Botley West Solar Farm

Environmental Statement

Volume 1

Chapter 11: Ground Conditions

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Glossary

Term	Meaning
The Applicant	SolarFive Ltd
The Project	The Botley West Solar Farm
Code of Construction Practice (CoCP)	A document detailing the overarching principles of construction, contractor protocols, construction related environmental management measures, pollution prevention measures, the selection of appropriate construction techniques and monitoring processes
Conceptual Site Model	used to identify potential sources, pathways and receptors and how they interact (i.e. potential pollutant linkages) on site post development
Controlled Waters	Controlled waters means territorial waters within the 3 nautical mile limit, coastal waters extending inland, inland waters and ground water
Desk Top Study	A desk study is the collation and review of information already available in the public domain and is carried out at an early stage of site appraisal and forms the basis of the preliminary risk assessment
Geodiversity	The range of rocks, minerals, fossils, soils and landforms.
Mineral Consultation Area	A geographical area based on a Mineral Safeguarding Area, where the district or borough council should consult the Mineral Planning Authority for any proposals for non-minerals development
Minerals resources of local and national importance	Minerals which are necessary to meet society's needs, including aggregates, brick clay (especially Etruria Marl and fireclay), silica sand (including high grade silica sands), coal derived fly ash in single use deposits, cement raw materials, gypsum, salt, fluorspar, shallow and deep-mined coal, oil and gas (including conventional and unconventional hydrocarbons), tungsten, kaolin, ball clay, potash, polyhalite and local minerals of importance to heritage assets and local distinctiveness
Mineral Safeguarding Area	An area designated by minerals planning authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development
Pathway	How the contaminant may be expected to move/migrate to a receptor
Preliminary Risk Assessment	Report that presents a summary of readily-available information on the geotechnical and/or geo-environmental characteristics of the site and provides a qualitative assessment of geo-environmental and/or geotechnical risks in relation to the proposed development
Principal Aquifer	These formations provide a high level of water storage and may support water supply and/or river base flow on a strategic scale

Term	Meaning
Receptor	Target that could be adversely affected by contaminants
Secondary A Aquifer	These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers
Secondary B Aquifer	These formations are generally formed of lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering
Secondary Undifferentiated Aquifer	Secondary undifferentiated are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value
Site of Special Scientific Interest	Sites designated by Natural England under the Wildlife and Countryside Act 1981. This can include sites of national and international importance for sediments, rocks, fossils, and features of the landscape
Source	Source of contamination
Unproductive Strata	These formations have a low permeability and have negligible significance for water supply or base flow

Abbreviations

Abbreviation	Meaning
AOD	Above Ordnance Datum
bgl	Below Ground Level
BGS	British Geological Survey
CIRIA	Construction Industry Research and Information Association
CLR	Contaminated Land (England) Regulations
CoCP	Code of Construction Practice
CS	Characteristic Situation
CSM	Conceptual site model
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
DTS	Desk Top Study
EA	Environment Agency
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
ES	Environmental Statement
GCR	Geological Conservation Review

Abbreviation	Meaning
GWDTE	Groundwater Dependent Terrestrial Ecosystems
HDD	Horizontal Directional; Drilling
HEWRAT	Highways England water risk assessment tool
IPC	Integrated Pollution Control
JNCC	Joint Nature Conservation Committee
LCRM	Land Contamination Risk Management
MCA	Mineral Consultation Area
MMP	Materials Management Plan
MRA	Mineral Resource Assessment
MSA	Mineral Safeguarding Area
NGET	National Grid Electricity Transmission
NGR	Ordnance Survey National Grid Reference
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NVZ	Nitrate Vulnerable Zone
PAOC	Potential Areas of Concern
PEIR	Preliminary Environmental Information Report
PINS	The Planning Inspectorate
PPP	Pollution Prevention Plan
PRA	Preliminary Risk Assessment
PV	Photovoltaic
PVDP	Photovolt Development Partners GmbH
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SOM	Soil Organic Matter
SPA	Special Protection Area
SPZ1	Groundwater Source Protection Zone - Inner Zone
SPZ2	Groundwater Source Protection Zone - Outer Zone
SPZ3	Groundwater Source Protection Zone - Total Catchment
SSSI	Site of Special Scientific Interest
UXO	Unexploded Ordnance

Abbreviation	Meaning
VOC	Volatile Organic Compound
WFD	Water Framework Directive
ZOI	Zone of Influence

Units

Unit	Description
%	Percentage
km	Kilometre
km^2	Square kilometres
m	Metres
mg/kg	Milligrams per kilogram

11 Ground Conditions

11.1 Introduction

Overview

11.1.1 This chapter of the ES sets out the approach to the assessment of likely significant effects, of the Project, upon ground condition receptors. The application for development consent is being made to the Planning Inspectorate (PINS) under the Planning Act 2008. The proposal is to install and operate approximately 840MWe of solar generation in parts of West Oxfordshire, Cherwell and Vale of White Horse Districts, within the county of Oxfordshire (the Project).

11.1.2 This second version of the chapter has been produced to address comments from the Environment Agency received during the Examination process. It provides the following additional information:

- Summary of groundwater data identified to date;
- Inclusion of active groundwater abstractions as sensitive receptors; and
- Summary review of the Conceptual Site Model associated with Oxford Airport as an off-site source of potential contamination.

11.1.3 This chapter of the Environmental Statement (ES) has been prepared by RPS for Photovolt Development Partners GmbH (PVDP) on behalf of SolarFive Ltd (the Applicant).

11.1.4 SolarFive is the 'special purpose vehicle' (SPV) for the Project and has been awarded a generation licence by Ofgem and offered a grid connection by National Grid Electricity Transmission (NGET) from October 2027. SolarFive is a licence holder under the Electricity Act 1989 and is also a company registered in England and Wales (company no. 12602740).

11.1.5 This ES is in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, as amended (the EIA Regulations), and other required documents including a statement on pre-application consultation.

11.1.6 This ES Chapter has been prepared in accordance with the approach set out in the Scoping Report and the subsequent Preliminary Environmental Information Report (PEIR).

11.1.7 The assessment presented is informed by the following technical chapters:

- Chapter 1 – Introduction **[EN010147/APP/6.3]**;
- Chapter 2 – Existing baseline **[EN010147/APP/6.3]**;
- Chapter 3 – Consenting Process **[EN010147/APP/6.3]**;
- Chapter 4 – Approach to Environmental Assessment **[EN010147/APP/6.3]**;
- Chapter 5 – Alternatives Considered **[EN010147/APP/6.3]**;

- Chapter 6 – Project Description **[EN010147/APP/6.3]**; and
- Chapter 20 – Cumulative Effects and Inter-relationships **[EN010147/APP/6.3]**.

11.1.8 This chapter also draws upon information contained within the following appendices **[EN010147/APP/6.5]**;

- Appendix 11.1 - Botley Northern Site Area – Land Parcel 2, Desk Top Study And Preliminary Risk Assessment
- Appendix 11.2 - Botley Northern Site Area – Land Parcel 3, Desk Top Study And Preliminary Risk Assessment
- Appendix 11.3 - Botley Northern Site Area – Land Parcel 4, Desk Top Study And Preliminary Risk Assessment
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- Appendix 11.14 – Mineral Resource Assessment for Photovolt Development Partners Ltd – Botley West Solar Farm

11.1.9 This ES chapter presents the findings of EIA work undertaken to date concerning the potential impacts of the Project on Geology, Hydrogeology and Ground Conditions with respect to;

- Possible land and groundwater contamination;
- Geological conservation sites designated as Sites of Special Scientific Interest (SSSIs) or are being considered for notification as such by the

Joint Nature Conservation Committee (JNCC) in the Geological Conservation Review (GCR);

- Ground instability resulting from the Project; and
- Nature and extent of Mineral Safeguarding Areas.

11.2 Legislative and Policy Context

National Legislation

11.2.1 The following key national legislation is relevant to ground conditions and provides the technical framework relevant to this chapter;

The Environmental Protection Act 1990

11.2.2 The Environmental Protection Act 1990 (EPA) provides a risk based framework for the identification, assessment and management of contaminated land within the UK.

11.2.3 The Part IIA regime is aimed at ensuring that actions taken with respect to contaminated land are directed by a technically well-founded assessment of risk that considers the 'contaminant-pathway-receptor' scenario (contaminant linkage). Under the section 78A(2) of the EPA, contaminated land is defined as:

"…any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

(a) significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused."

11.2.4 Under the section 78A(4), 'Harm' is defined as:

> *"... harm to the health of living organisms or other interference with the ecological systems of which they form part and, in the case of man, includes harm to his property."*

The Environmental Protection Act 1990: Part 2A: Contaminated Land Statutory Guidance (2012)

11.2.5 'Significant harm' is not defined in the Act but the Environmental Protection Act 1990: Part IIA Contaminated Land Statutory Guidance (2012) defines 'Significant harm' as "death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive functions".

11.2.6 Under Part IIA, for a relevant risk to exist there needs to be one or more contaminant pathway-receptor linkages – "contaminant linkage" – by which a relevant receptor might be affected by the contaminants in question. The guidance provides the following definitions for these elements as follows;

- *A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.*
- *A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters.*
- *A "pathway" is a route by which a receptor is or might be affected by a contaminant.*

11.2.7 A source, pathway and receptor must all be present to complete the pollutant linkage and for a potentially significant risk to exist. As such, the presence of contamination in itself does not necessarily indicate a need for remedial action. Accordingly, a site can only be considered 'contaminated' when a risk to the environment or human health is present due to the presence of a 'source-pathway-receptor' linkage. The EPA provides a means of identifying and remediating land that poses a significant risk to human health and/or the environment, where risks cannot be controlled by other means. It also works alongside the planning system to help ensure that land is made suitable for use following redevelopment.

11.2.8 If risks are presented by groups of substances that are likely to behave in a similar manner relating to the risks that they present, then the groups of contaminants and multiple linkages can be treated as a single contaminant where there is reason to do so.

11.2.9 In considering contaminant linkages, it should be considered whether there are several different pathways linking one or more contaminants to the same receptor. If there is more than one significant linkage identified, it may be appropriate for remediation to be dealt with separately for each significant contaminant linkage.

Hazardous Waste (England and Wales) Regulations 2005

11.2.10 The aim of the Hazardous Waste (England and Wales) Regulations 2005 set out a regime to control and track the movement of hazardous waste in England and Wales. Under the Regulations, a process of registration of hazardous waste producers and a system for recording the movement of waste has been developed, to ensure that certain sites where hazardous waste is produced are notified to the Environment Agency.

The Contaminated Land (England) Regulations 2006

11.2.11 These regulations provide the contaminated land management regime for implementing the requirements of Part IIA of the EPA, including actions for the remediation of such land. These regulations (and the accompanying 2012 statutory guidance (Defra, 2012)) introduced a four category test which is intended to clarify when land does, and does not, need to be remediated.

Water Resources Act 1991

11.2.12 The Water Resources Act principally relates to the protection of controlled water (i.e. rivers, lakes, canals and groundwater) from pollution. It sets out the responsibilities of the Environment Agency in relation to water pollution, resource management, flood defence, fisheries and, in some areas, navigation. It also regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwater.

Water Supply (Water Quality) (Amendment) Regulations 2016~~8~~

11.2.13 ~~The Water Supply Regulations set out measures to protect the quality of water intended for human consumption~~The Water Supply (Water Quality) (Amendment) Regulations 2018 are amendments to the Water Supply (Water Quality) Regulations 2016 in England. These regulations primarily implement the requirements of Commission Directive (EU) 2015/1787, which amended the EU's Council Directive 98/83/EC concerning the quality of water intended for human consumption. The purpose of these amendments is to align water quality standards and principles in England with those established by the EU.

11.2.14 They regulate the quality of water supplied by water undertakers to ensure it is safe for drinking, washing, cooking, and food production. The regulations also include provisions for the publication of information about water quality.

The Environment Agency's Approach to Groundwater Protection 2018

11.2.15 The Environment Agency's 2018 approach to groundwater protection sets out a risk-based framework aimed at safeguarding groundwater quality across England. It focuses on preventing pollution through proactive measures such as defining Source Protection Zones (SPZs), regulating potentially harmful activities, and promoting best practices in land and waste management. The approach emphasizes the precautionary principle to protect vital groundwater resources that supply drinking water and support ecosystems. It aligns with relevant water quality legislation and provides guidance for managing activities that could impact groundwater, ensuring sustainable use and long-term protection of this essential resource.

Environmental Damage (Prevention and Remediation) (England) (Amendment) Regulations 2015~~9~~

~~11.2.13~~11.2.16 ~~The aim of the Environmental Damage Regulations is to prevent and remedy damage to land, water and biodiversity~~These regulations are in regard to the prevention and remedying of environmental damage.

