.

1.2.2 Further information in relation to the Hydrogeology within the Order Limits and surrounding area is contained within ES Appendix 10.2: Hydrogeology Baseline and Assessment (**application document 6.3.10.2**).

2. Geology and Ground Conditions

2.1 Introduction

2.1.1 The published geology within the Order Limits is shown on the Geological Survey of Great Britain (England and Wales) Sheet numbers, 207 Ipswich (British Geological Survey (BGS), 2006), 206 Sudbury (BGS, 1991) and 223 Braintree (BGS, 1982). The 1:50,000 series mapping comprising the superficial and solid geology within the Order Limits is shown on Figure 10.1: Superficial Geology and Figure 10.2: Bedrock Geology (**application document 6.4**). This is also supplemented by the BGS online mapping for bedrock and superficial geology (BGS, 2022). Available ground investigation reports were also reviewed to inform the geology baseline, and the ones made available to us were undertaken by Catsurveys Group Limited (2013a; 2013b), Jacobs (2021), Card Geotechnics Limited (2022) and Structural Soils Ltd (2022).

2.1.2 In addition, information provided from relevant planning authorities, in relation to sites of local geological interest, have been used to identify any designated sites, along with Department for Environment, Food and Rural Affairs (Defra) mapped information, via Magic.gov.uk (Defra, 2022c).

2.2 British Geological Survey Mapping

2.2.1 The likely composition of natural superficial strata within the Order Limits, is described in Table 2.1. This is based on information taken from the published geological maps of the area and available BGS borehole records. The table is split into sections based on anticipated geology.

Table 2.1 – Conjectural Superficial Geological Succession Beneath Sections

Geological Unit	Brief Description	Anticipated Thickness (m)
Sections AB, C and D		
Alluvium	Normally soft to firm, consolidated, compressible, silty clay, but can contain layers of silt, sand, peat and basal gravel.	Only located locally within the river valleys in the Order Limits. Anticipated to be between 2-3m in thickness. Not present within the remainder of the Order Limits.
Clay Head Deposits	Sandy, gravelly clay.	Only located locally within the river valleys in the Order Limits. Anticipated to be between 2-5m in thickness. Not present in other sections.
Lowestoft Formation – Glacial Till Deposits	Brown and yellow, chalky clay with flint. Occasionally interbedded with sand and gravel-rich lenses and rare peat.	Present in Section AB: Bramford Substation/Hintlesham and Section D: Polstead. Approximately up to 6m in thickness. Not present in Section C: Brett Valley.
Lowestoft Formation – Fluvioglacial Sand and Gravel	Sand and gravel with rare clay interbeds; often cross-bedded.	Approximately 2-3m in Section AB: Bramford Substation/Hintlesham and up to approximately 3-4m in Section D: Polstead. Absent in Section C: Brett Valley.
Kesgrave Catchment Subgroup	Moderately sorted sand and gravel.	Approximately 2-3m in Section AB: Bramford Substation/Hintlesham approximately 8m in Section D: Polstead.

Geological Unit	Brief Description	Anticipated Thickness (m)
		Not present in Section C: Brett Valley.
Sections E, F, G and H		
Alluvium	Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present.	Few meters within the River Box Valley and River Stour Valley, absent elsewhere in these sections.
Glaciofluvial Deposits (Terraced Valley Gravels, Glacial Sands and Gravels)	Sand and gravel.	3-9m. Not present in Section F: Leavenheath/Assington.
Lowestoft Formation (Glacial Till Deposits)	Brown and yellow chalky clay and flint and beds of sand, gravel and silt.	2-10m within the River Box channel. 5-7m in Section F: Leavenheath/Assington and Section G: Stour Valley.
Kesgrave Catchment Subgroup	Sands and gravels.	7-8m Not present in Section F: Leavenheath/Assington.

2.2.2 In certain parts of the route, particularly within areas of Section C: Brett Valley, Section D: Polstead and Section H: GSP Substation, superficial deposits are anticipated to be generally absent.

2.2.3 The solid (bedrock) geological succession beneath the Order Limits for all sections, as indicated by the BGS geological mapping and borehole records, is presented in Table 2.2.

Table 2.2 – Conjectural Solid Geological Succession Beneath All Sections

Geological Unit	Brief Description	Anticipated Thickness (m)
Chilesford Church Sand Member	Well sorted, fine to medium grained, micaceous, buff to pale brown, quartz sand. Commonly decalcified.	Only encountered in the western end of Section C: Brett Valley and only a few metres in thickness assumed.
Red Crag Formation	Coarse-grained, poorly sorted, cross-bedded, abundantly shelly sands.	18-20m present in central areas of Section AB: Bramford Substation/Hintlesham and within Section F: Leavenheath/Assington. Not present in Section C: Brett Valley and D: Polstead. Outcrops at the surface on the western side of the River Box Valley, 1-2m anticipated. Up to 7m in Section F: Leavenheath/Assington.
London Clay Formation	Fine, sandy, silty clay/clayey silt. Glauconitic at base.	Approximately 2 to 45m. Shows thinning towards the River Box.

Thanet Sand and Lambeth Group	Glauconitic sands at base (Thanet Sand Formation), overlain by grey clays and sands with brackish fauna (Woolwich Beds), and interleaved red and variegated clays and sands (Reading Beds).	Approximately 10-20m.
White Chalk Sub-Group	Chalk with flints. With discrete marl seams, nodular chalk, sponge-rich and flint seams throughout.	Approximately 50-100m, exposed in River Stour and Brett valleys.

2.3 Ground Investigation Data

2.3.1 Ground investigation has been undertaken for the project as follows;

- In 2013 within Section E: Dedham Vale AONB, Section F: Leavenheath/Assington and Section G: Stour Valley (Catsurveys Group Limited, 2013a and 2013b);
- In 2021 within Section AB: Bramford Substation/Hintlesham, Section D: Polstead, Section E: Dedham Vale AONB, Section F: Leavenheath/Assington and Section G: Stour Valley (Card Geotechnics Limited, 2021);
- In 2021 within Section H: GSP Substation (Jacobs, 2021); and
- In 2022 within Section G: Stour Valley in the area of proposed trenchless crossings at the River Stour and Ansell's Grove (Structural Soils Ltd, 2022).

2.3.2 In general, the ground conditions encountered during the ground investigations were as anticipated based on the published geology.

Section AB: Bramford Substation/Hintlesham

2.3.3 Two boreholes (4YL18A and RB017) were sunk within Section AB: Bramford Substation/Hintlesham during the 2021 ground investigation (Card Geotechnics Limited, 2022), as shown on Figure 10.1: Superficial Geology (**application document 6.4**). These were located at approximate National Grid References TM 05891 41807 and TM 05973 41696 respectively. Table 2.3 presents the geological sequence within the boreholes.

