



The Sizewell C Project

6.3 Volume 2 Main Development Site Chapter 18 Geology and Land Quality

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Figures

None provided.

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None provided.

Appendices

- Appendix 18A: Main Development Site: Phase 2 Geo-Environmental Interpretative Report, 2019
- Appendix 18B: Conceptual Site Models
- Appendix 18C: Impact Assessment Tables
- Appendix 18D: Assessment of Off-site Development Areas
- Appendix 18E: Borrow Pit Risk Assessment

18. Geology and Land Quality

18.1 Introduction

18.1.1 This chapter of **Volume 2** of the **Environmental Statement (ES)** (Doc Ref. 6.3) presents an assessment of the potential effects on geology and land quality arising from the construction and operation of the main development site (referred to throughout this volume as the 'proposed development'). This includes an assessment of potential impacts, the significance of effects, the requirements for mitigation and the residual effects.

18.1.2 Detailed descriptions of the proposed development site (referred to throughout this volume as the 'site'), the proposed development and the different phases of development are provided in **Chapters 1 to 4** of this volume of the **ES**. A description of the anticipated activities for the decommissioning of the Sizewell C power station, including a summary of the types of environmental effects likely to occur is provided in **Chapter 5** of this volume. A glossary of terms and list of abbreviations used in this chapter is provided in **Appendix 1A** of **Volume 1** of the **ES**.

18.1.3 The Government's Good Practice Guide for Environmental Impact Assessment¹ (EIA) (Ref. 18.1) outlines the potential environmental effects that should be considered for geology and land quality, e.g. physical effects of the development, effects on geology and effects on contamination. Further information on these potential environmental effects and those which have been scoped into the geology and land quality assessment can be found in **Appendix 6N** of **Volume 1** of the **ES**.

18.1.4 This assessment has been informed by data from other assessments as follows:

- **Chapter 17** of this volume: Soils and agriculture.
- **Chapter 19** of this volume: Groundwater and surface water.
- **Chapter 21** of this volume: Marine water quality and sediments.

18.1.5 This assessment has been informed by data presented in the following technical appendices:

¹ It should be noted that this document has been withdrawn; however, it still constitutes good advice and should be referred to in the absence of alternative guidance documents

- **Appendix 18A** of this volume: Main development site: Phase 2 Geo-Environmental Interpretative Report, 2019.
- **Appendix 18B** of this volume: Conceptual site models.
- **Appendix 18C** of this volume: Impact assessment tables.
- **Appendix 18D** of this volume: Assessment of off-site development areas.
- **Appendix 18E** of this volume: Borrow pit risk assessment.

18.1.6 A standalone ES was prepared for the Sizewell B relocated facilities works for submission with the hybrid planning application under the Town and Country Planning Act 1990 (East Suffolk Council application ref. DC/19/1637/FUL). Chapter 12 of the Sizewell B relocated facilities ES (refer to **Volume 1, Appendix 2A**) included an assessment of likely significant effects associated with geology and land quality and identified mitigation specific to the Sizewell B relocated facilities works. However, as the Sizewell B relocated facilities works form part of the Sizewell C Project and consent is sought for these works through the Development Consent Order (DCO), an updated assessment of the likely significant effects of these works is also set out in this chapter.

18.2 Legislation, policy, and guidance

18.2.1 **Appendix 6N** of **Volume 1** of the **ES** identifies and describes legislation, policy and guidance of relevance to the assessment of the potential geology and land quality impacts associated with the Sizewell C Project across all **ES** volumes.

18.2.2 This section provides an overview of the legislation, policy and guidance specific to the assessment of the proposed development.

a) International

18.2.3 International legislation or policy relevant to the geology and land quality assessment includes the Water Framework Directive (WFD) 2000/60/EC (Ref. 18.2) and the Waste Framework Directive 2008 (Ref. 18.3). The requirements of these, as relevant to the geology and land quality assessment, are described in **Appendix 6N** of **Volume 1** of the **ES**.

b) National

i. Legislation

18.2.4 National legislation relevant to the geology and land quality assessment includes:

- Part IIA of the Environmental Protection Act 1990 (Ref. 18.4).
- Water Resources Act 1991 (Ref. 18.5).
- The Control of Substances Hazardous to Human Health (COSHH) Regulations 2002 (Ref. 18.6).
- Construction (Design and Management) Regulations (CDM Regulations) 2015 (Ref. 18.7).
- Waste Management Regulations 2016 (Ref. 18.8).
- Landfill (England and Wales) Regulations 2005 (Ref. 18.9).
- Hazardous Waste (England and Wales) Regulations 2005 (Ref. 18.10).
- The Environmental Permitting (England and Wales) Regulations 2016 (Ref. 18.11).

18.2.5 The requirements of these, as relevant to the geology and land quality assessment, are described in **Appendix 6N** of **Volume 1** of the **ES**.

ii. Planning policies

18.2.6 National Policy Statements (NPS) set out national policy for energy infrastructure. The overarching NPS for Energy (EN-1) (Ref. 18.12) and NPS for Nuclear Power Generation (EN-6) (Ref. 18.13) provide the primary policy framework within which the development will be considered. A summary of the relevant planning policy, together with consideration of how the advice has been taken into account is provided in **Appendix 6N** of **Volume 1** of the **ES**.

18.2.7 Other national policies relevant to the geology and land quality assessment include the National Planning Policy Framework 2019 (Ref. 18.14), Planning Practice Guidance 2019 (Ref. 18.15) and the Government's 25 Year Environment Plan 2018 (Ref. 18.16). The requirements of these are described in **Appendix 6N** of **Volume 1** of the **ES**.

c) Regional

18.2.8 No regional policy is deemed relevant to the assessment of geology and land quality for this site.

d) Local

18.2.9 **Appendix 6N** of **Volume 1** of the **ES** summarises the requirements of Suffolk Coastal District Council (SCDC) Local Plan Core Strategy and Development Management Polices (Ref. 18.17) and Suffolk Coastal Local Plan (Ref. 18.18)

e) Assessment guidance

18.2.10 Guidance relating to the geology and land quality assessment include:

- The Department for Environment, Food and Rural Affairs (Defra) Contaminated Land Statutory Guidance 2012 (Ref. 11.19).
- Contaminated Land Report (CLR) 11² (Ref. 18.20).
- Guiding Principles for Land Contamination (GPLC) (Ref. 18.21).
- The Definition of Waste: Development Industry Code of Practice (DoWCoP) (Ref. 18.22).
- The Design Manual for Roads and Bridges (DMRB) (2008) Volume 11, Section 2, Part 5 Assessment and Management of Environmental Effects (Ref. 18.23).
- DMRB (1993) Volume 11, Section 3, Part 11 Geology and Soils (Ref. 18.24).
- Department of the Environment (DoE) (1995) Industry Profiles for previously developed land, Environment Agency (Ref. 18.25).
- Construction Industry Research and Information Association (CIRIA) C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice (Ref. 18.26).
- National House-Building Council and Environment Agency (2008) Guidance on the Safe Development of Housing on Land Affected by

² It is noted that CLR11 is due to be withdrawn in early 2020 and replaced by updated online guidance: Environment Agency Land contamination: Risk Management (LCRM).

Contamination (R&D66) (Ref. 18.27).

- CIRIA C665 (2007) Assessing Risks Posed by Hazardous Ground Gases to Buildings (Ref. 18.28).
- British Standards (2015) BS 8485 +A1:2019 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (Ref. 18.29).
- CIRIA C681 (2009) Unexploded Ordnance (UXO) – A Guide for the Construction Industry (Ref. 18.30).
- CIRIA C733 (2014) Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks (Ref. 18.31).
- CIRIA C682 (2009) The Volatile Organic Contaminants Handbook (Ref. 18.32).
- British Standards (2015) BS 5930 – Code of practice for ground investigations (Ref. 18.33).
- British Standards (2017) BS 10175:2011+A2:2017 – Code of Practice for Investigation of Potentially Contaminated Sites (Ref. 18.34).

18.2.11 Further detail on this guidance, as relevant to the geology and land quality assessment is set out in **Appendix 6N** of **Volume 1** of the **ES**.

18.3 Methodology

a) Scope of the assessment

18.3.1 The generic EIA methodology is detailed in **Volume 1, Chapter 6** of the **ES**.

18.3.2 The full method of assessment for geology and land quality that has been applied for the Sizewell C Project is included in **Appendix 6N** of **Volume 1** of the **ES**.

18.3.3 This section provides specific details of the geology and land quality methodology applied to the assessment of the proposed development and a summary of the general approach to provide appropriate context for the assessment that follows. The scope of assessment considers the impacts of the construction and operation of the proposed development.

- 18.3.4 The scope of this assessment has been established through a formal EIA scoping process undertaken with the Planning Inspectorate. A request for an EIA Scoping Opinion was initially issued to the Planning Inspectorate in 2014, with an updated request issued in 2019; see **Appendix 6A** of **Volume 1** of the **ES**.
- 18.3.5 Comments raised in the EIA Scoping Opinion received in 2014 and 2019 have been taken into account in the development of the assessment methodology. These are detailed in **Appendices 6A** and **6C** of **Volume 1** of the **ES**.
- 18.3.6 The Government's Good Practice Guide³ for EIA states that the following potential environmental effects should be considered for geology and land quality:
- physical effects of the development: such as changes in topography, soil compaction, soil erosion, ground stability, etc.;
 - effects on geology as a valuable resource: such as mineral resource sterilisation, loss or damage to regionally important geological sites, geological Sites of Special Scientific Interest (SSSIs) etc.;
 - effects on soil as a valuable resource: such as loss or damage to soil of good agricultural quality;
 - effects associated with ground contamination that may already exist on-site: such as introducing or changing pathways and receptors;
 - effects associated with the potential for polluting substances used (during the various phase) to cause new ground contamination issues on-site, such as introducing or changing the source of contamination and/or pathways; and
 - effects associated with re-use of soils and waste soils: such as re-use of site-sourced materials on- or off-site, disposal of site-sourced materials off-site, importation of materials to the site, etc.

³ It should be noted that this document has been withdrawn; however, it still constitutes good advice and should be referred to in the absence of alternative guidance documents

- 18.3.7 The proposed development is considered unlikely to have an impact on important geological sites as no geological SSSIs or local geological sites have been identified within the study area which is described below in **section 18.3c** of this chapter. However, given comments in the revised scoping opinion received in 2019 in relation to effects on geology as a valuable resource, an assessment of the effects on mineral resources has been included within the assessment.
- 18.3.8 Physical effects in relation to changes in topography are discussed in **Chapter 13** of this volume. The effects on soil as a valuable resource are discussed in **Chapter 17** of this volume. Management of site-sourced waste materials, other than site soils (i.e. general waste materials from construction and operational phases), is summarised in **Chapter 8** of this volume, with further details provided in the **Waste Management Strategy** which is detailed in **Appendix 8A** of **Volume 2** of the **ES**.
- 18.3.9 Therefore, the following remaining environmental effects have been considered and form part of the assessment:
- physical effects including soil erosion, soil compaction and ground stability;
 - mineral resource loss, damage or sterilisation;
 - effects associated with existing ground contamination and potential new ground contamination issues; and
 - effects associated with the re-use or disposal of site sourced soils and waste soils.
- 18.3.10 Potential impacts from existing and new contamination sources on controlled waters have been considered as part of the geology and land quality assessment to determine and classify potential effects. Further description of the effects from contamination to controlled waters is provided in **Chapter 19** and **Chapter 21** of this volume.
- 18.3.11 This chapter provides an initial indication of chronic long-term risks to construction and maintenance workers. In accordance with the **Code of Construction Practice (CoCP)** (Doc Ref. 8.11), short-term acute risks should be assessed, managed and mitigated by the Contractor with appropriate risk assessments and methods statements, and subsequent control measures.

b) Consultation

- 18.3.12 The scope of the assessment has also been informed by ongoing project-wide consultation and engagement with statutory consultees throughout the design and assessment process as outlined in **Appendix 6N** of **Volume 1** of the **ES**.

c) Study area

- 18.3.13 To consider the physical effects of the proposed development and the effects associated with mineral resources, the re-use of soils and waste soils, the study area is defined as the site boundary. The site boundary of the proposed development is presented in **Chapter 1, Figure 1.1** of this volume.
- 18.3.14 The study area for the consideration of effects on human receptors, controlled waters, ecological receptors and property receptors includes the site and land immediately beyond it to a distance of 500m. This area takes into account the transport and final destination of potential contaminants of concern in the environment and the connectivity of these contaminants via pathways of migration or exposure to the receptors identified.
- 18.3.15 Based on the Phase 2 Geo-Environmental Interpretative Report provided in **Appendix 18A** of this volume, this buffer zone was considered sufficient for the assessment of the potential land contamination and associated potential contaminant linkages (PCL)⁴ risks as no significant contamination has been identified within previous ground investigations undertaken within the main platform and the Sizewell B relocated facilities area. In addition, the land within the temporary construction area and Land East of Eastlands Industrial Estate (LEEIE) has undergone limited development and contamination is therefore likely to be limited or have a limited lateral mobility, if present.

d) Assessment scenarios

- 18.3.16 The assessment of effects on geology and land quality includes the assessment of the construction and operational phases of the proposed development, rather than specific assessment years.

⁴ Where a linkage exists or is considered likely to be present between a potential contamination hazard/source, pathway and receptor relevant to the site.

e) Assessment criteria

18.3.17 As described in **Volume 1, Chapter 6** of the **ES**, the EIA methodology considers whether impacts of the proposed development would have an effect on any identified resources or receptors. For physical effects, the assessments broadly consider the magnitude of impacts and value or sensitivity of resources or receptors that could be affected in order to classify effects. For land contamination, the assessment considers the change in the level of contaminative risks to the relevant receptors in order to classify effects.

18.3.18 A summary of the two assessment methods and assessment criteria used in the geology and land quality assessment is presented in the following sub-sections.

f) Physical effects, mineral resources, waste soils and soil re-use

18.3.19 An impact assessment of the potential physical effects of the proposed development on geology and the effects associated with mineral resources, soils re-use and waste soils has been undertaken using a qualitative approach considering the effects of the construction and operational phases of the proposed development on soil compaction, soil erosion, ground stability, mineral resources, potential for soil re-use and waste soil generation.

i. Value/sensitivity

18.3.20 The value/sensitivity of a receptor is considered when determining the consequence of an effect in the impact assessment. Where the attribute falls within two value/sensitivity criteria, the worst case value/sensitivity is selected. The value/sensitivity of soil and geological receptors has been determined using the classifications given in **Table 18.1**.

