The Great Grid Upgrade

Sea Link

# Sea Link

**Volume 6: Environmental Statement**

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**Part 2 Suffolk**
**Chapter 5 Appendix 2.5.B**
**Qualitative Groundwater Risk Assessment**

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# 1. Introduction

## 1.1 Overview

1.1.1 This preliminary groundwater risk assessment appendix has been produced to inform **Application Document 6.3.2.5 Part 2 Suffolk Chapter 5 Geology and Hydrogeology**, of the Environmental Statement. This appendix has been prepared to provide baseline information regarding the groundwater (hydrogeology) and a preliminary groundwater risk assessment.

1.1.2 As described in **Application Document 6.3.2.5 Part 2 Suffolk Chapter 5 Geology and Hydrogeology** of the Environmental Statement the study area for hydrogeology comprises the physical extents of the Order Limits plus a buffer of 500 m.

## 1.2 Structure of the Appendix

1.2.1 The structure of this assessment is as follows:

- **Chapter 1 Introduction** (this section) – provides an introduction to the assessment and sources of information consulted;
- **Chapter 2 Methodology** – which presents information on the methodology followed in this appendix and the accompanying classification tables;
- **Chapter 3 Abstraction Data** – which contains information received from the relevant authorities regarding abstractions, deregulated abstractions and private water supplies; and
- **Chapter 4 Qualitative Groundwater risk assessment** – which presents an assessment of the groundwater risks of each element of the Proposed Project using a combination of receptor identification and associated sensitivity and magnitude of the potential risk.

## 1.3 Sources of information

1.3.1 This baseline appendix is informed by a desk-based study of available information, including maps, geological data, selected data collected from ground investigations and other publicly available data. The following is a list of the key sources of information used to inform the desk study:

- British Geological Survey (BGS) 1:50,000 scale geological mapping (British Geological Survey, 2024);
- BGS Geoindex Viewer (British Geological Survey, 2024);
- BGS Hydrogeological Map of Southern East Anglia (British Geological Survey, 1981);
- Defra mapped information, via the MAGIC website (Defra, 2024) for Source Protection Zones (SPZ), aquifer designations, hydrological features, groundwater vulnerability, drinking water safeguard zones and statutory designated sites;

- Groundwater abstraction data from the Environment Agency and private water supply information from East Suffolk District Council; and
- Selected ground investigation data from the interpretative reports undertaken by Mott MacDonald, included as **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report – Suffolk** and **Application Document 6.3.2.5.E Quantitative Risk Assessment – Suffolk**.

# 2. Methodology

2.1.1 This preliminary risk assessment for groundwater has been based on standard industry guidance provided within the Construction Industry Research and Information Association (CIRIA) report C552, Contaminated Land Risk Assessment (CIRIA, 2001). To determine the risk to the identified receptor, both the probability (Table 2.1) and the degree of harm to a potential receptor (consequence - Table 2.2) are used and the risk estimated using the matrix in Table 2.3. The risk classifications are defined in Table 2.4.

## Table 2.1 Classification of probability

| 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 2.2 Classification of consequence

| Classification | Examples |
|---|---|
| Severe | 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.<br>Ecological effect – short-term exposure likely to result in a substantial adverse effect. |
| Medium | Controlled water effect – equivalent to Environment Agency Category 2 incident requiring notification of abstractor.<br>Ecological effect – short-term exposure may result in a substantial adverse effect. |

| Classification | Examples |
|---|---|
| Mild | Controlled water effect – equivalent to Environment Agency Category 3 incident (short lived and/or minimal effects on water quality).<br>Ecological effect – unlikely to result in a substantial adverse effect. |
| Minor | Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. |

## Table 2.3 Classification of risk

| | 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 |

## Table 2.4 Risk rating definitions

| 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. |

# 3. Abstraction Data

## 3.1 Licenced and deregulation groundwater abstractions

3.1.1 Information providing licensed groundwater abstractions and deregulated groundwater abstractions has been provided by the Environment Agency in response to a data request and is presented in Table 3.1 and Table 3.2. There are no licensed or deregulated groundwater abstractions indicated within the Order Limits. The locations of the abstractions identified within the study area are shown on **Application Document 6.4.2.5.3 Groundwater Receptors**.