Table 2.3 – Encountered Geology within Section AB: Bramford Substation/Hintlesham

Geological Unit	Brief Description	Depth to Base (m below ground level (bgl*)	Thickness (m)
Topsoil	Firm, dark brown, sandy gravelly Clay, with frequent rootlets.	0.3 - 0.4	0.3 - 0.4
Lowestoft Formation	Stiff, yellowish brown mottled orange, sandy gravelly Clay. Gravel is rounded to angular flint and chalk.	6.3 - 10.1	6.0 - 9.7
Kesgrave Catchment Subgroup	Yellowish brown, clayey gravelly Sand. Gravel is subangular to angular flint and occasional quartzite.	14.5 - >15	4.4 - >8.7

Weathered London Clay Formation	Stiff, brown, sandy gravelly Clay. Gravel is subrounded to rounded chalk and quartzite.	>15.0 (base not proven)	>0.5

Section D: Polstead

2.3.4 Eight boreholes and four trial pits were undertaken within Section D: Polstead during the 2013 (Catsurveys Group Limited, 2013a and 2013b) and 2021 (Card Geotechnics Limited, 2022) ground investigations, as shown on Figure 10.1: Superficial Geology (**application document 6.4**). These were mostly undertaken within the underground sections, with boreholes BH24, BH25, BH26 and BH27 to the south of the current overhead alignment and close to the Dedham Vale AONB. Table 2.4 presents the geological sequence within the boreholes.

Table 2.4 – Encountered Geology within Section D: Polstead

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Lowestoft Formation	Firm to stiff, red brown, gravelly Clay or sandy SILT.	3.1 - 4.8	3.1 - 4.8
Kesgrave Catchment Subgroup	Medium dense to dense, orangish brown to grey, slightly silty gravelly Sand.	13.2 - 14.6	9.4 - 11.0
Red Crag Formation	Medium dense, orangish brown, fine to medium silty Sand.	17.8 - >20.0	3.6 - 6.0
Lambeth Group	Firm to stiff, reddish brown to grey, sandy silty CLAY.	>20.0	>2.2

2.3.5 Groundwater was struck during drilling in all of the boreholes at depths ranging from 4.4m to 14.6m below ground level (bgl) within the Kesgrave Catchment Subgroup. Resting water levels ranged between circa 3.7m to 13.8m bgl.

Section E: Dedham Vale AONB

2.3.6 Nineteen boreholes and three trial pits were undertaken within Section E: Dedham Vale AONB across both the 2013 and 2021 ground investigations, as shown on Figure 10.1: Superficial Geology (**application document 6.4**). The 2013 ground investigation (Catsurveys Group Limited, 2013a and 2013b) included the drilling of boreholes in the vicinity of the River Box and to the south of the current overhead line. During the 2021 ground investigation (Card Geotechnics Limited, 2022) an additional borehole was sunk within the vicinity of the River Box and trial pits were excavated within the proposed underground section alignment, to the north of the current overhead lines.

2.3.7 The geological sequence described in Table 2.5 was encountered away from the River Box. The strata encountered in the vicinity of the River Box has been described separately in Table 2.6, as this is not considered to be representative of the overall ground conditions across Section E: Dedham Vale AONB.

Table 2.5 – Encountered Geology within Section E: Dedham Vale AONB Away from the River Box

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Topsoil	Firm, dark brown, sandy gravelly Clay, with occasional rootlets.	0.2 - 0.4	0.2 - 0.4
Glacial Sand and Gravel	Loose, light greyish brown, fine to medium Sand and fine, rounded to sub rounded, flint gravel.	5.4 - 12.4	5.0 - 12.1
Lowestoft Formation	Stiff, orangish brown, gravelly sandy silty Clay, with a low cobble content. Gravel is rounded to subangular flint and chalk. Cobbles are of rounded flint.	>1.4 - 4.5	>1.0 - 4.2
Kesgrave Catchment Subgroup	Orangish brown, silty sandy, rounded to subangular, Gravel of fine to course flint and chalk, with a low cobble content.	>1.4	>1.2
Red Crag Formation	Dense, orangish brown, gravelly, fine to medium, Sand and occasional cobbles.	>9.45 - >20.0	4.95 - >7.6
London Clay Formation	Firm to stiff, dark grey, silty Clay.	>10.0	>3.3 - >4.6

2.3.8 Four Particle Size Distribution (PSD) tests were undertaken in the near surface material present between 0.8m and 1.2m below ground level, which is likely to be intercepted by the cable trench. The material in this range was found to be variable and described on the log as sandy gravelly CLAY to silty sandy GRAVEL (strata name not provided). The PSD tests indicate the clay/silt fraction varies from between 7% and 78%, the sand fraction varies from 16% and 41% and the gravel portion varies from between 6% and 77%. On the basis of these three tests, the composition of the material that is likely to be intercepted by the cable trench in Section E is anticipated to be highly variable.

2.3.9 Groundwater was struck during drilling within all boreholes at a depth of between 2.4m to 16.7m bgl, within the Glacial Sands and Gravels, however the groundwater level at this location was not recorded after the initial strike.

2.3.10 Table 2.6 describes the strata encountered within the vicinity of the River Box.

Table 2.6 – Encountered Geology within Section E: Dedham Vale AONB in the Vicinity of the River Box

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Topsoil	Soft, dark brown, silty sandy Clay, with frequent rootlets.	0.3 - 0.6	0.3 - 0.6
Alluvium	Soft to firm, dark brown or greyish green, sandy gravelly Clay or gravelly Silt, with occasional wood fragments and lenses of soft dark brown Peat (up to 0.3m thick).	1.5 - 3.3	1.2 - 3.8

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Glacial Sand and Gravel	Loose to medium-dense, clayey gravelly Sand or sandy Gravel. Gravel is rounded to subangular flint with occasional flint cobbles and inclusions of, grey brown, sandy silt.	4.0 - 8.3	1.6 - 6.2
Lowestoft Formation	Firm to stiff, grey, very silty Clay or clayey Silt with fine shell fragments and chalk gravel.	13.3 - 17.2	8.0 - 10.3
Lambeth Group	Firm to very stiff, grey, sandy, silty, Clay.	>10 - >20.0	>2.2 - >2.8

2.3.11 In BH2 located approximately 10m to the west of the River Box, as shown on Figure 10.1: Superficial Deposits (**application document 6.4**), groundwater was struck within the Alluvium at 1.9m bgl with final resting levels measured at 3.4m bgl. Groundwater was not struck within BH01.

2.3.12 In BH3 and BH4 located to the east of the River Box, groundwater was struck between 1.50m to 2.10m bgl within the Alluvium, with resting groundwater levels at between 0.80m and 1.50m bgl.