Table 18.1: Criteria for classifying the value and/or sensitivity of environmental resources/receptors.

Value/Sensitivity.	Criteria	Description
High	Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor. Attribute has a very low capacity to accommodate the proposed change.	Regionally important mineral resource. Within a Mineral Safeguarding Area. Major ground stability, soil compaction or erosion hazards currently present at the site. High potential for soils re-use.

Value/ Sensitivity.	Criteria	Description
Medium	Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor. Attribute has a low capacity to accommodate the proposed change.	Moderately economically viable mineral resource. Adjacent to a Mineral Safeguarding Area. Moderate ground stability, soil compaction or erosion hazards currently present at the site. Moderate potential for soils re-use.
Low	Attribute only possesses characteristics which are locally significant. Attribute has some tolerance to accommodate the proposed change.	Low economically viable minerals. Low ground stability, soil compaction or erosion hazards currently present at the site. Limited opportunity for soils re-use.
Very low	Attribute characteristics do not make a significant contribution to local character or distinctiveness. Attribute is generally tolerant and can accommodate the proposed change.	No economically viable minerals. No ground stability, soil compaction or erosion hazards currently present at the site. No opportunity for soils re-use.

ii. Magnitude

18.3.21 Following determination of the value/sensitivity of the receptors, the magnitude of potential impacts are determined. The criteria for the assessment of impact magnitude for physical effects and effects associated with mineral resources, waste soils and soil re-use are defined in **Table 18.2**.

Table 18.2: Assessment of magnitude of impacts for physical effects and effects associated with mineral resources, waste soils and soil re-use.

Magnitude	Criteria
High	Total loss of major alterations to one or more of the key elements, features or characteristics of the baseline. The situation will be fundamentally different.
Medium	Partial loss or alteration to one or more of the key elements or characteristics of the baseline. The situation will be partially changed.
Low	Minor loss or alteration to one or more of the key elements, features or characteristics of the baseline. The change will be discernible but the underlying situation will remain similar to the baseline.
Very low.	Very minor loss or alteration to one or more of the key elements, features or characteristics of the baseline, such that the change will be barely discernible, approximating to the 'no change' situation.

iii. Effect definitions

18.3.22 The overall potential significance of physical effects and effects associated with mineral resources, waste soils and soil re-use is defined using the matrix presented in **Table 18.3**, which describes the relationship between the value/sensitivity of the receptor as defined in **Table 18.1** and the magnitude (change) of the potential impact as defined in **Table 18.2**.

18.3.23 Following the classification of an effect as presented in **Table 18.3**, a clear statement is made as to whether the effect is 'significant' or 'not significant'. Major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant. However, professional judgement is also applied where appropriate.

Table 18.3: Criteria for determining the significance of physical effects and effects associated with mineral resources, waste soils and soil re-use.

		Value/Sensitivity of Receptor.			
		Very low.	Low	Medium	High
Magnitude	Very low.	Negligible	Negligible	Minor	Minor
	Low	Negligible	Minor	Minor	Moderate
	Medium	Minor	Minor	Moderate	Major
	High	Minor	Moderate	Major	Major

18.3.24 Physical effects and effects associated with mineral resources, waste soils and soil re-use are described as adverse/negative or beneficial/positive, major, moderate, minor or negligible considering the value of the receptor, area over which the impact may occur, whether the impact is direct or indirect, the duration of the impact (short-term: less than three years; medium term: three to ten years; or long-term: more than ten years), and whether the impact is permanent or temporary.

18.3.25 The categories of physical effects are described in **Table 18.4**.

Table 18.4: Classification of effects.

Classification	Effect
Major adverse	Major sterilisation of mineral resources from either an active mining /quarrying site or Mineral Safeguarding Area. Major soil erosion, soil compaction or ground instability that is permanent in nature. The generation of major volumes of soils classified as hazardous waste requiring off-site disposal.

NOT PROTECTIVELY MARKED

Classification	Effect
Moderate adverse	Moderate sterilisation of a mineral resource or Mineral Safeguarding Area. Moderate soil erosion, soil compaction, or ground instability that is either permanent or long-term in nature. The generation of moderate volume of waste requiring off-site disposal.
Minor adverse	Minor sterilisation of a mineral resource or Mineral Safeguarding Area. Limited medium-term soil erosion, soil compaction, or ground instability. The generation of a minor amount of waste soil requiring off-site disposal.
Negligible	No change to a mineral resource or Mineral Safeguarding Area. No measurable impact on soil erosion, soil compaction, waste volumes, or ground instability or impacts that are only temporary in nature (less than three years). No change in contamination risks.
Minor beneficial	Minor improvement in access to a mineral resource potentially facilitating future mineral extraction. Limited medium-term reduction in existing soil erosion, soil compaction, or ground instability issues. A minor amount of materials re-use on-site, thereby reducing off-site disposal volumes.
Moderate beneficial	Moderate improvement in access to a mineral resource facilitating future mineral extraction. Moderate permanent or long-term reduction in existing soil erosion, soil compaction, or ground instability issues. A moderate amount of materials reuse as part of the development, thereby reducing off-site disposal volumes by a significant extent.
Major beneficial	Major improvement in access to a mineral resource facilitating future mineral extraction. Major permanent reduction in existing soil erosion, soil compaction or ground instability issues. Sustainable reuse of materials on-site with no, or only minimal, offsite disposal of waste soils.

g) Land contamination

18.3.26 The generic EIA methodology as described in **Volume 1, Chapter 6** of the **ES** is not used to consider the effects on land contamination from the proposed development. Instead, the assessment considers the risks to various receptors from land contamination and the change in this risk profile during construction and operation. As such, the magnitude of the impact is not determined, being replaced by the change in risk level to the various receptors, which is subsequently used to define the effect.

18.3.27 The assessment of the potential impacts of the proposed development on land contamination has been undertaken over two stages including:

- stage 1 – a land contamination risk assessment; and
- stage 2 – a land contamination impact assessment.

i. Stage 1 – risk assessment

18.3.28 A Phase 2 Geo-Environmental Interpretative Report which is provided in **Appendix 18A** of this volume, was prepared for the site which sets out the baseline environmental characteristics for the proposed development and surrounding areas. The baseline assessment was undertaken using existing data, publicly available information and historical records. This Phase 2 Geo-Environmental Interpretative Report also defines the preliminary conceptual site model (PCSM). Based on the PCSM, qualitative risk assessments have been undertaken in accordance with relevant guidance, considering the potential sources, pathways and receptors present during the baseline, construction and operational phases and are included in **Appendix 18B** of this volume.

18.3.29 To assist in the risk assessment process by helping determine the consequence of contamination being present as seen in **section 18.3** of this chapter, a value/sensitivity has been assigned to each of the contaminated land receptors. The definition of each of these is given in **Table 18.5**.

Table 18.5: Assessment of the value or sensitivity of receptors associated with land contamination.

Value/Sensitivity	Criteria	Description
High	<p>Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor.</p> <p>Attribute has a very low capacity to accommodate the proposed change.</p>	<p>Principal aquifer providing potable water to a large population, within an inner or outer groundwater source protection zones (SPZ) (SPZ 1 or SPZ 2).</p> <p>WFD high status water body (surface water) providing potable water to a small population.</p> <p>Sensitive human health receptors, for example young children/other users of residential areas, schools and parks.</p> <p>Buildings, including services and foundations but of high historic value or other sensitivity for example. Statutory historic designations, schools, residential dwellings.</p> <p>Ecological statutory designations with high sensitivity or international designations for example. Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar etc.</p> <p>Crops and livestock with a high commercial/ economic value.</p>

NOT PROTECTIVELY MARKED

Value/Sensitivity	Criteria	Description
Medium	<p>Attribute possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site/receptor.</p> <p>Attribute has a low capacity to accommodate the proposed change.</p>	<p>Principal aquifer beyond a SPZ secondary aquifer providing abstraction water for single private potable water supplies, agricultural or industrial use.</p> <p>WFD good status water body (surface water).</p> <p>Moderate sensitivity human health receptors, for example commercial/industrial users.</p> <p>Buildings and infrastructure of high regional value or high sensitivity e.g. schools, hospitals, residential dwellings.</p> <p>Ecological statutory designations with medium sensitivity or national designations for example SSSI, National Nature Reserve, Area of Outstanding Natural Beauty (AONB), Marine Conservation Zone, etc.</p> <p>Crops and livestock with a medium commercial/economic value.</p> <p>Local geological site or regionally important geological sites etc.</p>
Low	<p>Attribute only possesses characteristics which are locally significant.</p> <p>Attribute has some tolerance to accommodate the proposed change.</p>	<p>Secondary aquifer not currently used for groundwater abstraction.</p> <p>WFD moderate status (surface water).</p> <p>Less sensitive human health receptors, for example construction workers using mitigation measures.</p> <p>Buildings and infrastructure of local importance or low sensitivity (commercial/industrial buildings, main roads, railways).</p> <p>Ecological statutory designations with low sensitivity or sites with local designations for example Local Nature Reserve.</p> <p>Crops and livestock with a low commercial/economic value.</p>
Very low.	<p>Attribute characteristics do not make a significant contribution to local character or distinctiveness.</p> <p>Attribute is generally tolerant and can accommodate the proposed change.</p>	<p>Non-productive strata (groundwater).</p> <p>WFD poor status (surface water).</p> <p>No sensitive human receptors.</p> <p>Locally important infrastructure (local roads, bridges, footpaths).</p> <p>Land with low sensitivity and/or non-statutory designations.</p> <p>No crop or livestock receptors.</p>

- 18.3.30 The risk assessment then applies the principles given in the National House Building Council and Environment Agency report R&D66 and CIRIA C552, which provide guidance on the development and application of the consequence and probability matrix (as presented in **Table 18.6**) for contaminated land risk assessment.
- 18.3.31 The potential risk to a receptor is a function of the probability and the consequence of a PCL being realised. Probability (likelihood of an event occurring) takes into account both the presence of the hazard and the receptor and the integrity of the exposure pathway. Consequence takes into account both the potential severity of the hazard and the value/sensitivity of the receptor. Definitions of probability, consequence and the classified risks adopted for this assessment are detailed in **Appendix 6N** of **Volume 1** of the **ES**.

Table 18.6: Land quality estimation of the level of risk by comparison of consequence and probability.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood.	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood.	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

- 18.3.32 The descriptions of the classified risks and likely action required as given in R&D66 are detailed in **Appendix 6N** of **Volume 1** of the **ES**.
- ii. [Stage 2 – impact assessment](#)
- 18.3.33 The impact assessment has been undertaken by comparing the baseline risk assessments with the construction and operational phase risk assessments. This approach enables changes in the contaminated land status during the various phases to be identified and recorded.
- iii. [Effect definitions](#)
- 18.3.34 The effects of the proposed development are described as adverse/ negative or beneficial/positive, major, moderate, minor or negligible on the basis of **Table 18.7**.

Table 18.7: Classification of effects.

Classification	Effect
Major adverse	An increase in contamination risk from the existing baseline conditions of four or five risk levels in the risk matrix, e.g. land that has a very low contamination risk in the baseline becomes a high or very high risk. Land that does not meet the statutory definition of Contaminated Land in the existing baseline becomes capable of being determined under Part IIA of the Environmental Protection Act 1990 ('Part IIA').
Moderate adverse	An increase in contamination risk from the existing baseline conditions of two or three risk levels in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate or high risk. Land that does not meet the statutory definition of Contaminated Land in the existing baseline becomes capable of being determined under Part IIA.
Minor adverse	An increase in contamination risk from the existing baseline conditions of one risk level in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate to low risk.
Negligible	No change in contamination risks.
Minor beneficial	A reduction in contamination risk from the existing baseline conditions of one risk level in the risk matrix, e.g. land that has a moderate to low contamination risk in the baseline becomes a low risk.
Moderate beneficial	A reduction in contamination risk from the existing baseline conditions of two or three risk levels in the risk matrix, e.g. land that has a high contamination risk in the baseline becomes a moderate/low or low risk. Land that meets the statutory definition of Contaminated Land in the existing baseline is no longer capable of being determined under Part IIA.
Major beneficial	A reduction in contamination risk from the existing baseline conditions of four or five risk levels in the risk matrix, e.g. land that has a very high contamination risk in the baseline becomes a low or very low risk. Land that meets the statutory definition of Contaminated Land in the existing baseline is no longer capable of being determined under Part IIA.

18.3.35 Following the classification of an effect as presented in **Table 18.7**, a clear statement is made as to whether the effect is 'significant' or 'not significant'. Major and moderate effects are considered to be significant and minor and negligible effects are considered to be not significant.

18.3.36 It should be noted that, given the information known at the time of writing, professional judgement has been applied in certain circumstances where the introduction or removal of a receptor has automatically triggered a minor adverse or minor beneficial effect.

h) Assessment methodology

18.3.37 Detailed assessment methodologies for geology and land quality are presented in **Appendix 6N** of **Volume 1** of the **ES**. A summary is provided in the following sections.

i. General approach

18.3.38 The approach to the geology and land quality assessment comprises:

- establishing the baseline conditions for the study area with respect to geology, ground stability, hydrology, hydrogeology, contaminated land (including the potential for UXO and ground gases) and historical uses;
- identification of potential impacts on identified resources and receptors from the construction and operation of the proposed development;
- assessment of the significance of likely effects from the proposed development including the consideration of mitigation measures; and
- identification of any residual effects and secondary mitigation, where required.

ii. Establishing the baseline

18.3.39 The baseline assessment has relied on existing data, previous desk study and ground investigation reports, groundwater monitoring data, and historical records. The following sources have been reviewed:

- historical mapping and additional environmental information including historical landfill information and contemporary trade directories provided in several Envirocheck reports as provided in **Appendix 18A** of this volume;
- existing geo-environmental reports including a previous Phase 1 Desk Study Report; an Explosive Ordnance Desktop Study; ground investigation information; gas, groundwater and surface water monitoring and sampling information; a Phase 2 Contamination Assessment as provided in **Appendix 18A** of this volume and the Hydrogeological CSM as provided in **Appendix 19B** of this volume;
- publicly available information from the British Geological Survey (BGS) (Ref. 18.35) online mapping resource;
- Suffolk County Council Minerals Local Plan (Ref. 18.36);

- Suffolk Biodiversity Information Service website (Ref. 18.37);
- publicly available information from the Department of Environment, Food and Rural Affairs (Defra) Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref. 18.38);
- publicly available information from the Yell website (Ref. 18.39);
- Zetica online unexploded ordnance (UXO) risk map (Ref. 18.40); and
- publicly available information from the Environment Agency (Ref. 18.41).

