



**The Great Grid Upgrade**

Sea Link

# Sea Link

**Volume 6: Environmental Statement**

Document: 6.2.2.5

Part 2 Suffolk

Chapter 5

Geology and Hydrogeology

Planning Inspectorate Reference: EN020026

Version: A

March 2025

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

**nationalgrid**

**Page intentionally blank**

# Contents

<b>5.</b>	<b>Geology and Hydrogeology</b>	<b>1</b>
<b>5.1</b>	Introduction	1
<b>5.2</b>	Regulatory and Planning Context	2
<b>5.3</b>	Scoping Opinion and Consultation	9
<b>5.4</b>	Approach and Methodology	16
<b>5.5</b>	Basis of Assessment	25
<b>5.6</b>	Study Area	28
<b>5.7</b>	Baseline Conditions	28
<b>5.8</b>	Proposed Project Design and Embedded Mitigation	33
<b>5.9</b>	Assessment of Impacts and Likely Significant Effects	35
<b>5.10</b>	Additional Mitigation	39
<b>5.11</b>	Residual Effects and Conclusions	39
<b>5.12</b>	Sensitivity Testing	40
<b>5.13</b>	References	41

## Table of Tables

Table 5.1 NPS EN-1 requirements relevant to geology and hydrogeology	4
Table 5.2 NPS EN-5 requirements relevant to geology and hydrogeology	5
Table 5.3 NPPF requirements relevant to geology and hydrogeology	6
Table 5.4 Local planning policies relevant to geology and hydrogeology – Suffolk Coastal Local Plan	8
Table 5.5 Local planning policies relevant to geology and hydrogeology – Suffolk Minerals and Waste Local Plan	8
Table 5.6 Comments raised in the scoping opinion	9
Table 5.7 Sensitivity criteria	19
Table 5.8 Magnitude criteria	22
Table 5.9 Flexibility assumptions	26



# 5. Geology and Hydrogeology

## 5.1 Introduction

- 5.1.1 This chapter of the Environmental Statement (ES) presents the assessment of the likely significant effects on geology and hydrogeology that could result from 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**).
- 5.1.2 Geology and Hydrogeology effects associated with the Suffolk Onshore Scheme relate to the potential impacts that construction, operation and decommissioning of the Proposed Project may have on existing geology and hydrogeology conditions. This includes an assessment of the potential for existing contamination and pollutant linkages with sensitive receptors such as site workers, and groundwater. This also includes the potential for impacts on designated geological sites, mineral resources and changes to groundwater flow and levels.
- 5.1.3 The Order Limits, which define the boundary of the Proposed Project, are illustrated on **Application Document 2.2.1 Overall Location Plan** and the Suffolk Onshore Scheme Boundary is illustrated on **Application Document 2.2.2 Suffolk Location Plan**.
- 5.1.4 This chapter should be read in conjunction with the following ES chapters:
- **Application Document 6.2.1.3 Part 1 Introduction Chapter 3 Main Alternatives Considered;**
  - **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project;**
  - **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology;**
  - **Application Document 6.2.1.6 Part 1 Introduction Chapter 6 Scoping Opinion and EIA Consultation;**
  - **Application Document 6.2.2.2 Part 2 Suffolk Chapter 2 Ecology and Biodiversity;**
  - **Application Document 6.2.2.4 Part 2 Suffolk Chapter 4 Water Environment;** and
  - **Application Document 6.2.4.1 Part 4 Marine Chapter 1 Physical Environment.**
- 5.1.5 This chapter is supported by the following figures:
- **Application Document 6.4.2.5 Geology and Hydrogeology.**
- 5.1.6 This chapter is supported by the following appendices:
- **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment;**
  - **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment;**

- **Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment;**
- **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report – Suffolk;** and
- **Application Document 6.3.2.5.E Appendix 2.5.E Generic Quantitative Risk Assessment – Suffolk.**

5.1.7 This chapter is supported by the following application documents:

- **Application Document 7.5.3 Onshore Construction Environmental Management Plan (CEMP);**
- **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice;** and
- **Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments (REAC).**

## 5.2 Regulatory and Planning Context

5.2.1 This section sets out the legislation and planning policy that is relevant to the geology and hydrogeology effects assessment. A full review of compliance with relevant national and local planning policy is provided within the **Application Document 7.1 Planning Statement** submitted as part of the application for Development Consent.

5.2.2 Policy generally seeks to minimise geology and hydrogeology effects from development and to avoid significant adverse effects.

### Legislation

#### Environmental Protection Act 1990

5.2.3 Part 2A of the Environmental Protection Act 1990 (HM Government, 1990) and associated Statutory Guidance is the primary legislation on contaminated land. It provides a framework for the assessment and, where necessary, the remediation of contaminated land. Part 2A focuses on the identification and remediation of land which in its current use poses an unacceptable risk to people or the environment.

5.2.4 The Statutory Guidance that accompanies the Environmental Protection Act 1990, includes the Contaminated Land Statutory Guidance (HM Government, 2012) which provides a definition of what constitutes “contaminated land” and sets out the responsibilities of the Local Authority and the Environment Agency in the identification and management of contaminated land. The regulations also include a definition of 'risk', where a risk is said to be a combination of "*(a) the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and (b) the scale and seriousness of such harm or pollution if it did occur*".

#### Environmental Damage (Prevention and Remediation) Regulations 2015

5.2.5 The Environmental Damage (Prevention and Remediation) Regulations 2015 (HM Government, 2015) aim to prevent new land contamination that will damage water or health. The Regulations also include enforcement procedures, including criminal sanctions, for breaches of the Regulations.

## **Environmental Permitting (England and Wales) Regulations 2016 and Environmental Permitting (England and Wales) (Amendment) (England) Regulations 2023**

- 5.2.6 The Environmental Permitting (England and Wales) Regulations (HM Government, 2016) and the Environmental Permitting (England and Wales) (Amendment) (England) regulations (HM Government, 2023) include transposition of the EU Landfill Directive (The Council of the European Union, 1999) into UK law. These Regulations cover sites that are covered by environmental permits, such as landfills, and how these are regulated. The Proposed Project may cross sites where there are permits currently held.
- 5.2.7 These Regulations also cover the licensing of surface waters and groundwater abstractions and protect water resources through Source Protection Zones (SPZs). The Proposed Project may require abstractions or discharges during construction.

## **Water Resources Act 1991**

- 5.2.8 The Water Resources Act (HM Government, 1991) aims to maintain and improve the quality of controlled waters. Part II of the Act covers the licensing of surface water and groundwater abstractions.

## **The Water Environment (Water Framework Directive) Regulations 2017**

- 5.2.9 The Water Framework Directive (WFD) Regulations (HM Government, 2017) establish a framework for the protection of surface waters and groundwater and to prevent the deterioration of WFD water bodies.
- 5.2.10 A WFD assessment will be undertaken and included within **Application Document 6.9 Water Framework Directive Assessment** and is also described further in **Application Document 6.2.2.5 Part 2 Suffolk Chapter 5 Water Environment**.

## **The Groundwater Regulations 2009**

- 5.2.11 The Groundwater Regulations (HM Government, 2009) cover potential groundwater contamination that could eventuate from spillages or disturbance of contaminated ground. The Proposed Project has the potential to cross contaminated land or to create pollution risks during construction.

# **National Policy**

## **National Policy Statements**

- 5.2.1 National Policy Statements (NPS) set out the primary policy tests against which the application for a Development Consent Order (DCO) for the Proposed Project would be considered. Table 5.1 and Table 5.2 below provides details of the elements of NPS for Energy (EN-1) (Department for Energy Security and Net Zero, 2023) and NPS for Electricity Networks Infrastructure (EN-5) (Department for Energy Security and Net Zero, 2023) that are relevant to this chapter. NPS EN-3 Renewable Energy Infrastructure has relevance to the Proposed Project, but only in respect of the offshore elements. As such it has no relevance to the assessment presented in this chapter.

**Table 5.1 NPS EN-1 requirements relevant to geology and hydrogeology**

<b>NPS EN-1 section</b>	<b>Where this is covered in the ES</b>
Part 5.4.17 “[...] Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ... geological conservation importance.”	The assessment is presented in Section 5.7 of this chapter and did not identify any designated geological sites within the study area.
Part 5.4.19 “The applicant should show how the project has taken advantage of opportunities to conserve and enhance geological conservation interests.”	The optioneering of the Proposed Project has sought to avoid geological conservation sites where practicable. Further to this, the assessment is presented in Section 5.7 of this chapter and did not identify any designated geological sites within the study area.
Part 5.4.42 “As a general principle, and subject to the specific policies below, development should, in line with the mitigation hierarchy, aim to avoid significant harm to biodiversity and geological conservation interests, including through consideration of reasonable alternatives (as set out in Section 4.3 above). Where significant harm cannot be avoided, impacts should be mitigated and as a last resort, appropriate compensation measures should be sought.”	The assessment presented in Section 5.7 of this chapter did not identify any designated geological sites within the study area. Effects on biodiversity are considered within <b>Application Document 6.2.2.2 Part 2 Suffolk Chapter 2 Ecology and Biodiversity</b> .
Part 5.11.8 “For developments on previously developed land, the applicant should ensure that they have considered the risk posed by land contamination and how it is proposed to address this.”	<b>Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment to support the baseline information presented in Section 5.7 of this chapter and informs the assessment presented in Section 5.9.
Part 5.11.19 “Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place.”	<b>Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment</b> presents an assessment of the mineral resources identified within the Study Area and informs the assessment on mineral resources presented in Section 5.9.
Part 5.11.28 “Where a proposed development has an impact upon a Mineral Safeguarding Area (MSA), the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.”	<b>Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment</b> presents an assessment of the mineral resources identified within the study area and informs the assessment on mineral resources presented in Section 5.9.

NPS EN-1 section	Where this is covered in the ES
Part 5.16.7 <i>“The ES should in particular describe:... any impacts of the proposed project on... source protection zones (SPZs) around potable groundwater abstractions.”</i>	The assessment presented in Section 5.7 of this chapter includes SPZs. Information has been obtained from the Local Planning Authority and the Environment Agency in relation to groundwater abstractions and the potential impacts and effects are discussed within <b>Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment</b> .

**Table 5.2 NPS EN-5 requirements relevant to geology and hydrogeology**

NPS EN-5 section	Where this is covered in the ES
Part 2.2.10 <i>“[...]applicants must take into account Schedule 9 to the Electricity Act 1989, which places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to “have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest.”</i>	The assessment presented in Section 5.7 of this chapter did not identify any designated geological sites within the study area. Effects on biodiversity are considered within <b>Application Document 6.2.2.2 Part 2 Suffolk Chapter 2 Ecology and Biodiversity</b> .
Part 2.3.3 <i>“Section 4.10 of EN-1 advises that the resilience of the project to the effects of climate change must be assessed in the Environmental Statement (ES) accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see Section 5.8 in EN-1).”</i>	The future baseline in regard to geology and hydrogeology is set out in Section 5.7, and includes discussion relating to climate change impacts on geology, contamination and groundwater.

## National Planning Policy Framework

- 5.2.2 The National Planning Policy Framework (NPPF) as revised in December 2024 (Ministry of Housing, Communities and Local Government, 2024) sets out national planning policies that reflect priorities of the Government for operation of the planning system and the economic, social, and environmental aspects of the development and use of land. The NPPF has a strong emphasis on sustainable development, with a presumption in favour of such development. The NPPF has the potential to be considered important and relevant to the Secretary of State (SoS) consideration of the Proposed Project.
- 5.2.3 Table 5.3 below provides details of the elements of the NPPF that are relevant to this chapter, and how and where they are covered in the ES.