Section F: Leavenheath/Assington

2.3.13 Four boreholes were undertaken as part of the 2013 ground investigation (Catsurveys Group Limited, 2013a and 2013b) and a further two trial pits were undertaken as part of the 2021 ground investigations (Card Geotechnics Limited, 2022) within Section F: Leavenheath/ Assington, the locations of which are shown on Figure 10.1 Superficial Geology (**application document 6.4**). The locations were concentrated in the location of the proposed cable sealing end (CSE) compound, at the intersection between the overhead and underground lines and identified the following stratigraphy. Table 2.7 describes the strata encountered within Section F: Leavenheath/Assington.

Table 2.7 – Encountered Geology within Section F: Leavenheath/Assington

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Topsoil	Firm, dark brown, gravelly sandy silty Clay, with occasional rootlets.	0.3 - 0.35	0.3 - 0.35
Lowestoft Formation	Firm to stiff, orangish to yellowish brown, sandy silty Clay with occasional gravel and cobbles of rounded to subrounded fine to coarse chalk and flint.	>1.4 - 7.2	>1.05 - 6.9
Kesgrave Catchment Subgroup	Medium dense to dense, orangish brown silty, clayey Sand with occasional fine to medium subrounded gravel and rare cobbles.	10.0 - 18.0	5.7 - 10.8
London Clay Formation	Firm to stiff, brown sandy silty Clay.	>20.0	>2.0 - >6.0

2.3.14 Groundwater was struck between 4.7m and 12.5m bgl, rising to between 3.9m and 11.2m bgl.

Section G: Stour Valley

2.3.15 Fifty-seven boreholes and two trial pits were undertaken within Section G: Stour Valley during the 2013, 2021 and 2022 ground investigations. Exploratory holes were located in the area of the proposed trenchless crossing beneath the River Stour, the Sudbury Branch Railway Line, along the Ansell's Grove trenchless crossing and along the underground section and CSE compound located to the south of Henny Back Road, the locations of which are shown on Figure 10.1: Superficial Geology (**application document 6.4**).

2.3.16 Across the majority of the Section G: Stour Valley away from the River Stour, the geology is characterised by a succession similar to other sections, with the Lowestoft Formation overlying the Kesgrave Catchment Subgroup and the London Clay Formation as described in Table 2.8. In the river valley within close proximity to the River Stour, the general geological sequence is characterised by Alluvium and River Terrace Deposits, directly overlying the Chalk as described in Table 2.9.

Table 2.8 – Encountered Geology within Section G: Stour Valley Away from the River Stour

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Topsoil	Firm, dark brown, sandy gravelly Clay, with occasional rootlets. Gravel is rounded to angular, fine to coarse flint.	0.2 - 0.45	0.3 - 0.45
Lowestoft Formation	Firm to stiff, light orangish brown or greyish brown, gravelly sandy silty Clay. Gravel is rounded to subangular flint and chalk.	1.2 - 2.95	0.95 - 3.4
Kesgrave Catchment Subgroup	Medium dense to very dense, light yellowish brown, silty clayey gravelly Sand or sandy Gravel. Gravel is rounded to subangular flint and quartzite.	9.0 - 10.4	5.6 - 9.2
Red Crag Formation	Medium dense, reddish brown, clayey gravelly Sand. Gravel is fine to medium subangular flint.	12.6 - 15.9	3.6 - 6.5
London Clay Formation	Stiff, dark brownish grey, sandy silty Clay.	>20.0	>4.1 - >7.4

2.3.17 Five PSD were undertaken on material recovered from near surface materials of the Lowestoft Formation (Four PSD) and Kesgrave Catchment Subgroup (one PSD) present between 0.5m and 1.5m bgl.

2.3.18 The PSD undertaken in the material described by the borehole logs as the Lowestoft Formation was described by the PSD as slightly gravelly, sandy, silty clay on the PSD soil description. The PSD indicated the clay fraction to be between 22% and 49%, the silt fraction to be between 22% and 32% the sand fraction to be between 20% and 47% and the gravel fraction to be between 5% and 10%.

2.3.19 The PSD undertaken in the material described by the borehole logs as Kesgrave Catchment Subgroup was described as gravelly clayey silty sand on the PSD soil description. The PSD indicates the clay fraction to be 7%, the silt fraction to be 19%, the sand fraction to be 59% and the gravel fraction to be 5%.

2.3.20 A further thirty-seven tests were undertaken within the proposed Ansell's Grove trenchless crossing during the 2022 ground investigation (Structural Soils Ltd, 2022). Twenty-one samples were undertaken in the superficial deposits that are described as either a clay or silt. The PSD indicated the clay fraction was between 5% and 39%, the silt fraction was between 21% and 69%, the sand fraction was between 4% and 50% and the gravel fraction was between 0% and 29%. A further sixteen were undertaken within the superficial material described as either a sand or a gravel. The PSD indicated the fines fraction was between 1% and 36%, the sand fraction was between 29% and 96% and the gravel fraction was between 0% and 62%. One sample also identified cobble fraction of 7%.

2.3.21 On the basis the PSD undertaken to date, the composition of the near surface superficial material in Section G: Stour Valley is anticipated to be variable.

Table 2.9 – Encountered Geology within Section G: Stour Valley, in the Vicinity of the River Stour

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Topsoil	Firm to stiff brown topsoil	0.3 - 0.4	0.3 - 0.4
Superficial Deposits	Clays/Silt: Soft grey clayey SILT or silty CLAY with beds of Peat comprising very soft, fibrous to amorphous clayey or silty Peat up to 2.65m thick.	5.5 – 12.4	5.1 – 10.8
	Sand: Loose to medium dense orangish brown fine to medium gravelly, silty, clayey SAND		
Chalk	Structureless Chalk comprised of very soft sandy gravelly SILT or Weak to moderately strong white CHALK as fine to medium angular gravel in a putty chalk matrix (Structureless Chalk) OR Moderately strong, white fractured CHALK, as fine to medium angular chalk gravel. (Structured Chalk)	>20.0	>10.0 - >17.0

2.3.22 Forty-five PSD test were undertaken within material obtained from the 2022 ground investigation (Structural Soils Ltd, 2022) at the proposed River Stour and Sudbury Branch Railway Line trenchless crossing. Fifteen samples were undertaken in the superficial deposits that are described as either a clay or silt. The PSD indicated the clay fraction was between 3% and 44%, the silt fraction was between 21% and 60%, the sand fraction was between 5% and 60% and the gravel fraction was between 1% and 23%.

2.3.23 A further twenty-eight were undertaken within the superficial material described as either a sand or a gravel. The PSD indicated the fines fraction was between 1% and 41%, the sand fraction was between 7% and 86% and the gravel fraction was between 0% and 90%. Three samples also identified a cobble fraction of between 2% and 6%.