18.3.40 It is noted that the Envirocheck reports as provided in **Appendix 18A** of this volume, were obtained in 2012. Updated information has therefore been obtained from publicly available sources of information, including ground investigations and other surveys/reports completed since this date. Information obtained during the site visit undertaken in March 2019 was also used to determine whether there had been any substantial changes between 2012 and the present day.

iii. Assessment of effects

18.3.41 An assessment of the potential physical effects of the proposed development on geology and the effects associated with soils re-use and waste soils has been undertaken using a qualitative approach considering the effects on soil compaction, soil erosion and ground stability; mineral resources; the potential for soil re-use and waste soil generation in accordance with methods outlined previously.

18.3.42 The assessment of the potential impacts of the construction and operational phases of the proposed development on land contamination has been undertaken in accordance with the method outlined previously.

i) Assumptions and limitations

18.3.43 The following assumptions have been made in this assessment:

- development is undertaken within the parameters as set out in the description of development in **Chapter 2** of this volume of the **ES** and the illustrative landscape scheme set out in **Figure 2.1** of **Chapter 2** of this volume of the **ES**;
- A cut-off wall would be installed to allow excavation of material for the main platform. The cut-off wall would be installed to a depth of approximately 50m below ground level (bgl). Continuous flight

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augered piles would be installed to a depth of approximately 12m bgl to support the cut-off wall excavation. A dewatering pumping system would be installed within the Crag Sand to lower groundwater levels within the cut-off wall.

- Made Ground, alluvium, peat, and Crag Sands would be excavated within the main platform in accordance with the design requirements. These excavated materials would be transported and segregated within the stockpile areas in the temporary construction area. Alluvium, and peat unsuitable for reuse within the development would be removed and deposited in the borrow pits within the temporary construction area.
- Topsoil and subsoil would be stripped from the borrow pits and stored as windrows around the borrow pits up to a height of approximately 3.5m above ground level for reinstatement;
- Crag Sands and gravels would be excavated from the borrow pits to an average depth of 8m bgl and stockpiled before being used as backfill on the main platform to raise levels to +7.3m Above Ordnance Datum (AOD).
- Following backfill of the borrow pits, stockpiles would be stored on the borrow pits to maximum height of approximately 5m above ground level.
- The existing Bent Hills sea defence would be excavated down to +3m AOD, moved approximately 40m east and built back up to 7m AOD using rock armour. The existing Northern Mound would also be demolished and excavated down to a suitable formation layer before being built back up to a height of 14.2m AOD. The western part of the permanent sea defences would involve the raising of the construction phase sea defence, to the final permanent level of between +10.2m to +12.2m AOD.
- Sizewell drain would be realigned along the western edge of the main platform to connect into Leiston drain to the north. Sheet piling would be installed on the eastern bank of the drain into the Crag Sand during realignment works.
- An initial temporary drainage system would be installed for predominately managing surface water run-off. This would be replaced by the site construction drainage system which would manage site-wide surface water run-off associated with the various platforms, groundwater from dewatering, and treated sewage effluent and any other permitted construction waste streams.

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- Temporary buildings for contractor's compounds and the accommodation campus including site offices, welfare units and storage areas would mainly comprise prefabricated and/or modular construction on concrete foundations.
- Piling for the beach landing facility would be undertaken to a depth of approximately 23m below sea bed level.
- The cooling water tunnels would be bored using tunnel boring machines at depths of approximately 30m under the seabed as they extend offshore. The excavated material would be recovered and stored in stockpiles onsite prior to re-use or disposal.
- Both the construction drainage outfall and the fish recovery and return system would be tunnelled, terminating in a seabed outfall structure approximately 300m offshore.
- The creation of the park and ride and freight management facility within the LEEIE and creation of other temporary works within the area of the main platform and the temporary construction area would include clearance of vegetation, and the removal of topsoil and potentially subsoil in accordance with the **Outline Soil Management Plan** as provided in **Volume 2, Appendix 17C** of the **ES**.
- The use of grid connections for electricity, where possible, rather than generators for the temporary welfare buildings and support infrastructure to reduce the potential for storage of fuels on-site.
- Following construction of the Sizewell C power station, the temporary construction area and LEEIE would be restored to a predominantly natural landscape in accordance with the operational masterplan and **Outline Landscape and Ecology Management Plan (oLEMP)** (Doc Ref. 8.2), including removal of temporary hardstanding areas, temporary structures and buildings, temporary rail infrastructure and other temporary works.
- For the operational phase assessment, it has been assumed that all primary, tertiary and secondary mitigation measures proposed for construction have been adopted / implemented.

18.3.44 The following limitations have been identified:

- Ground investigation data is not available for the majority of the temporary construction area and the LEEIE and the baseline for these areas has been prepared using BGS mapping supplemented by exploratory hole logs where available for the temporary construction

area.

18.4 Baseline environment

18.4.1 This section presents a description of the baseline environmental characteristics within the study area.

18.4.2 Further detail can also be found in **Appendix 18A** of this volume.

18.4.3 A description of the baseline environment relevant to Sizewell B relocated facilities is set out in **Chapter 12 of Sizewell B relocated facilities ES** (refer to **Volume 1, Appendix 2A**).

18.4.4 Baseline information for off-site development areas, including the off-site sports facilities at Leiston, is set out in **Appendix 18D** of this volume. The fen meadow compensation sites south of Benhall and east of Halesworth, and the marsh harrier habitat improvement area (Westleton) have been screened out of the land quality and geology assessment as they are not likely to give rise to significant environmental effects.

18.4.5 Baseline information for the offshore area is provided in **Chapter 21** of this volume.

a) Current baseline

i. Site visit

18.4.6 A site visit was undertaken during March 2019 to gain further information on the site setting and study area, to consider the context of the site, and to support the desk study mapping and aerial photographs. Additionally, it was an opportunity to identify potential visual or olfactory contamination present at the site at the time of the visit.

18.4.7 The northern section of the main platform largely comprises open fields. The Sizewell Marshes SSSI and associated drains are present in the north-western section of the main platform. An area of hardstanding is present in the south-western corner of the main platform which is currently used as a car park. There is a road in the centre of the northern area of the main platform entering from the north and providing access to the car park in the west.

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- 18.4.8 The central section of the main platform extends into the existing Sizewell B power station and comprises several temporary buildings and hardstanding associated with the power station. The southern section of the main platform consists of a circular area of land immediately south of the existing Sizewell B power station which comprises open fields, Sandy Lane and several drains. An access road from Sizewell Gap running north into the main platform is present in the south-east. The southernmost part of the main platform comprises agricultural land known as Pillbox Field.
- 18.4.9 An existing mound known as Bent Hills is present within the main platform adjacent to the north and east of the main platform. The mound is approximately 4.5m high and is likely to comprise re-worked sand and gravel and Made Ground (rubble / gravel) from the construction of Sizewell B.
- 18.4.10 The temporary construction area largely comprises agricultural land and open fields with a few residential properties, lanes and tracks. The majority of the residential properties appeared to be farms. Further details are provided in the health and wellbeing chapter as seen in **Chapter 28** of this volume. Several forested areas including Dunwich Forest, Great Mount Wood, Ash Wood and Greenhouse Plantation are also present within the temporary construction area.
- 18.4.11 The LEEIE comprises open fields with an area of hardstanding in the south. The Saxmundham to Leiston branch line is present running through the west of the LEEIE. Valley Road and Lover’s Lane are present running through the north and east of the LEEIE.

ii. Site history

- 18.4.12 The following section summarises key historical land use information for the study area. This has been compiled using an Envirocheck report which covers the study area. The site history details are divided into three areas: the main platform, temporary construction area and the LEEIE.

Table 18.8: Historical development of the site within the Main Platform.

Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
1883–1884 (1:10,560).	The main platform comprises open fields in the north and south. There are drains and an old drainage pump located in the north and centre of the main platform. Two sand pits and Warren House are located in the south of the northern section of the main platform. Sandy Lane is present in the west of the southern section of the main platform.	The surrounding land use comprises primarily open fields, woodland and agricultural land. Sizewell Gap is present adjacent to the southern boundary of the main platform. There are two sand pits located 250m north-west and south-east of the northern section of the main platform and three sand pits located 60m north east, 100m and 500m north of the southern section of the main platform. The Sizewell Belts are

Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
		located to the adjacent west of the main platform. Sizewell Farm is approximately 150m south of the main platform. The Vulcan Arms Public House is approximately 50m east of the main platform and Sizewell Cottage is approximately 200m east of the main platform. A Coastguard Station is labelled approximately 200m south east of the main platform.
1904 (1:2,500). 1905 (1:10,560).	A wind pump is located in the north-eastern corner of the main platform and additional sand pits are present in the centre of the main platform.	An additional sand pit is present 500m west of the main platform.
1928–1958 (1:10,560).	The area of drains in the north and centre of the main platform are labelled as ‘Liable to Floods’. There is a rifle range in the centre of the main platform and targets located in the east of the main platform. Form Fours Wood and Coronation Wood are labelled along the southern boundary of the main platform. Additional sand pits are indicated in the south-western corner of the main platform.	The area of land to the north of the main platform is labelled as liable to floods.
1976 (1:10,000).	The drains are now labelled on the map and there are several ponds present in the north-western corner of the main platform. There appear to be some foundations within the southern half of the main platform. A sewage works is present within the western boundary of the main platform adjacent to the foundations.	The foundations present in the south of the main platform extend off-site further to the south. Sizewell A power station is labelled located 500m south of the main platform. Cliff House Caravan Park is labelled approximately 400m south-east of the main platform.
2006–2012 (1:10,000).	Sizewell B power station has been developed further extending into the southern half of the main platform.	Additional drains are present surrounding the main platform. An electricity substation is present approximately 150m west of the main platform.
2019	No substantial changes.	No substantial changes.

Table 18.9: Historical development of the site within the Temporary Construction Area.

Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
1883–1884	The temporary construction area	The surrounding land use comprises

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Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
(1:10,560).	<p>comprises open fields, farmland, marshland and woodland including Goose Hill in the east and Greenhouse Plantation in the west.</p> <p>Several roads and tracks are present transecting the temporary construction area from north to south including Lover’s Lane and Abbey Road.</p> <p>Isolated residential properties and farms are present across the temporary construction area. Upper Abbey Farm is present in the west of the temporary construction area around Theberton.</p> <p>Drains and a sand pit are present in the east of the temporary construction area around Goose Hill. Several other areas which appear to be pits are present in the centre of the temporary construction area around Upper Abbey.</p> <p>Broom Covert is labelled in the centre of the location of the proposed construction corridor for the electrical supply connection to the east of the LEEIE. A track is present running along the proposed water detention area to the east of the LEEIE.</p>	<p>primarily open fields (which appear to be farmland), marshland and woodland. Leiston Carr and the Sizewell Belts are located adjacent to the south of the temporary construction area.</p> <p>Isolated residential properties and farms are present surrounding the temporary construction area. The village of Eastbridge is located 500m to the north-west of the temporary construction area. The town of Leiston is located 1.5km to the south of the temporary construction area and Theberton is located 1km to the north-west of the temporary construction area.</p> <p>Leiston Old Abbey is present adjacent to the south-west of the temporary construction area. Lower Abbey is present 200m to the north-east of the temporary construction area around Eastbridge.</p> <p>An old sand pit is present 250m to the south of the temporary construction area, south of Leiston Old Abbey.</p>
1904 (1:2,500). 1905 (1:10,560).	No substantial changes.	A wind pump is labelled adjacent to the east of the temporary construction area around Goose Hill.
1928–1951 (1:10,560).	A wind pump is present adjacent to Upper Abbey in the west of the temporary construction area.	The area of land to the north-east and east of the temporary construction area around Goose Hill is labelled as liable to floods.
1957–1958 (1:2,500).	An area in the east of the temporary construction area around Goose Hill is labelled as turf pits.	The wind pump adjacent east of the temporary construction area around Goose Hill is now labelled as a drainage pump.

Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
1976 (1:10,000).	<p>An area in the east of the temporary construction area adjacent to Goose Hill is now labelled as Dunwich Forest.</p> <p>The drains in the east of the temporary construction area around Goose Hill are now labelled on the map.</p> <p>The sand pit and other unnamed pits in the centre of the temporary construction area around Upper Abbey are now labelled as pit (disused).</p> <p>The track within the proposed water detention area to the east of the LEEIE is now labelled as Sandy Lane.</p>	<p>A complex drainage network is present adjacent to the south and north of the temporary construction area around Dunwich Forest and Goose Hill.</p> <p>Sizewell A power station is now labelled on the map located approximately 750m south-east of the temporary construction area.</p>
1982 (1:10,000).	No substantial changes.	The villages surrounding the temporary construction area have expanded.
2006 (1:10,000).	No substantial changes.	No substantial changes.
2012 (1:10,000).	An electricity substation is present at the eastern extent of the proposed construction corridor for the electrical supply connection to the east of the LEEIE.	No substantial changes.
2019	No substantial changes.	No substantial changes.

Table 18.10: Historical development of the site within the Land East of Eastlands Industrial Estate.

Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
1883–1884 (1:10,560).	<p>The LEEIE comprises open fields. The Great Eastern Railway Line (Aldeburgh Branch) is present running through the west of the LEEIE. Valley Road and Lover’s Lane are present running through the north and east of the LEEIE.</p> <p>A signal post related to the railway line is labelled in the west of the LEEIE.</p>	<p>The surrounding land use comprises primarily open fields (which appear to be farmland), marshland and woodland. The village of Leiston is present adjacent to the south-west of the LEEIE.</p> <p>A brick works, Works Farm and an associated clay pit are located 300m to the north-west of the LEEIE. A brick field and kilns are present 300m to the west of the LEEIE.</p> <p>A smithy is located approximately 450m south-east of the LEEIE. A windmill (pumping) is shown approximately 460m west of the LEEIE and a windmill (corn) is located approximately 220m west of the LEEIE.</p>

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Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
<p>1904 (1:2,500).</p> <p>1905 (1:10,560).</p>	<p>A well and several buildings are shown in the area of Sizewell Crossing.</p>	<p>An area of buildings / hardstanding is shown adjacent to the railway line at Sizewell Halt approximately 10m to the south of the LEEIE.</p> <p>A tank and sewage outfall are present 100m to the north-west of the LEEIE. The brick field and kilns are no longer labelled on the map. An additional brick works is indicated 500m to the south west of the LEEIE.</p> <p>The smithy and windmill (pumping) is no longer shown on the maps. The land to the south of the railway is now shown as allotment gardens.</p>
<p>1928 (1:10,560).</p>	<p>No substantial changes.</p>	<p>The brick works and Works Farm are now labelled as Brick Works Farm. The tank and sewage outfall are now labelled as sewage disposal works with septic tanks.</p> <p>A gasworks is now shown approximately 40m from the western corner of the LEEIE, comprising two gasholders and several tanks. Tanks are labelled approximately 380m west of the LEEIE.</p> <p>The town of Leiston has expanded. An Isolation Hospital is present 500m to the south-west of the LEEIE.</p>
<p>1938–1958 (1:10,560).</p>	<p>No substantial changes.</p>	<p>The town of Leiston has continued to expand.</p>
<p>1971 (1:10,000).</p>	<p>No substantial changes.</p>	<p>The railway line associated with Sizewell Halt to the south of the LEEIE is shown to have been dismantled.</p> <p>A factory is present adjacent to the south of the LEEIE. An electricity substation is shown approximately 100m south-west of the LEEIE. A coal yard is present approximately 55m west of the LEEIE, adjacent to the gas works.</p> <p>A school is labelled approximately 350m south-west of the LEEIE with an associated playing field and recreation ground. The tanks to the west of the LEEIE are now labelled as gas holders.</p>

Map Date.	Key Contamination Sources On-Site.	Key Contamination Sources in Study Area.
1976–1977 (1:10,000).	No substantial changes.	Brick Works Farm is now labelled as Brick Kiln Farm and the associated clay pit is marked as disused. A caravan park is shown approximately 75m south-west of the LEEIE. A refuse tip is shown approximately 130m north of the LEEIE beyond the sewage works. The town of Leiston has continued to expand.
1986 (1:10,000).	A small reservoir is shown in the north-west of the LEEIE, adjacent to the road; this is not shown on present day maps. Aerial photography indicates that it may be been infilled.	No substantial changes.
2012 (1:10,000).	A pond is shown in the central area of the northern field area; current aerial photography shows this to be a poorly drained area.	The gas works have been demolished, now showing a vacant area. The factory adjacent to the south of the LEEIE has expanded and is labelled as Eastlands Industrial Estate.
2019	No substantial changes.	No substantial changes.

18.4.13 Reference to previous geo-environmental reports has provided the following additional site history information as summarised in **Appendix 18A** of this volume:

- Between 1964 and 1971 the ground surface within the main platform was raised with surplus spoil from the construction of Sizewell A, levelled and a series of roadways was constructed. This area was then used as a contractors’ compound for fabrication, processing, storage and spoil disposal areas during the construction of Sizewell B (1987 to 1994).
- The buildings and other above ground structures were demolished and removed from the main platform upon completion of Sizewell B. Structures such as lagoons and other excavations appear to have been backfilled and the area covered with 2m to 2.5m of reworked sands and peats, levelled and planted with woodland and grassland. A remaining mound of surplus spoil in the northern area of the main platform formed the Northern Mound (flood bund).
- Made Ground described as sandy fill (reworked Crag deposits) and construction waste (e.g. concrete) up to 6m deep, overlying superficial deposits have been reported within this area of the main platform.
- Several areas of potential contamination and potentially contaminating

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activities were identified within the adjacent Sizewell B power station site including the Pond area, Splitter Vane store, Regenerant Neutralising Tank, Flask Transport and Storage Areas, Low Level Waste sorting area, reactor building area, active effluent discharge line, Hazardous Waste Store, diesel storage tanks, fuel oil tank, the waste oil/incinerator compound, handling of radioactive fuel and waste, non-active plant effluent and site drainage.

- Asbestos lined tanks / reservoirs were present within the area of the Sizewell B relocated facilities adjacent to Coronation Wood. The tanks have since been removed and the area validated as provided in **Appendix 18A** of this volume.

iii. Geology

- 18.4.14 Made Ground is indicated to be present on BGS online mapping within the main platform associated with the construction of the adjacent Sizewell B power station. Made Ground is also likely to be present within the LEEIE associated with the railway line and within the temporary construction area associated with sand and clay pits located in this area.
- 18.4.15 Available BGS records indicate that superficial deposits comprising marine beach deposits (sands and gravels) and tidal flat deposits (clay and silt) are present underlying the eastern area of the site within the main platform and temporary construction area. Alluvium, peat and Head Deposits are present underlying the southern part of the main platform and eastern part of the temporary construction area. The Lowestoft Formation (diamicton and sand and gravel) is present within the LEEIE and central and eastern areas of the temporary construction area.
- 18.4.16 According to the BGS website, bedrock geology beneath the site comprises sand of the Crag Group, described as 'shallow-water marine and estuarine sands, gravels, silts and clays'. Underlying the Crag Group is the London clay formation and the Chalk Group.
- 18.4.17 The Envirocheck reports as provided in **Appendix 18A** of this volume, indicate that there are no ground dissolution stability hazards at the site. Collapsible ground stability hazards, shrinking or swelling clay ground stability hazards and landslides range from no hazard to low risk.

18.4.18 The majority of the site is classified as having no hazard for compressible ground. However, an area of peat within the temporary construction area is classified as having a moderate to high risk of compressible ground stability hazards and the southern section of the main platform is classified as having a high risk of compressible ground stability hazards. Running sand ground stability hazards are generally classified as very low to low across the site. However, the eastern area of the site adjacent to the coast is classified as having a moderate risk of running sand ground stability hazards.

iv. Mineral extraction

18.4.19 The Envirocheck reports as provided in **Appendix 18A** of this volume, indicate that the site is in an area unlikely to be affected by mining for coal or other mineral resources.

18.4.20 The Envirocheck reports as provided in **Appendix 18A** of this volume, indicate that there are no historical extractive activities on or within the study area. However, reference to the site history maps included in the Envirocheck reports as provided in **Appendix 18A** of this volume, indicates that several sand and clay pits were located across the site and in the local area which are now marked as disused.

18.4.21 The Suffolk County Council Minerals Local Plan and associated 2019 modifications have been viewed, which indicate that the site is not located within a minerals safeguarding area and there are no planned areas of mineral extraction within the study area.

v. Local geological sites

18.4.22 According to protected sites mapping on the Suffolk Biodiversity Information Service website, the site is not located within or in proximity to a geological SSSI or local geological site.

vi. Hydrogeology

- 18.4.23 According to the MAGIC website the marine beach deposits, Tidal flat deposits, alluvium and Lowestoft Sand and Gravel superficial deposits are classified by the Environment Agency as a secondary A aquifer⁵. The peat, Head Deposits and Lowestoft Diamicton superficial deposits are classified as unproductive strata⁶.
- 18.4.24 The superficial deposits are thought to be in partial hydraulic continuity with the underlying Crag aquifer. However, due to local variability in lithological composition, inconsistent areas of cohesive material may act to delay recharge to the Crag.
- 18.4.25 The peat deposits are classified as a non-aquifer. However, they store and transmit water originating from groundwater, surface water and precipitation which is important in sustaining the SSSI habitats, particularly the reedbeds, fen meadows and rush pastures. Subsequently, due to their ecological importance associated with the Sizewell Marshes SSSI they are considered as a high value receptor for the purpose of the contamination risk assessment.
- 18.4.26 According to the MAGIC website, the Crag Group and chalk bedrock underlying the site are classified by the Environment Agency as principal aquifers⁷. The two aquifers are hydraulically separated by the presence of the London clay formation (unproductive strata). Due to the thickness of the low permeability London clay formation aquiclude, there is not considered to be the potential for significant environmental effects on the chalk aquifer and is therefore not considered further as a receptor.
- 18.4.27 A SPZ 3 (Outer Zone)⁸ is located approximately 340m to the west of the LEEIE around Leiston.

⁵ Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

⁶ Unproductive strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

⁷ Principal aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

⁸ Source Protection Zones show the risk of contamination from activities that might cause pollution in the area. The closer the activity, the greater the risk.

- 18.4.28 The Envirocheck reports as provided in **Appendix 18A** of this volume, indicate that two permitted groundwater abstractions are located on-site, one is located at Upper Abbey Farm for general farming and domestic purposes and the second is a groundwater abstraction at Sizewell B power station for make-up/top-up water. The permit end dates are not supplied.
- 18.4.29 An additional 10 permitted groundwater abstractions are listed within the study area. The closest abstraction to the site is a borehole located 20m to the east of the site at Aldhurst Farm for use within the river/wetland area.
- 18.4.30 Groundwater level and quality monitoring has been undertaken at the site as part of previous investigations for the Crag and overlying superficial deposits. Water levels in the peat range from 0.0m AOD in summer to 0.7m AOD in winter. Average groundwater levels in the Crag Formation typically increase with distance from the coast. The highest recorded groundwater levels occur in the far north of the site, with a maximum value of 2.5m AOD. There is evidence of a tidal influence within the Crag, particularly in the eastern sections of the Sizewell Marshes SSSI and close to Leiston drain.
- 18.4.31 Further baseline hydrogeological information for the site is provided in **Chapter 19** of this volume.

vii. Hydrology

- 18.4.32 The coastal water of the North Sea is located adjacent to the eastern boundary of the site. A series of surface freshwater features are also present within the study area. These include an extensive network of ponds and drainage ditches, referred to as the Sizewell Belts, located adjacent to the west and south of the site.
- 18.4.33 Leiston drain, located to the west of the main platform, receives drainage from the Sizewell Belts and runs north, parallel with the coast, before joining the Minsmere New Cut River, a large watercourse running west to east discharging to the sea via a sluice gate known as Minsmere Sluice, approximately 2km north of the site. The Minsmere New Cut river is classified as a heavily modified waterbody with an ecological status of moderate and a chemical status of good in 2016.
- 18.4.34 Reference to the Envirocheck reports as provided in **Appendix 18A** of this volume indicates that there is a discharge consent listed on-site in the south-western corner of the main platform for sewage discharges of trade effluent associated with the existing Sizewell B power station activities into Leiston drain.
- 18.4.35 Additional discharge consents are listed within the study area relating to:

- processes being undertaken at the existing Sizewell B power station including cooling water, process water, site drainage and treated effluent discharges to the North Sea and Leiston Beck;
- sewage discharges from Leiston Sewage Works into Leiston drain; and
- the discharge of trade effluent by Suffolk Water Company into Leiston drain.

18.4.36 Reference to the Envirocheck reports as provided in **Appendix 18A** of this volume indicates that several Category 3 – Minor pollution incidents have been recorded in relation to the North Sea to the east of the existing Sizewell power station complex from activities associated with the Sizewell B power station, roads and other properties (power generation/distribution) relating to oils, chemicals, organic wastes, crude and storm sewage and naturally occurring pollutants.

18.4.37 Further consideration of the hydrology of the site is provided in **Chapter 19** and **Chapter 21** of this volume.

viii. Flood risk

18.4.38 The Environment Agency flood risk map contained within the Envirocheck reports as provided in **Appendix 18A** of this volume indicate that several areas of the site are indicated to be at risk of flooding (Flood Risk 1, 2 and 3) as a result of rivers or the sea without defences, including the southern, western and northern sections of the main platform and the eastern and southern sections of the temporary construction area.

18.4.39 Further consideration of flood risk is provided in **Chapter 19** of this volume and the **Sizewell C Main Development Site Flood Risk Assessment** (Doc. Ref. 5.2).

ix. Historic and environmentally sensitive sites

18.4.40 A review of the MAGIC website has identified the following sensitive sites located within the study area:

- Nitrate Vulnerable Zone – the entire site is located within a Nitrate Vulnerable Zone;
- Suffolk Coast and Heaths AONB – the AONB is present within the main platform and eastern edge of the temporary construction area;
- Sizewell Marshes SSSI – the SSSI is present within the western edge

of the main platform and adjacent to the south and north of the temporary construction area; and

- Minsmere-Walberswick Heaths and Marshes SSSI, SAC, Ramsar and SPA – is located adjacent to the north-east of the temporary construction area.

18.4.41 Leiston Abbey (second site) and moated site, which is designated as a Scheduled Monument (SM 1014520) is present 125m to the west of the site. Several Grade II⁹ listed buildings are also indicated to be present within the study area including Upper Abbey Farmhouse and the Barn which are located within the site boundary.

18.4.42 Further consideration of designated sites for ecology and historic environment, both statutory and non-statutory is given in **Chapter 14** and **Chapter 16** of this volume respectively.

x. [Waste management and other permitted sites](#)

18.4.43 The Envirocheck reports as provided in **Appendix 18A** of this volume indicate that there are two waste management sites located within the study area as follows:

- a Household Waste Amenity Site located on Lover's Lane 350m to the north of the LEEIE. The licence for the site was issued in May 1994 to Waste Recycling Ltd, but has since been transferred; and
- a Register Waste Transfer Site is located on Lover's Lane 355m to the north of the LEEIE. The licence for the site is registered to Suffolk Waste Disposal Company and was issued in May 1994. The site has a very small input rate (less than 10,000 tonnes per year) and is permitted to receive household waste. The site is assumed to be operational.

18.4.44 The Envirocheck reports as provided in **Appendix 18A** of this volume indicate that there are two registered landfills and three historical landfill sites located within the study area including:

- Ogilvie at Home Farm, Sizewell, a registered landfill site located 200m south of the main platform. There is no identified restriction on the source of waste received by the landfill. The dates of operation of the landfill are not provided. The status of the licence is listed as lapsed;

⁹ Grade II Listed buildings are of special interest and the vast majority of listings.

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- Leiston Landfill, a registered landfill site located 500m to the west of the LEEIE. The landfill was operational from June 1977 and there is no identified restriction on the source of waste received by the landfill. The status of the licence is listed as lapsed/cancelled or surrendered;
- Carrs Pit historical landfill located 500m to the west of the LEEIE. Inert and industrial waste were accepted at the landfill from December 1976 to December 1987;
- Abbey Pit historical landfill located adjacent to the south-west of the temporary construction area. No information is provided on the waste type or quantity received by the landfill or the dates of operation; and
- Aldhurst Farm historical landfill located 300m to the north-west of the LEEIE and 340m west of the southern section of the main platform. Inert, industrial, commercial, household and other (construction, demolition and dredging) wastes were accepted at the site from June 1990. There is no end date for acceptance of waste. The landfill is listed as large receiving equal to or greater than 75,000 tonnes of waste per year.

18.4.45 The Environment Agency public register indicates that Sizewell A and Sizewell B power stations both have radioactive substances permits for the use or storage of radioactive substances.