### Table 3.1 Licenced groundwater abstractions within study area

| Abstraction License Number | Purpose | Use | Grid Reference | Approximate Distance from the Order Limits (m) |
|---|---|---|---|---|
| AN/035/0005/014 | Water Supply | Drinking, cooking, washing | TM 4456 5891 | 220 |
| 7/35/05/*G/0046 | Industrial, Commercial and Public Services | Spray Irrigation - Direct | TM 4475 5809 | 500 |
| 7/35/05/*G/0008 | Agriculture | Spray Irrigation - Direct | TM 4142 6020 | 335 |
| 7/35/03/*G/0001 | Agriculture | Spray Irrigation - Direct | TM 4280 6120 | 150 |

### Table 3.2 Deregulated groundwater abstractions within study area

| Abstraction License Number | Purpose | Use | Grid Reference | Approximate Distance from the Order Limits (m) |
|---|---|---|---|---|
| 7/35/04/*G/0085 | Agriculture | General farming and domestic | TM 4042 6173 | 175 |
| 7/35/05/*G/0011 | Agriculture | General farming and domestic | TM 4580 5779 | 330 |

## 3.2 Groundwater Private water supplies

3.2.1 Data describing private water supplies has been provided by East Suffolk District Council in response to a data request and is presented in Table 3.3. There are no groundwater private water supplies indicated to be present within the Order Limits. The locations of the private water supplies identified within the study area are shown on **Application Document 6.4.2.5.3 Groundwater Receptors**.

## Table 3.3 Groundwater private water supplies within study area

| Abstraction Reference | Purpose | Class of Supply | Grid Reference | Approximate Distance from the Order Limits (m) |
|---|---|---|---|---|
| 00/00010/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4094 6074 | 100 |
| 00/00489/PWWELL | Domestic Residential | Small Supply | TM 3993 6038 | 90 |
| 00/00196/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4265 6038 | 280 |
| 04/00001/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4279 5911 | 450 |
| 00/00157/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4411 5808 | 375 |
| 00/00527/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4412 5813 | 355 |
| 00/00509/PWWELL | Commercial | Holiday Let | TM 4407 5811 | 310 |
| 00/00242/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4404 5810 | 300 |
| 00/00197/PWBORE | Domestic Residential | Small Supply | TM 4381 5841 | 60 |
| 00/00367/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4409 5839 | 270 |
| 00/00158/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4564 5832 | 30 |
| 00/00491/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4367 5816 | 50 |
| 00/00160/PWWELL | Domestic Residential | Single Domestic Dwelling | TM 4419 5798 | 500 |

# 4. Qualitative groundwater risk assessment

## 4.1 Overhead line

4.1.1 Within the Suffolk Onshore Scheme there is currently proposed to be 2 new pylon locations (under the scenario where Friston substation is built as part of the Proposed Project).

### Dewatering

4.1.2 Within the section of new overhead line groundwater is not expected to be encountered by the shallow excavations, based on the information obtained from the ground investigation report, included as **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report - Suffolk**. Therefore, dewatering and discharges are unlikely to be required within these areas and changes in groundwater levels or flow pathways are not anticipated.