2.3.24 One PSD was undertaken within the Chalk which identified a clay fraction of 21%, a silt fraction of 33%, a sand fraction of 39% and a gravel fraction of 7%. One PSD was also undertaken within the peat which identified a clay fraction of 9%, a silt fraction of 71%, a sand fraction of 18% and a gravel fraction of 2%.

2.3.25 On the basis of the PSD undertaken to date, the composition of the near surface superficial material adjacent to the River Stour is anticipated to be variable.

Section H: GSP Substation

2.3.26 A site specific ground investigation was undertaken within the GSP substation site in 2021 by Geotechnical Engineering Ltd (Jacobs, 2021).

2.3.27 The ground investigation comprised two dynamic sampling boreholes with rotary follow on to depths up to 12m below ground level (bgl) and included installation of groundwater monitoring pipework in one of the boreholes. The ground conditions encountered in the exploratory holes is described in Table 2.10.

Table 2.10 – Encountered Geology during Site Specific Ground Investigation

Geological Unit	Brief Description	Depth to Base (m bgl)	Thickness (m)
Topsoil	Soft, brown, sandy silty Clay, with some gravel and frequent roots.	0.35 - 0.4	0.35 - 0.4
Boulder Clay (Glacial Till) – assumed to be Lowestoft Formation	Firm to stiff, slightly gravelly sandy silty Clay.	6.65 - 7.6	6.35 - 7.2
Kesgrave Sand and Gravels	Very dense, fine Sand and dense slightly sandy fine and medium Gravel.	>9.5 - <12.0 (unproven)	>2.85 - >4.4 (unproven)

2.4 Designated Sites

2.4.1 There are no statutory designated sites for geological importance within 1km of the Order Limits (e.g. Sites of Special Scientific Interest designated for their geological importance). There is one notified Local Geological Site and two Potential Local Geological Sites within 1km of the Order Limits. These local sites are each designated because they contain sarsen stones within a churchyard. There are no notified or potential Local Geological Sites within the Order Limits.

3. Land Contamination

3.1 Introduction

3.1.1 The assessment of land contamination within the Order Limits has been undertaken following a staged approach as recommended by the guidance provided in Land Contamination Risk Management (LCRM) (Environment Agency, 2021). This presents a three-stage process to the management of contaminated land:

- Stage 1 – risk assessment;
- Stage 2 – options appraisal; and
- Stage 3 – remediation.

3.1.2 The Stage 1 risk assessment is undertaken in a phased manner comprising three tiers, as follows:

- Tier 1 – Preliminary Risk Assessment (PRA) – a qualitative assessment of historical and published information in order to develop a preliminary conceptual site model to inform a preliminary risk assessment;
- Tier 2 – Generic Risk Assessment – a quantitative assessment using published criteria to screen site specific ground condition data; and
- Tier 3 – Detailed Risk Assessment – a quantitative assessment involving the generation of site-specific assessment criteria.

3.1.3 This chapter provides a PRA (Tier 1) of ground conditions for the project and identifies locations where there is potential for significant sources of contamination. The results of the PRA form the basis for the baseline conditions and assessment within ES Chapter 10: Geology and Hydrogeology (**application document 6.2.10**).

3.2 Sources of Information

3.2.1 The following primary sources of information were used in the compilation of this assessment:

- Defra mapped information, via Magic.gov.uk (Defra, 2022c) for Source Protection Zones (SPZ), aquifer designations, hydrological features, groundwater vulnerability, drinking water safeguard zones and statutory designated sites;
- Locations for historical and active landfill sites (Environment Agency, 2020c; 2020d), permitted waste sites (Environment Agency, 2022a) and category 1 and 2 pollution incidents (Environment Agency, 2022b);
- Information provided from relevant planning authorities, including land with a potentially contaminative former use (Babergh and Mid Suffolk District Councils, 2021) (Braintree Council, 2021);
- Historical mapping (National Library of Scotland, 2022);
- Google Earth Historical Aerial Photography (Google Earth, 2022); and
- Historical Aerial Photography (Britain from Above, 2022).

3.3 Preliminary Risk Assessment

Initial Assessment

3.3.1 The first stage of the PRA was to undertake an initial assessment to determine potential locations for existing sources of contamination within the Study Area. The initial assessment was undertaken on the Study Area to identify sources of potential significant contamination. These were identified based on the historical and current land use information determined from a variety of information sources including historical ordnance survey mapping, aerial imagery and regulatory enquiries, as described in Section 3.2.

3.3.2 The sites were then given a classification score for their potential for generating contamination. The criteria used in this assessment for classifying hazards/potential for generating contamination is presented in Table 3.1, which has been developed using the guidance within LCRM (Environment Agency, 2021).

Table 3.1 – Criteria for Classifying Potential for Generating Contamination

Classification Score	Potential for Generating Contamination
Very Low	Land Use Examples: Residential, retail or office use, agriculture. Contamination Potential: Limited
Low	Land Use Examples: Recent small scale industrial and light industry Contamination Potential: Locally slightly elevated concentrations
Moderate	Land Use Examples: Railway yards, collieries, scrap yards, inert landfills Contamination Potential: Possible widespread slightly elevated concentrations and locally elevated
High	Land Use Examples: Heavy industry, non-hazardous landfills Contamination Potential: Possible widespread elevated concentrations

3.3.3 The initial assessment identified 40 locations with a low or very low potential for generating significant contamination and these were scoped out of further assessment. This was on the basis that there was no significant contamination source and therefore no source-pathway-receptor pollutant linkage which could result in significant effects. A list of these low and very low contamination potential sites is provided in Annex A: List of Scoped Out Sites.

3.3.4 An additional six sites were identified with a moderate and above potential for generating contamination, and these were taken forward for further assessment, which is presented in Annex B: Potentially Contaminated Former Use Sites.

Further Assessment

3.3.5 Six sites were taken forward for further assessment as these had been identified as having a moderate and above risk for potential existing contamination. Further desk based assessment was undertaken to identify pollutant linkages in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences.

3.3.6 A pollutant linkage consists of the following three elements:

- A source of contamination or hazard that has the potential to cause harm or pollution;
- A pathway for the hazard to move along / generate exposure; and
- A receptor which is vulnerable to the potential adverse effects of the hazard.

3.3.7 All three elements need to be present to lead to a potential risk.

3.3.8 Each tier of the Stage 1 risk assessment comprises the following four stages:

- Hazard Identification – which involves identifying potential contaminant sources within 250m of the Order Limits;
- Hazard Assessment – assessing the potential for unacceptable risks by identifying what pathways and receptors could be present, and what pollutant linkages could result (forming the Conceptual Site Model);
- Risk Estimation – predict what degree of harm or pollution might result and how likely); and
- Risk Evaluation – evaluating whether the risk is acceptable or whether further assessment, remediation or mitigation is required.