European Legislation

~~11.2.14~~11.2.17 The following European legislation is also relevant to the assessments undertaken in this chapter;

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

~~11.2.15~~11.2.18 These regulations were prepared to implement the European Water Framework Directive in the UK. Although the Directive no longer has effect, the regulations remain in place to control groundwater pollution and contaminated land and establish a legislative framework for the protection of surface waters and groundwater.

Planning policy context

National Policy Statements

~~11.2.16~~11.2.19 There are currently six designated energy National Policy Statements (NPS), EN-1, EN-2, EN-3, EN-4, EN-5 and EN-6. The 2023 revised NPSs (EN-1 to EN-5) came into force on 17 January 2024.

~~11.2.17~~11.2.20 **Table 11.1** EN-1 and EN-5 are the relevant NPSs to this chapter. Table 11.1 below sets out a summary of the policies within these NPSs, relevant to Ground Conditions.

Table 11.1: Summary of designated NPS document requirements relevant to this chapter

Summary of NPS Requirement	How and where considered in the ES
Geological Conservation Sites	
Where the development is subject to EIA the applicant should ensure that the Environmental Statement clearly sets out the effects on internationally, nationally and locally designated sites of ecological or geological conservation importance (paragraph 5.4.17 of **NPS EN-1**).	Review of Designated and Non-designated Geological Conservation Sites in **section 11.6** para 11.6.28 confirms that there are no geological conservation sites within the Project area. As such a Geodiversity Management Strategy is not considered necessary. Opportunities to avoid effects have been taken during the site selection process and are set out in Volume 1: Chapter 5: Alternatives Considered **[EN010147/APP/6.3]**.
The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests (paragraph 5.4.19 of **NPS EN-1**).	
To further minimise any adverse impacts on geodiversity, where appropriate applicants are encouraged to produce and implement a Geodiversity Management Strategy to preserve and enhance access to geological interest features, as part of relevant development proposals. (paragraph 5.4.38 of **NPS EN-1**).	
Development proposals provide many opportunities for building-in beneficial biodiversity or geological features as part of good design. (paragraph 5.4.46 of **NPS EN-1**).	
There is a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to “have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest”. (paragraph 2.2.10 of **NPS EN-5**).	

Summary of NPS Requirement	How and where considered in the ES
Development consent for underground sections of a proposed line over an overhead alternative only to be granted if it is satisfied that the benefits accruing from the former proposal clearly outweigh any extra economic, social, or environmental impacts that it presents (including on geology) and that any technical obstacles associated with it are surmountable. (paragraph 2.9.25 of **NPS EN-5**).	
Land Contamination	
Where pre-existing land contamination is being considered within a development, the objective is to ensure that the site is suitable for its intended use. Risks would require consideration in accordance with the contaminated land statutory guidance as a minimum (paragraph 5.11.5 of **NPS EN-1**).	The ES considers the risk posed by land contamination in **Section 11.9** and how such risk will be appropriately managed.
The sustainable reuse of soils needs to be carefully considered in line with good practice guidance where large quantities of soils are surplus to requirements or are affected by contamination. (paragraph 5.11.14 of **NPS EN-1**).	
Applicants should ensure that a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. (paragraph 5.11.17 of **NPS EN-1**)	
For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination, and where contamination is present, applicants should consider opportunities for remediation where possible. (paragraph 5.11.8 and 5.11.18 of **NPS EN-1**)	
Hydrogeology	
Infrastructure development can have adverse effects resulting in groundwater or protected areas failing to meet environmental objectives established under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (paragraphs 5.16.1 and 5.16.2 of **NPS EN-1**).	Assessment of ground disturbance is undertaken specifically on Principal Aquifers and Secondary A Aquifers in **Section 11.9**.
Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and the impacts of the proposed project on water quality, water resources and physical characteristics of the water environment. In particular the Environmental Statement should describe any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive (WFD) and Source Protection Zones (SPZs) around potable groundwater abstractions (paragraphs 5.16.3 and 5.16.7 of **NPS EN-1**).	The risk of potential impacts on the water environment will be appropriately managed through design to facilitate adherence to good pollution control practice, as discussed in **Section 11.8**. Impacts on SPZs and water bodies protected under the WFD are assessed in **Section 11.9**.
Land Instability	
Applicants should ensure that a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. (paragraph 5.11.17 of **NPS EN-1**).	An evaluation of the potential risks of land instability from natural processes or mining related activities is included for each of the

Summary of NPS Requirement	How and where considered in the ES
Developments should contribute to and enhance the natural and local environment by preventing new and existing developments from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. (paragraph 5.11.15 of **NPS EN-1**).	land parcels in the supporting Appendices 11.1 – 11.13.
Mineral Reserves	
Applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place. (paragraph 5.11.19 of **NPS EN-1**).	A MSA for sharp sand and gravels has been identified within the Project area. In accordance with local planning policy and consultation with the Minerals and Waste Local Plan Principal Officer, a Mineral Resource Assessment (MRA) has been undertaken that demonstrates that although sand and gravel deposits of potential commercial interest are present sporadically beneath Botley Central Site Area, the Project will not result in the permanent sterilisation of these resources. The MRA is presented as Appendix 11.14 **[EN010147/APP/6.5]**.
Where a proposed development has an impact upon a Mineral Safeguarding Area (MSA), the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources. (paragraph 5.11.28 of **NPS EN-1**)	

The National Planning Policy Framework

~~11.2.18~~11.2.21 The National Planning Policy Framework (NPPF) was published in 2012 and updated in 2018, 2019, 2021 and twice in 2023, and in December 2024 (Department for Levelling Up, Housing and Communities, 202~~3~~4). The NPPF sets out the Government's planning policies for England.

~~11.2.19~~11.2.22 The Planning Practice Guidance (PPG) (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) supports the NPPF and provides guidance across a range of topic areas. The PPG includes guidance on the following topics relevant to this chapter:

- Land affected by contamination;
- Land Stability;
- Minerals;
- Natural Environment; and
- Water supply, waste water and water quality

~~11.2.20~~11.2.23 **Table 11.2** sets out a summary of the NPPF policies relevant to this chapter.

Table 11.2: Summary of NPPF requirements relevant to this chapter

Policy	Key Provisions	How and where considered in the ES
15. Conserving and Enhancing the Natural	Planning policies and decisions should contribute to and enhance	**Section 11.6** Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks.

Policy	Key Provisions	How and where considered in the ES
Environment (paras 18~~0~~7 (e) and 18~~0~~7 (f))	the natural and local environment by: • preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of pollution including soil and water or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality; and • remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.	**Table 11.17** – additional investigation required to inform whether there are contamination or land instability risks.
15. Ground Conditions and Pollution (paras 196~~89~~ (a), 1~~89~~96 (b) and 1~~89~~96 (c))	Planning policies and decisions ensure that: • A site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation); • After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and • Adequate site investigation information is available to inform these assessments.	**Section 11.6** Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks. **Table 11.17** – additional investigation required to inform whether there are contamination or land instability risks.
17. Facilitating the sustainable use of minerals (paras 2~~1~~623 (c) and 2~~1~~623 (d))	• Safeguard mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that	Following the identification of the Minerals Safeguarding Areas within the extents of the Project in the scoping exercise a Minerals Resource Assessment (Appendix 11.14) **[EN010147/APP/6.5]** has been undertaken to evaluate the constraint that mineral resources, present on the Project, are likely to place on the proposed development given local mineral planning policy.

Policy	Key Provisions	How and where considered in the ES
	the resources defined will be worked); • Set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development to take place;	
17. Facilitating the sustainable use of minerals (para 2~~25~~18)	• Local planning authorities should not normally permit other development proposals in Mineral Safeguarding Areas if it might constrain potential future use for mineral working.	

~~11.2.21~~11.2.24 The Planning Practice Guidance (PPG) (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) supports the NPPF and provides guidance across a range of topic areas. The PPG includes guidance on the following topics relevant to this chapter:

- land affected by contamination;
- land stability;
- minerals;
- natural environment; and
- water supply, waste water and water quality.

~~11.2.22~~11.2.25 **Table 11.2** sets out a summary of the PPG relevant to this chapter.

Table 11.3: Summary of PPG relevant to this chapter

PPG	Key PPG Guidance
Land Affected by Contamination	**What is a contamination risk assessment and what can it contain? (Paragraph: 007 Reference ID: 33-007-20190722)** If there is a reason to believe contamination could be an issue, applicants should provide proportionate but sufficient site investigation information (a risk assessment) prepared by a competent person to determine the existence or otherwise of contamination, its nature and extent, the risks it may pose and to whom/what (the 'receptors') so that these risks can be assessed and satisfactorily reduced to an acceptable level. The National Quality Mark Scheme (NQMS) accredits competent persons with regard to assessing and reporting land contamination issues. The Department for Environment, Food and Rural Affairs has published a policy companion document considering the use of 'Category 4 Screening Levels' in providing a simple test for deciding when land is suitable for use and definitely not contaminated land. A risk assessment of land affected by contamination should inform an Environmental Impact Assessment if one is required. The risk assessment should also identify the potential sources, pathways and receptors ('pollutant/contaminant linkages') and evaluate the risks. This information

PPG	Key PPG Guidance
	will enable the local planning authority to determine whether more detailed investigation is required, or whether any proposed remediation is satisfactory. At this stage, an applicant may be required to provide at least the report of a desk study and site walk-over. This may be sufficient to develop a conceptual model of the source of contamination, the pathways by which it might reach vulnerable receptors and options to show how the identified pollutant/contaminant linkages can be broken. Unless this initial assessment clearly demonstrates that the risk from contamination can be satisfactorily reduced to an acceptable level, further site investigations and risk assessment will be needed before the application can be determined. Further guidance can be found on land contamination risk management. Note that remediation or site investigation activities themselves, including field trials, may require planning permission if not carried out as part of a development, and in some cases may also need environmental permits. **Using planning conditions (Paragraph: 010 Reference ID: 33-010-20190722)** The stages and the factors to consider in framing appropriate planning conditions can include: • site characterisation; • submission of the remediation scheme; • implementation of the approved remediation scheme; and • monitoring and maintenance.
Land Stability	**Where can information on land stability issues be obtained from?** **Paragraph: 004 Reference ID: 45-004-20140306** Information about land instability may be obtained from: • geological information held by the British Geological Survey, including the national dataset on landslides and mapping and borehole records; • coal mining records held by the Coal Authority; • the planning authority's own information, including building control records, which may contain issues such as previous surveys, records of previous events; • local libraries and archives; and • information about previous land uses contained in the National Land Use database.

PPG	Key PPG Guidance
Minerals	**What is the purpose of safeguarding mineral resources? (Paragraph: 002 Reference ID: 27-002-20140306)** Since minerals are a non-renewable resource, minerals safeguarding is the process of ensuring that non-minerals development does not needlessly prevent the future extraction of mineral resources, of local and national importance. What steps should mineral planning authorities take to safeguard mineral resources? (Paragraph: 003 Reference ID: 27-003-20140306) Mineral planning authorities should adopt a systematic approach for safeguarding mineral resources, which: • uses the best available information on the location of all mineral resources in the authority area. This may include use of British Geological Survey maps as well as industry sources; • consults with the minerals industry, other local authorities (especially district authorities in 2-tier areas), local communities and other relevant interests to define Minerals Safeguarding Areas; • sets out Minerals Safeguarding Areas on the policies map that accompanies the local plan and define Mineral Consultation Areas; and • adopts clear development management policies which set out how proposals for non-minerals development in Minerals Safeguarding Areas will be handled, and what action applicants for development should take to address the risk of losing the ability to extract the resource. This may include policies that encourage the prior extraction of minerals, where practicable, if it is necessary for non-mineral development to take place in Minerals Safeguarding Areas and to prevent the unnecessary sterilisation of minerals. What is the role of the district council, as the local planning authority, in safeguarding minerals? (Paragraph: 005 Reference ID: 27-005-20140306) Whilst district councils are not mineral planning authorities, they have an important role in safeguarding minerals in 3 ways: • having regard to the local minerals plan when identifying suitable areas for non-mineral development in their local plans. District councils should show Mineral Safeguarding Areas on their policy maps; • in those areas where a mineral planning authority has defined a Minerals Consultation Area, consulting the mineral planning authority and taking account of the local minerals plan before determining a planning application on any proposal for non-minerals development within it; and • when determining planning applications, doing so in accordance with development policy on minerals safeguarding, and taking account of the views of the mineral planning authority on the risk of preventing minerals extraction.
Natural environment (Geo-diversity)	**How can biodiversity and geodiversity be taken into account in preparing a planning application? (Paragraph: 018 Reference ID: 8-018-20240214)** Information on biodiversity and geodiversity impacts and opportunities needs to inform all stages of development (including site selection and design, pre-application consultation and the application itself). As with other supporting information, local planning authorities should require ecological surveys only where clearly justified. Assessments should be proportionate to the nature and scale of development proposed and the likely impact on biodiversity (geo-diversity). Further guidance on information requirements is set out in making an application.