### New Flow Pathways

4.1.3 Ground disturbance during construction could create new groundwater flow pathways, where permeable materials or flow routes are introduced through piling or through permeable backfill material, allowing movement of existing contamination or mixing of aquifers. However, as shown in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment** a worst case, low risk of contamination is expected within the Order Limits. Information obtained from the Mott Macdonald Generic Quantitative Risk Assessment (GQRA), included in **Application Document 6.3.2.5.E Appendix 2.5.E Quantitative Risk Assessment – Suffolk**, indicates that there were no recorded exceedances of the assessment criteria for a commercial land use within the soils tested. However, the GQRA indicates that exceedances of some potential contaminants were recorded within the groundwater samples from across the site. Therefore, there is considered to be a very low risk of mobilising any existing contamination in soil through ground disturbance but there is a low/moderate risk of mobilising existing contamination in the groundwater (through the creation of new flow pathways). Commitment GH02 in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** requires the selection of appropriate piling techniques (to minimize the risk of the mixing of aquifers) and a Foundation Works Risk Assessment to be undertaken at all locations where piling is proposed, and therefore risks associated with creation of new flow/contamination pathways are considered to be very low.

### Infiltration and recharge

4.1.4 Effects on infiltration and recharge of groundwater may arise if the permeability of the ground surfaces is changed. However, within the areas of new overhead line the Proposed Project only requires minimum areas of new hard standing, including pylon bases. This means that changes to infiltration and recharge are not anticipated, and therefore it is considered that there is a very low risk to groundwater and groundwater receptors , or groundwater flow pathways.

## 4.2 Underground cables (opencut method)

4.2.1 The depth of the trenches for sections of underground cable being constructed via opencut methods are anticipated to be typically 1.5 m depth below ground level (bgl) with the joint bays needing to extend to around 2.0 m bgl as described in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**.

4.2.2 During ground investigations undertaken for the Proposed Project boreholes were undertaken within the vicinity of the opencut trenches and the ground conditions have been described within the Mott Macdonald Ground Investigation Report, included in **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report – Suffolk**, and a summary reproduced below.

### Table 4.1 Summary of ground conditions within opencut trenches

| Geological Unit | Typical Description | Depth to base (m bgl) | Thickness (m) |
|---|---|---|---|
| Topsoil | Grass or crops overlying brown slightly gravelly clayey or silty fine SAND with frequent rootlets | 0.20 – 0.60 | 0.30 – 0.50 |
| Made Ground (encountered in 3 locations) | Brown gravelly silty fine to medium SAND with frequent rootlets. Gravel is angular to rounded flint, chalk, mudstone occasional brick and pottery fragments. | 0.20 – 0.95 | 0.20 – 0.95 |
| Lowestoft Formation – Diamicton | Firm becoming stiff friable light greenish brown mottled orangish brown, slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded chalk. | >4.10* | >3.60* |
| Lowestoft Formation – Sand and Gravel | Yellowish or orangish brown slightly to very gravelly slightly to clayey or silty to very silty fine to coarse SAND. Local low cobble content of angular flint. Gravel is subangular to subrounded coarse quartz/quartzite, flint, chalkand mudstone | 3.80 - >4.20* | 3.50 - >3.90 |
| Possible Crag Group (Chillesford Church Clay Member) | Soft friable thinly laminated orangish brown mottled light grey and reddish brown slightly sandy silty CLAY with occasional iron staining. | >4.00* | >0.20* |

*Base/thickness not proven

4.2.3 The information presented above indicates that the opencut trenched sections are likely to be located within the upper parts of the Lowestoft Formation.

## Dewatering

4.2.4 Information from the ground investigation indicates that groundwater was not encountered within the depth of the proposed opencut trench sections at the exploratory hole locations. Therefore, dewatering and discharges are unlikely to be required within these areas and changes in groundwater levels or flow pathways are not anticipated.