3.3.9 To determine the risk to the identified receptor, both the probability (Table 3.2) and the degree of harm to a potential receptor (consequence – Table 3.3) are used and the risk estimated for each pollutant linkage using the matrix in Table 3.4, which is based on standard industry guidance provided within the Construction Industry Research and Information Association (CIRIA) report C552, Contaminated Land Risk Assessment (CIRIA, 2001). The risk classifications are defined in Table 3.5.

Table 3.2 – Classification of Probability (Based on CIRIA, 2001)

Classification	Definition
High likelihood	There is a pollution linkage and an event either appears very likely in the short-term and almost inevitable over the long-term, or there is already evidence at the receptor of harm / pollution.
Likely	There is a pollution linkage, and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter-term.
Unlikely	There is a pollution linkage, but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table 3.3 –Classification of Consequence (Based on CIRIA, 2001)

Classification	Examples
Severe	Human health effect – exposure likely to result in 'significant harm' as defined in the Defra (2012) Part 2A Statutory Guidance Controlled water effect – short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to Environment Agency Category 1 incident (persistent and/or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture, or commercial value. Major fish kill. Ecological effect – short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings, or property
Medium	Human health effect – exposure could result in 'significant harm' Controlled water effect – equivalent to Environment Agency Category 2 incident requiring notification of abstractor Ecological effect – short-term exposure may result in a substantial adverse effect Damage to crops, buildings, or property
Mild	Human health effect – exposure may result in 'significant harm' Controlled water effect – equivalent to Environment Agency Category 3 incident (short lived and/or minimal effects on water quality) Ecological effect – unlikely to result in a substantial adverse effect Minor damage to crops, buildings, or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability)
Minor	No measurable effect on humans. Protective equipment is not required during site works Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects to crops, buildings, or property. The loss of plants in a landscaping scheme. Discolouration of concrete

Table 3.4 – Classification of Risk (Based on CIRIA, 2001)

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability	**High Likelihood**	Very High	High	Moderate	Low
	Likely	High	Moderate	Moderate	Low
	Low Likelihood	Moderate	Moderate	Low	Very low
	Unlikely	Low	Low	Very low	Very low

Note: This risk matrix applies to qualitative risk assessment only.

Table 3.5 – Risk Rating Definitions (Based on CIRIA, 2001)

Risk Classification	Description
Very high	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Preliminary Conceptual Site Model

Potential Sources of Contamination

3.3.10 The potentially contaminated site desk studies are presented in Annex B: Potentially Contaminated Former Use Sites, for each of the six locations identified by the initial assessment as requiring further assessment.

Potential Receptors

3.3.11 Potential receptors have been identified for each potential contamination source and are included within the individual desk studies in Annex B. Each receptor is allocated a sensitivity which is used to inform the consequence element of the risk estimation process.

Potential Exposure Pathways.

3.3.12 The potential pathways by which contaminants may affect the identified receptors have been identified for each potential contamination source and are included within Annex B: Potentially Contaminated Former Use Sites.

3.4 Conclusion

3.4.1 The qualitative risk assessment carried out for each potential contamination source, in accordance with the methodology set out in LCRM (Environment Agency, 2021) described above, is presented within the individual desk studies in Annex B.

3.4.2 The qualitative risk assessment undertaken for each pollutant linkage at each potential contamination source presented in Annex B, indicates that the worst-case risk estimation for any of the pollutant linkages is 'low'. A low risk is defined within Table 3.5 as '*it is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild*'.

Annex A: List of Scoped Out Sites

Table A.1 – Scoped Out Sites Within the Order Limits

Site Name/Ref	Address
12&181 - Unknown Quarry	North-east of Doves Cottage, Chattisham, IP8 3PX.
143 – Unknown Quarry	Unknown Quarry, South of Peyton Hall, Stone Street, Boxford, CO10 5NS
Boxford Suffolk Farms	Hill Farm, Boxford, Sudbury, CO10 5NY
18, 68, 126, 148 – Gravel Pit	Gravel Pit, Hill Farm, Brick Kiln Hill, Boxford, CO10 5NY
46, 127, 169 – Unknown Quarry	Unknown Quarry, Southeast of Mill House, Bures Road, Assington, CO10 5LZ
45, 75, 128 – Gravel Pit	Unknown Quarry, North of Mill House, Bures Road, Assington, CO10 5LZ
74 – Windmill Corn	Windmill Corn South of Mill House, Bures Road, Assington, CO10 5LZ
Bte325 – Unknown infill	58764, 237139

Table A.2 – Scoped Out Sites Within the Study Area

Site Name/Ref	Address
63 - Gravel Pit	Gravel Pit, West of Water Run Cottage, Chattisham, IP8 3PX
139 – Unknown quarry	Unknown Quarry, southeast of Doves Cottage, Chattisham, IP8 3PX
31, 62, 138 – Food and Drink Manufacturing	Chattisham Mill, Chattisham, IP8 3PX
180 – Sewage Works and Sewage Farm	Sewage Works, Duke Street, Hintlesham, IP8 3PP
43 - Unknown Quarry	Unknown Quarry, East of Sewage Works, Layham Road, Layham, IP7 5ND
11 – Septic Tank	Septic Tank, Layham, Ipswich, IP7 5RP
10 – Unknown Quarry	Unknown Quarry, West of Valley Farm, Rands Road, Layham, IP7 5RW.
67, 116, 144 – Old Sand Pit	Old Sand Pit, Southwest of Hightrees Farm, Holt Road, Polstead, CO6 5BU
115 – Unknown Quarry	Unknown Quarry, northeast of Nussteads, Boxford Road, Polstead, CO6 5DN
114 – Unknown Quarry	Unknown Quarry, South of Broomhill, White Street Green, Boxford, CO10 5JN.
113 – Unknown Quarry	Unknown Quarry, Southwest of Broomhill, White Street Green, Boxford, CO10 5JN

Site Name/Ref	Address
60– Unlabelled Quarry	Unlabelled Quarry, Northwest of Bramwell House, Colchester Road, Assington, CO10 5LX
61– Smithy	Smithy, St Enodoc, Marshalls Lane, Assington, CO10 5LS
189 – Garage	Garage, The Street, Assington, CO10 5LW.
76&186 – Assington Mill	Assington Mill, Mill Farm, Bures Road, Assington, CO10 5LZ.
34 – Gravel Pit	Gravel Pit, Southeast of Chestnut Grove, Bures Road, Assington, CO10 5NF
32, 81, 120, 168 – Unknown Quarry	Unknown Quarry, Wrights Plantation, Bures, CO8 5BW
79 & 166 – Unknown Quarry	Unknown Quarry, Warren Cottage, Bures, CO8 5BW
155 – Unknown Quarry	Unknown Quarry, North of Warren Cottage, Bures, CO8 5BW
90 – Sand Pit	Sand Pit, Off Sudbury Road, Bures, CO8 5JT
172 – Unknown Quarry	Unknown quarry, Oak Tree Cottage, Sudbury Road, Bures, CO8 5JT
104 – Domestic Heating Oil Tank	Gordon Hills, Slough Lane, Little Conard, Sudbury, CO10 0NY
101 – Unknown Quarry	Unknown Quarry, Lamarsh, Bures
100, 102, 173, 174 – Unknown Quarry	Unknown Quarry, Lamarsh, Bures
Small Unknown infill	TL 86804 36126
Bte229 – Small unknown infill	TL 86679 35063
Bte326 – Small unknown infill	TL 86804 36115
Bte296 – Small unknown infill	TL 85599 37328
Bte297 – Small unknown infill	TL 85166 37275
Bte223 – Small unknown infill	TL 84782 36800
Bte298 – Small unknown infill	TL 84046 36866
Bte301 – Small unknown infill	TL 84160 36187