**Table 5.3 NPPF requirements relevant to geology and hydrogeology**

NPPF section	Where this is covered in the ES
<p>187 <i>“Planning policies and decisions should contribute to and enhance the natural and local environment by:</i></p> <p><i>... remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.”</i></p>	<p><b>Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment to support the baseline information presented in Section 5.7 of this chapter and assessment presented in Section 5.9.</p>
<p>192 <i>“To protect and enhance biodiversity and geodiversity, plans should:</i></p> <p><i>(a) Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity 65; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation 66; and</i></p> <p><i>(b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.”</i></p>	<p>The assessment presented in Section 5.7 of this chapter identifies that there are no designated geological sites within the study area. Effects on biodiversity are considered within <b>Application Document 6.2.2.2 Part 2 Suffolk Chapter 2 Ecology and Biodiversity</b>.</p>
<p>196 <i>“Planning policies and decisions should ensure that:</i></p> <p><i>(a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);</i></p> <p><i>(b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and</i></p> <p><i>(c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.”</i></p>	<p>Impacts from land instability are considered within the engineering design of the Proposed Project (see Section 5.8 for further details).</p> <p><b>Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment which identifies potential sources of contamination to support the baseline information presented in Section 5.7 and the assessment presented in Section 5.9.</p>
<p>223 <i>“Planning policies should:</i></p> <p><i>(a) provide for the extraction of mineral resources of local and national importance, but not identify</i></p>	<p><b>Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment</b> presents an</p>

NPPF section	Where this is covered in the ES
<p><i>new sites or extensions to existing sites for peat extraction;</i></p> <p><i>(b) so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously;</i></p> <p><i>(c) safeguard mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas 74; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that the resources defined will be worked);</i></p> <p><i>(d) set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place;</i></p> <p><i>(e) safeguard existing, planned and potential sites for: the bulk transport, handling and processing of minerals; the manufacture of concrete and concrete products; and the handling, processing and distribution of substitute, recycled and secondary aggregate material; and...</i></p> <p><i>(h) ensure that worked land is reclaimed at the earliest opportunity, taking account of aviation safety, and that high quality restoration and aftercare of mineral sites takes place.”</i></p>	<p>assessment of the mineral resources identified within the Study Area and informs the assessment on mineral resources presented in Section 5.9.</p>

## National Planning Practice Guidance

- 5.2.4 The National Planning Policy Framework is supported by the associated Planning Practice Guidance, including Land Affected by Contamination (Ministry of Housing, Communities and Local Government and Department for Levelling Up, Housing and Communities, 2019) which describes how to deal with land affected by contamination and also Land Stability (Ministry of Housing, Communities and Local Government and Department for Levelling Up, Housing and Communities, 2019) which describes how to ensure development is suitable for the ground conditions.

## Local Planning Policy

- 5.2.5 The Suffolk Onshore Scheme lies within the jurisdiction of Suffolk County Council. County and local planning policy and guidance relevant to geology and hydrogeology, which has informed the assessment of effects in this chapter, is as follows:
- Suffolk Minerals and Waste Local Plan (Suffolk County Council, 2020) adopted July 2020; and

- Suffolk Coastal Local Plan (East Suffolk Council, 2020) adopted in September 2020.

## Local Plans

- 5.2.6 The Suffolk Onshore Scheme (refer to **Application Document 2.2.2 Suffolk Location Plan**) lies within the jurisdiction of East Suffolk Council. Local planning policy for East Suffolk Council consists of two parts; the Suffolk Coastal Local Plan (East Suffolk Council, 2020) and the Waveney Local Plan (East Suffolk Council, 2019). The Suffolk Onshore Scheme lies within the boundary of the Suffolk Coastal Local Plan (adopted September 2020) (East Suffolk Council, 2020).
- 5.2.7 Local Plan policies relevant to geology and hydrogeology assessment matters and which have informed the geology and hydrogeology assessment are described in Table 5.4 and Table 5.5.

**Table 5.4 Local planning policies relevant to geology and hydrogeology – Suffolk Coastal Local Plan**

Suffolk Coastal Local Plan - Policy	Where this is covered in the ES
<b>SCLP10.1: Biodiversity and Geodiversity Policy</b> <i>SCLP10.1 relates to maintaining and enhancing biodiversity and geodiversity and indicates what new development should provide to ensure this.</i>	The assessment presented in Section 5.7 of this chapter identified that there are no designated geological sites within the study area. Information on biodiversity is presented in <b>Application Document 6.2.2.2 Part 2 Suffolk Chapter 2 Ecology and Biodiversity</b> .
<b>SCLP10.3: Environmental Quality Policy</b> <i>SCLP10.3 relates to the protection of the quality of the environment and provides information on what new developments need to consider, one of which relates to land contamination.</i>	<b>Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment</b> presents a preliminary contamination risk assessment which identifies potential sources of contamination to support the baseline information presented in Section 5.7.

**Table 5.5 Local planning policies relevant to geology and hydrogeology – Suffolk Minerals and Waste Local Plan**

Suffolk Minerals and Waste Local Plan – Policy	Where this is covered in the ES
<b>MP10: Minerals Consultation and Safeguarding Areas Policy</b> <i>MP10 relates to the areas the County Council will safeguard and the information it would like to see for developments within a safeguarded area.</i>	<b>Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment</b> presents an assessment of the mineral resources identified within the Study Area and

## 5.3 Scoping Opinion and Consultation

### Scoping

- 5.3.1 A Scoping Report for the Proposed Project was issued to the Planning Inspectorate (PINS) on 24 October 2022 (**Application Document 6.14 Environmental Scoping Report 2022**) and a Scoping Opinion was received from the SoS on 1 December 2022 (**Application Document 6.15 Scoping Opinion**). Table 5.6 sets out the comments raised in the Scoping Opinion in relation to geology and hydrogeology and how these have been addressed in this ES. The Scoping Opinion takes account of responses from prescribed consultees as appropriate. **Application Document 6.3.1.6.A Appendix 1.6.A Responses to Scoping Opinion** provides responses to all of the comments made by the prescribed consultees at scoping stage and how each comment has been considered.

**Table 5.6 Comments raised in the scoping opinion**

ID	Inspectorate's comments	Response
3.5.1	<p><i>[Connection of two aquifer units at trenchless crossings as a result of the excavation of trenchless crossings (construction)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design.</p> <p>Table 2.6.2 does not expand on the specific 'mitigation by design' proposed to ensure this does not occur. It is noted that CoCP measure GH02 comprises "Construction methods such as appropriate piling techniques (if required) to minimise the risk of mixing of aquifer bodies through the creation of new pathways..."</p> <p>However, it is unclear whether this reference to piling methods would apply to trenchless crossings such that it would mitigate for effects. In the absence of supporting information on the location of crossings, proposed techniques including depths, and mitigation, the Inspectorate cannot agree to scope out this matter. The ES should include an assessment where likely significant effects could occur or provide further justification as to why this would not arise.</p>	<p>The connection of two aquifer units at trenchless crossings has been scoped into the ES and is assessed in <b>Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment</b>.</p>



ID	Inspectorate's comments	Response
3.5.2	<p><i>[Introduction of new potential contaminants to the environment from leaks, spills, fuels and oils from construction activities (construction, maintenance, and decommissioning)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design.</p> <p>The Inspectorate is content to scope this matter out on the basis that such matters are capable of mitigation by standard measures. The ES must provide specific details regarding the mitigation measures to be adopted to demonstrate that such measures will be monitored and effective.</p> <p>However, as noted at point 2.1.6 above, there is some concern with regards to the potential for break outs or frack-outs of bentonite during HDD activities. The ES should provide details of protocols/measures to be put in place to prevent break outs or frackouts of bentonite from occurring or minimise impacts should such events occur.</p>	<p>Noted that the introduction of new potential contaminants can be scoped out of further assessment. Details on the mitigation measures is included within <b>Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice</b>.</p> <p>Protocols for dealing within breakouts of drilling fluids during drilling activities are included within <b>Application Document 7.5.2 Offshore Construction Environmental Management Plan (CEMP)</b> and <b>Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment</b>.</p>
3.5.3	<p><i>[Physical and chemical changes to groundwater as a result of discharge of groundwater from dewatering (construction)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design.</p> <p>The Scoping Report does not expand on the specific mitigation that would address this potential impact. The Inspectorate notes measure GH07 of the CoCP relating to temporary dewatering in accordance with EA guidance, and an abstraction licence and Environmental Permit (EP) for the discharge (if required), and that dewatering activities during construction more generally are scoped into the assessment. The Inspectorate agrees that control measures applied would ensure no change to physical and chemical changes to groundwater and this matter can be scoped out of the assessment.</p>	<p>Noted, physical and chemical changes to groundwater as a result of discharge of groundwater from dewatering is scoped out of further assessment. This is based on mitigation measures included within <b>Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice</b> in relation to the requirement for any temporary dewatering activities to be undertaken in accordance with Environment Agency guidance and the relevant licences/permits.</p>
3.5.4	<p><i>[Effects on construction activities and the built development (at the operational phase) from natural geological hazards (ie dissolution</i></p>	<p>Effects on construction activities and the built development from natural geological hazards is scoped out of further</p>

ID	Inspectorate's comments	Response
	<p><i>features/soft ground/landslides/ aggressive ground conditions etc) (construction)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the incorporation of the mitigation by design.</p> <p>As previously, the Scoping Report does not expand on the specific measure to mitigate such effects, but it is assumed this relates to the inclusion of GH01, intrusive ground investigations and assessment will be undertaken prior to construction to inform appropriate geotechnical design in relation to the site/structure specific ground conditions including ground instability/adverse ground conditions. Alternatively, it may also relate to the initial project design and route/site selection. On the basis that natural hazards would be considered during the engineering design of the Proposed Development and avoided where possible, the Inspectorate is in agreement that this matter can be scoped out of the ES. The Applicant should clearly describe the consideration that has been given to avoiding natural geological hazards within the alternatives section of the ES.</p>	<p>assessment. This is based on mitigation measures within <b>Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice</b> which relates to the need for appropriate geotechnical design considering the ground conditions encountered by the intrusive ground investigation and any specific engineering or mitigation measures required for any natural geological hazards that are identified.</p>
3.5.5	<p><i>[Human health exposure to existing contamination – site workers and neighbours – all convertor site options (operation and maintenance)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect due to the nature of the project and the incorporation of the mitigation by design. The Inspectorate agrees, given the nature of the Proposed Development and existing legislation, that such effects are unlikely during the operation and maintenance stage and can be scoped out of the impact assessment.</p>	<p>Noted that human health exposure to existing contamination during operation and maintenance is scoped out of further assessment as contamination will be assessed within the construction phase and therefore significant effects during operation and maintenance stages are unlikely.</p>
3.5.6	<p><i>[Introduction of new potential contaminants to the environment from leaks, spills, fuels and oils during the operational phase (operation and maintenance)]</i></p> <p>This matter is proposed to be scoped out on the basis that it is not likely to result in a significant effect given the nature of the project and in consideration of best practice measures and maintenance. The Inspectorate agrees</p>	<p>Noted the introduction of new potential contaminants to the environment during the operation and maintenance of the Proposed Project is scoped out of further assessment as the Proposed Project is not considered to be contaminative and in consideration of best practise</p>