18.4.46 Sizewell B power station holds permits for the discharge of non-radioactive cooling water and process water to the North Sea and has a permit (EP3634LR) under the Integrated Pollution Prevention and Control regime for the combustion of fuel for the site's standby diesel generators.

18.4.47 Sizewell B power station is registered as a Control of Major Accident Hazards site. Sizewell A power station was formerly registered as a Control of Major Accident Hazards site; however, this registration has ceased, presumably with the closure of the power station circa 2006. Sizewell B power station also holds a hazardous substance consent.

xi. **Service stations**

18.4.48 The closest service station is an Esso garage located approximately 350m to the south of LEEIE according to the Envirocheck reports as provided in **Appendix 18A** of this volume and the Yell website.

xii. Potential for unexploded ordnance

- 18.4.49 A Zetica UXO map was obtained to assess the risk of encountering UXO at the site and is appended to the Phase 2 Geo-Environmental Interpretative Report as provided in **Appendix 18.A** of this volume. The UXO map indicates that the site is listed as being in an area at ‘moderate bomb risk’.
- 18.4.50 A UXO desk-based assessment was undertaken in 2010 for the area within the main platform and is provided in **Appendix 18A** of this volume. The report states that the main platform was not directly subject to bomb attacks, but that air raid bombing incidents were reported in several areas around Leiston and Sizewell, including Sizewell Common, Sizewell estate, Leiston heath land the Sizewell Road railway crossing. The study concludes that the possibility of encountering a UXO is unlikely within the main platform area but increases offshore.
- 18.4.51 Mitigation measures included the communication of UXO risks to all stakeholders, further planning for Sizewell C Project operations, UXO safety awareness training and the development of a non-intrusive UXO survey and the investigation of the development area to assess any ferrous objects located within the main platform footprint. No additional UXO assessments are available for the temporary construction area and LEEIE which are likely to be within or in close proximity to the areas of air raid attacks reported in the assessment as provided in **Appendix 18A** of this volume.

xiii. Previous ground investigations

- 18.4.52 Several previous ground investigations have been undertaken within the onshore area of the site by Structural Soils in 2009, 2014 and 2015 and ESG in 2011 as provided in **Appendix 18A** of this volume. The investigations comprised the drilling and excavation of 373 No. cable percussion boreholes, rotary core holes and trial pits to a maximum depth of 125.8m bgl. Soil, leachate, groundwater and surface water samples were collected and tested as part of the ground investigations. Groundwater level and gas monitoring was also undertaken.
- 18.4.53 Made Ground up to 10.8m bgl was encountered within the main platform overlying marine deposits, alluvium and peat, and the Crag Sand Formation. Ground conditions within the temporary construction area comprised Made Ground up to 3.2m bgl overlying alluvium, the Lowestoft till formation and the crag sand formation. Topsoil overlying the Lowestoft Till Formation and Crag Formation was encountered within the LEEIE. Groundwater was recorded within the within the Made Ground, peat, Lowestoft Formation (sand and gravel) and Crag Sand Formation, sometimes at depths of between 0.17m AOD to 3.47m AOD.

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- 18.4.54 There were no exceedances against the human health generic assessment criteria for either a commercial or public open space (parks) end use for the contaminants in the soil samples analysed. No asbestos was identified within the soil samples which were visually screened.
- 18.4.55 Leachate testing of soils identified limited exceedances of benzo(ghi)perylene, fluoranthene, zinc and chromium above water quality standards in the natural material from the Crag Sand Formation at three locations within the temporary construction area with no evidence of contamination within the overlying Made Ground. Due to the baseline water quality, the depth of groundwater and distance to surface water courses, it is considered unlikely that the exceedances identified in soil leachate would represent an unacceptable risk to identified controlled water receptors.
- 18.4.56 Elevated concentrations of inorganics, metals, nitrate and ammoniacal nitrogen were recorded in the groundwater and surface water samples tested. Exceedances of BTEX, Polycyclic Aromatic Hydrocarbons (PAHs) and Volatile Organic Compounds were reported in samples from five boreholes located within the main platform. The exceedances were generally only reported on one monitoring round at each location.
- 18.4.57 The groundwater underlying the majority of the main platform and parts of the temporary construction area is subject to significant saline intrusion and may also be affected by the underlying geology, adjacent marshes and farming activities. Water quality within the surface watercourses is also noted to be moderate to poor which is attributed to marine influences, discharges from the Leiston Sewage Treatment Works and farming activities in the surrounding areas.
- 18.4.58 The ground gas regime at the site was initially classified in accordance with BS8485:2015 as Characteristic Situation CS2, which implies a low risk but requires gas protection measures. Made Ground, peat and organic alluvium are considered to be the main sources of ground gas. However, these results are based on a limited dataset and do not take into account any earthworks proposed on-site. The incorporation of ground gas protection measures within the proposed development may be required depending on the proposed earthworks and construction works.
- 18.4.59 A radiochemical data assessment undertaken by AMEC in 2014 concluded that radiation levels within the soil, groundwater and surface water at the main platform were unlikely to pose a significant risk to human health.

18.4.60 The results suggest that site won materials would be suitable for re-use. However, in areas of proposed landscaping a suitable growing medium may be required. A preliminary waste assessment indicated that the majority of samples would be classified as non-hazardous waste with one sample classed as hazardous waste due to elevated lead and zinc concentrations.

18.4.61 Geotechnical constraints include the Made Ground, peat and clay which are considered unsuitable founding strata, the potential presence of historical buried foundations and structures, the presence of existing services, and UXO risks.

18.4.62 A further limited ground investigation (18 No. trial pits and 15 No. boreholes) was completed in 2017 by Structural Soils for the borrow pit area. This ground investigation generally confirmed the ground conditions and included additional groundwater monitoring. Further details of this investigation are provided in the borrow pit risk assessment in **Appendix 18E** of this volume.

b) Future baseline

18.4.63 There are several committed developments which have been identified within the study area as outlined in **Table 18.11**.

Table 18.11: Committed developments.

Planning Application Ref.	Site Address.	Description of Development.	Date of Approval.	Status	Distance (m).
DC/18/3897/ FUL	11 Eastlands Industrial Estate Eastlands Road Leiston Suffolk IP16 4LL.	To construct a new building for use as a storage and distribution (B8) facility on a vacant site similar to an earlier building destroyed by fire.	16/11/2018	Construction not commenced.	83
DC/17/4645/ OUT	The Mill 22 Carr Avenue Leiston Suffolk IP16 4JA.	Outline application for seven dwellings comprising two new flats maximum 7.5m to ridge, one duplex unit max 6.5m to ridge, conversion of existing eastern range to one dwelling, conversion to former mill to three flats.	19/04/2018	Construction not commenced.	382

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Planning Application Ref.	Site Address.	Description of Development.	Date of Approval.	Status	Distance (m).
DC/17/3773/ FUL	Land at Colonial House Station Road Leiston Suffolk.	Erection six no. 1 bed flats.	02/11/2017	Construction not commenced.	493
DC/17/1617/ FUL	Abbey View Lodges Orchard House 105 Abbey Road Leiston Suffolk IP16 4TA.	Redevelopment of the site for eight dwellings.	16/08/2017	Construction commenced.	83
DC/16/5035/ OUT	Part Side Garden 2 Abbey Road Leiston Suffolk.	Use of land for erection of two dwellings.	24/07/2017	Construction not commenced.	430
DC/16/2111/ FUL	15 High Street Leiston Suffolk IP16 4EL.	Residential development of three dwellings (plots 1-2-3) following demolition of existing bus depot building (including first floor residential flat).	28/06/2016	Construction commenced.	348
DC/16/1322/ OUT	Land east of Abbey Road Leiston Suffolk.	Outline application - 100 new residential units (C3) with employment floorspace (B1) (approx. 1000m ²) and family orientated public house / restaurant (A3/A4) (approx.770m ²).	07/06/2017	Construction not commenced.	431
DC/16/0931/ FUL	Land west of Mill Cottage Valley Road Leiston Suffolk.	Erection of 18 dwellings including parking and external works.	18/08/2017	Construction not commenced.	165
DC/16/0527/ OUT	Gas Works Carr Avenue Leiston Suffolk IP16 4AT.	Erection of 20 dwellings with associated paths, landscaping and boundary walls, gates and fences. Re-positioning of existing vehicular access to new drive and parking area.	23/06/2017	Construction commenced.	21

Planning Application Ref.	Site Address.	Description of Development.	Date of Approval.	Status	Distance (m).
DC/15/2817/FUL	27A Heath View Leiston, Suffolk IP16 4JW.	Proposed semi-detached dwelling comprising of one No. 3-bedroom dwelling and one No. 2-bedroom dwelling.	21/09/2015	Construction commenced.	275
DC/15/1760/FUL	Sizewell Crossing Industrial Estate King Georges Avenue, Leiston Suffolk.	Use of land for the siting of 10 self-storage containers and installation of security lighting.	21/07/2015	Construction not commenced.	11
DC/14/3166/OUT	Abbey View Lodges Orchard House 105 Abbey Road Leiston, Suffolk IP16 4TA.	Application for outline planning permission with all matters reserved for redevelopment of the site for 10 dwellings.	10/04/2015	Construction commenced.	96

18.4.64 These developments range in size, approval date and approval conditions, with construction timelines unconfirmed. However, planning permissions generally require construction to commence within three years of the grant of planning permission or reserved matters upon which the planning permission lapses. As such, given the nature and scale of the applications, it has been assumed that small scale residential developments will have been constructed prior to 2022. These developments have therefore been considered as future receptors as part of the baseline for the land contamination risk assessments and within the baseline assessment of physical effects and effects associated with mineral resources, soils re-use and waste soils.

c) Preliminary conceptual site model

18.4.65 A PCSM identifies the potential or known sources of contamination, receptors and pathways between the two. Where all three are present or are considered likely to be present (source-pathway-receptor linkage), they are called a potential contaminant linkage (PCL).

18.4.66 Three PCSMs (baseline, construction and operation) have been produced for the proposed development using the information summarised above. A summary of potential contamination sources is provided in **Table 18.12**, and potential pathways and receptors identified is provided in **Table 18.13**.

Table 18.12: Existing potential sources of contamination for the proposed development.

Potential Source of Contamination.	Potential Contamination.	Location
Former rifle range located in the centre of the main platform.	A range of inorganic and organic contamination including metals and hydrocarbons.	On-site
Made Ground within the north-east of the main platform.	A range of inorganic and organic contamination including metals and hydrocarbons, Polychlorinated Biphenyls (PCBs), asbestos, etc. Ground gas generation including carbon dioxide and methane.	
Drainage and wind pumps in the north and centre of the main platform.	A range of inorganic and organic contamination including metals and hydrocarbons.	
Sewage treatment works located on the western boundary of the main platform.	Metals and organic contaminants including biological contaminants.	
Made Ground, spoil disposal and construction waste on the main platform associated with the construction of Sizewell B and former contractors' compound.	A range of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc. Ground gas generation including carbon dioxide and methane.	
Activities relating to the former contractors' compound on the main platform for Sizewell B including possible storage areas, fabrication areas, lagoons, stone washing / concrete batching area.	A range of inorganic and organic contamination including metals and hydrocarbons, PCBs, solvents, paints, oils, asbestos, etc.	
Car park located on western edge of the main platform.	A range of inorganic and organic contaminants. Fuels and oils attributed to spills from vehicles, plus exhaust particulates.	
Activities within the main platform associated with the operation of Sizewell B power station including radioactive materials.	Risk of contamination from radioactive materials, fuel oil contamination, asbestos and PCBs.	
Former infilled sand pits located across the main platform and temporary construction area.	A range of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc. Ground gas generation including carbon dioxide and methane.	
Peat and alluvial deposits within the eastern edge of the temporary construction area and in the main platform.	Ground gas generation including carbon dioxide and methane.	

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Potential Source of Contamination.	Potential Contamination.	Location
Grass covered mounds (suspected Made Ground) located in the north-east of the temporary construction area.	A range of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc. Ground gas generation including carbon dioxide and methane.	
Fly tipping in the north-west of the LEEIE.	A range of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc.	
Railway line running through the western extent of the LEEIE.	A range of inorganic and organic contaminants including hydrocarbons, diesel, lubricating oils, PCBs, PAHs, solvents, herbicides, metals, asbestos and ash used as fill material.	
Made Ground present within the western section of the LEEIE associated with the railway line and in the northern section associated with an infilled reservoir.	A range of inorganic and organic contamination including metals and hydrocarbons, PCBs, asbestos, etc. Ground gas generation including carbon dioxide and methane.	
Electricity substation at the eastern extent of the proposed construction corridor for the electrical supply connection to the east of the LEEIE	A range of inorganic and organic contaminants including metals, asbestos, hydrocarbons and PCBs.	
Farming activities across the entire site area including potential for unmarked farmers' tips.	A range of inorganic and organic contaminants including herbicides, pesticides, silage, effluent, fuel oils, metals, hydrocarbons, asbestos and biological pathogens.	
Made Ground associated with the construction of the existing roads crossing the various areas of the site as well as activities associated with their operation.	A range of inorganic and organic contaminants including the potential for asbestos. Fuels and oils attributed to spills from vehicles on the roads, plus exhaust particulates.	
Activities associated with the operation of Sizewell A and B power stations including former asbestos lined tanks and their infill, the atmospheric deposition of radioactive materials on the main platform.	A range of inorganic and organic contaminants including radioactive materials, fuel oil contamination, asbestos and PCBs.	Off-site
Former sand pits located 250m north-west and south-east of the main platform and 250m to the south of the temporary construction area which have been infilled.	A range of inorganic and organic contaminants including metals and hydrocarbons, PCBs, asbestos, etc. Ground gas generation including carbon dioxide and methane.	