Annex B: Potentially Contaminated Former Use Sites

Table B1.1 – Layham Quarry Landfill

Site Name Ref	Layham Quarry Landfill
Site Location and Description	Rands Road, Layham, Hadleigh, Suffolk, IP7 5RW. The site is located off Rands Road approximately 2km southwest of Hadleigh in Suffolk and located partially within the Order Limits. Based on aerial imagery dated 2021 the area to the north of Pope's Green Lane comprises a mixture of grassy scrub and small copses/areas of informal woodland. The area to the south of Pope's Green Lane appears to be in agricultural use (open fields). The site is operated by Brett Aggregates but is understood not to have been operational since before 2013. Based on a review of historical aerial imagery (Google Earth, 2000-2021), it appears that the part of the quarry the Order Limits cross has previously been worked and at least partly restored. This was confirmed during a meeting between Brett Aggregates and Burton Knowles on 23 September 2021. An extension to Layham Quarry has previously been put forward for consideration following a call for sites and has since been included within the Suffolk Minerals and Waste Local Plan (2020). However, it is understood that this section has not yet been worked based on discussions with Brett Aggregates and a review of Google Earth aerial photography (Google Earth, 2022). The site was licenced to receive inert waste, which was used to infill the resulting void from the quarrying activities and was permitted from December 2006 until May 2018. The status description from the permit, available from the Environment Agency public register (Environment Agency, 2022) is described as being in closure. A further permit was issued in 2013 for '*mining waste operations'*
Site History	The earliest Ordnance Survey (OS) mapping reviewed, dates from 1896 and shows the site to be undeveloped and agricultural land. Google Earth aerial imagery from 2000 indicates earthworks assumed to be related to mineral extraction activity. Subsequent available Google Earth aerial imagery from 2007 to 2013 shows the site continuing to be worked with subsequent infilling and restoration. By the 2018 aerial imagery the site appears to have been fully restored, with the exception of the entrance section.
Other Pertinent Information	A review of the planning portal for Babergh and Mid Suffolk Council (2022) and Suffolk County Council (2022) indicates that consent for mineral extraction was first granted in 1959 followed by applications in 1998, 2001 and 2003 for extensions to the original quarrying area. In 1993 an application was granted for landfilling within part of the site previously excavated and to restore the area for agriculture. Further extensions for landfilling were granted in 1998 and 2000. In 2013, an application was submitted to extend the dates of infilling by a further 15 years, meaning landfilling is to cease by March 2028 and restoration

	completed by September 2028. However, the accompanying plans indicate this area of the site is to the south of the Order Limits. As discussed above, the landfill, permit for Layham Quarry indicates that the northern section is in closure A further planning application was submitted in 2019 for the section to the south of Pope's Green Lane, outside of the Order Limits, to extend the extraction date of the mineral to April 2032 with restoration completed by October 2033. Within this application it states that the northern section of Layham Quarry which the order limits crosses will be used as a plant and processing area.
Geology	The BGS GeoIndex (2022) indicates that the superficial geology at the site is predominantly found to be absent over large parts of the quarry, and when compared to the 1:50,000 geological map this correlates to areas of worked ground. It is therefore likely that there were superficial which have been excavated as part of the quarry operations. The GeoIndex and the maps indicate the presence of the Lowestoft Formation and Kesgrave Catchment Subgroup in the wider area overlying the solid geology. The 1:50,000 map also indicated an area of infilled ground within the site, and this corresponds with the landfill area as shown on the environmental data. The bedrock at the site predominantly comprises the Red Crag Formation (sand), with a small area in the north of the site where the Chillesford Church Sand Member (sand) is present.
Hydrogeology	The Red Crag Formation, that underlies the majority of the site is classified as a Principal Aquifer, whilst the superficial deposits of the Lowestoft Formation and the Kesgrave Catchment Subgroup are classified as Secondary Undifferentiated Aquifer and a Secondary A Aquifer respectively, where they are present. The site is also located within a Groundwater SPZ 3.
Hydrology	The site is located in the Brett Water Body which has been given a moderate ecological status and a fail chemical status as of 2019 (Environment Agency, 2022).
Environmental Setting	The site is located within a nitrate vulnerable zone and a surface water drinking water safeguard zone.
Potential for Generating Contamination	Low/Moderate
Potential Contaminants	Heavy metals, ash, clinker, sulphates, hydrocarbons, ground gas.
Potential Receptors	Human Health – Construction workers, groundwater, surface water

Table B1.2 – Layham Quarry Landfill Risk Estimation

Potential Source	Potential Pathway	Potential Receptors and Sensitivity	Classification of Consequence	Classification of Probability	Risk Rating
Inert Fill	Ingestion, inhalation, direct dermal contact	Construction Workers (high sensitivity)	Mild with appropriate personal protective equipment (PPE) and good practice measures.	Unlikely. The landfill is not anticipated to contain significantly contaminative materials based on it being an inert landfill. It is assumed that construction workers will wear appropriate PPE and follow appropriate protocols for unexpected contamination. In addition, there is not expected to be any confined spaces for any ground gases to accumulate and landfill gas generation is not anticipated as this is an inert landfill.	Very Low
	Leaching, migration, deposition	Groundwater (high sensitivity)	Medium	Unlikely. The landfill is inert and therefore not anticipated to contain material likely to be significantly contaminative. In addition, based on the dates of the infilling it is anticipated to have a barrier in place in accordance with the landfill directive.	Low
		Surface Water (medium sensitivity)	Mild		Very Low