ID	Inspectorate's comments	Response
	that such effects are unlikely during the operation and maintenance stage and can be scoped out of the impact assessment.	measures during any maintenance activities.
3.5.7	<p data-bbox="277 331 948 443"><i>[Changes to groundwater levels and/or recharge rates as a result of the introduction of impermeable surfaces (operation)]</i></p> <p data-bbox="277 450 948 1182">This matter is proposed to be scoped out on the basis that it is not likely to result in significant effects due to the small surface area of the built parts of the Proposed Development. Any new areas of hardstanding would be designed to meet current drainage standards. The Scoping Report does not confirm the likely area of the convertor site that would comprise hardstanding. Similarly, it does not confirm likely run-off rates and measures controlling these. The Inspectorate therefore cannot agree to scope this matter out at this stage. Details of the design of the convertor site and the location of drainage should be included in the ES, together with an assessment of their effectiveness at mitigating operational discharges and runoff. The ES should assess effects on groundwater levels and/or recharge rates as a result of impermeable surfaces, where significant effects are likely to occur.</p>	<p>Changes to groundwater levels and/or recharge rates as a result of the introduction of impermeable surfaces during the operation of the Proposed Project has been scoped into the ES and is assessed in <b>Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment</b>. Details of the converter site design and the location of drainage is shown on <b>Application Document 2.14.1 General Arrangement Plans – Suffolk</b> and the assessment of operational discharges are run off are presented within <b>Application Document 6.2.2.4 Part 2 Suffolk Chapter 4 Water Environment</b>.</p>
3.5.8	<p data-bbox="277 1205 948 1458"><i>[Mobilisation of existing contamination during general construction, impacting on land and/or groundwater quality on environmentally sensitive sites, groundwater, Groundwater Dependant Terrestrial Ecosystems (GWDTE), surface water, land quality for all converter site options (operation and maintenance)]</i></p> <p data-bbox="277 1464 948 1794">No reasoning is provided within the Scoping Report for the scoping out of this matter. Despite this, the Inspectorate is of the view that provided a comprehensive construction stage assessment of this matter has been provided and mitigation/remedial measures are secured (as appropriate) that effects during the operation and maintenance stage can be scoped out of the assessment.</p>	<p>Mobilisation of existing contamination during the operation and maintenance phase is agreed to be scoped out as this will be dealt with during the construction phase of the Proposed Project as described in Section 5.9 of this chapter.</p>
3.5.9	<p data-bbox="277 1816 948 2069"><i>[Changes to groundwater levels, quality and groundwater flow direction caused by dewatering and discharge on environmentally sensitive sites, groundwater, GWDTE, and surface water for all converter site options (operation, decommissioning, and maintenance)]</i></p>	<p>Noted that changes to groundwater levels, quality and flow by dewatering and discharge during the operation, decommissioning and maintenance phase can be scoped out of the ES.</p>

ID	Inspectorate's comments	Response
	The Inspectorate agrees that such effects are unlikely during the operation, maintenance and decommissioning stages and can be scoped out of the impact assessment.	
3.5.10	<p><i>[Damage to/destruction of designated geological sites (operation, maintenance and decommissioning) for all converter site options]</i></p> <p>The Inspectorate notes that summary Table 2.6.12 (Proposed scope of the assessment) states that this matter is scoped out for all converter site options.</p> <p>However, this matter is only included in Table 2.6.3, 2.6.4 and 2.6.7. The Inspectorate has considered scoping out for all converter site options. On the basis that the nearest feature of any designated geological sites is located approximately 9 km from the Suffolk Scoping Boundary and there are no potential effect pathways, the Inspectorate agrees that this matter can be scoped out of the assessment for all converter site options.</p>	Noted that damage to/destruction of designated geological sites can be scoped out for operation, maintenance and decommissioning of the converter site(s).
3.5.11	<p><i>[Sterilisation of safeguarded minerals for all converter site options (maintenance and decommissioning)]</i></p> <p>The Scoping Report confirms mineral reserves are present within the study area which could be damaged and result in significant effects during construction and operation. This matter is however scoped out for maintenance and decommissioning. Although no reason is provided as to why this matter is to be scoped out, the Inspectorate considers that mineral safeguarding will be considered at the construction stage and on the basis of the likely nature and scale of maintenance activities and on the basis that decommissioning does not further sterilise, undisturbed mineral resources, this matter can be excluded for the maintenance and decommissioning stages.</p>	Noted, sterilisation of safeguarded minerals during maintenance and decommissioning can be scoped out of further assessment as this is considered within the construction phase as described in <b>Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment</b> and Section 5.9 of this chapter.
3.5.12	<p><i>[Assessment methodology]</i></p> <p>The Inspectorate notes that a Tier 0 assessment will be undertaken as a first stage screening and that "where a very low or low risk rating is assessed, these areas will not be taken forward for further assessment in the ES on the basis they have a low likelihood of significant effects." The Inspectorate notes that</p>	Thematic meetings have been held with the Environment Agency and Local Planning Authorities to confirm the approach of the contaminated land risk assessment. The methodology used conforms with the standard Land Contamination Risk Management guidance



ID	Inspectorate's comments	Response
	this approach diverges from the standard Land Contamination Risk Management approach. The Applicant should seek to agree the methodology with relevant consultation bodies, including the EA.	(Environment Agency, 2023), and is presented in <b>Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment</b> .
3.5.13	<p><i>[Mitigation by design and scoping out]</i></p> <p>This aspect of the chapter relies on 'mitigation by design' to scope out various matters; however, what measures encompass mitigation by design is not clear in the chapter. 'Mitigation by Design' is defined in Chapter 2.11 (Socio-economics, Recreation and Tourism), which states</p> <p><i>"Mitigation measures will be included in the design (Mitigation by Design) where practicable to help avoid, prevent or reduce effects on the environment."</i></p> <p>However, in the case of the Geology and Hydrogeology chapter it appears to also relate to mitigation measures secured through the CoCP. The ES should make clear what measures are being relied upon to avoid/reduce impacts, and how these are to be delivered/secured through the DCO.</p>	The measures the assessment has relied upon have been included within Section 5.8 and are set out within the <b>Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice</b> and <b>Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments (REAC)</b> which are secured by Requirement 6 of the DCO.

## Statutory Consultation

- 5.3.2 Statutory Consultation for the Proposed Project took place between 24 October and 18 December 2023. A further Targeted Consultation exercise on the main changes to the Proposed Project introduced after the 2023 statutory consultation, was undertaken between 8 July and 11 August 2024. In addition, a project update and local engagement exercise took place between 22 November 2024 and 12 January 2025, focusing on design amendments made following Targeted Consultation. A summary of relevant feedback received during statutory consultation relating to geology and hydrogeology is provided below. Further details on how consultation responses have informed the assessment can be found in **Application Document 5.1 Consultation Report** and **Application Document 5.1.9 Appendix H Summary 2023 Response**.
- 5.3.3 Feedback was received from a number of stakeholders, including Suffolk County Council, East Suffolk District Council and the Environment Agency. The statutory consultation comments predominantly related to the potential for existing contamination, including impacts and effects on groundwater quality, minerals, and also the potential for dewatering - which are all discussed within this chapter.
- 5.3.4 The feedback comments relating to groundwater quality related to the potential for unplanned losses of drilling fluids impacting groundwater and in turn the environment and protected species. The dewatering comments were in relation to ensuring the inclusion and consideration of private water supplies in the assessment.

- 5.3.5 The feedback comments regarding minerals provided confirmation that the Proposed Project does not interact within any existing minerals facilities. and in general supported that the Proposed Project would not have a significant adverse effect on minerals.
- 5.3.6 The comments regarding existing contamination generally agreed with the approach used for the contamination assessment and the outcome of the assessment undertaken. The comments also refer to the need for an unexpected contamination protocol being needed which should be agreed with the Local Authority. This has been taken forward as a commitment in **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**.

## Further Engagement

- 5.3.7 A thematic meeting was held with Suffolk County Council to discuss the impacts on safeguarded mineral resources.
- 5.3.8 A thematic meeting was held with Suffolk County Council and East Suffolk District Council to discuss the Statutory Consultation feedback received in relation to geology and hydrogeology as well as the baseline information and assessment methodology in relation to contaminated land and groundwater.
- 5.3.9 A thematic meeting was held with the Environment Agency to discuss the Statutory Consultation feedback received in relation to geology and hydrogeology as well as the baseline information and assessment methodology in relation to contaminated land and groundwater.

## Summary of Scope of Assessment

- 5.3.10 This section describes which aspects of geology and hydrogeology have been scoped in and scoped out of the assessment through the scoping process and consultation with stakeholders.

### Aspects scoped into the assessment

- 5.3.11 The following impacts have been scoped into the assessment:
- damage to/destruction of designated sites of geological importance through physical destruction during construction where the Proposed Project directly interacts with the designated site;
  - human health exposure to existing potential contamination through ground disturbance during construction and decommissioning activities;
  - Mobilisation of existing contamination, during general construction/decommissioning, impacting on land and/or groundwater quality;
  - ingress and accumulation of ground gas in buildings/confined spaces/trenches during construction and operation – resulting in explosion/asphyxiation/exposure;
  - mixing of aquifer bodies due to the connection of aquifer units at trenchless crossings;
  - changes to groundwater levels, quality and groundwater flow direction caused by dewatering during construction;
  - sterilisation of safeguarded minerals from the presence of new infrastructure during construction and operation; and

- changes to groundwater levels and/or recharge rates from the introduction of impermeable surfaces during operation.

### Aspects scoped out of the assessment

5.3.12 Several aspects have been scoped out of the assessment in accordance with the Scoping Opinion as summarised in Table 5.6 and are as follows:

- damage to/ destruction of the built development due to natural geological hazards during all phases;
- damage to/ destruction of designated sites of geological importance during operation, maintenance and decommissioning;
- sterilisation of safeguarded minerals during maintenance and decommissioning;
- mobilisation of existing contamination, during operation and maintenance impacting on land and/or groundwater quality;
- introduction of new potential contaminants to the environment from leaks, spills, fuel and oils from construction activities and during the all phases;
- human health exposure to existing contamination during operation and maintenance;
- changes to groundwater levels, quality and groundwater flow direction caused by dewatering during operation, decommissioning and maintenance; and
- physical and chemical changes to groundwater as a result of discharge of groundwater from dewatering during all phases.

## 5.4 Approach and Methodology

5.4.1 **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology** sets out the overarching approach which has been used in developing the ES. This section describes the technical methods used to determine the baseline conditions, sensitivity of the receptors and magnitude of effects and sets out the significance criteria that have been used for the geology and hydrogeology assessment.

### Guidance Specific to the Geology and Hydrogeology Assessment

5.4.2 The geology and hydrogeology assessment has been carried out in accordance with the following good practice guidance documents:

- Land Contamination Risk Management (LCRM) (Environment Agency, 2023);
- CIRIA 552: Contaminated Land Risk Assessment, A guide to good practice (CIRIA, 2001);
- CIRIA 665: Assessing risks posed by hazardous ground gases to buildings (CIRIA, 2007);
- BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (British Standard Institution, 2019);
- The Environment Agency's Guiding Principles for Managing and Reducing Land Contamination (GPLC2) (Environment Agency, 2016 );

- The Environment Agency's Hydrogeological Impact Appraisal for Dewatering Abstractions (Environment Agency, 2007);
- The Environment Agency's Groundwater Protection Position Statements (Environment Agency, 2018);
- Design Manual for Roads and Bridges (DMRB), LA 109: Geology and soils (Highways England, 2019);
- DMRB, LA 113: Road drainage and the water environment (Highways England, 2020); and
- Guidance for the Safe Development of Housing on Land Affected by Contamination (National House Building Control, 2008).