PPG	Key PPG Guidance
Water supply, wastewater and water quality	**What might need to be considered when planning for water infrastructure, water quality and wastewater? (Paragraph: 006 Reference ID: 34-006-20161116** Plan-making may need to consider: • how to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage. For example, can the plan steer potentially polluting development away from the most sensitive areas, particularly those in the vicinity of drinking water supplies (designated source protection zones or near surface water drinking water abstractions) • where an assessment of the potential impacts on water bodies and protected areas under the Water Environment Regulations 2017 may be required, consider the type or location of new development • whether measures to improve water quality, for example sustainable drainage schemes, can be used to address impacts on water quality in addition to mitigating flood risk

Local planning policy

~~11.2.23~~11.2.26 The relevant local planning policies applicable to Ground Conditions based on the extent of the study areas for this assessment are summarised in **Table 11.4**.

Table 11.4: Summary of local planning policy relevant to this chapter

Policy	Key Provisions	How and where considered in the ES
West Oxfordshire Local Plan 2031 (adopted 2018)		
EH8: Environmental Protection	Contaminated Land – proposals for development of potentially contaminated land must incorporate appropriate level of investigation and if necessary remedial measures must be identified and implemented. Water Resources – proposals for development will only be acceptable provided there is no adverse impact on quantity and quality of water bodies and groundwater resources.	**Section 11.6** Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks. **Section 11.8** Measures adopted as part of the Project (Commitments) sets out measures to be adopted in the event of contaminated land discovery and to minimise risk through construction of contamination of groundwater/surface water.
EH3: Biodiversity and Geodiversity	Avoidance of loss or deterioration to locally important geological sites.	**Para 11.6.31** Review of Designated and Non-designated Geological Conservation Sites – confirms that there are no geological conservation sites within the Project area.
Cherwell District Council Local Plan 2011- 2031 (adopted 2015)		

Policy	Key Provisions	How and where considered in the ES
ESD10: Protection and Enhancement of Biodiversity and the Natural Environment	Development that would result in damage to or loss of a site of biodiversity or geological value of national importance will not be permitted unless benefits outweighs the harm caused to the site and the wider network of SSSIs and the loss can be mitigated to achieve a net gain in biodiversity/geodiversity. Development that would result in damage to or loss of a site of biodiversity or geological value of regional or local importance will not be permitted unless the benefits of the development clearly outweigh the harm caused to the site and the loss can be mitigated to achieve a net gain in biodiversity/geodiversity.	**Para 11.6.31** Review of Designated and Non-designated Geological Conservation Sites – confirms that there are no geological conservation sites within the Project area.
ESD8: Water resources	Reduction of impact of development on the water environment and maintain water quality.	**Section 11.6** Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks. 11.8 Measures adopted as part of the Project (Commitments) sets out measures to be adopted in the event of contaminated land discovery and to minimise risk through construction of contamination of groundwater/surface water.
Vale of White Horse District Council Local Plan 2011- 2031 (adopted 2016)		
Core Policy 43: Natural Resources	The effective use of natural resources is encouraged by ensuring that the land is of a suitable quality for development and that remediation of contaminated land is undertaken where necessary.	**Section 11.6** Assessment of PRA Findings – summary of CSM findings identifying land instability and ground contamination risks. **Section 11.8** Measures adopted as part of the Project (Commitments) sets out measures to be adopted in the event of contaminated land discovery and to minimise risk through construction of contamination of groundwater/surface water.
Core Policy 46: Conservation and Improvement of Biodiversity	Development likely to result in the loss, deterioration or harm to habitats of importance for geological conservation interests (Locally Important Geological Sites), either directly or indirectly, will not be permitted unless the need for/benefits outweighs the	**Para 11.6.31** Review of Designated and Non-designated Geological Conservation Sites – confirms that there are no geological conservation sites within the Project area.

Policy	Key Provisions	How and where considered in the ES
	adverse effect, it can be demonstrated that it could not reasonably be located on an alternative site that would result in less harm, or measures can be provided that would avoid/mitigate or compensate for the adverse effects likely to result from development.	
Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy (Adopted September 2017)		
Policy M1: Recycled and Secondary Aggregate	So far as is practicable, aggregate mineral supply to meet demand in Oxfordshire should be from recycled and secondary aggregate materials in preference to primary aggregates, in order to minimise the need to work primary aggregates.	Appendix 11.14 – Mineral Resource Assessment **[EN010147/APP/6.5]** and initial consultation summarised in **Table 11.6**: Summary of consultation relevant to this chapter
Policy M3: Principal locations for working aggregate minerals	The land parcels located within Mineral Safeguarding Areas and Mineral Consultation Areas are situated within the Oxford Mineral Strategic Resource Area for sharp sand and gravel an area identified for proposed future working of sharp sand and gravel.	Appendix 11.14 – Mineral Resource Assessment **[EN010147/APP/6.5]** and initial consultation summarised in **Table 11.6**: Summary of consultation relevant to this chapter
Policy M8: Safeguarding Mineral Resources	Mineral resources in Mineral Safeguarding Areas shown on the accompanying Policies Map are safeguarded for possible future use. Development that would prevent or otherwise hinder the possible future working of the mineral will not be permitted unless it can be shown that: • The site has been allocated for development in an adopted local plan or neighbourhood plan; or • The need for the development outweighs the economic and sustainability considerations relating to the mineral resource; or • The mineral will be extracted prior to the development taking place.	Appendix 11.14 – Mineral Resource Assessment **[EN010147/APP/6.5]** and initial consultation summarised in **Table 11.6**: Summary of consultation relevant to this chapter

11.3 Consultation and Engagement

11.3.1 On 15 June 2023, the Applicants submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operation and maintenance and decommissioning phases. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Project would not have the potential to give rise to significant environmental effects in these areas.

11.3.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 24 July 2023. Key issues raised during the scoping process specific to Ground Conditions are listed in **Table 11.5**, together with details of how these issues have been addressed within the ES.

Table 11.5: Summary of scoping responses

	Comment	How and where considered in the ES
PINs ID	**Planning Inspectorate Scoping Opinion - Section 3.5**	
3.5.1	The Scoping Report proposes to scope this matter out on the basis that historic contamination information and other background information has ruled out contamination issues within these land parcels. However, this information has not been provided within the Scoping Report.	Baseline information regarding contamination is included in the supporting DTS and PRA documents forming the appendices to this chapter.
3.5.2	Scoping Report paragraph 7.5.14 states that ground instability may occur as a result of construction disturbance promoting landslips and landslides through slope destabilisation. Impacts from ground instability have been scoped out without any further explanation or justification.	Baseline information regarding ground instability is included in the supporting DTS and PRA documents forming the appendices to this chapter. Further assessment/mitigation measures by way of land instability included in **Table 11.17** of this chapter.
3.5.3	On the basis that these land parcels are not located in any Mineral Safeguarding Areas, the Inspectorate is content to scope them out from further assessment in relation to mineral resources.	No further comment required.
3.5.4	The Scoping Report mentions groundwater contamination but does not identify groundwater receptors with potential to be impacted by the Proposed Development. Please see ID 3.4.4 above in relation to this matter.	Baseline information regarding groundwater receptors is included in the supporting DTS and PRA documents forming the appendices to this chapter. Further risk assessment and subsequent mitigation measures to prevent potential groundwater contamination included in **Table 11.17** of this chapter.

	Comment	How and where considered in the ES
3.5.5	Scoping Report paragraph 7.5.5 states that a data search buffer of up to 100m will be applied to this assessment but this study area is not justified. The ES should fully justify the study area and explain how it has been applied based on the Zone of Influence (ZOI).	The study area buffer has been increased to 250 m in preparation of this chapter. Based on professional judgement this is considered sufficient to enable the identification of off-site potential sources of contaminants of concern, other factors which may have influenced site conditions and/or sensitive off-site receptors that require consideration as detailed in **paragraph 11.4.12**
3.5.6	The Scoping Report states that six land parcels (7, 8, 9, 10, 12, and 13) and part of the cable route area (16) fall within Mineral Safeguarding Areas. The ES should demonstrate that the Mineral Planning Authority has been consulted and that the proposed development does not impact on future ambitions for mineral extraction within the region.	**Table 11.6** consultation with Oxfordshire CC confirming the requirements for a Mineral Resource Assessment as presented in Appendix 11.14 **[EN010147/APP/6.5]**. Further consultation will be undertaken with the regional Minerals Officer to confirm no impact on future mineral resources.
3.5.7	Scoping Report Table 7.10 provides the combination of receptor sensitivity and magnitude of impact but does not explain which effects will be considered significant or how it will be determined whether an effect is significant if the outcome has potential to be either minor or moderate or either moderate or major etc. The ES should clearly set out how significant effects are defined and describe how any decisions are made where there is potential for an effect to either be significant or not.	The definition of significance of effects are included in **Table 11.11**.
3.10.7	Best practice measures are proposed to be secured through management plans to reduce/avoid risks of pollution to waterbodies and responses to accidental spills. The Scoping Report states that construction and decommissioning activities are unlikely to affect bathing waters. It is proposed that where significant effects are identified in the Hydrology and Ground Conditions Chapter of the ES, an assessment of significant effects to human health from water quality/availability changes will be included. The Inspectorate agrees with this approach on the basis that the ES cross-references where appropriate.	Assessment of effects are considered in **section 11.9** of this chapter. Mitigation measures to be adopted as shown in **Table 11.17**
3.10.8	Best practice measures are proposed to be secured through management plans to reduce/avoid	Assessment of effects considered in **section 11.9** of this chapter. Mitigation measures to be adopted shown in **Table 11.17**.

	Comment	How and where considered in the ES
	risks of pollution to waterbodies and responses to accidental spills. Operational effects on water quality and availability are not anticipated on a scale that would lead to likely significant effects. Where significant adverse effects are identified in the Hydrology and Ground Conditions Chapters this impact will be included in the Human Health Chapter, otherwise it is proposed to be scoped out. The Inspectorate agrees that where potential significant adverse effects are identified to water quality/availability in the Hydrology/Ground Conditions Chapters, impacts to Human Health should be assessed and where no significant adverse effects are identified to water quality/availability in the Hydrology/Ground Conditions Chapters, this can be scoped out of the Human Health Chapter. Appropriate cross-reference should be made in the ES.	
3.10.9	Scoping Report paragraph 6.2.21 states that limited excavations will be associated with the Proposed Development (e.g., cable routes) and that material will be reused in reinstatement and landscaping and restoration of the site. Best practice measures are proposed to be secured through relevant management plans to manage impacts from contamination (existing historic, dust etc.). It is proposed that where significant effects are identified in the Agricultural Land and Soil Chapter of the ES, an assessment of significant effects to human health from potential land contamination will be included. The Inspectorate agrees with this approach and Appropriate cross reference should be made in the ES.	There is commitment to the adoption of best practice and management plans for all stages of the Project as identified in **Table 11.17**. Where significant effects to human health are identified in Chapter 17: Agricultural Land Use and Public Rights of Way **[EN010147/APP/6.3]**, these are assessed in **section 11.9** of this chapter.
3.10.10	Excavations are not anticipated to be required during operation. Best practice measures are proposed to be secured through management plans to reduce/avoid risks of contamination. Operational effects on land quality are not anticipated on a scale that would lead to likely significant effects. The Inspectorate agrees to scope this matter out.	There is commitment to the adoption of best practice and management plans for all stages of the Project as identified in **Table 11.17** of this chapter

	Comment	How and where considered in the ES
Oxfordshire County Council		
-	Proposed approach is acceptable. Management of waste relating to replacement of any solar panels during the lifetime of the development and at the final decommissioning stage should be scoped in.	To be included in Chapter 18: Waste and Resources of the ES **[EN010147/APP/6.3]**.
Cassington Parish Council		
	Question the parsimonious nature of the buffer zones proposed (up to 100m), noting that in this instance there will only be a data (desktop) search within the buffer area.	A Study Area with a buffer of 250 m has been utilised in preparation of this ES chapter, which is considered appropriate. This is further detailed in **para 11.4.12.**
	Contend that all phases will impact ground conditions and we would urge that all future communications dispense with the incorporation of this speculative narrative because of its inaccuracy.	All phases (construction, operation and decommissioning) have been assessed in **section 11.9** and appropriate mitigation measures detailed in **Table 11.17**.
	Majority of land parcels have potential to have impacts relating to land contamination, ground instability or mineral resources, with the need for further assessment indicated as necessary. However, the nature of that assessment is not indicated i.e. will it be primary surveys or will it be a reliance upon historical data? If it is the latter, then we consider this to be particular cause for concern as we draw into question the reliability of historic data collection and reporting mechanisms, especially as they will be used to both predict the magnitude of the impacts likely encountered and guide the sensitivity categories of the receptor sites.	An initial desk-based assessment has been undertaken for all but one of the land parcels and these have been included as appendices 11.1 to 11.13. These assessments have been completed in accordance with the LCRM guidance on managing the risks from land contamination through a staged risk based approach. Where any potentially unacceptable risks relating to ground conditions are identified these will be further assessed, with any intrusive investigation, remediation/mitigation implemented, as required.
Eynsham Parish Council		
No Comment		-
Hanborough Parish Council		
No Comment		-
Cumnor Parish Council		
	Council requests that the cumulative effects on ground contamination and ground water contamination of the use of cleaning products and other materials on the PV panels and	Operational effects on land and groundwater quality to be mitigated by operational best practice measures and management plans. The Project has a 35 year lease with the option to extend to 42 years.