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Potential Source of Contamination.	Potential Contamination.	Location
Former brick works, brick field and clay pit located 300m to the west of the LEEIE which have been infilled.	A range of inorganic and organic contaminants including metals and hydrocarbons, PCBs, asbestos, etc. Ground gas generation including carbon dioxide and methane.	
Smithy located approximately 450m south-east of the LEEIE.	A range of inorganic and organic contaminants including metals and hydrocarbons.	
Tank and sewage works located 500m to the south-west of the LEEIE.	A range of inorganic and organic contaminants including metals, hydrocarbons and biological contaminants.	
Gasworks, coal yard and tanks/gas holders located 40m to the west of the LEEIE.	Coal tar, natural gas processing, fuels. Inorganic chemicals acids and alkalis, other inorganic compounds, metals and metal compounds and asbestos.	
Historical landfills within the study area including unnamed refuse tip, Ogilvie at Home Farm, Leiston Landfill, Carrs Pit, Abbey Pit and Aldhurst Farm.	A range of inorganic and organic contaminants including metals, leachate, nitrates, and the potential for ground gas generation.	
Electrical substation located 100m south-west of the LEEIE.	A range of inorganic and organic contaminants including metals and hydrocarbons and PCBs.	
Farming activities in surrounding areas including potential for unmarked farmers tips.	A range of inorganic and organic contaminants including metals and hydrocarbons, PCBs, asbestos, herbicides, pesticides, silage, effluent, and fuel oils.	
Allotments adjacent to the south of the LEEIE.	A range of inorganic and organic contaminants including herbicides, pesticides and fuel oils.	
Works and factories within Eastlands Industrial Estate.	A range of inorganic and organic contaminants including metals and hydrocarbons, asbestos, etc.	
Made Ground associated with the construction of existing roads surrounding the site as well as activities associated with their operation.	A range of inorganic and organic contaminants including the potential for asbestos. Fuels and oils attributed to spills from vehicles on the roads, plus exhaust particulates.	

Table 18.13: Potential receptors and contaminant exposure and migration pathways at baseline and resulting from the proposed development.

Receptor group.	Receptor	Principal contaminant migration pathways.
Human health (on-site).	Pedestrians, residents and road users using existing and future roads, roundabout, footpaths and fields within the site (note that Sizewell C power station site will be secure).	Dermal contact with and ingestion of contaminants in soils, soil-derived dusts and water. Inhalation of contaminants in soil, soil-derived dust, fibres, gas and vapours.
	Farmers and workers on agricultural land.	
	Construction and maintenance workers.	
	Recreational site users of the Sizewell Marshes SSSI, marshes and beach along the foreshore.	
	Current Sizewell B site workers using the main platform.	
	Future site workers and visitors.	
Human health (off-site).	Occupants of nearby residential and commercial properties.	Dermal contact with and ingestion of contaminants in soil, soil-derived dust and water which may have migrated off-site. Inhalation of contaminants in soil, soil-derived dust, fibres and gas/vapours which may have migrated off-site.
	Pedestrians accessing surrounding roads and footpaths.	
	Recreational site users of the surrounding Sizewell Marshes SSSI and marshes.	
	Farmers and workers on agricultural land.	
	Workers in adjacent Sizewell A and B power stations.	
Controlled waters: groundwater (on-site and off-site).	Groundwater in Principal bedrock aquifer and Secondary A superficial aquifer.	Leaching/migration of contaminants in soil to groundwater in underlying aquifers. Migration of contaminated water through preferential pathways such as underground services, pipes and granular material to groundwater in underlying aquifers.
Controlled waters: surface	Ponds and drains on-site.	Migration of contaminated groundwater, ground gas and/or

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Receptor group.	Receptor	Principal contaminant migration pathways.
waters (on-site and off-site).	Ponds and drains off-site within study area.	vapours along strata and preferential pathways such as service routes or differentially permeable strata. Discharge of contaminants entrained in groundwater and, or surface water run-off followed by overland flow and discharge.
	North Sea (on-site and off-site).	
Property (on-site and off-site).	Existing on-site and off-site services and structures. including Leiston Abbey Scheduled Monument and listed buildings. Proposed on-site services and structures.	Direct contact of contaminants in soil and/or groundwater with existing and proposed structures and buried services. Migration of contaminated groundwater, ground gas and/or vapours along strata and preferential pathways such as service routes or differentially permeable strata.
	Crops and livestock (on-site and off-site).	Migration of contaminated waters/dust/fibres and subsequent uptake by crops or ingestion/ inhalation/dermal contact by livestock.
Ecological Receptors (on-site and off-site).	Sizewell Marshes SSSI (on-site and off-site).	Migration of contaminated waters/dust/fibres and subsequent uptake by flora or ingestion/ inhalation/dermal contact by fauna.
	Minsmere-Walberswick Heaths and Marshes SSSI, RAMSAR, SAC and SPA (off-site).	
	Suffolk Coast and Heaths AONB (off-site).	

18.5 Environmental design and mitigation

18.5.1 As detailed in **Volume 1, Chapter 6** of the **ES**, a number of primary mitigation measures have been identified through the iterative EIA process and have been incorporated into the design and construction planning of the proposed development. Tertiary mitigation measures are legal requirements or are standard practices that would be implemented as part of the proposed development.

18.5.2 The assessment of likely significant effects of the proposed development assumes that primary and tertiary mitigation measures are in place. These measures are summarised in this section so that it is clear where and why these measures have been included and the way in which they have contributed to the management and reduction of environmental effects.

a) **Environmental design and mitigation for the Sizewell B relocated facilities works during Phase 0**

18.5.3 In line with the project programme set out in **Chapter 3** of this volume, it is anticipated that the first phase of the Sizewell B relocated facilities works, which is referred to as 'Phase 0', would be carried out pursuant to the planning permission granted by East Suffolk Council on 13 November 2019 (application ref. DC/19/1637/FUL). The second phase of the Sizewell B relocated facilities works would take place in Phases 1 and 2 in parallel with other DCO works due to take place at this time and would be carried out pursuant to the DCO.

18.5.4 Under the existing planning permission, mitigation measures for land quality effects that occur as a result of Phase 0 of the Sizewell B relocated facilities works include the following:

- Primary mitigation:
 - measures embedded within design to reduce impacts on land quality included the design of grass reinforcement on the proposed outage car park at Pillbox Field to reduce the potential impact of soil erosion and compaction, and the use of Sustainable Drainage Systems to prevent the pollution of controlled waters due to surface water drainage;
 - the proposed laydown area and operational car park in Coronation Wood is to be surfaced with a heavy duty permeable block paving that would allow full infiltration of surface water run-off into the subsurface; and
 - the proposed outage store will have inspection areas for contamination and radiation under existing Sizewell B procedures

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including the requirements of the existing Sizewell B Radiological Substances Permit, Nuclear Site Licence and as outlined in EDF Energy (NGL) Technical Guidance Note (TGN) for Chemical Storage (BEG/SPEC/ENG/TGN/062) to mitigate the risk of the chemical storage contaminating the ground.

- Tertiary mitigation:
 - all construction works will be conducted in accordance with the Outline Construction Environmental Management Plan submitted with the application, which set out measures for pollution prevention and for the implementation of a Pollution Incident and Control Plan. If piling is required, a piling risk assessment would be undertaken. In addition, appropriate procedures to address and manage the risks from unexploded ordnance (UXO) would be implemented. Materials would be managed in accordance with a Materials Management Plan (MMP).
- Secondary mitigation:
 - Further assessment of the geotechnical and geo-environmental ground conditions underlying the site may be undertaken to confirm specific requirements for detailed design if required.

18.5.5 Details of these measures are provided in Chapter 12 of the Sizewell B relocated facilities ES (refer to **Volume 1, Appendix 2A**).

18.5.6 It is anticipated that the mitigation measures summarised above would largely be in place or under way by the end of Phase 0. However, in order to allow for this mitigation to be implemented in Phases 1 and 2, if required (or if the works are instead carried out entirely under the DCO – see **Volume 2, Appendix 6A** of the ES), these measures have also been incorporated within the DCO.

b) **Environmental design and mitigation for the DCO**

18.5.7 Primary and tertiary mitigation for off-site development areas are set out in **Appendix 18D** of this volume.

i. **Primary mitigation**

18.5.8 Primary mitigation is often referred to as ‘embedded mitigation’ and includes modifications to the location or design to mitigate impacts; these measures become an inherent part of the proposed development.

18.5.9 Primary mitigation for the proposed development would include:

- design of the road and car parking areas and the selection of construction materials would be in accordance with the DMRB, British Standards and best practice guidance at the time of the design. The design would be required to take into account the ground conditions including the potential for ground movement, compaction, ground gas and ground aggressivity;
- design of the railway and associated structures within the temporary construction area and LEEIE would be in accordance with appropriate standards and best practice guidance at the time of the design;
- selection of materials for the railway would be required to take into account the ground conditions including the potential for ground movement, compaction, ground gas and ground aggressivity;
- gas mitigation measures would be provided in the buildings on-site and other relevant structures where required, the design of which would be dependent on the risk profile and the nature/usage of the building/structure;
- hardstanding would be provided to avoid spills and leaks from leaching into the underlying groundwater;
- the nuclear island common foundation raft would provide stability and reduce differential displacement between the nuclear island buildings; act as a barrier for environmental protection by minimising soil contamination in case of installation failure; protect the water table from risk of contamination and protect the structures from groundwater; and
- the use of appropriate drainage systems in accordance with the **Drainage Strategy** as provided in **Appendix 2A** of **Volume 2** of the **ES**, to reduce the potential for contamination to migrate and impact on the ground, groundwaters and surface waters. This would include the use of lined drainage and bypass separators where necessary to protect the ground and underlying groundwater and separate out oils/hydrocarbons for suitable off-site disposal. A temporary drainage system would also be implemented to manage drainage during earthworks (in accordance with the **Drainage Strategy**).

ii. Tertiary mitigation

18.5.10 Tertiary mitigation will be required regardless of any EIA assessment, as it is imposed, for example, as a result of legislative requirements and/or standard sectoral practices.

18.5.11 Tertiary mitigation measures to be incorporated into the proposed development during construction, set out in the **CoCP** include:

- prior to stockpiling or other groundworks, topsoil present would be removed and appropriately stored for potential re-use in landscaping areas, subject to demonstrating suitability for reuse criteria. This process would reduce the potential for buried topsoil to generate ground gas beneath the proposed development which may pose a risk to human health;
- development of health and safety risk assessments and method statements by the Contractor and provision of appropriate personal protective equipment (PPE) for the protection of construction workers;
- implementation of a contamination watching brief by suitably qualified and experienced personnel would be completed for the proposed development when excavating areas of potential contamination risk. If unidentified contamination is encountered, works will be temporarily suspended in the area and appropriate investigations and remediation will be discussed and agreed with stakeholders and completed in accordance with current best practice;
- implementation of appropriate dust suppression measures to reduce migration of contaminated dust, further details are provided in the air quality chapter as provided in **Chapter 12** of this volume;
- minimising the area and duration of soil exposure and timely reinstatement of vegetation or hardstanding to reduce soil exposure/erosion and reduce temporary effects on soil compaction;
- stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) to reduce windblown dust and surface water run-off;
- clear segregation between stockpiled material including imported material, excavated material stockpiled for re-use and excavated waste material stockpiled for treatment and / or off-site disposal;
- covering/hydroseeding of the landscape bunds and temporary stockpiles to reduce soil erosion and dust generation;
- stockpiles would be located a minimum of 10m from the nearest watercourse;
- implementation of working methods during construction to ensure that surface water run-off from the stockpiles, landscape bunds or working

areas into adjacent surface watercourses or leaching into underlying groundwater in accordance with best practice;

- provision of a settlement and infiltration lagoon for each borrow pit during excavation to capture surface water run-off;
- piling risk assessment in accordance with Environment Agency guidance may be required to ensure that piling techniques deemed appropriate are implemented at the site by identifying and managing potential risks as a result of creating pathways to the aquifer;
- implementation of appropriate pollution incident control, e.g. plant drip trays and spill kits; and
- implementation of appropriate and safe storage of fuel, oils and equipment during construction in accordance with COSHH regulations and oil storage regulations.

18.5.12 Additional tertiary mitigation that are secured by the **CoCP** include:

- implementation of the materials management measures, informed by the **Materials Management Strategy** provided in **Appendix 3B** of this volume. These measures set out how the excavated materials would be dealt with, stored on site and the verification process;
- implementation of the site waste management measures, informed by the **Waste Management Strategy** as provided in **Appendix 8A** of this volume; and
- implementation of the soil management measures, informed by the **Outline Soil Management Plan**, as provided in **Appendix 17C** of **Volume 2** of the **ES**.

18.5.13 For the operational phase, storage and disposal of wastes and hazardous substances would be managed in accordance with current guidance and legislative requirements. Furthermore, Sizewell C power station would be subject to a Control of Major Accident Hazards consent and a hazardous substances consent which set out requirements for the storage and use of hazardous materials. Radioactive materials and waste will be managed in accordance with the requirements of the Radioactive Substances Regulations Environmental Permit and Nuclear Site Licence. Operational drainage from the power station will be discharged into the North Sea under an Operational Water Discharge Activity permit. Operational management arrangements would be set out within an integrated environmental management system for the proposed development to ensure compliance with any environmental permits and the nuclear site license.

18.6 Assessment

a) Introduction

18.6.1 This section presents the findings of the geology and land quality assessment for the construction and operation of the proposed development.

18.6.2 This section identifies any likely significant effects that are predicted to occur and **section 18.7** of this chapter highlights the secondary mitigation and monitoring measures that are proposed to minimise any adverse significant effects (if required).

18.6.3 The assessment of effects associated with off-site developments is set out in **Appendix 18D** of this volume. An environmental screening exercise was undertaken to identify which of the off-site development works may give rise to environmental effects that could potentially be significant. This concluded that the off-site sports facilities at Leiston should be taken forward to the assessment of likely effects on land quality and geology.

18.6.4 The fen meadow compensation sites south of Benhall and east of Halesworth, and the marsh harrier habitat improvement area west of Westleton have been screened out of the land quality and geology assessment as they are not likely to give rise to significant environmental effects. Further details are provided in **Appendix 18D** of this volume.

b) Construction

i. Sizewell B relocated facilities effects

18.6.5 An assessment of effects on geology and land quality that would occur due to Sizewell B relocated facilities works during the construction phase is presented in **Chapter 12** of the **Sizewell B relocated facilities ES** (that ES is provided in full at **Volume 1, Appendix 2A**).