## Baseline Data Gathering and Forecasting Methods

- 5.4.3 The methodology adopted in this assessment is qualitative with a progression from published and readily available information (stated with reasonable certainty) regarding the baseline conditions, to assessment informed by professional judgement and expression of opinions on the relative significance.
- 5.4.4 The baseline assessment has been informed by a desk based study which has drawn on the following information sources:
- 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;
  - The Environment Agency datasets for the locations for historical landfills and permitted landfill and waste sites, and category 1 and 2 pollution incidents (Environment Agency, 2024);
  - Environment Agency Catchment Data Explorer (Environment Agency, 2024);
  - Natural England, Designated Sites View (Natural England, 2024);
  - GeoSuffolk, records of Regionally Important Geological Sites (RIGS), referred to in Suffolk as Local Geological Sites (LoGS) and Suffolk County Geodiversity Sites (GeoSuffolk, 2024);
  - Georeferenced historical Ordnance Survey maps for the United Kingdom (National Library of Scotland, 2024);
  - Google Earth Historical Aerial Imagery;
  - Historical aerial photography; and
  - Groundwater abstraction data from the Environment Agency and private water supply information from East Suffolk District Council.



## Contaminated Land

- 5.4.5 The assessment methodology which has been used for assessing contaminated land and for developing the baseline is presented within **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**. This appendix provides a Preliminary Risk Assessment (PRA) (Tier 1)<sup>1</sup> (described in detail in Appendix 2.5.A) and identifies locations where there is potential for significant sources of contamination to be present in accordance with the method identified within LCRM (Environment Agency, 2023). In order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences, a source-pathway-receptor methodology has been adopted as described within **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**.
- 5.4.6 The risk assessment approach presented in this methodology is transposed into Environmental Impact Assessment (EIA) classification by assigning receptor sensitivity and impact magnitude (significance criteria) to each potential effect using the criteria provided below. These are then combined to determine the significance of effect.

## Geology

- 5.4.7 A preliminary qualitative minerals resource assessment (MRA) is presented within **Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment**. This appendix has been prepared to inform the baseline and the assessment in relation to minerals. The appendix includes the methodology used for the preliminary assessment, which has been prepared with regard for Minerals Safeguarding Practice Guidance (Minerals Production Association, 2019).
- 5.4.8 A desk study has been undertaken to identify if there are any Sites of Special scientific Interest (SSSI) designated for geology, Geological Conservation Review sites and Local Geological Sites within the defined study area. The desk study information has been used to inform the assessment in this chapter relating to geology. There is no published assessment methodology that relates to impacts relating to geology (e.g. geo-conservation). For consistency, a similar approach has been adopted to the contamination assessment, to assess these effects (i.e. combination of receptor identification and associated sensitivity and magnitude of potential impacts).

## Hydrogeology

- 5.4.9 The baseline assessment is informed by a desk-based study of available information, data collected from ground investigation and publicly available data such as abstractions and private water supply data.
- 5.4.10 The baseline information uses a source-pathway-receptor linkage approach, as described in the contamination methodology, to assess the potential impacts on groundwater quality and levels that may result in significant effects on identified receptors, in accordance with the policy guidance outlined.

---

<sup>1</sup> The assessment of land contamination is based on guidance presented in Land Contamination Risk Management (LCRM) (Environment Agency, 2023) which sets out a three-stage process (Stage 1 risk assessment, Stage 2 options appraisal, Stage 3 remediation). Stage 1 comprises three tiers: Tier 1 (Preliminary Risk Assessment) - comprising 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.

- 5.4.11 The assessment methodology which has been used for assessing hydrogeology risks is presented within **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment**. The risk approach presented in this methodology is transposed into EIA classification in the same way as the contaminated land methodology.

## Assessment Criteria

- 5.4.12 The assessment criteria for geology and hydrogeology is based on guidance (described above), professional judgement, and previous experience together with additional guidance set out in DMRB LA 109 Geology and Soils (Highways England, 2019) and DMRB LA 113 Road drainage and the water environment (Highways England, 2020). Whilst primarily intended for use in assessing the impacts of highways projects, the methodology is widely accepted as suitable for assessing the effects of other types of linear infrastructure projects on identified receptors. The method promotes assessment that is proportionate to the scale and nature of the proposals and that considers the sensitivity of the identified receptors to change.

### Sensitivity of geology and hydrogeology receptors

- 5.4.13 The criteria used to determine the value and sensitivity of receptors specific to geology and hydrogeology are set out in Table 5.7. These values are based on the generic criteria presented in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 Approach and Methodology** and Table 3.70 of DMRB LA 113: Road drainage and the water environment (Highways England, 2020), Table 3.11 of DMRB LA 109: Geology and soils (Highways England, 2019) and professional judgement.

**Table 5.7 Sensitivity criteria**

Sensitivity	General criteria
Very High	<p>Very high importance and rarity. International scale and limited potential for substitution.</p> <p><b>Geology:</b></p> <p>Very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, Site of Special Scientific Interest (SSSI) and Geological Conservation Review (GCR) where citations indicate features of international importance). Geology meeting international designation criteria which is not designated as such.</p> <p><b>Minerals:</b></p> <p>Existing Mineral sites.</p> <p><b>Contamination:</b></p> <p>1) human health: very high sensitivity land use such as residential or allotments;</p> <p>2) surface water: Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan (RBMP) and <math>Q95 \geq 1.0 \text{ m}^3/\text{s}</math>. Site protected/designated under EC or UK legislation (Special Areas of</p>

Sensitivity	General criteria
High	<p data-bbox="309 219 1442 293">Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI), Ramsar site); and</p> <p data-bbox="309 315 1430 389">3) groundwater: Principal aquifer providing a regionally important resource and regionally important public water supplies, Source Protection Zone (SPZ) 1.</p> <p data-bbox="309 412 539 450"><b>Hydrogeology:</b></p> <p data-bbox="309 472 1469 577">Principal aquifer providing a regionally important source and regionally important public water supplies. Groundwater quality associated with SPZ 1 associated with licensed abstractions.</p> <p data-bbox="309 600 1469 786">Water supplying groundwater dependant terrestrial ecosystems (GWDTEs) with a high groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs).</p>
	<p data-bbox="309 819 1430 857">High importance and rarity. National scale and limited potential for substitution.</p> <p data-bbox="309 880 451 918"><b>Geology:</b></p> <p data-bbox="309 940 1453 1081">Rare and of national importance with little potential for replacement (e.g. geological SSSI, Area of Special Scientific Interest (ASSI), National Nature Reserves (NNR)). Geology meeting national designation criteria which is not designated as such.</p> <p data-bbox="309 1104 451 1142"><b>Minerals:</b></p> <p data-bbox="309 1164 655 1202">Mineral preferred areas.</p> <p data-bbox="309 1225 547 1263"><b>Contamination:</b></p> <p data-bbox="309 1285 1358 1359">1) human health: high sensitivity land use such as public open space, and construction workers;</p> <p data-bbox="309 1382 1469 1456">2) surface water: Watercourse having a WFD classification shown in a RBMP and Q95 &lt;1.0 m<sup>3</sup>/s; and</p> <p data-bbox="309 1478 1326 1552">3) groundwater: Principal aquifer providing locally important resource or supporting a river ecosystem, SPZ 2.</p> <p data-bbox="309 1574 539 1612"><b>Hydrogeology:</b></p> <p data-bbox="309 1635 1453 1709">Principal aquifer providing a locally important source and locally important public water supplies, SPZ 2.</p> <p data-bbox="309 1731 1453 1872">Water supplying GWDTEs with a moderate groundwater dependence with high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding highly groundwater dependent GWDTE with a national non-statutory UK Biodiversity Action Plan (BAP) priority.</p>
Medium	<p data-bbox="309 1906 1350 1980">Medium or high importance and rarity, regional scale, limited potential for substitution.</p> <p data-bbox="309 2002 451 2040"><b>Geology:</b></p>

---

**Sensitivity    General criteria**

---

Regional importance with limited potential for replacement (e.g. regionally important geological sites (RIGS)). Geology meeting regional designation criteria which is not designated as such.

**Minerals:**

Mineral Safeguarded Areas (MSA) and Mineral Consultation Area (MCA).

**Contamination:**

- 1) human health: medium sensitivity land use such as commercial or industrial;
- 2) surface water: Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001 m<sup>3</sup>/s; and
- 3) groundwater: Secondary A Aquifers. Extensive non-licensed private water abstractions (i.e. supplying ten or more properties or supplying large farming/animal estates). SPZ 3.

**Hydrogeology:**

Secondary A aquifer. Groundwater flow and yield and quality associated with extensive non-licensed private water abstractions (i.e. supplying ten or more properties or supplying large farming/animal estates). Groundwater quality associated with SPZ 2 (Outer Protection Zone) associated with licensed abstractions. Residential and commercial properties.

Water supplying GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding moderately groundwater dependent GWDTE with a national non-statutory UK BAP priority.

---

Low

Low or medium importance and rarity, local scale.

**Geology:**

Local importance/interest with potential for replacement (e.g. non designated geological exposures, former quarry's/mining sites).

**Minerals:**

Mineral present but outside of any mineral preferred area/MSA/MCA.

**Contamination:**

- 1) human health: low sensitivity land use such as highways and rail;
- 2) surface water: Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001 m<sup>3</sup>/s; and
- 3) groundwater: Secondary B or Secondary Undifferentiated aquifer. Small scale private water abstractions (i.e. supplying fewer than ten properties).

**Hydrogeology:**

Secondary B or Secondary Undifferentiated aquifer. Groundwater flow and yield and quality associated with small scale private water abstractions (i.e. feeding fewer than ten properties). Groundwater quality associated with SPZ 3 (Source

---



<b>Sensitivity</b>	<b>General criteria</b>
	<p>Catchment Protection Zone) associated with licensed abstractions and with licensed abstractions for which no SPZ is defined.</p> <p>Water supplying GWDTEs of low groundwater dependence with a national non-statutory UK BAP priority; or water supplying highly or moderately groundwater dependent GWDTE sites with no conservation designation.</p>
Negligible	<p>Very low importance and rarity, local scale.</p> <p><b>Geology:</b></p> <p>No geological exposures, little/no local interest.</p> <p><b>Mineral:</b></p> <p>No mineral identified.</p> <p><b>Contamination:</b></p> <p>1) human health: undeveloped surplus land/no sensitive land use proposed;</p> <p>2) surface water: not present; and</p> <p>3) groundwater: Unproductive strata.</p> <p><b>Hydrogeology:</b></p> <p>Very poor groundwater quality and/or very low permeability make exploitation of groundwater unfeasible. No active groundwater supply.</p> <p>Water supplying GWDTEs of low groundwater dependence with no designation or groundwater that supports a wetland not classified as a GWDTE, although may receive some minor contribution from groundwater.</p>

### **Magnitude of geology and hydrogeology effects**

- 5.4.14 The criteria used to determine the magnitude of impact for geology and hydrogeology are set out in Table 5.8. These values are based on the generic criteria presented in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 Approach and Methodology**, Table 3.71 of DMRB LA 113 (Highways England, 2020) Table 3.12 of DMRB LA 109 (Highways England, 2019) and professional judgement. The magnitude of impact considers the expected scale, extent and duration of change following consideration of the measures embedded into the design.

**Table 5.8 Magnitude criteria**

<b>Magnitude</b>	<b>General criteria</b>
Large	<p><b>Geology adverse:</b> Permanent loss of geological feature/designation and/or quality and integrity, severe damage to key characteristics, features or elements.</p> <p><b>Contamination adverse:</b> Significant contamination identified, and contamination level significantly exceed human health and environmental assessment criteria</p>

---

**Magnitude    General criteria**

---

with the potential for significant harm to be caused. Contamination heavily restricts future use of land.

**Contamination benefit:** Substantial betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.

**Hydrogeology adverse:** Major or irreversible change to groundwater aquifer(s) flow, water level, quality or available yield which endangers the resources currently available. Groundwater resource use/abstraction is irreparably impacted upon, with a major or total loss of an existing supply or supplies. Changes to water table level or quality would result in a major or total change in, or loss of, a groundwater dependent area, where the value of a site would be severely affected. Changes to groundwater aquifer(s) flow, water level and quality would result in major changes to groundwater baseflow contributions to surface water and/ or alterations in surface water quality.