	Comment	How and where considered in the ES
	other infrastructure over 42 years be assessed.	The final two years of the lease will be the decommissioning phase.
	Cherwell District Council	
	Satisfied approach is acceptable	-
	Vale of White Horse District Council	
	Satisfied approach is acceptable	-

11.3.3 Following scoping, consultation and engagement with interested parties specific to Ground Conditions has continued.

11.3.4 The PEIR was issued to inform the statutory consultation carried out on the Project between 30 November 2023 and 8 February 2024. It presented the preliminary findings of the EIA process for the Project at that time. The consultation responses specific to Ground Conditions and the way in which they have been taken into account in this ES chapter are set out in below.

11.3.5 A summary of the key issues raised during consultation activities undertaken to date is presented in **Table 11.6**, together with how these issues have been considered in the production of this ES chapter.

Table 11.6: Summary of consultation relevant to this chapter

Date	Consultee and type of response	Issues Raised	How and where considered in the ES
Geological Conservation Sites			
-	-	-	In the absence of any identified geo-conservation sites within the study area no further consultation is considered necessary.
Land Contamination			
18 March 2024	Environment Planning & Engagement Team Environment Agency (Thames Area) – formal e-mail response to request for information	Additional data request relating to Hensington Cutting Landfill Site	**Section 11.6** Baseline Environment Conditions. Additional data has been reviewed and included in the baseline section in Table 11.13 Summary of Key Data on Hensington Cutting Landfill Site
19 March 2024	Environmental Protection & Enforcement Cherwell District Council – formal e-mail response to request for information	Additional data request relating to Hensington Cutting Landfill Site	**Section 11.6** Baseline Environment Conditions. Additional data has been reviewed and included in the baseline section in Table 11.13 Summary of Key Data on Hensington Cutting Landfill Site
27 February 2024	Senior Contamination Officer, Publica Group on behalf of West Oxfordshire District Council – formal e-mail response to request for information	Additional data request relating to Hensington Cutting Landfill Site	**Section 11.6** Baseline Environment Conditions. Additional data has been reviewed and included in the baseline section in Table 11.13 Summary of Key Data on Hensington Cutting Landfill Site
26 February 2024	Minerals and Waste Local Plan Principal Officer, Oxfordshire County Council – formal e-mail response to request for information	Additional data request relating to Hensington Cutting Landfill Site	**Section 11.6** Baseline Environment Conditions. Additional data has been reviewed and included in the baseline section in Table 11.13 Summary of Key Data on Hensington Cutting Landfill Site
-	Kidlington Parish Council Section 42 response	State that *'Toxic chemicals leak slowly from commercial panels and permanently pollute the soil.'*	Considered in **section 11.9** Assessment of Effects. Documented research reports undertaken for Welsh Government

Date	Consultee and type of response	Issues Raised	How and where considered in the ES
Hydrogeology			
-	-	-	In the absence of any SPZs or licensed potable groundwater abstractions within the Study Area, no further consultation is considered necessary.
Land Instability			
-	-	-	There is no consultee relevant to land instability
Mineral Reserves			
14 July 2023	Minerals and Waste Local Plan Principal Officer, Oxfordshire County Council – formal e-mail correspondence	Confirmation requested for inclusion of Mineral Consultation Areas identified by Desk Study research as impinging within the Project within a Mineral Resource Assessment (MRA).	The response received from OCC confirmed that any development that would prevent or otherwise hinder the possible working of a future mineral area would need to provide clear evidence that it does not do so. It was indicated that this could be in the form of a MRA. Following the identification of Minerals Safeguarding Areas within the extents of the Project in the scoping exercise a MRA was undertaken to evaluate the constraint that mineral resources, present within the Project, are likely to place on the proposed development given local mineral planning policy. This was shared with OCC in December 2023.
13 December 2023	Minerals and Waste Local Plan Principal Officer, Oxfordshire County Council – formal e-mail correspondence	Request to OCC for contact details for submission of draft report for review.	
15 December 2023	Minerals and Waste Local Plan Principal Officer, Oxfordshire County Council – formal e-mail correspondence.	Response received from OCC confirming MRA to be submitted to Principal Officer.	
22 February 2024	Minerals and Waste Local Plan Policy and Strategy Team Leader, Oxfordshire County Council – formal e-mail correspondence	Comments received from OCC following review of the draft MRA submitted.	Comments adopted into revision of the MRA document, the revised version is presented as Appendix 11.14 of this chapter **[EN010147/APP/6.5]**. In summary the MRA has concluded that although much of the Botley Central Site Area and the proposed cable route corridor between Botley Central Site Area and Southern Site Area are within Mineral Safeguarding Areas for Sharp

Date	Consultee and type of response	Issues Raised	How and where considered in the ES
			Sand and Gravel, these will not be permanently sterilised due to the temporary nature of the Project, the only remaining features not being decommissioned likely to be cables beneath existing roads where reserves have already been sterilised. Prior extraction is considered impractical considering the overburden that would have to be removed and the national importance of The Project in meeting requirements for Oxfordshire's electricity demand through sustainable energy solutions.

11.4 Assessment Methodology

Relevant Guidance

11.4.1 The following guidance documents that are relevant to ground conditions provides the basis of assessment relevant to this chapter.

- Environment Agency (2023) Land Contamination: Risk Management (LCRM 2023)
- British Standard requirements for the 'Investigation of potentially contaminated sites - Code of practice'. BS10175:2011+A2:2017
- British Standard requirement for 'Soil quality - conceptual site models for potentially contaminated sites'. BS EN ISO 21365:2020
- CIRIA Document C552 – Contaminated Land Risk Assessment: A Guide to Good Practice (2001)
- CIRIA Document C665 – Assessing risks posed by hazardous ground gases to buildings (2007)
- Bureau of Land Management (BLM) Manual 3031 (1985) – Energy and Mineral Resource Assessment

Scope of the Assessment

11.4.2 The scope of this ES has been developed in consultation with relevant statutory and non-statutory consultees as detailed in **Table 11.5** and **Table 11.6**.

11.4.3 Taking into account the scoping and consultation process, **Table 11.7** summarises the issues considered as part of this assessment.

Table 11.7: Activities considered within this assessment

Activity	Potential effects scoped into the assessment
Construction Phase	
Construction activities (including demolition if applicable)	Runoff from construction areas to soils (and subsequent leaching into controlled waters receptors) including compounds. Contamination risk to off-site users, e.g. airborne migration and subsequent dermal contact and ingestion of contaminants, ground gas migration during trench excavation.
Operation and Maintenance Phase	
Operation and maintenance of the Project	Contamination risk from spillages during site operations. Contamination risk to site operatives/maintenance workers. Contamination risk to off-site users and controlled waters receptors. Potential temporary sterilisation of mineral reserves.
Decommissioning Phase	
Decommissioning and removal of the Project infrastructure	Runoff from construction areas to soils (and subsequent leaching into controlled waters receptors).

Activity	Potential effects scoped into the assessment
	Contamination risk to off-site users, e.g. airborne migration and subsequent dermal contact and ingestion of contaminants, ground gas migration.

11.4.4 Effects which are not considered likely to be significant have been scoped out of the assessment. A summary of the effects scoped out is presented in **Table 11.8**.

Table 11.8: Issues scoped out of the assessment

Issue	Justification
Construction Workers	
Exposure of construction workers to potential soil, groundwater or ground gas contaminants	The preliminary risk assessments undertaken do not consider pollutant linkages for construction workers. It is expected that any relevant linkages will be managed by appropriate health and safety measures. As construction workers are protected under existing health and safety legislation, any potential effects will be avoided, prevented and reduced through the implementation of standard mitigation measures (including personal protective equipment, training and toolbox talks) to be included in the outline CoCP. Work will be carried out in accordance with relevant Construction Design Management (CDM) Regulations 2015.

Study area

11.4.5 The study area for this topic comprises the Project and a data search buffer of up to 250m around the Project footprint. This distance has been selected based upon professional judgement. This enables the identification of both on-site and off-site sources of potential contamination and other factors which may influence ground conditions at the Project and also allows for any minor design scheme changes that have occurred since procurement of the environmental datasets used in the baseline assessment. The inclusion or otherwise of relevant sensitive sources and receptors gives due consideration to the following;

- The nature of the proposed development which will not include occupied buildings, therefore the risk from ground gases (including radon) is considered low. Potential ground gas sources are therefore restricted to features located within or adjacent to the Project;
- Pollution incidents classified as having a ‘major’ impact on land or controlled waters; and
- Active groundwater/surface water abstractions.

11.4.6 The extent of the data search buffer used in the assessment is represented on the mapping presented in the Groundsure Insights Reports included in the Appendices accompanying this chapter.

11.4.7 In order to provide a sufficient level of detail for assessment, the Project area was divided into 14 land parcel survey areas, as shown on Figure 11.1 with an additional two survey areas identified for the proposed cable routes linking Botley Northern Site Area to Botley Central Site Area (land

parcel 15) and Botley Central Site Area to Botley Southern Site Area (land parcel 16).

11.4.8 Botley Northern Site Area comprises approximately 248 ha of proposed developable area and is located north of the town of Woodstock, west of Tackley and east of Wootton. The majority of Botley Northern Site Area lies within West Oxfordshire District, but with some fields on the eastern edge falling into Cherwell District. None of the Northern Site is within the Oxford Green Belt. The area comprising Botley Northern Site Area comprises land parcels 1 to 4. Botley Central Site Area is the largest of the three areas defining the Project comprising approximately 546 ha of developable area. The large majority of the Central Site lies within West Oxfordshire District, but again some fields on the eastern fringes, nearest to Oxford Airport and Begbroke, lie within Cherwell District. This area comprises land parcels 5 to 14. Botley Southern Site Area comprises approximately 50 ha and is located within Vale of White Horse District Council. This is designated land parcel 15.

11.4.9 Detailed scoping assessment based upon potential for resulting impacts relating to land contamination, ground instability and sterilisation of mineral resources was undertaken on the 16 land parcels to determine requirements for a more detailed desk study appraisal. Following completion of the scoping exercise it was possible to scope out Land Parcel 1 as requiring further detailed appraisal and PRA as part of the ES assessment.

Methodology for Baseline Studies

Desk studies

11.4.10 The Model Procedures for the Management of Land Contamination indicates that the first step in evaluating land contamination risks is a PRA. The objective of the PRA is to identify and evaluate potential land quality risks and development constraints associated with the Project and to construct an initial conceptual site model that can be used to inform future decision making and the design of future ground investigation.

11.4.11 A series of desk based Preliminary Risk Assessments (Appendix 11.1 to 11.13) and a Minerals Resource Assessment (Appendix 11.14) **[EN010147/APP/6.5]** provide the prime source of data that informs this ground conditions chapter. As stated in 11.4.3.3, on completion of the scoping exercise 15 land parcels were scoped in as requiring more detailed PRA or MRA. The PRA consists of an appraisal of the source-pathway-receptor 'contaminant linkages', which is central to the approach used to determine the existence of 'Contaminated Land' as defined in Part IIA of the EPA. For a risk to exist (under Part IIA), all three of the following components must be present to facilitate a potential 'contaminant linkage.

- Source of contamination (e.g. primary sources – leaking above ground storage tanks; secondary sources – free phase product (typically hydrocarbon contamination present as a discrete product

rather than mixed with soil or water) within the ground or soil/groundwater migration);

- Receptor (living organisms, ecological systems or property which may be harmed, e.g. end users of site, groundwater, surface water and fauna and flora).
- Pathway (a route or means by which a receptor can be exposed to or affected by a contaminant) i.e. Target mechanism between the source and receptor (e.g. gas/liquid migration through permeable strata).

11.4.12 The mere presence of a contaminant source does not mean that there will necessarily be attendant risks requiring remedial action or that the site will be designated as 'Contaminated Land'.

11.4.13 The Desk Study Assessments have also considered the potential risk of ground instability as a result of construction disturbance, for example promoting landslips/landslides through slope destabilisation or triggering of potentially unstable natural solution features through vibration in construction or loading or changes of drainage patterns during operation.

11.4.14 The assessments include consideration of the Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy Adopted Plan (2017) and accompanying Policies Maps to determine which, if any, parts of the Project fall within designated Mineral Consultation or Mineral Safeguarding Areas.