18.6.6 The assessment considered the likelihood for significant effects on human health, controlled waters, ecological and property receptors due to the disturbance of any potential existing ground contamination. In addition, the assessment considered potential effects on physical soil features due to soil erosion, soil compaction, ground stability and the potential for increased volumes of waste soils to be generated. The assessment concluded that the Sizewell B relocated facilities works on their own would result in no significant effects on the assessed receptor groups (refer to **section 18.8** of this chapter for a summary of effect categories).

ii. Main development site construction

Physical effects

- 18.6.7 A qualitative approach has been undertaken to assess the likely effects of the proposed development on soil erosion. The effects have then been categorised in accordance with the methodology described in **Appendix 6N** of **Volume 1** of the **ES**, and summarised in **section 18.3** of this chapter, and confirmed as either temporary or permanent, adverse or beneficial and **significant** (moderate or major effects) or **not significant** (minor or negligible).
- 18.6.8 The proposed development may result in physical effects to soils and geological receptors, arising from changes in soil erosion, soil compaction and ground instability issues associated with stripping of topsoil, vegetation clearance, stockpiling, earthworks, piling, tunnel boring and construction of new buildings and infrastructure and removal and reinstatement of temporary construction areas. These are considered in further detail below.
- ### Soil erosion and soil compaction
- 18.6.9 Construction will require piling and deep excavations within the main platform for the main platform as well as raising land levels to achieve the permanent platform height. This would both require substantial quantities of material for use as backfill (and generate substantial quantities of excavated spoil. Further details are provided in the **Materials Management Strategy** which is seen in **Appendix 3B** of this volume.
- 18.6.10 The excavation and reconstruction of the sea defences, dredging for offshore facilities and boring for the offshore cooling water tunnels and drilling of the fish recovery and return tunnels and combined drainage outfall would also generate significant quantities of excavated spoil. Dredged sediment would be disposed of at sea and tunnel arisings would be taken onshore and potentially re-used on-site as part of the construction works.
- 18.6.11 An area of borrow pits within the temporary construction area would be used to generate material for use as backfill for the main platform and will be reinstated with alluvium, and peat excavated from the main platform in accordance with the borrow pit risk assessment as provided in **Appendix 18E** of this volume and the **Materials Management Strategy** as provided in **Appendix 3B** of this volume.
- 18.6.12 Excavated material, suitable for re-use, would be stored in temporary stockpiles and in landscape bunds around the site at various periods over the construction phase prior to use on-site as seen in **Chapter 3** of this volume.

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- 18.6.13 Following construction of the power station, the temporary construction area and LEEIE would be restored to a predominantly natural landscape, including removal of temporary hardstanding areas, temporary structures and buildings, temporary rail infrastructure and other temporary works. These works may also cause physical effects including changes in soil erosion, soil compaction and ground instability issues associated with demolition of the rail infrastructure and associated services, earthworks and movement of heavy plant for the reinstatement of the site.
- 18.6.14 There is the potential for increased soil erosion and runoff with a high sediment load to impact local surface waters. Earthworks would be planned to minimise soil exposure as far as practicable and areas required for temporary works would be reinstated as soon as possible when they are no longer required. Stockpiles would be managed to reduce soil erosion and increased dust by applying preventative techniques which may include water spraying and hydroseeding. The impacts on soil erosion and soil compaction are therefore considered to be temporary, medium term, and direct.
- 18.6.15 Given that there are moderate soil erosion hazards at the site associated with running sand in the eastern section of the site, the value/sensitivity of the receptor is classed as medium. With the primary and tertiary mitigation measures, the magnitude of the impact is considered to be low. The overall effect is therefore considered to be minor adverse and classed as **not significant**.

Ground stability

- 18.6.16 Historical extraction of sand and clay has been undertaken on-site and within the study area. The site is also identified as having a moderate UXO risk. The presence of unsuitable founding strata has been identified underlying the site including Made Ground and peat and there is also the potential to encounter buried foundations and existing services within the site. Several of the proposed works may affect the stability of the ground at the site including the construction of the concrete cut-off wall between the site and Sizewell Marshes SSSI, deep excavations within the main platform and the installation of cooling tunnels (to a depth of up to 30m bgl).
- 18.6.17 There are potential ground stability hazards at the site associated with UXO risks. In addition, the proposed earthworks may affect ground stability. The impacts on ground stability during the construction phase is therefore considered to be temporary, medium term, and direct. The value/sensitivity of the receptor is therefore classed as medium. With primary and tertiary mitigation, the magnitude of the impact is considered to be medium. The overall effect is therefore considered to be moderate adverse and classed as **significant**.

Mineral resources

- 18.6.18 A qualitative approach has been undertaken to assess the likely effects of the proposed development on mineral resources in accordance with the methodology outlined in **Appendix 6N** of **Volume 1** of the **ES** and summarised in **section 18.3** of this chapter.
- 18.6.19 The potential for the proposed development to cause impacts upon mineral resources and associated Mineral Safeguarding Areas including the loss, damage or sterilisation of important mineral resources were assessed.
- 18.6.20 Materials including gravels and Crag Sand are proposed to be excavated from the borrow pits to an average depth of 8m bgl, for re-use as backfill on the main platform.
- 18.6.21 The baseline assessment indicates the presence of historical mineral extraction sites (sands, clays, etc.) within the study area. However, the site and study area are not located within a coal mining area, an area of planned mineral extraction or a minerals safeguarding area. In addition, the pits identified within the baseline assessment were no longer recorded present generally by publication of the ordnance survey maps in the 1970s. Therefore, there would be a limited impact on the current regional mineral resources. The impacts on mineral resources during the construction phase are therefore considered to be temporary, medium term and direct.
- 18.6.22 Given that there are limited valuable/viable mineral resources located within the study area, the value/sensitivity of the receptor is classed as low. The magnitude of the impact is considered to be low as there would be limited loss of regional mineral resources. The overall effect is therefore considered to be minor adverse and classed as **not significant**.

Effects associated with ground contamination

- 18.6.23 The construction PCSM and risk assessments are presented in **Appendix 18B** and the impact assessments in **Appendix 18C** of this volume. The construction impact assessment is undertaken by comparing the baseline land contamination risks to those predicted during construction, while considering any new sources and pollution pathways introduced by construction activities.

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- 18.6.24 The construction phase would potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination. Construction and removal and reinstatement activities, such as excavation and piling may introduce new pathways for migration of existing contamination and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration. Potential changes to the baseline situation creating PCLs, which have been assessed within this chapter are:
- the potential for mobilising contaminants by excavation and stockpiling of material, increasing the risk to controlled water receptors through leaching and run-off. Earthworks could provide opportunities for run-off to contain suspended solids, if not carried out in line with required management procedure;
 - the potential for introducing new sources of contamination i.e. from spillages and leaks;
 - the potential for exposure of human receptors by generation of potentially contaminated dust and vapours released by the construction works; and
 - the potential for creation of new pathways to groundwater during groundworks, through opening up ground temporarily and construction activities, such as earthworks, piling, installation of drainage and other below-ground services.
- 18.6.25 The impacts on land contamination are considered to be permanent, and direct. Mitigation measures would be incorporated into the construction process as outlined in **section 18.5** of this chapter. These would include the adoption of working methods during construction and removal and reinstatement to manage groundwater appropriately, implementation of appropriate pollution incident control and implementation of appropriate and safe storage of fuel, oils and equipment.
- 18.6.26 A summary of the construction phase PCSM and impact assessment is provided in **Table 18.14** and includes the risks identified to the receptors. A more detailed assessment of construction risk and impact assessment is provided in **Appendices 18C** and **11D** of this volume.

18.6.27 It is considered that with the primary and tertiary mitigation measures adopted, the risks identified to human health, controlled waters, ecological and property receptors during construction would range from very low to moderate/low risk. Compared to the existing baseline, the level of risk to receptors has generally remained the same or slightly increased during the construction phase. An overall negligible to minor adverse effect is therefore predicted which is classed as **not significant**.

Table 18.14: Construction phase effects for the proposed development.

Receptor	Value/ Sensitivity	Baseline Risk.	Construction Risk.	Classification of Effect.
Human (on-site).	High	Very low to low.	Very low to low.	Negligible to minor adverse (not significant).
Human (off-site).	High	Very low.	Very low to low.	Negligible to minor adverse (not significant).
Controlled waters: groundwater (on-site and off-site).	Medium	Low	Low to moderate/low risk.	Negligible to minor adverse (not significant).
Controlled waters: surface water (on-site and off-site).	Medium	Very low to low.	Very low to moderate/low risk.	Negligible to minor adverse (not significant).
Property: existing and future structures and services (on-site and off-site).	Medium	Very low.	Very low.	Negligible (not significant).
Property: crops and livestock (on-site and off-site).	Medium	Very low.	Very low to low.	Negligible to minor adverse (not significant).
Ecological (on-site and off-site).	High	Very low.	Very low to low.	Negligible to minor adverse (not significant).

NOT PROTECTIVELY MARKED**Effects associated with waste soils and soil re-use**

- 18.6.28 Waste soils would be generated during construction through excavation works. There is the potential that waste soil generated during construction would be classified as unsuitable for re-use on-site or hazardous, therefore requiring removal from site. Waste soils would be dealt with in accordance with the **Waste Management Strategy** presented in **Appendix 8A** of this volume.
- 18.6.29 A **Materials Management Plan** would set out how material is managed on-site during construction and removal and reinstatement in accordance with appropriate guidance such as the CL: AIRE Development Industry Code of Practice, to allow the re-use of suitable soils during the removal and reinstatement of the temporary construction area and LEEIE as provided in the **Materials Management Strategy**. An **Outline Soil Management Plan** will also be implemented to manage the reinstatement of agricultural land as provided in **Appendix 17C** of **Volume 2** of the **ES**.
- 18.6.30 In line with the waste hierarchy, the design would seek as far as reasonably practicable, to reduce the amount of soil/materials excavated and/or of a hazardous nature, to re-use and recycle waste soils/materials on-site, where possible and to manage soils/materials suitably including off-site disposal of waste if required, in accordance with relevant legislation. Alluvium, and peat which are unsuitable for re-use on the main platform would be deposited in the borrow pits. Made Ground would be re-used as backfill material within the development, where geotechnically and chemically suitable. Therefore, the impacts on waste soils and soil re-use are considered to be temporary, medium -term and direct.
- 18.6.31 Given the proposals to re-use site won material as part of the proposed development, the value/sensitivity of the receptor is classed as medium. With the primary and tertiary mitigation measures, the magnitude of the impact is considered to be low. The overall effect is therefore considered to be minor adverse and **not significant**.

Inter-relationship effects

- 18.6.32 This section provides a description of the identified inter-relationship effects that are anticipated to occur on geology and land quality receptors between the individual environmental effects arising from construction of the proposed development.
- 18.6.33 There are anticipated to be inter-relationship effects between geology and land quality, soils and agriculture, ecology, heritage and groundwater and surface water in relation to potential receptors which could be impacted by ground contamination during the construction of the proposed development.

18.6.34 Potential impacts would include the contamination of sensitive/high value receptors such as good quality or best and most versatile (BMV) agricultural land, SSSIs, listed buildings, principal aquifers, WFD rivers and groundwater SPZs during construction works. Construction activities may introduce new sources of contamination, new pathways for migration of contamination and disturb and mobilise existing sources of contamination.

18.6.35 However, given the primary and tertiary mitigation measures proposed in relation to these disciplines as outlined in **section 18.5** of this chapter, it is not expected that the combined impact of these inter-relationship effects would be greater than those effects predicted for the geology and land quality assessment as presented within this chapter. Only minor adverse inter-relationship effects are anticipated, which are classified as **not significant**. Further details are provided in **Chapter 17**, **Chapter 19** and **Chapter 21** of this volume.

c) Operation

i. Sizewell B relocated facilities effects

18.6.36 An assessment of effects on geology and land quality that would occur due to Sizewell B relocated facilities works during the operational phase is presented in **Chapter 12** of the **Sizewell B relocated facilities ES** (that ES is provided in full at **Volume 1, Appendix 2A**).

18.6.37 The assessment considered the likelihood for significant effects on human health, controlled waters, ecological and property receptors due to the introduction of any new sources of contamination or pollution pathways by operational activities. In addition, the assessment considered potential effects on physical soil features due to soil erosion, soil compaction, ground stability and the potential for increased volumes of waste soils to be generated. The assessment concluded that the Sizewell B relocated facilities works on their own would result in no significant effects on the assessed receptor groups (refer to **section 18.8** of this chapter for a summary of effect categories).

ii. Main development site operation

i. Physical effects

Soil erosion, soil compaction, and ground stability

18.6.38 Physical effects are considered to be mainly related to the construction phase. During operation, there would be limited effects on soil erosion, ground stability and soil compaction through maintenance operations which may include excavations for landscaping and for repairs, upgrades or installation of services and infrastructure. The development would be designed and constructed to take into account the ground conditions to minimise potential physical effects during operation including ground movement, compaction and ground aggressivity hazards. The proposed development would be operated in accordance with the relevant regulations and best practicable measures.

18.6.39 Given soil erosion, soil compaction and ground stability hazards at the site will be mitigated during the construction phase, there is considered to be less potential for ground hazards at the site during operation and the value/sensitivity of the receptor is classed as low. This also assumes that any UXO risks associated with the site will be dealt with at construction stage. The impacts on soil erosion, soil compaction and ground instability during the operational phase from maintenance operations are therefore considered to be temporary, short-term, and direct.

18.6.40 With mitigation measures undertaken during construction, the value/sensitivity of the receptors are classed as low and the magnitude of the impacts are considered to be very low. The overall effects on soil erosion, soil compaction and ground stability are therefore considered to be negligible and classed as **not significant**.

ii. Mineral resources

18.6.41 Effects in relation to mineral resources during the operation phase relate to the permanent sterilisation/loss of minerals, preventing future extraction. The impacts on mineral resources during the operational phase are therefore considered to be permanent and direct.

18.6.42 Given that there are limited valuable mineral resources located within the study area, the value/sensitivity of the receptor is classed as low. The magnitude of the impact is considered to be low as there would be limited loss of regional mineral resources. Effects in relation to loss, damage or sterilisation of mineral resources would remain as minor adverse and classed as **not significant**.

iii. Effects associated with ground contamination

- 18.6.43 The operational PCSM and risk assessment are presented in **Appendix 18B** and the impact assessment in **Appendix 18C** of this volume. The operational impact assessment has been undertaken by comparing the baseline land contamination risks to those predicted during operation, while considering any new sources and pollution pathways introduced by operational activities.
- 18.6.44 The operation of the proposed development would potentially introduce new sources of contamination. Spillages and leaks may occur and below ground services could create additional potential pathways for the migration of potential contamination that were not present at baseline. The impacts on land contamination during the operational phase are considered to be permanent and direct.
- 18.6.45 A summary of the operational phase contamination effects is provided in **Table 18.15**. A more detailed assessment of operational risk and impact assessment is provided in **Appendices 18B** and **18C** of this volume. It is considered that with proposed mitigation, risks identified to human health, controlled waters, ecological and property receptors during operation are assessed as very low to moderate/low. Compared to the existing baseline, the level of risk to receptors has generally remained the same or slightly decreased. An overall negligible to minor beneficial effect is therefore concluded which is classed as **not significant**.

Table 18.15: Operational phase effects for the proposed development.