**Hydrogeology beneficial:** Major increase in groundwater resource availability. Results in the achievement of Good Status for a WFD groundwater body or GWDTE which is currently failing its WFD objectives. Removal of existing or potential polluting discharge to groundwater.

---

**Medium**

**Geology adverse:** partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.

**Contamination adverse:** Contamination levels marginally exceed human health and environment assessment criteria. Control/remediation measures are required to reduce risks to human health/make land suitable for intended use.

**Contamination benefit:** Moderate Betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.

**Hydrogeology adverse:** Moderate long term or temporary significant changes to groundwater aquifer(s) flow, water level, quality or available yield which results in moderate long term or temporarily significant decrease in resource availability. Groundwater resource use/abstraction is impacted slightly, but existing supplies remain sustainable. Changes to water table level or groundwater quality would result in partial change in or loss of a groundwater dependent area, where the value of the site would be affected, but not to a major degree. Changes to groundwater aquifer(s) flow, water level and quality would result in moderate changes to groundwater baseflow contributions to surface water and/ or alterations in surface water quality, resulting in a moderate shift from baseline conditions.

**Hydrogeology beneficial:** Moderate increase in groundwater resource availability. Contributes, in combination with other effects, to the achievement of Good Status for a WFD groundwater body or GWDTE which is currently failing its WFD objectives. Significant reduction of existing or potential polluting discharge to groundwater.

---

Magnitude	General criteria
Small	<b>Geology adverse:</b> minor measurable change in geological feature/designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	<b>Contamination adverse:</b> Contamination levels below human health and environment assessment criteria and remediation is not required. Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health.
	<b>Contamination benefit:</b> Slight betterment of ground or groundwater quality/contamination conditions through remediation and/or mitigation.
	<b>Hydrogeology adverse:</b> Minor changes to groundwater aquifer(s) flow, water level, quality or available yield leading to a noticeable change, confined largely to the Proposed Project area. Changes to water table level, groundwater quality and yield result in little discernible change to existing resource use. Changes to water table level or groundwater quality would result in minor change to groundwater dependent areas, but where the value of the site would not be affected. Changes to groundwater aquifer(s) flow, water level and quality would result in minor changes to groundwater baseflow contributions to surface water and/or alterations in surface water quality, resulting in a minor shift from baseline conditions.
Negligible	<b>Hydrogeology beneficial:</b> Minor increase in groundwater resource availability. Leads to improvement of a WFD groundwater body which is currently failing its WFD objectives but insufficient effect to achieve Good Status. Minor reduction of existing or potential polluting discharge to groundwater.
	<b>Geology adverse:</b> Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature/designation. Overall integrity of resource not affected.
	<b>Contamination:</b> Contamination levels substantially below human health and environment assessment criteria and remediation is not required. No requirement for control measures to reduce risks to human health/make land suitable for intended use.
	<b>Hydrogeology adverse:</b> Very slight change from groundwater baseline conditions, approximating to 'no change' conditions. Dewatering effects create no or no noticeable effects.

## Significance of effects

- 5.4.15 The sensitivity of a receptor and magnitude of impact are combined to give an overall significance of effect using the matrix set out in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology**. This has been supplemented by professional judgement, which where applicable has been explained to give the rationale behind the values assigned.

## Assumptions and Limitations

- 5.4.16 The assessment approach in this chapter is based on published and readily available information supported by site specific information where available and appropriate. Where site specific information is not available a 'Reasonable worst case' assumption regarding the likely ground and groundwater conditions has been made when assessing effects, determined from the information collated and reviewed.
- 5.4.17 Information regarding private water supplies and abstractions has been requested and received from the relevant authorities however, the completeness and accuracy of this information is limited to that of the source records received.
- 5.4.18 The key parameters and assumptions considered within this assessment include:
- Piling assumptions: Percussive piling may be required at some pylon locations and for the foundations of the converter and substation, depending on ground conditions. The assessment set out in this chapter assumes that piling is required at all pylon locations, converter and substation (as a reasonable worst-case scenario).
  - Abstractions: It is assumed, based on available project information that no consumptive groundwater abstractions are required to facilitate construction of the Proposed Project, nor during operation.
  - Discharges: Discharges from dewatering of open cut trenches to remove rainwater and minor groundwater seepages would be made to ground. At deeper excavations, it is assumed that if required discharges would be subject to treatment to settle sediments, prior to discharge to watercourses. It is assumed that all discharges will be subject to their own relevant permit applications.
  - Dewatering: Dewatering would be undertaken by pumping out of seepages of water, rather than active lowering of the groundwater table.
  - Construction methodology: The Proposed Project has committed to undertaking trenchless crossings at the landfall location using horizontal directional drilling (HDD). It is assumed that the water used to facilitate the drilling technique will be brought to site in tankers to facilitate drilling.

## 5.5 Basis of Assessment

- 5.5.1 This section sets out the assumptions that have been made in respect of design flexibility maintained within the Proposed Project and the consideration that has been given to alternative scenarios and the sensitivity of the assessment to changes in the construction commencement year.
- 5.5.2 Details of the available flexibility and assessment scenarios are presented in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project** and **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology**.

### Flexibility Assumptions

- 5.5.3 The environmental assessments have been undertaken based on the description of the Proposed Project provided in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**. To take account of the flexibility allowed in the Proposed Project, consideration has been given to the potential for



effects to be of greater or different significance should any of the permanent or temporary infrastructure elements be moved within the Limits of Deviation (LoD) or Order Limits.

- 5.5.4 The assumptions made regarding the use of flexibility for the main assessment, and any alternatives assumptions are set out in Table 5.9.

**Table 5.9 Flexibility assumptions**

<b>Element of flexibility</b>	<b>How it has been considered within the assessment</b>
Lateral LoD HVDC/HVAC cables	The lateral LoD of the HVDC cables within the Order Limits has been assessed in relation to the potential impacts on geology and hydrogeology. Positioning the HVDC cables anywhere within the LoD is not anticipated to change the assessment presented in this chapter as they remain inside the area assessed and no new receptors would be impacted.
Lateral LoD Saxmundham Converter Station and Friston Substation	The entire lateral LoD of the Saxmundham Converter Station and the Friston Substation within the Order Limits has been assessed in relation to the potential impacts on geology and hydrogeology. Positioning of Saxmundham Converter Station and Friston Substation anywhere within their respective LoD is not anticipated to change the assessment presented in this chapter as it would remain inside the area assessed and no new receptors would be impacted.
Vertical LoD Saxmundham Converter Station and Friston Substation	<p>The vertical LoD above ground does not affect the likely significance of effects on geology and hydrogeology receptors which are predominantly below ground.</p> <p>It has been assumed that the Proposed Project will extend down to the Crag Formation to allow for the potential for a piled foundation solution into the bedrock. This does not change the assessment presented within this chapter as no new receptors would be impacted.</p>
Lateral and Vertical LoD overhead line (where Friston Substation is built as part of the Proposed Project)	The assessment considers the potential for the proposed overhead line works to be located anywhere within the lateral LoD as shown in <b>Application Document 2.5.1 Work Plans –</b>

Element of flexibility	How it has been considered within the assessment
	<b>Suffolk.</b> The vertical LoD of OHL does not affect the likely significance of effects on geology and hydrogeology receptors.
Order Limits – temporary construction works	The entire Order Limits have been assessed in relation to the potential impacts on geology and hydrogeology during construction phase.

## Consideration of Scenarios

- 5.5.5 The following scenarios with regards to Friston Substation have been considered in the assessment as described in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**:
- Friston Substation is constructed under the development consent granted to Scottish Power Renewables (SPR), pursuant to ‘The East Anglia ONE North (EA1N) Offshore Wind Farm Order 2022’ and ‘The East Anglia TWO (EA2) Offshore Wind Farm Order; or
  - Friston Substation is constructed as part of the Proposed Project.
- 5.5.6 Friston substation being constructed as part of the Proposed Project is considered to be the reasonable worst case for the geology and hydrogeology assessment and has therefore been assessed within this chapter.
- 5.5.7 The following options with regards to the proposed bridge over the River Fromus have been considered in the assessment as described in **Application Document 6.2.1.4 Part 1 Introduction Chapter 4 Description of the Proposed Project**:
- Option 1 - a bridge height of up to 6 m (from the ground level at the abutment to the top of the parapet) with 62 m long approach ramps; and
  - Option 2 - a bridge height of up to 4 m (from the ground level at the abutment to the top of the parapet) with 42 m long approach ramps.
- 5.5.8 This chapter has considered both options for the proposed bridge over the River Fromus.
- 5.5.9 There are also three alternative locations for the converter station construction compound (locations S02, S03 and S05/05) within the Order Limits as illustrated in **Application Document 2.14.1 Indicative General Arrangement Plans – Suffolk**. The potential for the compound to be sited in any of the three locations has been considered within this chapter.

## Sensitivity Test

- 5.5.10 It is likely that under the terms of the draft DCO, construction could commence in any year up to five years from the granting of the DCO which is assumed to be 2026. Consideration has been given to whether the effects reported would be any different if the works were to commence in any year up to year five this will not change the assessment of effects in relation to geology and hydrogeology.

## 5.6 Study Area

- 5.6.1 The study area for geology and hydrogeology comprises the Order Limits for the Suffolk Onshore Scheme plus a 250 m buffer for geology and contaminated land and up to a 500 m buffer for hydrogeology.
- 5.6.2 Given the scale and nature of the Proposed Project, this is considered a robust yet proportionate approach, and although not directly relevant for this development type, accords with the study area recommended in Guidance for the Safe Development of Housing on Land Affected by Contamination (National House Building Control, 2008).

## 5.7 Baseline Conditions

- 5.7.1 This section of the chapter comprises an overview of the baseline conditions for geology and hydrogeology, in order to establish the likely type and nature of potential effects.

### Geology

#### Superficial Deposits

- 5.7.2 The superficial geology present beneath the Order Limits for the Suffolk Onshore Scheme is variable, as shown on **Figure 6.4.2.5.1 Superficial Geology**.
- 5.7.3 The superficial deposits are present across the majority of the Order Limits and comprise the various lithologies of the Lowestoft Formation, described by the BGS (British Geological Society, 2024) as “*chalky till, together with outwash sands and gravels, silts and clays*”. The lithology type present is heavily influenced by the river network within the area.
- 5.7.4 Outside of the river network, the Lowestoft Formation comprises material known as diamicton (commonly referred to as ‘boulder clay’). Where the rivers have eroded the diamicton deposits the Lowestoft Formation comprises granular deposits of sand and gravel, with limited areas of clay and silt present within the sides of the river valleys.
- 5.7.5 Elsewhere within the Order Limits there are also limited areas shown on published mapping to be underlain by the following superficial deposits:
- at the Suffolk landfall a ‘strip’ of Marine Beach Deposits, comprising “*Shingle, sand, silt and clay*” (British Geological Society, 2024) are indicated to be present;
  - in the southeast, along the coast to the north of Aldeburgh, Tidal Flat Deposits, comprising “*consolidated soft silty clay, with layers of sand, gravel and peat*” (British Geological Society, 2024) are indicated to be present;
  - within the valley associated with the Hundred River and River Fromus deposits of Alluvium, comprising “*normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel*” (British Geological Society, 2024) are indicated to be present; and
  - in small discrete areas of the Order Limits, associated with the River Fromus, a very limited area of Head, comprising “*gravel, sand and clay ... locally with lenses of silt, clay or peat and organic material*” (British Geological Society, 2024) is indicated to be present.