11.4.15 The location of designated geological conservation sites listed by the Joint Nature Conservation Committee (JNCC) in the Geological Conservation Review (GCR) has been undertaken through inspection of the on-line GCR database maintained by the JNCC. The GCR is a database to identify those sites of national and international importance for sediments, rocks, fossils, and features of the landscape. These sites are typicallly notified as as Sites of Special Scientific Interest (SSSIs) or are being considered for notification as such.

Site-specific surveys

11.4.16 No site specific surveys (walkovers or intrusive surveys) have been required for establishment of baseline conditions.

11.5 Assessment Criteria and Assignment of Significance

Overview

11.5.1 The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of an impact. This section describes the criteria applied in this chapter to characterise the sensitivity of receptors and magnitude of potential impacts. The terms used to define magnitude and sensitivity are based on and have been adapted from those used in the Design Manual for Roads and Bridges (DMRB) methodology (Highways England *et al.,* 2020).

11.5.2 The approach to determining the significance of effects is a two-stage process that involves defining the magnitude of the impact and the sensitivity of the receptor. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 4: Approach to Environmental Assessment of the ES.

Receptor Value and Sensitivity

11.5.3 The criteria for defining sensitivity in this chapter are outlined in **Table 11.9** below.

Table 11.9: Sensitivity criteria

Sensitivity	Definition
Very High	**Geology**: very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, SSSI's and GCR where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such. Excellent quality economically extractable mineral resource. **Contamination**: 1) human health: very high sensitivity land use such as residential or allotments; 2) surface water: Watercourse having a WFD classification shown in a RBMP and Q_{95} ≥ 1.0 m^3/s. Site protected/designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation; and 3) groundwater: Principal aquifer providing a regionally important resource and/or supporting a site protected under EC and UK legislation. Groundwater locally supports GWDTE SPZ1.
High	**Geology**: rare and of national importance with little potential for replacement (e.g. geological SSSI, ASSI, National Nature Reserves (NNR)). Geology meeting national designation citation criteria which is not designated as such. Good quality economically extractable mineral resource **Contamination**: 1) human health: high sensitivity land use such as public open space; 2) surface water: Watercourse having a WFD classification shown in a RBMP and Q_{95} <1.0 m^3/s. Species protected under EC or UK legislation; and 3) groundwater: Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater locally supports GWDTE SPZ2.
Medium	**Geology**: of regional importance with limited potential for replacement (e.g. RIGS). Geology meeting regional designation citation criteria which is not designated as such. Mineral resource present but unlikely to be economically viable for extraction. **Contamination**:

Sensitivity	Definition
	1) human health: medium sensitivity land use such as commercial or industrial; 2) surface water: Watercourse not having a WFD classification shown in a RBMP and Q_{95} >0.001m^3/s; and 3) groundwater: Secondary aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3.
Low	**Geology**: of local importance/interest with potential for replacement (e.g. non designated geological exposures, former quarries/mining sites). Mineral resource not of sufficient quality or quantity to be economically viable; **Contamination**: 1) human health: low sensitivity land use such as highways and rail; 2) surface water: Watercourses not having a WFD classification shown in a RBMP and Q_{95} ≤0.001m^3/s; and 3) groundwater: Unproductive strata
Negligible	No surface waterbodies. Mineral Resource not present.

Magnitude of impact

11.5.4 The criteria for defining magnitude in this chapter are outlined in **Table 11.10** below.

Table 11.10: Impact magnitude criteria

Magnitude of impact		Definition
High	Adverse	Geology: loss of geological feature/designation and/or quality and integrity, severe damage to key characteristics, features or elements, large scale landslides or ground destabilisation across a wide area. Contamination: 1) human health: significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria (e.g. category 4 screening levels) SP1010 with potential for significant harm to human health. Contamination heavily restricts future use of land; 2) surface water: Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.; and 3) groundwater: Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff. Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects.
	Beneficial	Highly beneficial to the geology/hydrogeology environment resources of the area e.g. exposure of new geological formations that may become designated sites of significant regional and or national interest or removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to an

Magnitude of impact		Definition
		aquifer/watercourse. Improvement in water body WFD classification. Recharge of an aquifer.
Medium	Adverse	Geology: partial loss of geological feature/designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements, Moderate scale landslides or ground destabilisation within a localised area. Contamination: 1) human health: contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria (e.g. category 4 screening levels) SP1010. Significant contamination can be present. Control/remediation measures are required to reduce risks to human health/make land suitable for intended use; 2) surface water: Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to reduction in water body WFD classification. and 3) groundwater: Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/industrial/agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification.
	Beneficial	Moderate benefit to the hydrogeological environment/soils resource of the area e.g. the Proposed Development results in a brownfield contaminated site that is or is likely to be determined as contaminated land being remediated, contribution to improvement in water body WFD classification or reduction of groundwater hazards to existing structures.
Low	Adverse	Geology: minor measurable change in geological feature/designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, Small scale localised landslides/ground destabilisation. Contamination: 1) human health: contaminant concentrations are below relevant screening criteria (e.g. category 4 screening levels) SP1010 [Ref 4.N]. Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health; 2) surface water: Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages ≥0.5% annually and < 1% annually. Minor effects on water supplies. and 3) groundwater: Potential low risk of pollution to groundwater from routine runoff. Minor effects on an aquifer, GWDTEs, abstractions and structures.
	Beneficial	Minor benefit to the hydrogeological environment/mineral resources. E.g., the Proposed Development may result in the exposure of geological formations that may become of significant local interest. Reduction of groundwater hazards to existing structures.
Negligible	Adverse	Geology: very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature/designation. Overall integrity of resource not affected. Very limited or no landslides.

Magnitude of impact		Definition
		Contamination: 1) human health: contaminant concentrations substantially below levels outlined in relevant screening criteria (e.g. category 4 screening levels) SP1010 No requirement for control measures to reduce risks to human health/make land suitable for intended use; 2) surface water; No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%. and 3) groundwater: No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%.
	Beneficial	Surface Water; HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage risk by 50% or more.
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

11.5.5 The criteria for defining duration of impact magnitude in this chapter are as follows;

- short term: a period of months, up to one year;
- medium term: a period of more than one year, up to five years; or
- long term: a period of greater than five years

Significance of effect

11.5.6 The significance of the effect upon Ground Conditions has been determined by considering the sensitivity of the receptor and the magnitude of the impact. The method employed for this assessment is presented in **Table 11.11**. Where a range of significance levels is presented, the final assessment for each effect is based upon expert judgement.

11.5.7 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of effect has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached.

11.5.8 For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the EIA Regulations.

Table 11.11: Assessment matrix

Sensitivity of Receptor	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Negligible	Negligible	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	Negligible	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate

Sensitivity of Receptor	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Medium	Negligible	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Negligible	Minor	Minor or Moderate	Moderate or Major	Major
Very High	Negligible	Minor	Moderate or Major	Major	Substantial

11.5.9 Where the magnitude of impact is 'no change', no effect would arise.

11.5.10 The definitions for significance of effect levels are described as follows.

- Substantial: Only adverse effects are normally assigned this level of significance. These effects are generally, but not exclusively, associated with sites or features of international importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of national importance may also enter this category.
- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. Effects upon human receptors may also be attributed this level of significance.
- Moderate: These beneficial or adverse effects have the potential to be important and may influence the key decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
- No change: No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Assumptions and limitations of the assessment

11.5.11 No walkover surveys or intrusive ground investigations have been undertaken to support the findings of the DTS and PRA reports. The information used to determine the significance of potential impacts is

therefore based primarily upon a review of the desk-based information detailed within the DTS and PRA reports and the Minerals Resource Assessment as presented in Appendices 11.1 to 11.14.

11.5.12 The limitations of the DTS and PRA are set out in Annex 2 in each PRA report (Appendices 11.1 to 11.13). No further assumptions or limitations have been identified in the preparation of this chapter with regard to ground conditions that would prevent a preliminary assessment of the potential effects being made for ES purposes.

11.6 Baseline Environment Conditions

Desk Study

11.6.1 Information on Ground Conditions within the study area was collected through a detailed review of existing studies and datasets. These are summarised in **Table 11.12**.

Table 11.12: Summary of desk study sources used

Title	Source	Year	Author
Groundsure Enviro+Geo+Map Insights Reports Refs GSIP–2022–2757-10507 GSIP–2022–2757-10508 GSIP–2022–2757-10509 GSIP–2022–2757-10510 GSIP–2022–2757-10511 GSIP–2022–2757-10512 GS-2I7-N35-7VP-9KP GS-VXZ-ISE-8WE-3DP	Groundsure	2022 - 2024	N/A
BGS Onshore Geoindex and Lexicon of Named Rock Units	British Geological Survey	2023-2024	N/A
Interactive Map Viewer	Gov.uk	-	The Coal Authority
Source Protection Zones	Magic Maps and Data Services Portal	-	Defra
Protected Sites (Sites of Scientific Interest, Special Areas of Conservation)	Magic Maps; and Groundsure Enviro-Geo Insights Report	-	Defra and Groundsure
Aquifer designation – Bedrock and Superficial Deposits; Groundwater vulnerability; Groundwater safeguard zones Source Protection Zones.	Magic Maps	-	Defra
Ground investigation exploratory hole data local to the Project	British Geological Survey	2023-2024	N/A

Title	Source	Year	Author
Local planning authority records (including those relating to contaminated land).	Cherwell District Council West Oxfordshire District Council Vale of White Horse District Council	N/A	N/A
Zetica Unexploded Bomb Risk map	Zetica UXO maps	2023	N/A

Site History

11.6.2 The land comprising Botley Northern Site Area (Land Parcels 1-4) has had a predominantly agricultural historical usage since the 1870s. There is little evidence of potentially contaminative historical industrial land use within the Study Area other than localised old pits or quarries (some of which may have been infilled with unknown materials) and farms, which represent potential locations for the storage and use of oils, fuels or agrochemicals.

11.6.3 A key historical feature identified for Botley Northern Site Area is a former railway cutting on the eastern side of Woodstock (Hensington Cutting) used for licensed landfill disposal for inert, industrial, commercial, household, special, liquid sludge wastes. The location of this feature is shown on Figure 11.1 **[EN010147/APP/6.4]**.

11.6.4 Although outside of the Study Area for the allocated area for PV panel distribution, this historical landfill site is within the corridor of the proposed cable route linking Botley Northern Site Area to Botley Central Site Area. The details on this feature are included in Appendix 11.12 **[EN010147/APP/6.5]** and are summarised in the table below.

Table 11.13: Summary of Key Data on Hensington Cutting Landfill Site

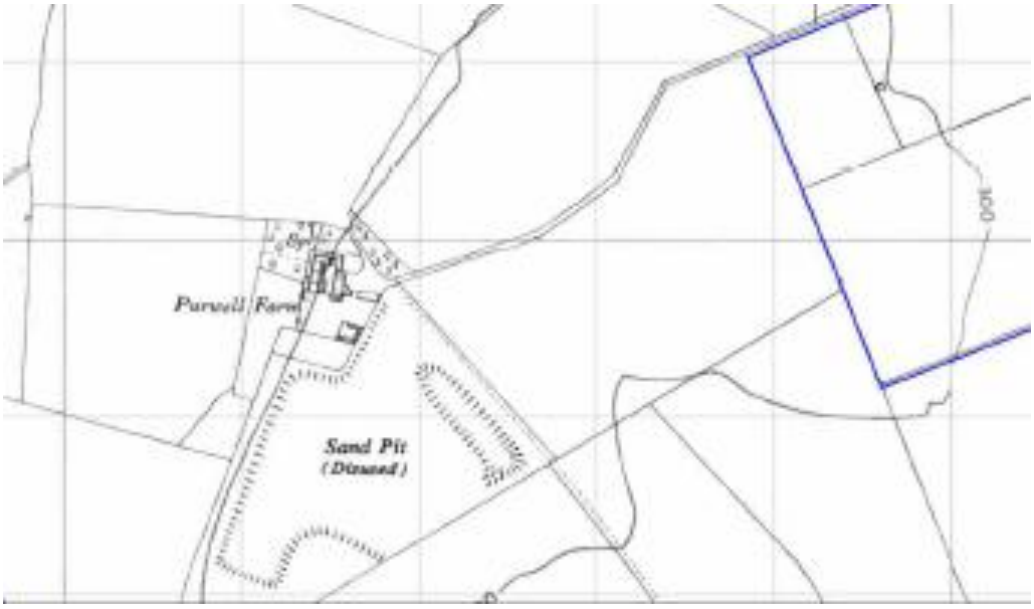
Source	Location/operator	Waste Licence No	Waste Types	Dates of Operation
Groundsure Insights Report Ref: GSIP–2022–2757-10508	Hensington Railway Cutting/J. Curtis and Sons	TP0420/0421, W10017, OCC/032, 13.6.4517	Inert, Industrial, Commercial, Household, Special and Liquid Sludge	31/12/1979 – 31/12/1980
Oxfordshire County Council	No relevant information provided			
Publica Group on behalf of West Oxfordshire District Council	Site Operator: J Curtis and Sons Site Name: Hensington Railway Cutting.	-	Waste Category A, B and C. Semi-inert, bio-degradable, building waste, 'extensive tipping of asbestos'	-

Source	Location/operator	Waste Licence No	Waste Types	Dates of Operation
Cherwell District Council	No relevant information provided			
Environment Agency - Thames Area	-	-	inert, semi-inert, biodegradable, difficult waste, builders waste plus asbestos. Temporary gas monitoring well installed in 1990 did not identify any methane emissions.	Operational 1979-1980

11.6.5 Initially included in Appendix 11.4 **[EN010147/APP/6.5]**, it is apparent that there are two BGS exploratory hole records undertaken for the A34 Woodstock Bypass in 1990 located in the vicinity of the proposed cable route crossing of the Hensington Cutting landfill. One of these is assumed to have been sunk through the Hensington Cutting landfill site. This record identified 4.80 m of Made Ground comprising three distinct layers, an upper layer of brick and limestone fragments in a silty sand matrix to a depth of 1.00 m bgl, a second layer of gravel and cobble sized fragments of concrete, bitumen, remnants of paper, carpet, wood and textile in a matrix of soft grey malodorous sandy clay to 3.10 m bgl and a basal layer of gravel sized limestone fragments in a soft sandy clay matrix to 4.80 m bgl. Beneath the Made Ground was a thin band of grey mudstone to 5.30 m bgl underlain by 'weak light brown oolitic limestone with occasional thin bands of mudstone', assumed to be limestone dominated strata of either the Forest Marble Limestone or the underlying White Limestone Formation, to the base of the borehole at 6.40 m bgl. It is noted that a gas monitoring standpipe was installed on completion of drilling, the date of which coincides with the reference made by the EA to a temporary gas monitoring borehole installation.