Table B2.1 – Bramford Substation

Site Name/Ref	1 – Bramford Substation
Site Location and Description	Bullen Lane, Bramford. The site comprises an electrical substation which covers approximately 0.12km^2. The site is located off Bullen Lane, approximately 2km west of Bramford and is located adjacent to the Order Limits. Based on aerial imagery dated 2021, the substation is covered in hardstanding – particularly where the equipment is located. There are some areas around the edges of the site where the hardstanding appears to be absent and there are some storage compounds. The site is surrounded by a mixture of woodland and open fields.
Site History	The earliest OS mapping reviewed, dated 1885-1900, shows the area labelled as Bullen Wood with no evidence of the substation. From aerial photography held by Historic England, dated 1962, it appears that tree clearance has taken place within Bullen Wood to facilitate the substation Google Earth aerial imagery from 2012 to 2021 shows the gradual expansion of the substation.
Geology	The BGS GeoIndex (2022) indicates that the superficial geology at the site comprises the Lowestoft Formation described as chalky till. The superficial deposits are underlain by bedrock of the Thames Group comprising clay, silt and sand.
Hydrogeology	The Thames Group, which forms the bedrock at the site, is classified as unproductive strata, whilst the superficial deposits of the Lowestoft Formation are classified as a Secondary Undifferentiated aquifer. The site is also located within a groundwater SPZ 3.
Hydrology	A stream is located approximately 450m to the southwest of the site. The site is located within the Belstead Brook Water Body which has a poor ecological status and a fail chemical status in 2019 (Environment Agency, 2022).
Environmental Setting	The site is located within a Nitrate Vulnerable Zone, and adjacent (on the eastern side) to, ancient woodland of Bullen Wood.
Potential for Generating Contamination	Moderate
Potential Contaminants	Polychlorinated biphenyl (PCB), heavy metals, hydrocarbons, solvents, oils
Potential Receptors	Human Health – Construction/maintenance workers, groundwater, surface water

Table B2.2 – Bramford Substation Risk Estimation

Potential Source	Potential Pathway	Potential Receptors and Sensitivity	Classification of Consequence	Classification of Probability	Risk Rating
Contaminated Ground	Ingestions, inhalation, direct dermal contact	Construction/maintenance Workers (high sensitivity)	Medium	Unlikely. The nature of the anticipated geology at the site and the presence of hard standing would inhibit the movement of any potential contamination. In addition, the substation is outside the Order Limits with the nearest works likely to cause ground disturbance is approximately 150m from the substation boundary which is unlikely to disturb any existing contamination.	Low
	Leaching, migration, deposition	Groundwater (low sensitivity)	Mild	Unlikely due to the presence of a relatively thick layer of the very low permeability Thames group which will inhibit the downward migration of any potential contamination into the underlying chalk formation, which the SPZ 3 is associated with.	Very Low
		Surface Water (low sensitivity)	Mild	Unlikely. The potential contamination that could be present at the substation is expected to comprise relatively immobile compounds and the nearest surface water feature is located approximately 450m to the southwest of the site. The works located close to the substation comprise the removal of pylons and is unlikely to require any ground disturbance, the nearest new pylon is located approximately 200m away from the boundary of the Substation.	Very Low

Table B3.1 – Pond Hall Industrial Estate

Site Name/Ref	107 – Pond Hall Industrial Estate
Site Location and Description	Pond Hall Industrial Estate, Pond Hall Road, Hadleigh, Ipswich, IP7 5PW. The site is located directly south of Pond Hall Road, approximately 2km to the southeast of Hadleigh and approximately 200m northwest of the Order Limits. It comprises approximately six large buildings with associated parking and green space. The industrial estate includes an aluminium foundry, a manufacturer of sailing boat masts and rigging, and a cosmetics lab. There also appears to be a scrapyard towards the southern part of the site. The industrial estate is surrounded by open fields.
Site History	The earliest mapping reviewed, dated 1885 to 1900 shows the site to be an undeveloped field to the southwest of Pond Farm. The site remains largely unchanged until the mapping dated 1945-1965 which indicates one large and two smaller buildings in the north of the site adjacent to the main road. The earliest available Google Earth aerial imagery for this area is dated 2000 and shows the industrial estate to be constructed in its present-day form, Subsequent aerial imagery shows the site has remained largely unchanged since 2000.
Geology	The BGS GeoIndex (2022) indicates that the superficial geology at the site comprises the Lowestoft Formation, described as chalky till. The superficial deposits are underlain by bedrock of the Thames Group comprising clay, silt and sand.
Hydrogeology	The Thames Group, which forms the bedrock at the site, is classified as unproductive strata, whilst the superficial deposits of the Lowestoft Formation are classified as a Secondary Undifferentiated aquifer. The site is also located within a groundwater SPZ 3.
Hydrology	A small unnamed stream is located approximately 200m to the east of the site, flowing approximately north/south, and forming a tributary of the River Brett. The site is in the Brett water body which has a designated moderate ecological status and a fail chemical status as of 2019 (Environment Agency, 2022).
Environmental Setting	The site lies within a nitrate vulnerable zone and a surface water drinking water safeguard zone.
Potential for Generating Contamination	Moderate
Potential Contaminants	Heavy metals, inorganic and organic compounds, solvents, fuels, PCB.
Potential Receptors	Human health – Construction/maintenance workers, groundwater, surface water
Risk Assessment	There is a moderate potential for contamination at the site, but the nature of the anticipated geology would inhibit movement of any potential contamination. The industrial estate is outside of the Order Limits and therefore there are no works proposed at the site that could disturb any existing contamination and therefore a pollutant linkage has not been identified for human health or controlled waters and the site is not considered further.

Table B4.1 – Hadleigh Railway Walk – Former Great Eastern Railway

Site Name/Ref	58 – Hadleigh Railway Walk – Former Great Eastern Railway
Site Location and Description	Hadleigh Railway Walk, Hadleigh, IP7 5JD. The site consists of Hadleigh Railway Walk, which follows the route of the disused railway line that once linked Hadleigh to London in an approximate northwest to southeast direction. The walk comprises a dirt track which is surrounded by mature trees. The walk is surrounded by open fields.
Site History	The earliest historical OS mapping reviewed, dated 1885 to 1900, shows the Great Eastern Railway (Hadleigh Branch) which is located within a cutting where the Order Limits cross the line. The maps indicates that during the early 1970's the Hadleigh Railway Branch was dismantled. Google Earth aerial imagery of the area is available from 2000 and shows the railway tracks have been removed and a semi formal path in place of the line, with little further change to the area noted.
Geology	The BGS GeoIndex (2022) indicates that the bedrock geology at site comprises the Thames Group, comprising clay, silt and sand, which is overlain in the northern part by superficial deposits of the Kesgrave Catchment Subgroup, comprising sand and gravel, The superficial deposits are indicated to be absent in the southern part. The site could be underlain by a limited thickness of Made Ground, due to its prior use as a railway line.
Hydrogeology	The Thames Group, which formed the bedrock at the site is classified as unproductive strata, whilst the overlying superficial deposits of the Kesgrave Catchment Subgroup classified as a Secondary A aquifer. The site is also located within a groundwater SPZ 3.
Hydrology	The site is located within the Brett Water Body catchment which has a moderate ecological status and a fail chemical status as of 2019. A tributary of the River Brett crosses the walk approximately 100m to the south of the Order limits (Environment Agency, 2022).
Environmental Setting	The site lies within a nitrate vulnerable zone and a surface water drinking water safeguard zone.
Potential for Generating Contamination	Moderate
Potential Contaminants	Made ground – hydrocarbons, PCB, polyaromatic hydrocarbons (PAH), solvents, heavy metals, sulphates, ash and fill
Potential Receptors	Human health – Construction/maintenance Workers, groundwater, surface water
Risk Assessment	There is the potential for limited Made Ground and a moderate potential for contamination to be present associated with the former railway line. However, this section of the Order Limits is within an area of overhead line where the pylons are not expected to intercept the historical railway land. Therefore, there is unlikely to be a potential pollutant linkage and this site is not considered further.