- 5.7.6 There are also some areas within the Order Limits where the BGS mapping indicates an absence of superficial deposits. These areas are predominantly adjacent to the Hundred River and River Fromus.

### Bedrock Geology

- 5.7.7 The bedrock geology present within the Order Limits for the Suffolk Onshore Scheme is shown on **Figure 6.4.2.5.2 Bedrock Geology**.
- 5.7.8 The majority of the northern two-thirds of the Order Limits are indicated to be underlain by bedrock of the Crag Formation, described by the BGS (British Geological Survey, 2024) as “*Sands, gravels, silts and clays. The sands are characteristically dark green [to] bright orange ... The gravels in the lower part of the group are almost entirely composed of flint*”. The BGS record that this Formation is up to 70 m thick.
- 5.7.9 The majority of the southern third of the Order Limits is shown to be underlain by bedrock of the Chillesford Church Sand Member, described by the BGS (British Geological Society, 2024) as “*well sorted, fine-to medium-grained, micaceous, buff to pale brown, quartz sand*”. The BGS record that this Member is up to 13 m thick.
- 5.7.10 A smaller area adjacent to the Suffolk landfall is shown to be underlain by the Corraline Crag, described by the BGS (British Geological Society, 2024) as “*Carbonate-rich skeletal sands ... Basal lag gravel rich in pebbles of phosphatic mudstone*”. The BGS record that this stratum is up to 25 m thick.
- 5.7.11 A very limited area directly to the south of the Order Limits, at Aldeburgh, is indicated to be underlain by the Chillesford Clay Member, described by the BGS (British Geological Society, 2024) as “*pale grey silty clay, with rare sand laminae*”. The BGS record that this Member is up to 6 m thick.
- 5.7.12 Underlying the Crag Formation, Chillesford Church Sand Member, Corraline Crag and Chillesford Clay member in large parts of the study area is the Thames Group, Lambeth Group and White Chalk Subgroup.

### Site specific ground conditions

- 5.7.13 An intrusive ground investigation was undertaken across parts of the Order Limits between September and October 2023 and a Ground Investigation Report which provides information on the ground conditions for the Suffolk Onshore Scheme was completed by Mott Macdonald and is included as **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report - Suffolk**. The ground investigation generally confirmed the anticipated geology within the area of the Proposed Project as described from the published information.
- 5.7.14 A summary of the ground conditions encountered within specific areas of the Proposed Project is presented in **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment**.

### Geo-Conservation

- 5.7.15 A review of the GeoSuffolk records (GeoSuffolk, 2024) and Department for Environment, Food and Rural Affairs (DEFRA's) MAGIC map (Defra, 2024) indicates that there are no Regionally Important Geological Sites (RIGS) (also referred to as Local Geological Sites [LoGS]), County Geo-Sites or geological Sites of Special Scientific Interest (SSSI) present within the Order Limits or study area.



- 5.7.16 The Leiston-Aldeburgh SSSI is located in the east of the Order Limits, however this SSSI is not designated for geological reasons.

## Minerals

- 5.7.17 The Suffolk Minerals and Waste Local Plan (Suffolk County Council, 2020) was adopted in July 2020 and the accompanying policies map within the adopted Minerals Local Plan identifies that *"Sand and gravel resources are located throughout the County."* The adopted plan indicates that parts of the study area are located within a Mineral Consultation Area, as shown on **Figure 6.4.2.5.4 Mineral Resources**.
- 5.7.18 The plans also indicate that the study area does not cross any existing minerals infrastructure.

## Hydrogeology

### Aquifer Designations – Superficial

- 5.7.19 DEFRA's MAGIC map (Defra, 2024) indicates that the superficial deposits are classified as follows:
- Secondary A Aquifer: Lowestoft Formation - Sand and Gravel, Marine Beach Deposits and Alluvium;
  - Secondary B Aquifer: Lowestoft Formation - Clay and Silt;
  - Secondary Undifferentiated Aquifer: Lowestoft Formation – Diamicton; and
  - Unproductive Strata: Tidal Flat Deposits and Head Deposits.
- 5.7.20 Secondary A Aquifers are described by the Environment Agency as *"permeable layers that can support local water supplies, and may form an important source of base flow to rivers"* (Environment Agency, 2024).
- 5.7.21 Secondary B Aquifers are described by the Environment Agency as *"mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers"* (Environment Agency, 2024).
- 5.7.22 The Secondary Undifferentiated Aquifer classification is applied by the Environment Agency *"where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value"* (Environment Agency, 2024).
- 5.7.23 Unproductive Strata are described by the Environment Agency as *"largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them"* (Environment Agency, 2024).

### Aquifer Designation – Bedrock

- 5.7.24 The bedrock of the Crag Group, Chillesford Church Sand Member and White Chalk Subgroup are classified by the Environment Agency as a Principal Aquifer, defined by the Environment Agency as rock layers that *"provide significant quantities of drinking water, and water for business needs. They may also support rivers, lakes and wetlands"* (Environment Agency, 2024).

- 5.7.25 The bedrock deposits of the Chillesford Clay Member (limited extent only within the study area but outside of the Order Limits) is classified as Unproductive Strata and the Lambeth Group is classified as a Secondary A Aquifer.
- 5.7.26 The contours of “*Potentiometric surface of the Crag*” as shown on the relevant BGS’ hydrogeological map (British Geological Survey, 1981), indicate that the piezometric surface within the study area is likely to be between five and zero metres Above Ordnance Datum (mAOD).

### Groundwater Monitoring

- 5.7.27 Groundwater monitoring was undertaken as part of the intrusive ground investigation and further information can be found within **Application Document 6.3.2.5.D Appendix 2.5.D Ground Investigation Report - Suffolk** and in **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment**.
- 5.7.28 Groundwater monitoring data generally indicates that groundwater is likely to be below the base of open cut trenches, launch/reception pits and the proposed substation which is discussed further within **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment**.

### Groundwater Vulnerability

- 5.7.29 DEFRA’s MAGIC map (Defra, 2024) indicates that the groundwater in the north-western part of the study area, i.e., approximately beneath areas where Lowestoft Formation Diamicton is indicated to be present overlying the Crag Group, is of “Medium” vulnerability.
- 5.7.30 In the south-eastern part of the study area, i.e., where the Lowestoft Formation Clay and Silt, and Sand and Gravel, and Alluvium are indicated to be present, the groundwater is shown to be of “Medium – High” vulnerability.
- 5.7.31 Where superficial deposits are indicated to be absent the groundwater vulnerability is considered to be “Medium-Low”.
- 5.7.32 The Environment Agency define High vulnerability as “*Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits*”, and areas of Low vulnerability as “*Areas that provide the greatest protection to groundwater from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability*”. Medium vulnerability is described as intermediate between Low and High vulnerability (Environment Agency, 2017).

### Groundwater Source Protection Zones

- 5.7.33 A groundwater source protection zone (SPZ) is a zone placed around a groundwater source, such as a well, borehole or spring, by the Environment Agency to protect a drinking water supply from pollution. Groundwater SPZ’s are generally split into three zones showing the level of risk to a groundwater source from contamination.
- 5.7.34 A SPZ1 is defined as the inner zone which is a 50-day travel time of a pollutant to an abstraction point. A SPZ2 Outer Zone is defined as a 400-day travel time of a pollutant to an abstraction point. A SPZ3 is defined as the total catchment, which is the area around a source within which all the groundwater ends at the abstraction point (Environment Agency, 2024).

- 5.7.35 DEFRA's MAGIC map (Defra, 2024) indicates that the majority of the Order Limits for the Suffolk Onshore Scheme are located within a groundwater Source Protection Zone (SPZ) 3 (or a series of connected SPZ 3's). The SPZ 3 appears, from the map, to be associated with SPZ 1's and SPZ 2's that are surrounding groundwater abstractions in Leiston, Knodishall and Saxmundham, the specific locations of which are outside of the study area. It is anticipated that the abstractions are all from the Crag Formation which is the predominant Principal Aquifer in these areas.
- 5.7.36 The location of the SPZs are shown on **Figure 6.4.2.5.3 Groundwater Receptors**.
- 5.7.37 The MAGIC map (Defra, 2024) also shows that the study area is not located within a groundwater Drinking Water Safeguard Zone (DWSZ) or a groundwater Nitrate Issues Priority Zone (NIPZ).

### Groundwater Body

- 5.7.38 The EA's Catchment Data Explorer (Environment Agency, 2024) indicates that the groundwater beneath the study area is part of the Waveney and East Suffolk Chalk and Crag groundwater body (ref: GB40501G400600). This groundwater body received an overall Water Framework Directive (WFD) status of "Poor" in 2019. This can be further broken down into a "Poor" status for both chemical quality and quantitative status. The Chalk and the Crag are likely to be in direct continuity in some parts of the catchment, however in large parts of the study area they are separated by the Thames Group and, Lambeth Group.

### Groundwater Abstractions

- 5.7.39 Information has been obtained from the Environment Agency regarding groundwater abstractions and deregulated groundwater abstractions and is presented in **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment**.
- 5.7.40 Information has also been obtained from East Suffolk District Council regarding private water supplies and is presented in **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment**.

### Potentially contaminative land uses

- 5.7.41 The majority of the Order Limits for the Suffolk Onshore Scheme and study area is indicated to have remained as undeveloped/agricultural land since the earliest available historical mapping (National Library of Scotland, 2024) dated 1885. In these areas it is considered that there is a very low risk of a significant source of potential contamination.
- 5.7.42 However, there are discrete areas within the Order Limits and study area where either the historical land use or the current land use have been identified as potentially contaminative. Where these areas are identified, readily available information relating to the Potential Sources of Contamination (PSC) has been gathered and an initial assessment has been undertaken to provide a classification score for their potential for generating contamination. This assessment is presented in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**.
- 5.7.43 Where the initial classification score is moderate or above within the study area these sites are taken forward for further assessment in relation to the risk to sensitive receptors. This assessment is presented in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**.

- 5.7.44 Based on the assessment presented in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**, following the Tier 1 assessment, there were no sites that were assessed to have a potential Moderate or above risk to sensitive receptors from existing contamination.
- 5.7.45 In addition, a Tier 2<sup>1</sup> generic quantitative risk assessment (as described in **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**) has been undertaken by Mott Macdonald, and included as **Application Document 6.3.2.5.E Appendix 2.5.E Generic Quantitative Risk Assessment – Suffolk**, which identified that all the soil samples tested were below the selected generic assessment criteria for a public open space and commercial/industrial end use and therefore the risks to human health receptors from, existing contamination were generally assessed to be low to very low. Some minor exceedances of the groundwater generic assessment criteria were recorded and therefore the risk to groundwater from mobilizing existing contamination was assessed to be low/moderate.

## Identified receptors

- 5.7.46 The following receptors have been identified within the study area that are relevant to the potential impacts scoped into the geology and hydrogeology assessment. The sensitivity of the receptor is also given based on the descriptions in Table 5.7.
- Construction and maintenance workers – high sensitivity; and
  - Groundwater and groundwater receptors (e.g. groundwater abstractions, ecological receptors, surface water that is groundwater fed) – very high to high sensitivity.

## Future Baseline

- 5.7.47 There are no foreseeable significant changes anticipated in relation to geology, hydrogeology or land contamination either prior to, or during the construction and operational phases in relation to direct man-made changes. It is assumed that any man-made changes (e.g., due to new developments) would be appropriately permitted/controlled and operated in accordance with current legislation to prevent or limit adverse impacts to ground conditions or controlled waters.
- 5.7.48 Climate change predictions for the UK indicate a trend of wetter winters, drier summers, higher average temperatures and higher intensity rainfall events. These could have an impact on soil erosion, groundwater levels, and indirectly (through groundwater level changes) – the potential for mobilisation of contamination.
- 5.7.49 In the context of soil erosion and groundwater levels, it is not considered these would have a noticeable impact on the significance of effects given the nature of the Proposed Project and the inherent engineering design. In relation to contamination, as any areas that may have a significant impact would be remediated or mitigated during design and construction of the Proposed Project, it is not considered that climate change would have a noticeable impact on the significance of effects for contamination.