## New Flow Pathways

4.2.5 Ground disturbance during construction could create new groundwater flow pathways, where permeable materials or flow routes are introduced through trenches or permeable backfill material, allowing movement of existing contamination or mixing of aquifers. As shown in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment** a worst case low risk of contamination is expected within the Order Limits. Information obtained from the Mott Macdonald GQRA, included in **Application Document 6.3.2.5.E Appendix 2.5.E Generic Quantitative Risk Assessment – Suffolk**, indicates that there were no recorded exceedances of the assessment criteria for a commercial land use within the soils tested. Therefore, there is considered to be a very low risk of mobilising any existing contamination in soils, through ground disturbance. In the context that the open cut trenches are not anticipated to encounter groundwater, then it is considered there is also a very low risk of mobilising any existing contamination in groundwater – through creation of new flow pathways. The open cut trenches are also unlikely to connect two aquifer units due to the anticipated, relatively shallow, depth of the open cut trenches and the anticipated depth to groundwater (below base of open cut trench).

# 4.3 Underground cables (Trenchless crossings)

4.3.1 One trenchless crossing is currently proposed within the Suffolk Onshore Scheme part of the Proposed Project, as described in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**. This comprises the onshoring/landfall location of the Proposed Project at Aldeburgh.

4.3.2 It is anticipated that the trenchless crossing at the landfall location will be drilled in one section, bringing the offshore cables onshore. The trenchless horizontal directional drill (HDD) section is anticipated to be approximately 1,500 m in length and would reach a depth of approximately 17 to 25 m below ground level for the majority of the length, but rising to near surface at the landfall location. Therefore, it would intercept the Crag Group and the underlying London Clay (see below).

4.3.3 The trenchless HDVC HDD does not require dewatering itself, however there is the potential for dewatering to be required at the launch pits depending on the groundwater levels. The depth of the launch pits is likely to be around 2.0 m below ground level to allow the installation of the joint bay as described in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**.

4.3.4 During the ground investigation a borehole (RedP-BH-4) and a trial pit (F22-TP222A) were undertaken within the vicinity of the launch/reception pit (transitional joint bay) at the landfall at Aldeburgh and a copy of the records for these exploratory holes is contained within the Structural Soils Factual Report (Structural Soils Ltd, 2024). A summary of the strata encountered in the exploratory hole locations is presented in Table 4.2.

## Table 4.2 Summary of ground conditions at the trenchless crossing launch pit

| Geological Unit | Description | Depth to Base (m bgl) | Thickness (m) |
|---|---|---|---|
| Topsoil | Orangish brown slightly gravelly SAND with rootlets | 0.30 - 0.35 | 0.30 - 0.35 |
| Crag Group | Medium dense to very dense orange mottled orangish brown slightly gravelly SAND with occasional shell fragments. Gravel is subangular to subrounded flint and cemented sand | >4.00* - 20.50 | >3.70* - 20.15 |
| London Clay Formation | Stiff to very stiff laminated very closely to closely fissure CLAY | >30.45* | >9.95* |

*Base not proven

### Dewatering

4.3.5 Based on the Ground Investigation Report by Mott Macdonald, included in **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report – Suffolk**, and the data presented within the factual ground investigation report (Structural Soils Ltd, 2024) groundwater was not encountered within RedP-BH-4 (drilled to a depth of 30 m bgl) and F22-TP222A (terminated at 4 m bgl). Therefore, groundwater is unlikely to be intercepted in the launch/reception pit and dewatering of the launch/receptor pits is unlikely to be required.

### New Flow Pathways

4.3.6 Ground disturbance during construction could create new groundwater flow pathways, where permeable materials or flow routes are introduced through permeable backfill material or through the construction of trenchless crossings, allowing movement of existing contamination or mixing of aquifers.

4.3.7 As shown in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment** a worst case, low risk of contamination is expected within the Order Limits. Information obtained from the Mott Macdonald GQRA, included in **Application Document 6.3.2.5.E Appendix 2.5.E Generic Quantitative Risk Assessment – Suffolk**, indicates that there were no recorded exceedances of the assessment criteria for a commercial land use within the soils tested. However, the GQRA indicates that exceedances of some potential contaminants were recorded within the groundwater samples from across the site Therefore, there is considered to be a very low risk of mobilising existing contamination in soils through ground disturbance, but there is a low/moderate risk of mobilizing existing contamination in the groundwater (through the creation of new flow pathways).