11.6.6 Botley Central Site Area has also comprised an agricultural historical land usage, with former sand and gravel pits (both within the limits of the Project and within the Study Area) and farm buildings in close proximity. This area has been crossed by a railway line since the 1880s. Oxford Airport has been present close to the north-east boundary of Botley Central Site Area since 1938. The permeable geology is constrained within this area with an absence of any significant continuous shallow groundwater flow paths. The proposed shallow excavations for foundations/cable routes and limited potential for vertical migration of contaminants within any shallow groundwater present to deeper groundwater units would conclude that no plausible source-pathway-receptor linkage has therefore been identified in relation to Oxford Airport.

11.6.7 The potentially infilled sand pit within the boundaries of the Project lies immediately south of Purwell Farm and was present on site between 1954 and 1956 (see Map Extract 1 below) before being restored as scrub woodland by 1981.



Map Extract 1: Purwell Farm Sand Pits

11.6.8 Botley Southern Site Area has also had an agricultural historical land usage, with a short period of time when some of the land was used as orchards (possible use of pesticides/herbicides) and a small chimney/kiln feature was present in the east between 1900 and 1937. No other possible sources of contamination were identified within the Study Area for the Botley Southern Site Area.

11.6.9 The main historical feature of note coinciding with the cable route options between Botley Northern Site Area and Botley Central Site Area is the Hensington Cutting Landfill Site as described in Section 11.6.3. The remainder of the cable route options for this area have comprised agricultural fields and roads (Shipton Road, Oxford Road and Upper Campsfield Road).

11.6.10 The cable route options between Botley Central Site Area and Southern Site Area historically also typically comprise agricultural fields and long-standing road routes and a former railway line route north of the Thames. The main historical feature of note is a former sewage works located to the east of Eynsham currently coinciding with the route of the B4449 and the preferred cable route option (see Map Extract 2 below). It is assumed that the construction of the B4449 in the 1980s would have included clearance and remediation of any sewage works related features however this has not been able to be verified.

Map Extract 2: Former Sewage Works on route of B4449

Geology

11.6.11 Botley Northern Site Area has an absence of Superficial Deposits other than a small expanse of Head Deposits located in Land Parcel 4. The outcropping bedrock geology comprises strata of the White Limestone Formation tending to limestones of the Cornbrash Formation overlying interbedded mudstone and limestone of the Forest Marble Formation with distance from north to south. Sites underlain by limestone can be prone to the presence of natural solution features formed by dissolution of the soluble strata. Recorded evidence of cavities is noted in records reviewed for Botley Northern Site Area although the BGS hazard rating for instability from such features is recorded as being negligible to low.

11.6.12 Botley Central Site Area has sporadic superficial cover of Alluvium associated with the River Evenlode and River Terrace Sands and Gravels identified as the Hanborough Gravel Member, the Summertown-Radley Sand And Gravel Member and the Northmoor Sand And Gravel Member. These deposits become more extensive towards the south of Botley Central Site Area with the confluence with the River Thames. The bedrock strata in this area shows a transition from the limestone/mudstone dominated strata as present in Botley Northern Site Area to the mudstones weathering to clays of the Kellaways Clay and Sand Members and then the Oxford Clay Formation And West Walton Formation present in Botley Southern Site Area.

11.6.13 Botley Southern Site Area is located on outcropping strata of the Oxford Clay Formation And West Walton Formation. This material is prone to having elevated sulphate concentrations and also presents a potential risk of clay heave/shrinkage due to a typically high plasticity.

11.6.14 The geology of the cable route between Botley Northern Area and Botley Central Site Area closely resembles that of the Northern Area with an absence of superficial deposits and outcropping strata of the Cornbrash and Forest Marble Formations and locally the Kellaways Clay Member.

11.6.15 The cable route between Botley Central Site Area and Botley Southern Site Area crosses the Thames and there are more extensive superficial deposits across this section with Alluvium overlying Northmoor Sand And Gravel Member deposits across much of the route options north of Swinford. The typical thickness of these deposits from available BGS borehole records is in the range of 5.00 to 6.50 m.

11.6.16 To the south-east of Swinford on the northern side of Beacon Hill, the cable route options coincide with landslip deposits as shown by diagonal hatching on Map Extract 3 below.

Map Extract 3: Extent of Land slipped material

11.6.17 The underlying bedrock for the southern cable route comprises the Oxford Clay Formation.

Hydrogeology

11.6.18 The Forest Marble Formation (limestone) and White Limestone Formation, both predominantly present in Botley Northern Site Area, are classed as Principal Aquifers. These formations provide a high level of water storage and may support water supply and/or river base flow on a strategic scale.

11.6.19 Where present the Alluvium and River Terrace Sands and Gravels are classified as a Secondary A Aquifer (These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers). Similarly the Cornbrash Formation and Forest Marble Formation (if mudstone) or interbedded mudstone/limestone dominated and the Kellaways Sand and Clay Members are classified as Secondary A aquifers.

11.6.20 The Oxford Clay and West Walton Formation are classified as Unproductive Strata with low permeability and negligible significance for water supply.

11.6.21 Groundwater information obtained from available BGS borehole records are summarised within Table 11.

Table 11.14: BGS Borehole Groundwater Strike Summary

Borehole Reference and Land Parcel	Geology	Groundwater Strikes
SP41SW/2 Land Parcel 9 – on site south	Sand and Gravel deposits	4.10 m bgl
SP41NE/66 Land Parcel 15 – on site central area	Forest Marble Formation - limestone	5.22 m bgl
SP41NE/67 Land Parcel 15– on site central area	Forest Marble Formation - mudstone	1.68 m bgl
SO41SW/184 and SO41SW/185 Land Parcel 16 – off site ~16 m east of the cable route (just north of the A40 roundabout) SP40NW18 – off site ~150 m west of the cable route SP40NW293 - off site ~2 m southwest of the cable route	River Terrace Deposits	1.40 to 3.20 m bgl

11.6.22 Shallow groundwater where present within granular superficial deposits and within limestone bedrock (fracture flow or through weathered bedrock) is likely to be in continuity with nearby surface watercourses/water bodies.

11.6.23 There are no identified Source Protection Zones or potable abstractions within the Study Area. The only noted current groundwater abstraction in the Study Area is recorded approximately 210 m to the east of the site at Cassington Quarry from the Thames groundwater by Hanson Quarry Products Europe Ltd for 'transfer between sources'.

Surface Water

11.6.24 There are numerous surface watercourses/water bodies within the Study Area. These include the River Glyme, a tributary of the River Evenlode, approximately 135 m west of Botley Northern Site Area, the River Evenlode which flows through the western part of Botley Central Site Area and the River Thames which flows south-west to north-east between Botley Central Site Area and Botley Southern Site Area. The main watercourse near Botley Southern Site Area is Filchamstead Brook which defines the northern boundary. These are all classified within a

River Basin Management Plan published by the EA under the European Water Framework Directive (2000).

11.6.25 Numerous minor land ditches/drains, streams or tributaries are also present across the site, the majority draining into the watercourses described above.

Ground Instability and Mining

11.6.26 There is no recorded coal or underground non-coal mining within the Study Area. There has been a number of recorded past quarrying activities for clays, sands, gravels or limestone within the Study Area, some of which have been backfilled on closure.

11.6.27 The main identified risk for ground instability is the cable route corridor option south of the River Thames where the route coincides with identified land slip deposits associated with Beacon Hill. These features have a moderate BGS hazard risk rating for subsidence potential indicating that slope instability problems are probably present or have occurred in the past and land use should consider specifically the stability of the site. Further consideration should be given to design of the cable route in this area to avoid potential destabilisation of slipped strata and further ground movement.

11.6.28 Ground instability concerns predominantly relate to the potential for clay shrinkage/heave and sulphate attack on concrete slabs/footings associated with the Oxford Clay And West Walton Formation and potential for destabilisation of solution features/natural cavities within the limestone bedrock present across much of Botley Northern Site Area and the western and northern parts of Botley Central Site Area. Evidence of cavities in the limestone (White Limestone Formation) has been determined from nearby borehole records reviewed for Land Parcel 2, however the BGS hazard risk ratings typically record a very low to low subsidence risk potential for ground dissolution, which indicates that although some dissolution features may be present, localised subsidence need not be considered except in exceptional circumstances.

11.6.29 As recommended in the DTS reports, geotechnical ground investigation is required to confirm anticipated design parameters for the proposed PV panel anchoring systems to be employed.

Mineral Resources

11.6.30 The Superficial Sands and Gravels recorded within Botley Central Site Area and the cable route between Botley Central Site Area and Southern Site Area and associated with the terrace deposits of the River Thames and the River Evenlode are identified as either safeguarded mineral reserves where a mineral resource assessment would be required to support a planning application or within a mineral consultation area (MCA) where further consultation with OCC Minerals and Waste Planning Team is required to determine the sensitivity of the resource.

11.6.31 The areas of mineral safeguarding and MCAs are shown on Figure 11.2.

11.6.32 The MRA undertaken has identified that approximately 270 ha of the Project area fall within MSAs equating to an estimated volume of 4,581,500 m^3 of sand and gravel resource. This does not allow for the buffers that would be applied around sensitive land uses or areas within the footprint of the Project that would not be developed. Buffer zones limit the area of potentially extractable resource, by defining those areas where the extraction of safeguarded mineral resources would not be expected such as in close proximity to sensitive development, designated sites and existing infrastructure such as roads, highways and utilities.

11.6.33 The conclusions of the MRA are that the temporary nature of the Project indicates that the development will not permanently sterilise safeguarded sharp sand and gravel reserves and there is a possibility that the minerals can be extracted in the future following decommissioning of the Project. Prior extraction through full extraction prior to or during construction is not considered feasible for a number of reasons including the time it would take to undertake extraction and variability in distribution of sand and gravel reserves, number of working sites needed to account for division of the mineral reserves by roads and infrastructure and large volume of alluvial overburden that would need to be excavated and temporarily stored. The overriding factor is the need for the Project as a Nationally Significant Infrastructure Project that will contribute to the transition to net-zero in Oxfordshire, against the potential for temporary sterilisation of mineral resources.

Environmental Data

11.6.34 A preliminary assessment of ground conditions across the study area has been presented in the accompanying appendices. These have included review of environmental permitted activities and waste management facilities.

11.6.35 No Integrated Pollution Control (IPC) permitted activities have been identified within the study area. Licensed industrial activities covered by Part A(1) regulations or Part A(2) and Part B regulations under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment within the Study Area are Swinford Water Treatment Works and Eynsham Fuel Filling Station located close to the proposed cable route corridor between Botley Central Site Area and Botley Southern Site Area.

11.6.36 Other than the Hensington Railway Cutting Landfill Site, the only other former landfill site identified within the Study Area is approximately 245 m west of Land Parcel 13 (New Wintles Farm) and was licensed for industrial and other wastes. The recorded absence of continuous granular superficial deposits between the location and the boundaries of the Project and absence of occupied structures during operation discounted this as being a key potential contamination source.