## 5.8 Proposed Project Design and Embedded Mitigation

- 5.8.1 The Proposed Project has been designed, as far as practicable, following the mitigation hierarchy in order to, in the first instance, avoid or reduce geology and hydrogeology impacts and effects through the process of design development, and by embedding measures into the design of the Proposed Project.



- 5.8.2 As set out in **Application Document 6.2.1.5 Part 1 Introduction Chapter 5 EIA Approach and Methodology**, mitigation measures typically fall into one of three categories: embedded measures; control and management measures; and mitigation measures. Embedded, and control and management measures are set out below. Additional mitigation measures have not been identified as being required.

## Embedded Measures

- 5.8.3 Embedded measures have been integral in reducing, and where possible avoiding, potential geology and hydrogeology effects of the Proposed Project. Measures that have been incorporated are:
- sensitive routing and siting of infrastructure and temporary works as to avoid sensitive features such as groundwater Source Protection Zone (SPZ) 1, where possible;
  - commitments made within **Application Document 7.5.3.2 CEMP Appendix B Register of Environmental Actions and Commitments (REAC)**; and
  - the Proposed Project incorporates suitable consideration of the ground conditions in the design based on data from site specific ground investigation and assessment, and therefore that any risks from ground instability, chemical aggressivity of the ground, ground gases and radon reports would be considered within the engineering design of the new infrastructure in accordance with best practice.

## Control and Management Measures

- 5.8.4 Measures for the control and management of impacts during construction have been included within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**. The following measures include elements to control and manage the geology and hydrogeology effects of the Proposed Project: GG01, GG06, GG15, GG17, W05, W06, W08, W09. The measures below are specific to geology and hydrogeology.
- GH01 - Intrusive ground investigations and assessment will be undertaken prior to construction which will inform appropriate geotechnical design in relation to the site/structure specific ground conditions including ground instability/adverse ground conditions.
  - GH02 - A Foundation Works Risk Assessment (FWRA) will be undertaken by the contractor where the use of piled foundations are anticipated and at trenchless crossings. The contractor will utilise construction methods such as appropriate piling techniques to minimise and avoid the risk of introducing new contamination (if required), creating new contamination pathways, and mixing of aquifer bodies. The FWRA would be undertaken once the proposed foundation solutions are known in accordance with Environment Agency guidance 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination'.
  - GH03 - Use of appropriate occupational health and safety measures e.g. Personal Protective Equipment (PPE), and statutory health and safety compliance (e.g. compliance with the Confined Spaces Regulations, 1997 in relation to ground gas from working in confined spaces/trenches) to minimise the risks associated with anticipated/unexpected contamination. Based on risk assessment informed by site specific information.

- GH04 - Appropriate training of construction and maintenance workers in the handling and use of potentially hazardous substances and the associated risks.
- GH05 – All materials that could be hazardous to water quality will be stored in suitable areas, more than 8 m away from a watercourse, away from site traffic and in containers which are fit for purpose, meeting the requirements of the Control of Pollution (Oil Storage) Regulations. The use and storage of chemicals and fuels will also be controlled and monitored under the Onshore Construction and Environmental Management Plan (CEMP) which will include, for example, protection from vandalism, procedures for good general construction site practices, environmental and waste management procedures, regular vehicle checks, use of spill kits, correct waste storage and disposal, use of oil-water separators as necessary (for example, for drainage from refuelling areas). Any washing of vehicles or equipment will only take place in controlled areas, and wash waters will not be discharged into the water environment. The wash water will be treated and discharged to an approved location.
- GH06 - The control of earthworks or materials movement (including any re-use of materials) under appropriate Environmental Permits, exemptions or Contaminated Land: Applications in the Real Environment (CL:AIRE) 'The definition of Waste: The development industry Code of Practice (2011).
- GH07 - Any temporary dewatering activities during construction will be undertaken in accordance with EA guidance, and if required, an Abstraction Licence and Environmental Permit (for the discharge) and will be limited to the depth and time required to facilitate construction activities.
- GH08 - A protocol will be developed for dealing with any unexpected contamination.
- GH09 - Where indicated in the ES, a Hydrogeological Risk Assessment will be undertaken during detailed design to assess the specific risks to groundwater and groundwater receptors at those locations and identify any additional mitigation or remediation that may be required. The nature and scope of any mitigation or remediation will be agreed with the Environment Agency or other stakeholders, as appropriate.
- GH10 - The provision of a drilling fluid breakout plan, where horizontal directional drilling is proposed, will be developed by the contractor and included within the Offshore and Onshore Construction and Environmental Management Plan's.

## 5.9 Assessment of Impacts and Likely Significant Effects

- 5.9.1 The assessment of the effects of the Proposed Project on geology and hydrogeology receptors described in this section considers the embedded and control and management measures described in Section 5.8.

### Construction Phase

#### Damage to/destruction of designated geological sites

- 5.9.2 No designated geological sites have been identified within the study area, therefore there is anticipated to be no change from the baseline conditions during construction, therefore effects would be **not significant**.

## Sterilisation of mineral resources

- 5.9.3 As presented within **Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment** the majority of the Order Limits are located within a Mineral Consultation Area (MCA) however the Proposed Project does not cross any active mineral extraction sites that would be impacted during the construction of the Proposed Project therefore there is anticipated to be no change from the baseline conditions during construction, therefore effects would be **not significant**.
- 5.9.4 The effects on the sterilisation of minerals within the wider MCA is described in the Operational and Maintenance Phase section below to avoid double counting of effects.

## Exposure to existing potential contamination through ground disturbance

- 5.9.5 Where a significant source of potential existing contamination is identified there is the potential for exposure of human health receptors if potential contamination is disturbed (e.g. by excavations).
- 5.9.6 A baseline assessment and preliminary contamination risk assessment (PRA) has been undertaken in accordance with the process of contamination risk assessment defined within LCRM (Environment Agency, 2023) and is presented within **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**. This PRA has identified a generally very low to low risk of significant existing contamination within the study area, and therefore a very low/low risk to sensitive receptors. The results of the Mott MacDonald Tier 2 generic quantitative risk assessment, included within **Application Document 6.3.2.5.E Appendix 2.5.E Generic Quantitative Risk Assessment – Suffolk**, identified the soil samples tested were below the selected assessment criteria and therefore the risk to human health receptors from existing contamination was assessed to be low to very low.
- 5.9.7 Therefore, with the good practice measures contained within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**, the potential temporary construction impacts from existing contamination are considered to be **negligible** as the risk to receptors from any pre-existing contamination is considered to be very low/low. Therefore for construction workers (high sensitivity), this would result in a **negligible** effect which would be **not significant**.

## The mobilisation of existing contamination

- 5.9.8 Where a significant source of potential existing contamination is identified, there is the potential for exposure of groundwater and groundwater receptors (e.g. groundwater abstractions, ecological receptors, surface water that is groundwater fed) if the potential contamination is mobilised through the creation of new pathways (e.g. piling, trenchless crossing etc).
- 5.9.9 A baseline assessment and preliminary contamination risk assessment (PRA) has been undertaken in accordance with the process of land contamination risk assessment defined within LCRM (Environment Agency, 2023) and is presented within **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**. A groundwater risk assessment has also been undertaken and is presented within **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment**. The assessments have concluded that there is a very low risk of any existing contamination within the soils but there is a low/moderate risk of existing contamination within groundwater, that could potentially be mobilised.

- 5.9.10 With the good practice measures contained within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**, the potential temporary construction impacts are considered to be small. Therefore, for groundwater and groundwater receptors (high sensitivity) this would result in a **minor** effect, which would be **not significant**.

### **Ingress and accumulation of ground gases**

- 5.9.11 If a potential source of ground gas exists within the study area (together with a pathway) there is the potential for ground gas to accumulate within any confined spaces such as trenches, which could result in significant effects on receptors such as construction workers.
- 5.9.12 As part of the baseline assessment, potential sources of ground gas have not been identified within the Order Limits. Therefore, with the good practice measures contained within **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**, the temporary construction impacts from ground gases are considered to be negligible. For construction workers (high sensitivity), this would result in a **negligible** effect which would be **not significant**.

### **Mixing of aquifer bodies due to the connection of aquifer units at trenchless crossings**

- 5.9.13 The groundwater risk assessment presented in **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment** has assessed the potential risks to groundwater quality from the connection of different aquifer units at trenchless crossings and informs the impact assessment presented in this section.
- 5.9.14 The assessment concluded that the horizontal directional drill (HDD) bore is unlikely to connect two aquifer units as the works would remain within the Crag Formation for its full length. As described within the groundwater risk assessment there is a low/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 be undertaken at all locations where trenchless crossings are proposed, and therefore risks associated with creation of new flow/contamination pathways from the connection of aquifer units are expected to be very low.
- 5.9.15 Therefore, the temporary construction impacts would be negligible and for groundwater and groundwater receptors (high sensitivity), this would result in a **negligible** effect which would be **not significant**.

### **Changes to groundwater levels, quality and groundwater flow direction caused by dewatering during construction**

- 5.9.16 The groundwater risk assessment presented in **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment** has assessed the potential risks associated with changes to groundwater levels, quality and groundwater flow due to dewatering, on groundwater receptors, and informs the impact assessment presented in this section.
- 5.9.17 The risk assessment concluded that dewatering within the Suffolk Onshore Scheme is unlikely to be required for any of the elements of the Proposed Project based on the site-specific information as groundwater was not identified at depths that are likely to interact with the Proposed Project.

- 5.9.18 A saline intrusion assessment has also been undertaken as part of **Application Document 6.3.2.5.B Appendix 2.5.B Qualitative Groundwater Risk Assessment** which assesses the potential risk from saline intrusion at the landfall location. 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.
- 5.9.19 Therefore, the temporary construction impacts would be negligible and for groundwater and groundwater receptors (high sensitivity), this would result in a **negligible** effect which would be not significant

## Operation and Maintenance Phase

### Sterilisation of mineral resources

- 5.9.20 As presented within **Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment** the majority of the Order Limits are located within a Mineral Consultation Area. However, it is considered that the physical footprint of the operational Proposed Project components (where mineral might be sterilised) is only a very small part of the Order Limits and an even smaller proportion of the overall MCA within Suffolk. In addition, any potential mineral sterilisation can be considered to be temporary, as although during the operational lifetime of the Proposed Project some areas of the mineral could not be feasibly extracted (beneath the built elements), upon decommissioning of the Proposed Project the permanent infrastructure could be removed and access to the underlying mineral restored.
- 5.9.21 The MRA explores the potential for prior and/or incidental extraction of the minerals but concludes that this is not environmentally or economically viable, and that the potential environmental effects associated with extracting the mineral could be disproportionate to the value gained from extracting the mineral.
- 5.9.22 Based on the national significance of the Proposed Project, that Suffolk has greater than the minimum 7-year landbank of sand and gravels required by National Planning Policy, and sufficient additional safeguarded areas, it is considered that the potential impact on the small volume of mineral associated with the Proposed Project is acceptable without consideration of further mitigation.
- 5.9.23 Therefore, based on the assessment presented within the MRA the operational impacts are considered to be negligible, for mineral resource (medium sensitivity) this would result in a **negligible** effect which would be not significant.