4.3.8 The trenchless HVDC is also unlikely to connect aquifers as it remains within the Crag Formation (or Unproductive London Clay) for its full length. Also, whilst it has been identified that there is a moderate risk of existing contamination in the groundwater, Commitment GH02 in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** requires a Foundation Works Risk Assessment (to identify and minimize risks to groundwater) to be undertaken at all locations where trenchless crossings are proposed, and therefore risks associated with creation of new flow/contamination pathways are expected to be very low.

## Saline intrusion assessment

4.3.9 The proximity of the landfall location to the coast poses a potential risk to groundwater (freshwater) aquifers from saline (seawater) intrusion. There is generally a natural gradient for groundwater towards the coast, but because seawater is slightly heavier than freshwater, seawater often intrudes to some extent into aquifers in coastal areas. The dynamic interface between the two waters, known as the saline-freshwater interface (SFI), is affected by movements such as seasonal variations of the groundwater table and daily tidal fluctuations.

4.3.10 The extent of any natural saline intrusion into freshwater aquifers in coastal areas can be affected by groundwater pumping to lower the groundwater level, which can alter the natural hydraulic gradient.

4.3.11 In the area of the Suffolk landfall location, the published geology indicates that there are no superficial deposits present, and that the bedrock comprises the Chillesford Church Sand Member (although the ground investigation is indicated to have encountered Crag and not the Chillesford Church Sand Member). The bedrock is designated as a Principal Aquifer.

4.3.12 A preliminary ground investigation for the Proposed Project (Structural Soils Ltd, 2024) included a trial pit at the landfall location, and a borehole within 100m of the landfall location. The trial pit, F22-TP222A, was excavated to 4m bgl (Crag) and groundwater was not encountered.

4.3.13 During drilling of the borehole, RedP-BH-4, superficial deposits were not recorded. Groundwater was struck during drilling at a depth of 6.1 m bgl rising to 4.2 m bgl.

4.3.14 As described in Section 4.3 above, dewatering of the launch and receptor pits for the proposed HDD trenchless crossing at the Suffolk landfall location is unlikely to be required. Therefore, the potential risk of saline intrusion related to dewatering is low.

4.3.15 The proposed HDD bore is anticipated to pass through the SFI and could create a new flow pathway in which upflow or mixing of saltwater and freshwater could occur. However, the natural groundwater gradient is out towards the coast, and therefore this is likely to limit the extent of any temporary passive (i.e. not driven by active mechanisms such as dewatering) saline intrusion inland. In addition, the HDD bore will be inclined through the coastal zone and the inclined nature of the HDD bore through the coastal zone is anticipated to further limit the extent of any saline intrusion inland.

4.3.16 In general, it is considered that there is a low risk of significant additional (additional to current natural processes) saline intrusion as a result of the proposed Project.

## Unplanned losses of drilling fluids

4.3.17 During the process of HDD, unplanned losses of drilling fluids can occur when the drilling bore encounters paths of lower resistance, such as fractures, fissures or voids in the ground, and also when the strength and pressure of the ground overlying a HDD bore is exceeded by the drilling fluid pressures. Unplanned losses of drilling fluids are often known as breakouts or frac outs.

4.3.18 Breakouts/frac outs are most likely to occur when the bore is in close proximity to the ground surface, for example near the launch and reception points of the HDD, and where the strata may have inherent fractures and fissures (e.g. Chalk).

4.3.19 To mitigate the risk of potential breakouts of drilling fluid, a drilling fluid management plan will be developed by the specialist HDD contractor (once appointed) in accordance with commitment GH10 of **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice**. The drilling fluid management plan will be informed by sufficient appropriate ground investigation to provide information on the strata that will be encountered during any HDD, and the nature/properties of the strata.