Unexploded Ordnance

11.6.37 Reference to the Zetica Unexploded Bomb Risk mapping indicates that the Study Area is in an area of low potential risk from Unexploded

Ordnance. No further consideration of Unexploded Ordnance relating to wartime bombing is considered necessary.

Assessment of PRA findings

11.6.38 The Preliminary Risk Assessments undertaken for land parcels 2 to 16 have included, in line with current best practice, assessment of potential plausible source-pathway-receptor linkages within a Conceptual Site Model. This assessment takes into consideration the sources of possible contaminant risks and the presence of any plausible pathways or receptors.

11.6.39 Potential contaminative sources identified are mainly associated with historical pits within the Study Area, which may have been filled with a variety of (potentially unlicensed) waste materials and rare evidence of kilns also associated with small pits/quarries. The key historical potential sources of contamination identified are the former railway cutting landfill site to the east of Hensington located on the proposed cable route, former sand pits around Purwell Farm that were potentially infilled post 1950s and a former sewage works aligned with the route of the B4449 east of Eynsham. Off-site sources may include farm buildings and yards where fuel and agrochemicals were/are stored although there is no indication of pollution incidents indicative of past major leaks or spillages from these locations.

11.6.40 The identified receptors include;

- Groundwater with Primary Aquifers (White Limestone Formation and Forest Marble Formation (limestone)) and Secondary A Aquifers (both superficial and bedrock strata) recorded within the North and Central Botley Study Areas. South Botley is located on unproductive Oxford Clay strata.
- Surface water, the Project is crossed by a variety of Surface Watercourses from minor drains, ditches, streams and ponds to larger WFD recognised rivers.
- Off-site residents – there are areas of larger scale residential development in close proximity to the Project that could be impacted by off-site migration of leachable or gaseous contaminants.
- Future site users – albeit a low risk due to anticipated part-time site attendance for maintenance work.
- Structures, foundations, slabs and cables from natural soils with elevated sulphate concentrations or high water table or land slipped materials.

11.6.41 Potential pathways relate to migration through permeable strata/fractures, shallow groundwater, leaching or for human health direct contact, ingestion or inhalation within buildings.

11.6.42 The majority of potential risks that have been identified have mainly been assessed by the PRA as being ‘not applicable’ to ‘low’ due to the shallow nature of proposed excavations and the absence of occupied structures

during operation and further assessment is not required to evaluate these linkages any further. There are currently no known active pollutant linkages whilst the Project remains in its current baseline condition and operates in accordance with existing procedures.

11.6.43 The two linkages identified as risks of moderate or above which may be active post development, relate to the Hensington Railway Cutting Landfill Site and the potentially infilled Purwell Farm Sand Pits both located within the boundaries of the Project and potential creation of new pathways through construction for gas or leachate migration to occur. Although a former sewage works has been identified coinciding with the cable route corridor between Botley Central Site Area and Botley Southern Site Area, it may be assumed that the sewage works was cleared and any contamination dealt with prior to the road construction.

Identification of designated sites

11.6.44 Through inspection of the on-line GCR database maintained by the JNCC, all statutory and non-statutory designated geological sites located in the Oxfordshire County Council area have been identified. It is concluded that there are no designated or non-designated geological sites located within the study area.

Site-specific surveys

11.6.45 No site specific surveys (walkovers or intrusive surveys) have been required for establishment of baseline conditions.

Future baseline conditions

11.6.46 The assessment of likely effects on geology and ground conditions considers any potential changes in baseline conditions that would alter the conclusions of the assessment. The primary sources of future change with respect to the baseline are changes in land use and climate change.

11.6.47 With regard to climate change it is anticipated that with the general trend of global warming that there is potential for more frequent and prolonged periods of extreme weather including longer and more frequent periods of rainfall. This has the potential to increase leaching of contaminants from soil or destabilise dormant natural cavities within soluble limestone strata.

11.6.48 Prolonged dry spells or increased rainfall, along with increased temperatures may impacts soil with a high volume change potential), which could result in settlement/heave of foundations and earthworks, in particular when located within the influence of trees and vegetation.

11.6.49 Increased ambient temperatures may result in the warming of soils and groundwater beneath the Site, which could have the following impacts:

- Accelerated breakdown of putrescible material in Made Ground (particularly where associated with the historical landfill crossed by the northern cable route), resulting in increased rates of carbon dioxide and methane production. Increased volumes of leachate

would also be produced with the accelerated breakdown of this material.

11.6.50 Changes in land use could influence the parameters upon which this assessment has been based by introducing new potential sources of contamination through industrial based development, or new receptors during the duration of the Project such as proximity of residential receptors through further expansion of existing residential centres or modification of existing pathways potentially increasing risk of mobilisation of contaminants.

11.6.51 These factors are taken into consideration, where practicable, in the assessment of effects.

Key receptors

11.6.52 **Table 11.15** identifies the receptors taken forward into the assessment.

Table 11.15: Key Receptors

Receptor	Description	Sensitivity/value
Human Health - Future Site Users	Operatives and maintenance workers	**Low** sensitivity due to infrequent and short term periods of site attendance.
Human Health – Off-site land users	Nearby residents, workers	**Very High** sensitivity – assumption that residential off site land users also include farm buildings.
Controlled Waters – Principal Aquifer	Bedrock strata of the White Limestone Formation or Forest Marble Formation (Limestone)	**High** although the absence of source protection zones and potable abstractions within the Study Area would suggest that this is overly conservative.
Controlled Waters – Secondary Aquifers	Superficial Deposits and Bedrock Strata of the Cornbrash Formation, Forest Marble Formation (mudstone or undifferentiated) and Kellaways Clay/Sand Members	**Medium** – again with no source protection zones and potable abstractions there is reason to reconsider the sensitivity as low.
Controlled Waters – Unproductive Strata	Bedrock of Oxford Clay and West Walton Formation	**Low** for the southern part of Botley Central Site Area and for Botley Southern Site Area.
Controlled Waters – Surface Watercourses/water bodies	Various Water Framework Directive watercourses within a River Basin Management Plan including the Rivers Glyme, Dorn, Evenlode and Thames. Numerous minor watercourses forming tributaries of these rivers together with ponds/lakes primarily flooded sand and gravel pits	**High** as most conservative value through presence of watercourses having a WFD classification and shown in a RBMP.

Receptor	Description	Sensitivity/value
Groundwater abstraction / Private Water Supply	Abstraction from the Great Oolite Thames groundwater for private non-industrial amenity use	High as based on Principal Aquifer source providing a locally important resource.
Sharp Sand and Gravel Reserves	Superficial River Terrace Deposits of sands and gravels	**Medium -** Mineral resource present but unlikely to be economically viable for extraction.

11.7 Key Parameters for Assessment

Maximum design scenario

11.7.1 The maximum design scenarios identified in **Table 11.16** have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in Volume 1, Chapter 6: Project Description of the ES **[EN010147/APP/6.3]**. Any other development scenario is considered to have less significant effects, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here being taken forward in the final design scheme.

11.7.2 A similar methodology has been adopted for the cumulative effects assessment using the information available on other projects and plans, in order to inform a 'maximum design scenario'. The maximum design scenarios identified are presented in **Table 11.19**

Table 11.16: Maximum design scenario considered for the assessment of potential impacts

Potential Impact Phase	Phase C	Phase O	Phase D	Maximum Design Scenario	Justification
Temporary sterilisation of sharp sand and gravel reserves within designated Mineral Safeguarding Area (land parcels 9, 10, 12 and 13 in Botley Central Site Area and cable route corridor connecting Botley Central Site Area and Southern Site Area)	✓	✓	×	**Construction phase** AC and DC cables linking PV panels, inverters and sub-station to be placed at approximate depths of 0.40 m to 1.20 m below ground level, lengths to be determined. Total developable area of Botley Central Site Area for solar arrays 545.2 Ha. Estimated area of potentially viable sand and gravel resources within the Project is 269.5 Ha. **Operation and maintenance phase** No change anticipated **Decommissioning phase** Temporary sterilisation until completion of decommissioning then mineral reserves will again be accessible for extraction if required with no viable change to volume of available reserves.	The maximum extent of safeguarded mineral reserves albeit without further consideration of likely distances from site boundary to edge of solar arrays and other buffer zones. Whether this is to be assessed further as a potential temporary impact will be dependent upon further consultation with the Local Authority minerals officer and their review of the revised MRA included as Appendix 11.14.
Creation of new pathways Mobilisation of leachate/leachable contaminants or ground gases from Hensington Cutting landfill site on northern cable route (land parcel 15).	✓	✓	✓	**Construction phase** 600 mm wide cable trench to be placed within a designated 20 m wide working area and is scheduled to be excavated to a depth of up to 1.20 m below ground level. Cable excavation is to cross entire width of recognised former landfill site estimated to be approximately 30 m wide and more than 4.00 m deep (See Appendix 11.15) **Operation and maintenance phase** No change anticipated. Pathway if created will still be present and potentially active. **Decommissioning phase** Pathway if created will still be potentially active following decommissioning unless excavation completely sealed off to mitigate pathway.	Reasonable maximum design scenario for works in area with proposed ground disturbance and depth of excavations, with potential to encounter ground contamination.
Mobilisation of leachate/leachable	✓	✓	✓	**Construction phase**	Proposed ground disturbance and depth of excavations, with potential to encounter

Potential Impact Phase	Phase C	Phase O	Phase D	Maximum Design Scenario	Justification
contaminants from potentially infilled sand pit in land parcel 9.				Infilled former sand pit measuring approximately 300 m x 300 m, depth unknown. Location is within area of proposed solar PV panels to be supported by driven or screw-piles to between 1.00 m and 3.00 m depth. **Operation and maintenance phase** Change in existing drainage patterns may occur through preferential runoff from PV panels locally increasing leaching potential. **Decommissioning phase** Pathway if created will still be potentially active following decommissioning unless excavation completely sealed off to mitigate pathway	ground contamination or mobilise contaminants through creation of new pathway via shallow groundwater or penetration of low permeability basal layer if present.
Potential for construction activity to cause soil or groundwater contamination	✓	×	✓	**Construction phase** Storage of fuel, oils, chemicals or minor maintenance of construction plant within construction compounds (Volumes TBC). The temporary construction compounds will be returned to original state upon completing construction. **Operation and maintenance phase** Not Applicable **Decommissioning phase** Similar activities and plant anticipated for decommissioning as for construction. Unknown as to number of compounds, material utilised. These will be identified in a Decommissioning Plan to be developed.	**Construction phase** Storage of potentially contaminating substances in four proposed construction compounds and frequency of maintenance or repair activities both inform the reasonable maximum design scenario for risk of soil or groundwater contamination. The number and size of storage areas, and frequency of maintenance and repairs will be confirmed by appointed construction contractor. **Decommissioning phase** On-site disassembly of equipment and demolition of structures would have similar potential for soil or groundwater contamination as construction phase.

[a] C=construction, O=operational and maintenance, D=decommissioning

11.8 Mitigation and Enhancement Measures Adopted as Part of the Project

11.8.1 The design process for the Project has been heavily influenced by the findings of early environmental appraisals and the EIA process. The Project has had several measures incorporated into the design to avoid or minimise environmental impacts.

11.8.2 The key aspects where the design has evolved are described in ES Volume 1, Chapter 5: Alternatives Considered **[EN010147/APP/6.3]**. These include measures required for legal compliance, as well as measures that implement the requirements of good practice guidance documents. The assessment has been undertaken on the basis that these measures are incorporated in the design and construction practices (i.e. they are 'embedded mitigation').

11.8.3 Embedded mitigation measures for the construction phase are set out in the ES Volume 1, Chapter 6: Project Description **[EN010147/APP/6.3]**, Appendix 6.1: Project Mitigation Measures and Commitments Schedule **[EN010147/APP/6.5]** and the various management plans outlined in this chapter **[EN010147/APP/7.7]**.

11.8.4 Implementation of embedded mitigation relied upon in the assessment will be secured in the DCO, including by ensuring the works described in Schedule 1 of the DCO are restricted to their corresponding works areas shown on the Works Plans **[EN010147/APP/2.3]**, a DCO requirement requiring compliance of detailed design of the Project to accord with the Outline Design Principles **[EN010147/APP/7.7]**, or through specific DCO requirements requiring compliance with a management strategy, plan, or other requirement document.

11.8.5 Consideration has been given to any ‘additional mitigation’ over and above the embedded mitigation that may be required and has the potential to mitigate any significant adverse effects identified following the assessment of the Project inclusive of its embedded mitigation. Where significant effects remain following the implementation of embedded mitigation and achievable further measures could lower the identified effect, the topic chapter identifies additional mitigation and explains how the additional mitigation is secured, for example via a specific DCO requirement, via a management plan, or document secured by a DCO requirement like the Project Mitigation Measures and Commitments Schedule **[EN010147/APP/6.5]**.