Receptor	Value/ Sensitivity	Baseline Risk.	Operational Risk.	Classification of Effect.
Human (on-site)	High	Very low to low	Very low to low	Negligible (not significant)
Human (off-site)	High	Very low	Very low	Negligible (not significant)
Controlled waters: groundwater (on-site and off-site)	Medium	Low	Low	Negligible (not significant)
Controlled waters: surface water (on-site and off-site)	Medium	Very low to moderate/low	Very low to moderate/low	Negligible to minor beneficial (not significant)

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Receptor	Value/ Sensitivity	Baseline Risk.	Operational Risk.	Classification of Effect.
Property: existing and future structures and services (on-site and off-site)	Medium	Very low	Very low	Negligible (not significant)
Property: crops and livestock (on-site and off-site)	Medium	Very low	Very low	Negligible (not significant)
Ecological (on-site and off-site)	High	Very low	Very low	Negligible (not significant)

iv. **Effects associated with waste soils and soil re-use**

18.6.46 The proposed development may also generate limited waste soils during operation due to maintenance requirements which may include excavations for landscaping, repairs and maintenance of services. The proposed development would also be operated in accordance with the relevant regulations and best practice pollution prevention guidance. Therefore, the impacts associated with waste soils are assessed to be temporary, short-term and indirect.

18.6.47 Given that there is less potential for soil reuse during the operational phase, the value/sensitivity of the receptor is classed as low. With the primary and tertiary mitigation measures, the magnitude of the impact is considered to be very low. The overall effect is therefore assessed to be negligible and classed as **not significant**.

v. **Inter-relationship effects**

18.6.48 This section provides a description of the identified inter-relationship effects that are anticipated to occur on geology and land quality receptors between the individual environmental effects arising from operation of the proposed development.

18.6.49 There are anticipated to be inter-relationship effects between geology and land quality, soils and agriculture, SSSIs, listed buildings and groundwater and surface water in relation to potential receptors which could be impacted by ground contamination during the operation of the proposed development.

18.6.50 Potential impacts would include the contamination of sensitive/high value receptors such as good quality or BMV agricultural land, SSSIs, listed buildings, principal aquifers, WFD rivers and groundwater SPZs during operation. Operation of the proposed development may introduce new sources of contamination and new pathways for migration of contamination.

18.6.51 However, given the primary and tertiary mitigation measures proposed in relation to these disciplines as outlined in **section 18.5** of this chapter, it is not expected that the combined impact of these inter-relationship effects would be greater than those effects predicted for the geology and land quality assessment as presented within this chapter. Only minor adverse inter-relationship effects are anticipated, which are classified **as not significant**. Further details are provided in **Chapter 17**, **Chapter 19** and **Chapter 21** of this volume.

18.7 Mitigation and monitoring

a) Introduction

18.7.1 Primary and tertiary mitigation measures which have been accounted for as part of the assessment are summarised in **section 18.5** of this chapter. Where further mitigation is required, this is referred to as secondary mitigation and where reasonably practicable, secondary mitigation measures have been proposed.

18.7.2 This section describes the proposed secondary mitigation measures for geology and land quality as well as describes any monitoring required of specific receptors/resources or for the effectiveness of a mitigation measure.

18.7.3 Additional mitigation and monitoring measures for off-site development areas are set out in **Appendix 18D** of this volume.

b) Mitigation

18.7.4 As set out in the **CoCP Part B** (Doc Ref. 8.11), an additional assessment of the moderate WWII UXO bomb risk identified across the site and in areas not previously covered by the 2010 report would be undertaken in the form of a detailed UXO desk study and risk assessment. Where required, mitigation measures would then be implemented as appropriate.

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18.7.5 The **CoCP Part B** (Doc Ref. 8.11) also requires that additional ground investigation would be undertaken for the proposed development to inform detailed design and confirm ground conditions, contamination status and other ground related risks in areas of the site, where limited existing information is available. This would be completed prior to construction works. Where the ground investigation identifies contamination and ground related risks, further detailed quantitative risk assessment and remediation of soil and groundwater contamination prior to construction may be required.

18.7.6 The additional ground investigation would also include testing of marine sediments within the offshore area to provide additional information for materials disposal.

18.7.7 Intrusive ground investigation would also be undertaken within the temporary construction area and LEEIE following the construction of the power station as part of removal and reinstatement. Remediation of soil or ground contamination would then be undertaken if deemed necessary.

c) **Monitoring**

18.7.8 A programme of short-term gas and groundwater monitoring would be designed as part of the additional ground investigation for the site and would be required prior to construction works commencing. The results of this would determine the need for further long-term gas and groundwater monitoring.

18.8 **Residual effects**

18.8.1 The following tables present a summary of the geology and land quality assessment for the main development site, the off-site sports facilities at Leiston and Sizewell B relocated facilities. They identify the receptor(s) likely to be impacted, the level of effect and, where the effect is deemed to be significant, the tables include the mitigation proposed and the resulting residual effect.

18.8.2 The fen meadow compensation sites south of Benhall and east of Halesworth, and the marsh harrier habitat improvement area west of Westleton have been screened out of the land quality and geology assessment as they are not likely to give rise to significant environmental effects. Further details are provided in **Appendix 18D** of this volume. The assessment of effects for Sizewell B relocated facilities has not changed from the assessment provided in **Chapter 12 of Sizewell B relocated facilities ES** as seen in **Appendix 2A of Volume 1 of the ES**.

- 18.8.3 With additional mitigation and monitoring in place, as described in **section 18.7** of this chapter, all effects associated with geology and land quality are reduced to minor or negligible (**not significant**).



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Table 18.16: Summary of effects for the construction phase.

Receptor	Impact	Primary Tertiary Mitigation.	or	Assessment of Effects.	Additional Mitigation.	Residual Effects.
Sizewell B relocated facilities works						
Geology	Soil erosion and compaction.	Health and safety risk assessments, method statements and appropriate PPE for the protection of construction workers. Implementation of measures in the Outline Construction Environmental Management Plan submitted with the relocated facilities planning application during construction works. Design and selection of construction materials in accordance with best practice.		Minor adverse (not significant) .	Further assessment of the geotechnical and geo-environmental ground conditions underlying the site would be undertaken to confirm specific requirements for detailed design.	Minor adverse (not significant) .
Geology	Ground stability.			Minor adverse (not significant) .		Minor adverse (not significant) .
Human Health.	Contamination from on-site and off-site sources.			Negligible (not significant) .		Negligible to minor beneficial (not significant) .
Controlled waters (groundwater)	Contamination from on-site and off-site sources.			Negligible (not significant) .		Negligible (not significant) .
Controlled waters (surface water on and off-site)	Contamination from on-site and off-site sources.			Negligible (not significant) .		Negligible to minor beneficial (not significant) .
Property (existing and future structures and services)	Contamination from on-site and off-site sources.			Negligible (not significant) .		Negligible to minor beneficial (not significant) .
Property (crops and livestock)	Contamination from on-site and off-site sources.			Negligible (not significant) .		Negligible (not significant) .
Ecological	Contamination from on-site and off-site sources.			Negligible (not significant) .		Negligible (not significant) .
Soils	Impacts from waste soils generated during construction works.			Minor adverse (not significant) .		Minor adverse (not significant) .
Main development site.						
Geology	Soil erosion and compaction.	Health and safety risk assessments,		Minor adverse (not significant) .	Additional assessment of the UXO risk	Minor adverse (not significant) .

Receptor	Impact	Primary or Tertiary Mitigation.	Assessment of Effects.	Additional Mitigation.	Residual Effects.
Geology	Ground stability.	method statements and appropriate PPE for the protection of construction workers. Implementation of measures in the CoCP during construction works. Design and selection of construction materials in accordance with best practice.	Moderate adverse (significant) .	on-site with associated mitigation measures where required. Additional ground investigation and risk assessment. Remediation of soil and groundwater if necessary. Longer term gas and groundwater monitoring if necessary.	Minor adverse (not significant) .
Mineral resources	Loss, damage or sterilisation.		Minor adverse (not significant) .		Minor adverse (not significant) .
Human Health	Contamination from on-site and off-site sources.		Negligible to minor adverse (not significant) .		Negligible (not significant) .
Controlled waters (groundwater)	Contamination from on-site and off-site sources.		Negligible to minor adverse (not significant) .		Minor beneficial (not significant) .
Controlled waters (surface water on and off-site)	Contamination from on-site and off-site sources.		Negligible to minor adverse (not significant) .		Negligible to minor beneficial (not significant) .
Property (existing and future structures and services)	Contamination from on-site and off-site sources.		Negligible (not significant) .		Negligible (not significant) .
Property (crops and livestock)	Contamination from on-site and off-site sources.		Negligible to minor adverse (not significant) .		Negligible (not significant) .
Ecological	Contamination from on-site and off-site sources.		Negligible to minor adverse (not significant) .		Negligible (not significant) .
Soils	Impacts from waste soils generated during construction works.		Minor adverse (not significant) .		Minor adverse (not significant) .
Off-site development areas (off-site sports facilities at Leiston).					
Geology	Soil erosion.	Health and safety risk assessments,	Negligible (not significant) .	Additional assessment of the UXO risk	Negligible (not significant) .

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Receptor	Impact	Primary or Tertiary Mitigation.	Assessment of Effects.	Additional Mitigation.	Residual Effects.
Geology	Ground stability	method statements and appropriate PPE for the protection of construction workers. Implementation of measures in the CoCP during construction works. Design and selection of construction materials in accordance with best practice.	Minor adverse (not significant).	on-site with associated mitigation measures where required. Ground investigation and risk assessment. Remediation of soil and groundwater if necessary. Longer term gas and groundwater monitoring if necessary.	Negligible (not significant).
Mineral resources.	Loss, damage or sterilisation.		Negligible (not significant).		Negligible (not significant).
Human Health	Contamination from on-site and off-site sources.		Negligible to minor adverse (not significant).		Negligible (not significant).
Controlled waters (groundwater)	Contamination from on-site and off-site sources.		Minor adverse (not significant).		Negligible (not significant).
Property (existing and future structures and services)	Contamination from on-site and off-site sources.		Minor adverse (not significant).		Negligible (not significant).
Property (crops and livestock)	Contamination from on-site and off-site sources.		Negligible (not significant).		Negligible (not significant).
Soils	Impacts from waste soils generated during construction works.		Minor adverse (not significant).		Minor adverse (not significant).

Table 18.17: Summary of effects for the operational phase.

Receptor	Impact	Primary or tertiary mitigation.	Assessment of effects.	Additional mitigation.	Residual effects.
Sizewell B relocated facilities works.					
Geology	Soil erosion and compaction.	Design and construction of the development in accordance with best practice.	Negligible (not significant).	Longer term gas and groundwater monitoring if necessary.	Negligible (not significant).
Geology	Ground stability.		Negligible (not significant).		Negligible (not significant).
Human Health.	Contamination from on-site and		Health and safety risk		Negligible (not

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Receptor	Impact	Primary or tertiary mitigation.	Assessment of effects.	Additional mitigation.	Residual effects.
	off-site sources.	assessments, method statements and appropriate PPE for the protection maintenance workers.	significant).		significant).
Controlled waters (groundwater).	Contamination from on-site and off-site sources.		Negligible to minor adverse (not significant).		Negligible to minor beneficial (not significant).
Controlled waters (surface water on and off-site).	Contamination from on-site and off-site sources.		Negligible (not significant).		Minor beneficial (not significant).
Property (existing and future structures and services).	Contamination from on-site and off-site sources.		Negligible (not significant).		Negligible (not significant).
Property (crops and livestock).	Contamination from on-site and off-site sources.		Negligible (not significant).		Negligible (not significant).
Ecological	Contamination from on-site and off-site sources.		Negligible (not significant).		Negligible (not significant).
Soils	Impacts from waste soils generated during construction works.		Negligible (not significant).		Negligible (not significant).
Main development site.					
Geology	Soil erosion and compaction.	Design and construction of the development in accordance with best practice. Operation of the development in accordance with the Control of Major Accident Hazards consent, hazardous substances	Negligible (not significant).	Longer term gas and groundwater monitoring if necessary.	Negligible (not significant).
Geology	Ground stability.		Negligible (significant).		Negligible (not significant).
Mineral resources	Loss, damage or sterilisation.		Minor adverse (not significant).		Minor adverse (not significant).
Human Health	Contamination from on-site sources.		Negligible (not significant).		Negligible (not significant).
Controlled waters (groundwater)	Contamination from on-site sources.		Negligible (not significant).		Minor beneficial (not significant).

NOT PROTECTIVELY MARKED

Receptor	Impact	Primary or tertiary mitigation.	Assessment of effects.	Additional mitigation.	Residual effects.
Controlled waters (surface water on and off-site)	Contamination from on-site sources.	consent, Radioactive Substances Regulations environmental permit, Nuclear Site Licence and Operational Water Discharge Activity permit. Health and safety risk assessments, method statements and appropriate PPE for the protection of maintenance workers.	Negligible to minor beneficial (not significant) .		Minor beneficial (not significant) .
Property (existing and future structures and services)	Contamination from on-site sources.		Negligible (not significant) .		Negligible (not significant) .
Property (crops and livestock)	Contamination from on-site sources.		Negligible (not significant) .		Negligible (not significant) .
Ecological	Contamination from on-site sources.		Negligible (not significant) .		Negligible (not significant) .
Soils	Impacts from waste soils generated during construction works.		Negligible (not significant) .		Negligible (not significant) .
Off-site development areas (off-site sports facilities at Leiston).					
Geology	Soil erosion.	Design and construction of the development in accordance with best practice. Health and safety risk assessments, method statements and appropriate PPE for the protection maintenance workers.	Negligible (not significant) .	Longer term gas and groundwater monitoring if necessary.	Negligible (not significant) .
Geology	Ground stability		Negligible (not significant) .		Negligible (not significant) .
Mineral resources.	Loss, damage or sterilisation.		Negligible (not significant) .		Negligible (not significant) .
Human Health	Contamination from on-site sources.		Negligible to minor adverse. (not significant) .		Negligible (not significant) .
Controlled waters (groundwater)	Contamination from on-site sources.		Minor adverse. (not significant) .		Negligible (not significant) .
Property (existing and future structures and services)	Contamination from on-site sources.		Minor adverse. (not significant) .		Negligible (not significant) .
Property (crops and livestock)	Contamination from on-site sources.		Negligible (not significant) .		Negligible (not significant) .

Receptor	Impact	Primary or tertiary mitigation.	Assessment of effects.	Additional mitigation.	Residual effects.
Soils	Impacts from waste soils generated during construction works.		Negligible (not significant).		Negligible (not significant).



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