4.3.20 The drilling fluid management plan will include the following information, as appropriate, the details of which will be added by the selected HDD contractor in response to their understanding of the site specific information:

- detailed and appropriate design of all trenchless crossings including demonstration of a suitable drilling profile and depth to mitigate the risk of breakout;
- description of drilling procedure and demonstration of suitability, including removal of borehole cuttings during drilling;
- annular pressure monitoring; and
- regular walkovers of the drill path to check for visible evidence of breakouts.

4.3.21 The drilling fluid management plan will also include contingency measures for the eventuality that a breakout occurs, to include as a minimum:

- measures to limit the volume of the drilling fluid loss;
- measures to contain the lost drilling fluid;
- measures to remove the lost drilling fluid;
- measures to seal the area of the breakout; and
- measures to provide any remediation, if appropriate.

4.3.22 **Application Document 7.5.2 Offshore Construction Environmental Management Plan** describes that any fluids used for the drilling of the trenchless crossings will be biologically inert and selected from the OSPAR (the Convention for the Protection of the Marine Environment of the North-East Atlantic) List of Substances/Preparations Used and Discharged Offshore which are Considered to Pose Little or No Risk to the Environment (PLONOR).

4.3.23 Commitment GH10 in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** requires the provision of a drilling fluid management plan to be undertaken at all locations where trenchless crossings are proposed, and therefore risks associated with the unplanned loss of drilling fluids are expected to be low.

## 4.4 Substation and converter station

4.4.1 During the ground investigation exploratory holes were undertaken within the area of the proposed Saxmundham Converter Station and Friston Substation. The ground conditions at these locations are noted to be similar to those anticipated within the cable sections and have been described within the Mott MacDonald Ground Investigation Report, included in **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report – Suffolk**. A summary of the strata encountered is presented in Table 4.3.

### Table 4.3 Summary of ground conditions at the substation and converter station locations

| Geological Unit | Typical Description | Depth to base (m bgl) | Thickness (m) |
|---|---|---|---|
| Topsoil | Grass or crops overlying brown slightly gravelly clayey or silty fine SAND with frequent rootlets. | 0.25 – 0.35 | 0.25 – 0.35 |
| Lowestoft Formation – Diamicton | Soft/firm generally becoming stiff to very stiff locally friable yellowish brown becoming bluish brown to dark grey, slightly gravelly slightly sandy CLAY. Gravel is angular to subrounded chalk. | 8.20 – 9.30 | 7.90 – 9.00 |
| Lowestoft Formation – Sand and Gravel | Dense to very dense yellowish or orangish brown mottled dark grey / white slightly gravelly clayey fine to coarse SAND. | 13.00 – 19.00 | 4.70- 9.70 |
| Crag Group | Dense to very dense orangish brown or dark grey mottled orangish grey slightly to gravelly clayey or silty fine to coarse SAND with rare to occasional shell fragments. Gravel is angular to rounded fine to medium flint. | >28.45* | >12.75* |

*Base/thickness not proven

### Dewatering

4.4.2 Based on the information within the Ground Investigation Report, included in **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report – Suffolk,** groundwater within the area of the converter and substation is anticipated to be relatively deep (c.15 m bgl) and therefore it is unlikely to be intercepted by any shallow foundation excavations in this location. Therefore, dewatering and discharges are unlikely to be required within these areas and changes in groundwater levels or flow pathways are not anticipated.

### New Flow Pathways

4.4.3 Ground disturbance during construction could create new groundwater flow pathways, where permeable materials or flow routes are introduced through piling or through permeable backfill material, allowing movement of existing contamination or mixing of aquifers. However, as shown in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment** a worst case, low risk of contamination is expected within the Order Limits. Information obtained from the Mott Macdonald Generic Quantitative Risk Assessment (GQRA), included in **Application Document 6.3.2.5.E Appendix 2.5.E Generic Quantitative Risk Assessment – Suffolk**, indicates that there were no recorded exceedances of the assessment criteria for a commercial land use within the soils tested. However, the GQRA indicates that exceedances of some potential contaminants were recorded within the groundwater samples from across the site. Therefore, there is considered to be a very low risk of mobilising any existing contamination in soil through ground disturbance but there is a low/moderate risk of mobilising existing contamination in the groundwater (through the creation of new flow pathways).