### Ingress and accumulation of ground gases

- 5.9.24 If a potential source of ground gas exists within the study area (together with a pathway) there is the potential for ground gas to accumulate within confined spaces, such as trenches which could result in significant effects on receptors such as maintenance workers.
- 5.9.25 As part of the baseline assessment, potential sources of ground gas have not been identified within the Order Limits. Therefore, the temporary maintenance impacts from ground gases are considered to be negligible. For maintenance workers (high sensitivity), this would result in a **negligible** effect which would be not significant.



## Changes to groundwater levels and/or recharge rates from the introduction of impermeable surfaces

- 5.9.26 Effects on infiltration and recharge of groundwater may arise if the permeability of the ground surface is changed. There are only relatively small areas of new hard standing anticipated to be required for the Proposed Project at the converter and substation, and these will be designed to meet the current drainage standards as described in **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**.
- 5.9.27 Hard standing at the new pylon bases is anticipated to be limited to very small areas, which means that there are not likely to be any noticeable changes on infiltration and recharge in these areas.
- 5.9.28 Therefore, the permanent operational impacts from the introduction of impermeable surfaces are considered to be negligible. For groundwater and groundwater receptors (high sensitivity) this would result in a **negligible** effect which would be not significant.

## Decommissioning Phase

- 5.9.29 The decommissioning impacts and effects are considered to be similar (or less significant) to the construction phase because the activities required to complete decommissioning are of a similar nature (e.g. ground disturbance extents and depths). In addition, all decommissioning activities would be expected to take place in accordance with UK environmental legislation, good practice control and management measures and the relevant environmental permitting regime (if appropriate) current at the time.
- 5.9.30 Therefore, the likely significant effects relating to the construction phase are applicable, on a conservative basis, to the decommissioning phase.

## 5.10 Additional Mitigation

- 5.10.1 The assessment has concluded that there are no likely significant effects in relation to geology and hydrogeology receptors, therefore no additional mitigation measures are required for geology and hydrogeology beyond the good practice measures and commitments set out in **Application Document 7.5.3.1 CEMP Appendix A Outline Code of Construction Practice**.

## 5.11 Residual Effects and Conclusions

- 5.11.1 The geology and hydrogeology assessment has considered the potential impacts that construction, operation and decommissioning of the Suffolk Onshore Scheme may have on existing geological and hydrogeological receptors. This includes an assessment of the potential for existing contamination and pollutant linkages, in relation to sensitive receptors such as human health and groundwater.
- 5.11.2 Geology and hydrogeology effects have been mostly avoided through design, by avoiding, where practicable, known sources of significant potential contamination (e.g. landfills) and receptors such as high sensitivity hydrogeological features. Further supporting assessment has also been undertaken and included within the relevant appendices to this chapter, such as **Application Document 6.3.2.5.A Appendix 2.5.A Preliminary Contamination Risk Assessment**, **Application Document 6.3.2.5.B**

**Appendix 2.5.B Qualitative Groundwater Risk Assessment and Application Document 6.3.2.5.C Appendix 2.5.C Preliminary Minerals Resource Assessment.** In addition, good practice measures and commitments have been outlined within **Application Document 7.5.3.1 CEMP Appendix A Code of Construction Practice** to support the assessment.

- 5.11.3 The assessment has concluded, as described in Section 5.9, that with the measures outlined above, there are no likely significant residual effects in relation to geology and hydrogeology receptors during construction, operation and maintenance, and decommissioning of the Suffolk Onshore Scheme.

## **5.12 Sensitivity Testing**

- 5.12.1 Under the terms of the DCO, construction could commence in any year up to five years from the granting of the DCO which is assumed to be 2026. It is considered that if the works were to commence in any year up to year five this will not change the assessment of effects in relation to geology and hydrogeology.

## 5.13 References

- British Geological Society. (2024). *Lexicon of Named Rock Units*. Retrieved from <https://webapps.bgs.ac.uk/lexicon/home.cfm>
- British Geological Survey. (1981). *Sheet 5 - Hydrogeological Map of Southern East Anglia (1:125,000)*. Retrieved August 2024, from <https://largeimages.bgs.ac.uk/iip/hydromaps.html?id=southern-east-anglia.jp2>
- British Geological Survey. (2024). *BGS Geoindex Viewer*. Retrieved August 2024, from <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>
- British Geological Survey. (2024). *Geological Survey of England and Wales 1:63,360/1:50,000 geological map series*. Retrieved August 2024, from BGS Maps Portal: <https://webapps.bgs.ac.uk/data/MapsPortal/>
- British Standard Institution. (2019). *BS 8485:2015+A1:2019, Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*.
- CIRIA. (2001). *Contaminated land risk assessment: A guide to good practice (C552)*. Retrieved August 2024, from <https://www.ciria.org/ProductExcerpts/C552.aspx>
- CIRIA. (2007). *Assessing risks posed by hazardous ground gases to buildings (C665)*.
- Defra. (2024). *Multi-Agency Geographic Information for the Countryside (MAGIC)*. Retrieved August 2024, from <https://magic.defra.gov.uk/>
- Department for Energy Security and Net Zero. (2023). *National Policy Statement for Electricity Networks Infrastructure (EN-5)*. Retrieved from <https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf>
- Department for Energy Security and Net Zero. (2023). *Overarching National Policy Statement for Energy (EN-1)*. Retrieved from <https://assets.publishing.service.gov.uk/media/65bbfdbc709fe1000f637052/overarching-nps-for-energy-en1.pdf>
- East Suffolk Council. (2019). *Waveney Local Plan*. Retrieved from <https://www.eastsuffolk.gov.uk/assets/Your-Council/WDC-Council-Meetings/2019/March/Council-20-03-19/Item-11-APPENDIX-A-Waveney-Local-Plan.pdf>
- East Suffolk Council. (2020). *Suffolk Coastal Local Plan*. Retrieved from <https://www.eastsuffolk.gov.uk/assets/Planning/Planning-Policy-and-Local-Plans/Suffolk-Coastal-Local-Plan/Adopted-Suffolk-Coastal-Local-Plan/East-Suffolk-Council-Suffolk-Coastal-Local-Plan.pdf>
- East Suffolk Council. (2020). *Suffolk Coastal Local Plan*. Retrieved from <https://www.eastsuffolk.gov.uk/assets/Planning/Planning-Policy-and-Local-Plans/Suffolk-Coastal-Local-Plan/Adopted-Suffolk-Coastal-Local-Plan/East-Suffolk-Council-Suffolk-Coastal-Local-Plan.pdf>
- Environment Agency. (2007). *Hydrogeological impact appraisal for dewatering abstraction*. Retrieved from <https://assets.publishing.service.gov.uk/media/5a7c67c5ed915d696ccfc8d2/scho0407bmae-e-e.pdf>
- Environment Agency. (2016). *Managing and reducing land contamination: guiding principles (GPLC)*. Retrieved from <https://assets.publishing.service.gov.uk/media/5a7b8340e5274a7318b8f256/geho1109brgz-e-e.pdf>
- Environment Agency. (2017). *Groundwater Vulnerability mapping methodology*. Retrieved from <https://www.gov.uk/government/publications/updated-groundwater-vulnerability-maps-improvements-to-methodology-and-data>
- Environment Agency. (2023). *Land Contamination Risk Management (LCRM)*. Retrieved August 2024, from <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>
- Environment Agency. (2024). *Catchment Data Explorer*. Retrieved August 2024, from <https://environment.data.gov.uk/catchment-planning/>
- Environment Agency. (2024). *Groundwater source protection zones (SPZs)*. Retrieved from <https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs>
- Environment Agency. (2024). *Information regarding historical landfills and permitted landfill and waste sites, and category 1 and 2 pollution incidents*. Retrieved August 2024, from <https://www.gov.uk/government/organisations/environment-agency>

- Environment Agency. (2024). *Protect groundwater and prevent groundwater pollution*. Retrieved from <https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution>
- GeoSuffolk. (2024). *Geodiversity Sites*. Retrieved from [https://geosuffolk.co.uk/images/GeologySites/Suffolk\\_County\\_Geodiversity\\_Sites\\_2021.pdf](https://geosuffolk.co.uk/images/GeologySites/Suffolk_County_Geodiversity_Sites_2021.pdf)
- Highways England. (2019). *Design Manual for Roads and Bridges: LA 109 Geology and Soils*. Retrieved from <https://www.standardsforhighways.co.uk/search/adca4c7d-4037-4907-b633-76eae30b9c0>
- Highways England. (2020). *Design manual for Roads and Bridges LA 113: Road drainage and the water environment*. Retrieved from <https://www.standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727>
- HM Government. (1990). *Environmental Protection Act*. Retrieved from <https://www.legislation.gov.uk/ukpga/1990/43/contents>
- HM Government. (1991). *Water Resources Act*. Retrieved from <https://www.legislation.gov.uk/ukpga/1991/57/contents>
- HM Government. (2009). *The Groundwater (England and Wales) Regulations*. Retrieved from <https://www.legislation.gov.uk/ukdsi/2009/9780111480816/contents>
- HM Government. (2012). *The Contaminated Land (England)(Amendment) Regulations*. Retrieved from <https://www.legislation.gov.uk/uksi/2012/263>
- HM Government. (2015). *Environmental Damage (Prevention and Remediation) Regulations*. Retrieved from <https://www.legislation.gov.uk/uksi/2015/810/contents>
- HM Government. (2016). *Environmental Permitting (England and Wales) Regulations*. Retrieved from <https://www.legislation.gov.uk/uksi/2016/1154/contents/made>
- HM Government. (2017). *The Water Environment (Water Framework Directive) (England and Wales) Regulations*. Retrieved from <https://www.legislation.gov.uk/uksi/2017/407/contents/made>
- HM Government. (2023). *The Environmental Permitting (England and Wales) (Amendment) (England) Regulations*. Retrieved from <https://www.legislation.gov.uk/uksi/2023/651/introduction/made>
- Minerals Production Association. (2019). *Minerals Safeguarding Practice Guidance*. Retrieved August 2024, from [https://mineralproducts.org/MPA/media/root/Publications/2019/MPA\\_POS\\_Minerals\\_Safeguarding\\_Guidance\\_Document.pdf](https://mineralproducts.org/MPA/media/root/Publications/2019/MPA_POS_Minerals_Safeguarding_Guidance_Document.pdf)
- Ministry of Housing, Communities and Local Government. (2024). *National Planning Policy Framework*. Retrieved January 2025, from <https://www.gov.uk/guidance/national-planning-policy-framework>
- Ministry of Housing, Communities and Local Government and Department for Levelling Up, Housing and Communities. (2019). *Land Stability Guidance*. Retrieved from <https://www.gov.uk/guidance/land-stability>
- Ministry of Housing, Communities and Local Government and Department for Levelling Up, Housing and Communities. (2019). *Land Affected by Contamination Guidance*. Retrieved from <https://www.gov.uk/guidance/land-affected-by-contamination>
- National House Building Control. (2008). *Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publication 66*.
- National Library of Scotland. (2024). *Map Images*. Retrieved August 2024, from <https://maps.nls.uk/>
- Natural England. (2024, August 2024). *Designated Sites View*. Retrieved from <https://designatedsites.naturalengland.org.uk/>
- Suffolk County Council. (2020). *Suffolk Minerals and Waste Local Plan*. Retrieved from <https://www.suffolk.gov.uk/planning-waste-and-environment/minerals-and-waste-policy/suffolk-minerals-and-waste-development-scheme/>.
- The Council of the European Union. (1999). *EC Directive 1999/31/EC on the landfill of waste*. Retrieved from Landfill Directive: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31999L0031>

National Grid plc  
National Grid House,  
Warwick Technology Park,  
Gallows Hill, Warwick.  
CV34 6DA United Kingdom

Registered in England and Wales  
No. 4031152  
[nationalgrid.com](http://nationalgrid.com)