Table B5.1 – Assington Scrapyard

Site Name/Ref	187–Scrapyard
Site Location and Description	Barracks Road, Assington, CO10 5LP. The site is located to the south of Barracks Road, approximately 650m southeast of Assington and is currently being used by a car breaker and scrap metal company, with a vehicle repair garage in the north of the site. The site is located approximately 120m to the north of the Order Limits and is mostly covered by hardstanding The site is surrounded generally by agricultural land to the east and south, farm buildings to the north and residential buildings to the west.
Site History	The earliest OS mapping reviewed dates from 1896 and shows the site to be undeveloped agricultural land. Google Earth aerial imagery of the site is available from 2000 and shows the site to be in use as a car scrap site, and this remains largely unchanged until the 2012 aerial imagery appears to indicate some development of the site takin place, but later imagery indicates continued use of the site as a scrap yard. Between 2017 and 2018, the site was extended towards the south, up to the boundary with the Order Limits, and used for car storage Subsequent aerial imagery appears to show the southern part of the site as being unused and returned to open fields.
Geology	The BGS GeoIndex (2022) indicates that the site is underlain by superficial deposits of Alluvium comprising clay, silt, sand and gravel and the bedrock geology comprises the London Clay Formation, described as clay, silt and sand. Underlying the London Clay Formation is likely to be the Lambeth Group and White Chalk Subgroup.
Hydrogeology	The London Clay is classified as unproductive strata, whilst the Alluvium is classified as a secondary undifferentiated aquifer. The site is also located within a groundwater SPZ 3.
Hydrology	An unnamed stream flows through the centre of the site from north to south and subsequently flows into the River Stour. The site lies within the Stour (Lamarsh – R. Brett) Water Body (based on the Environment Agency Catchment Data Explorer), which has a moderate ecological status and a fail chemical status as of 2019.
Environmental Setting	The site lies within a nitrate vulnerable zone and a surface water drinking water safeguard zone.
Potential for Generating Contamination	Moderate
Potential Contaminants	Hydrocarbons and additives (methyl tert-butyl ether (MTBE) etc), heavy metals, solvents
Potential Receptors and Pathways	Human Health – Construction/maintenance Workers Groundwater Surface Water

Table B5.2 – Assington Scrapyard Risk Estimation

Potential Source	Potential Pathway	Potential Receptors and Sensitivity	Classification of Consequence	Classification of Probability	Risk Rating
Contaminated Ground	Ingestion, inhalation and direct dermal contact	Construction /maintenance workers (high sensitivity)	Mild with appropriate PPE and best practice measures.	Low. Based on the site being outside of the Order Limits and the potential for the site to be impacting areas within the Order Limits is low. The hardstanding at the site and the anticipated geology, comprising mostly of clays, will inhibit the movement of any contaminants into and through the ground.	Low
	Leaching, migration, deposition	Groundwater (high sensitivity based on Chalk Aquifer)	Mild	Low due to the presence of a relatively thick layer of the relatively impermeable London Clay Formation which is preventing the downward migration of contamination into the sensitive strata of the chalk formation, which the SPZ 3 is in relation to. The site is also covered in hardstanding, limiting the movement of contamination into the underlying Alluvium.	Low
		Surface water	Mild	Low. There is a low likelihood that contamination could have migrated or leached into surface water as widespread gross contamination is considered unlikely at the site and the site is covered in hardstanding limiting the movement of contamination into the underlying ground. In addition, attenuation and dispersion is likely, meaning that any slightly elevated concentrations that would cause an impact to controlled waters is unlikely.	Low

Table B6.1 – Great Eastern Railway Line

Site Name/Ref	23 – Great Eastern Railway Line (Sudbury Branch)
Site Location and Description	Great Eastern Railway Line which connects Sudbury with Colchester and runs in an approximately north to south direction. Approximately 250m section of current railway line crosses the Order Limits. The railway line is surrounded by open fields.
Site History	The earliest mapping reviewed, dated 1885-1900 shows the railway line in the same alignment as currently. Google Earth aerial imagery for the site is available from 1945 and shows no significant changes having been made to the railway since its construction.
Geology	The BGS GeoIndex (2022) indicates that the geology at the site comprises superficial deposits of Alluvium described as clay, silt, sand and gravel, underlain by River Terrace Deposits described as sand and gravel. The bedrock strata, which underlies the superficial deposits comprises the Lewes Nodular Chalk Formation and the Seaford Chalk Formation (undifferentiated). It is also anticipated that the site is underlain by a limited thickness of Made Ground associated with the railway line.
Hydrogeology	The chalk bedrock which underlies the site is classified as a Principal aquifer. The overlying superficial deposits are classified as Secondary A superficial aquifers. The site is also located within a groundwater SPZ 3.
Hydrology	The site is located within the Stour (Wixoe – Lamarsh) Water Body catchment which has a Moderate ecological status and a fail chemical status as of 2019. The closest water feature to the site is the River Stour located approximately 450m to the east within the Order Limits and is crossed by the railway approximately 50m north of the Order Limits.
Environmental Setting	The site lies within a nitrate vulnerable zone and a surface water drinking water safeguard zone. The area also falls into the Stour Valley Project.
Potential for Generating Contamination	Low/Moderate
Potential Contaminants	Made ground – hydrocarbons, PCB, PAH, solvents, heavy metals, sulphates, ash and fill
Potential Receptors and Pathways	Groundwater, surface water, human health, ecological systems

Table B6.2 – Great Eastern Railway Line Risk Estimation

Potential Source	Potential Pathway	Potential Receptors and Sensitivity	Classification of Consequence	Classification of Probability	Risk Rating
Contaminated Made Ground	Ingestion, inhalation, direct dermal contact	Construction workers (high sensitivity)	Mild with appropriate PPE and best practice measures.	Unlikely as the trenchless crossing is unlikely to intercept made ground and come into contact with contamination.	Very Low
	Leaching, migration, deposition	Groundwater (high sensitivity), and surface water	Medium	Unlikely to intercept made ground and come into contact with contamination.	Low

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