4.4.4 Commitment GH02 in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** requires the selection of appropriate piling techniques (to minimize the risk of the mixing of aquifers) and a Foundation Works Risk Assessment (to identify and minimize risks to groundwater) to be undertaken at all locations where piling is proposed, and therefore risks associated with creation of new flow/contamination pathways are expected to be very low.

### Infiltration and recharge

4.4.5 Effects on infiltration and recharge of groundwater may arise if the permeability of the ground surfaces is changed. However, the project only requires small areas of new hard standing, and these would be designed to meet existing drainage standards as provided for in commitment W12 from **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice**. The small overall footprint of any new hard standing at the substation and converter station means there is likely to be no significant change to infiltration and recharge, and very low risk to waterbodies supported by groundwater or to groundwater flow pathways.

# 5. Conclusion

## 5.1 General

5.1.1 This Qualitative Groundwater Risk Assessment assesses the potential risks to groundwater levels, quality and flow, from the different elements of the Proposed Project including overhead line, open cut trenches, trenchless crossings, and the substation and converter stations.

5.1.2 For each element of the Proposed Project, the risk assessment assesses the potential risks relating to dewatering, creation of new flow pathways and connection of aquifers, and infiltration and recharge. In addition, preliminary assessment of saline intrusion and unplanned loss of drilling fluids is included in the section on trenchless crossings.

## 5.2 Dewatering

5.2.1 The risk assessment has concluded that dewatering (requiring lowering of groundwater levels rather than incidental pumping out of surface water ingress into excavations) within the Suffolk Onshore Scheme is unlikely to be required for any of the elements of the Proposed Project. Therefore the anticipated risks from dewatering are considered to be negligible. However, if unexpected dewatering is found to be required (following detailed design) that wasn’t anticipated and included in this assessment, a Hydrogeological Risk Assessment will be required to be undertaken. Commitment GH09 in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** secures the requirement for Hydrogeological Risk Assessment.

5.2.2 A saline intrusion assessment has also been undertaken which assesses the potential risk of saline intrusion at the landfall location, from dewatering. The assessment concluded that there is a low risk of significant additional (to current natural processes) saline intrusion as a result of the Proposed Project, because dewatering is not anticipated.

5.2.3 However, if unexpected dewatering is found to be required (following detailed design) that wasn’t anticipated and included in this assessment, a Hydrogeological Risk Assessment will be required to be undertaken, including an updated saline intrusion assessment. Commitment GH09 in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** secures the requirement for Hydrogeological Risk Assessment.

## 5.3 New Flow Pathways

5.3.1 The risk assessment has concluded that the HDD bore is unlikely to connect different aquifer units as the works would remain within the Crag Formation for its full length. Therefore, the risks associated with creation of new flow/contamination pathways from the connection of aquifer units will be expected to be very low.

5.3.2 The assessment has also concluded that with the implementation of the commitments provided in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction**

**Practice,** the risk to groundwater from mobilization of existing contamination is anticipated to be very low.

## 5.4 Infiltration and recharge

This risk assessment has concluded that the potential risks to infiltration and recharge of groundwater from the Proposed Project at the converter and substation site and in areas of overhead line is low.

## 5.5 Unplanned losses of drilling fluids

5.5.1 The risk assessment has concluded that the potential risks from unplanned losses of drilling fluids from the Proposed Project, following implementation of commitments such as GH01 and GH10 provided in **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice**, the risk to groundwater is anticipated to be low.

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