11.8.6 To the extent any likely significant effects are anticipated following the assessment of the Project after the implementation of embedded and additional mitigation, each topic chapter will report these as residual effects. Residual effects for all topics are summarised in Chapter 21: Summary of Significant Environmental Effects of the ES **[EN010147/APP/6.3]**.

11.8.7 Where relevant, measures have also been identified that may result in enhancement of environmental conditions. Enhancement measures are not required to mitigate significant effects of the Project and are not factored into the determination of residual effects. They are further measures which would have additional beneficial outcomes should they be implemented.

11.8.8 Both embedded and additional mitigation measures relevant to this chapter are summarised in **Table 11.17**.

Table 11.17: Mitigation measures intended to be adopted as part of the Project

Commitment number	Measure adopted	How the measure will be secured
11.1	Discovery Strategy - The discovery strategy would comprise a watching brief that would be undertaken by suitably trained personnel during construction activities. The strategy would also include a procedure for construction workers to follow in the event that previously unknown contamination is discovered during the construction phase.	Principles of discovery strategy to be set out within Outline CoCP. **[EN010147/APP/7.6.1]**.
11.2	Ground Investigations – As there has been minimal previous ground investigation across The Project, ground investigation and geotechnical testing, primarily for confirmation on potential land instability and pile design parameters would be undertaken. This should include investigation and slope stability assessments in the proposed cable route area south of the Thames coinciding with identified landslip material and should include geo-environmental testing in areas where DTS and PRA assessment has identified more than a low risk of contamination.	Detailed design stage for the development of the Project
11.3	DCO Remediation Strategy – Should ground investigation or the discovery strategy determine that remediation is required to ensure that the site is suitable for its proposed use, a remediation strategy would be prepared and agreed with the Environment Agency/relevant local planning authority prior to its implementation.	Regulatory requirement in the event of contamination being identified through ground investigation or from discovery strategy during construction.
11.4	To facilitate the management of soils - A Materials Management Plan (MMP) would be prepared at detailed design stage, in accordance with the CL:AIRE Code of Practice (CL:AIRE, 2011), to document the management of soils on the site. The Materials Management Plan will be included within the detailed CoCP and will be approved by the Environment Agency prior to earthworks commencing.	Commitment to prepare a Materials Management Plan set out in Outline CoCP **[EN010147/APP/7.6.1]**. The Materials Management Plan will be developed at detailed design stage, for inclusion within detailed CoCP.
11.5	Implementation of measures to prevent and control spillage of oil, chemicals and other potentially harmful liquids - appropriate storage and handling of materials and products in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001. Use of guidance such as the Environment Agency's Pollution Prevention Guidelines (PPG) (in particular PPG1, PPG5, PPG6, PPG21) as sources of good practice. These guidance documents although formally withdrawn on 17 December 2015 include recommendations regarding use of fuel spill kits and safe storage requirements. The application of appropriate working methods developed using these guidance documents would be used to mitigate	Commitment to prepare a PPP is set out in Outline CoCP **[EN010147/APP/7.6.1]**. The detailed CoCP will include a full PPP.

Commitment number	Measure adopted	How the measure will be secured
	against potential human health and controlled water contaminant linkages being created during construction	
11.6	To help avoid pollution incidents occurring - Implementation of measures to protect groundwater during construction, including good environmental practices based on legal responsibilities and guidance on good environmental management in: CIRIA C532 Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (2001b). This will include the requirement to undertake appropriate assessment and remediation where necessary, in the event the soil or groundwater is contaminated by site activities.	Commitment to prepare a PPP is set out in Outline CoCP **[EN010147/APP/7.6.1]**. The detailed CoCP will include a full PPP.
11.7	To mitigate risks to construction workers in areas of potential contamination such as Purwell Farm Sand Pits - Implementation of control measures, use of appropriate personal protective equipment, application of good working practices and adoption of high levels of personal hygiene by construction workers. Health and Safety risk assessments to be completed prior to construction workers in line with Construction (Design and Management) Regulations 2015	To be included as standard Health and Safety procedures within Outline CoCP **[EN010147/APP/7.6.1]** under CDM requirements
11.8	To help avoid pollution incidents occurring - During operation, maintenance activities may involve the use of chemicals and oils. Secure storage facilities would be provided, including a secondary containment system. A spillage control procedure would be implemented to ensure that any spillages are contained and removed. Regular inspection of infrastructure would be undertaken and maintenance completed as necessary during the period of operation This will include the requirement to undertake appropriate assessment and remediation where necessary, in the event the soil or groundwater is contaminated by site activities.	Operational procedures to be documented in Outline Operational Management Plan **[EN010147/APP/7.6.2]**.

11.9 Assessment of effects

11.9.1 The impacts of the construction, operation and maintenance, and decommissioning phases of the Project in accordance with the Maximum Design Scenario for the Project Design Envelope have been assessed below comprising the following potential impacts:

- Soil and groundwater contamination;
- Surface water contamination;
- Future land users; and
- Off-site land users.

Impact from ground contamination on soil/groundwater

11.9.2 With the act of breaking ground for construction there is a risk of increased potential for mobilisation of contaminants either through leaching from increased exposure to rainfall, changes in shallow drainage patterns or via perched or shallow groundwater, particularly where there are identified potential contamination sources within the Project boundaries. The majority of the Project comprises agricultural land and is not therefore considered to represent a potentially significant source of contaminants of concern. However, there are on-site potentially infilled areas of ground and former landfill which could represent sources of contaminants of concern.

11.9.3 There is also the potential for new contaminants during construction as a result of spillages or leakages from plant or fuel storage in compounds, albeit this can be readily mitigated by best practice measures and construction drainage design included in the CoCP.

Construction phase

Sensitivity of the receptor

11.9.4 The sensitivity of the groundwater as a receptor varies from **Low**, where there are outcropping strata designated as unproductive strata (Botley Southern Site Area), to **Medium** for superficial deposits and bedrock Secondary A Aquifers, to **High** primarily in the Botley Northern Site Area where there are limestone strata classed as Principal Aquifers:

11.9.5 The Project lies outside of any existing Source Protection Zones (SPZ) and there are no recorded potable groundwater abstractions within the Study Area. The presence of one of the key potential contamination sources (Hensington Cutting landfill site) in an area of a Principal Aquifer would indicate that the sensitivity rating of High would be applicable, therefore the overall sensitivity of the receptor is designated as **High.**

Magnitude of impact

11.9.6 The magnitude of the impact for ground contamination of groundwater during construction is:

- direct;
- short term; and
- The overall magnitude of the impact is Negligible (adverse) across the majority of the Project or Medium (adverse) for the historical landfill (indicated to be located above the Forest Marble Formation) as partial loss or change to an aquifer may occur through mobilisation of contaminants contained within the landfill if disturbed.

11.9.7 The impact is predicted to be of local spatial extent and short term duration. The magnitude is therefore **Negligible (adverse)** to **Medium (adverse)**.

Significance of the effect

11.9.8 Overall, the magnitude of the impact is Negligible/Medium (adverse) and the sensitivity of the receptor is High. The effect will, therefore, be of **Minor** to which is not significant in EIA terms to **Moderate (adverse)** significance for the landfill location which is significant.

Further mitigation and residual effects

11.9.9 The risks presented by contamination are considered to be very low other than the cable crossing location of the Hensington Cutting landfill site. Mitigation measures to avoid disturbance of the contents and potential mobilisation of gas/leachate/asbestos fibres generated from the landfill site that could represent a risk to soil or groundwater, could be achieved through design. Options include the use of Horizontal Directional Drilling (HDD) beneath the base of the feature to avoid disturbance of the contents or controlled direct excavation through the waste mass, including removal and disposal of in-situ waste materials and replacement with clean inert material and encapsulation of the excavation within a low permeability seal/wall. Any HDD beneath the landfill will be supported by a hydrogeological risk assessment and bentonite breakout plan.

11.9.10 With the further mitigation described above the magnitude of the impact is assessed as Low (adverse) and the sensitivity of the receptor is High. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant in EIA terms

Operation and maintenance

11.9.11 It is not envisaged that there would be additional impacts during the operational phase. Reference has been made to the ADAS review document for Welsh Government (The impact of solar photovoltaic (PV) sites on agricultural soils and land. Work Package Three: Review of Impacts, 2023). This is an evidence-based assessment of the impact of solar PV sites on agricultural land and soil. The work, under the Welsh Government's Soil Policy Evidence Programme SPEP 2021-22/03, is to inform Welsh Government and Natural England specialists when dealing with solar photovoltaic (PV) planning applications. This identifies a potential impact from spillages or leakage of fuels and oil during construction/decommissioning. It is stated that 'It is likely that the impact on solar PV sites will be minimal, as bio-oils are widely used and incidents managed through control of contaminants and action'. It is also identified that if galvanised beams/piles are used for support of PV panels there is a potential risk presented by degradation of zinc in the coating to the soil quality over the duration of the Project although this has not been substantiated and it is stated that 'Defra's code for using sewage sludge (Defra,2018) gives thresholds for zinc in soils of 200 – 300mg/kg; these levels are very unlikely to be achieved from the presence of piles in the soil'.

Sensitivity of receptor

11.9.12 Remains unchanged from construction i.e. **High**.

Magnitude of impact

11.9.13 The magnitude of impact is considered **Negligible (adverse)**:

Significance of effect

11.9.14 The magnitude of the impact is **Negligible (adverse)** and the sensitivity of the receptor is **High**. The effect will, therefore, be of **Minor** (adverse) significance, which is not significant.

Further mitigation and residual effects

11.9.15 No significant adverse effects have been predicted and no further mitigation is considered to be required for operation and maintenance.

Decommissioning

Sensitivity of receptor

11.9.16 Remains unchanged from construction i.e. **High**.

Magnitude of impact

11.9.17 The magnitude during decommissioning may be considered less than during the construction phase given that identified risks will be remediated/avoided. The magnitude of impact is therefore considered **low (adverse)** at worst.

Significance of effect

11.9.18 Overall, the magnitude of the impact is **Low (adverse)** and the sensitivity of the receptor is **High**. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant in EIA terms.

Further mitigation and residual effects

11.9.19 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Impacts from ground contamination on surface water

11.9.20 Impacts of the Project on surface water quality may arise from runoff from construction areas and also as a result of mobilisation of contaminants in shallow soils or perched groundwater migrating to surface waters.

11.9.21 The nearest identifiable surface water course to the historical landfill is the River Glyme, located approximately 1 km to the west of the Project. The nearest identifiable surface water course to the potentially infilled sand pits is the River Evenlode, located approximately 280 m to the west of the Project. Given the distance and underlying geology, the potential for contaminants of concern associated with these potential sources to impact on these surface water receptors is considered to be limited.

Construction phase

Sensitivity of the receptor

11.9.22 The sensitivity of surface water as a receptor varies from **Medium**, where there are minor waterbodies not having a WFD classification shown in a RBMP to **High** for some of the larger watercourses within a RBMP e.g. Rivers Glyme, Dorn, Evenlode and Thames.

Magnitude of impact

11.9.23 The magnitude of the impact of ground contamination on surface water during construction is:

- direct; and
- short term.

11.9.24 The overall magnitude of the impact is **Negligible (adverse)**, given the implementation of control measures identified within the CoCP.

Significance of effect

11.9.25 Overall, the magnitude of the impact is **Negligible (adverse)** and the sensitivity of the receptor is **Medium** to **High**. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant in EIA terms.

Further mitigation and residual effects

11.9.26 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Operation and maintenance

Sensitivity of the receptor

11.9.27 The sensitivity of the receptor as **Medium** to **High** remains unchanged during operation and maintenance.

Magnitude of impact

11.9.28 The magnitude of the impact of ground contamination on surface water during operation is **No Change**

11.9.29 No change is anticipated to the effects on surface water across the Project during the operational period comprising infrequent maintenance works, following completion of trench excavation and infilling of the cable route and PV panel placement. Operational areas with infrequent maintenance works will be managed in accordance with standard operational procedures and the mitigation measures identified in **Table 11.17**.

Significance of effect

11.9.30 Overall, the magnitude of the impact is **No Change** and the sensitivity of the receptor is **Medium** to **High.** The effect will, therefore, be **No Change**, which is not significant.

Further mitigation and residual effects

11.9.31 No significant adverse effects have been predicted and no further mitigation is considered to be required.

Decommissioning

11.9.32 Potential impacts from the decommissioning of the Project are assumed to be similar in nature with regard to receptors, magnitude of impact and significance of effect as those during construction, as some groundworks would be required to remove the foundations and other infrastructure installed.

11.9.33 As with the construction phase it is considered that the mitigation measures of standard industry good practice would be adopted and these would be set out in a decommissioning strategy to accompany the CoCP produced for the works involved with the construction phase.

11.9.1 Overall, the magnitude of the impact is **Negligible (adverse)** and the sensitivity of the receptor is **Medium** to **High**. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant in EIA terms.

Impacts from ground contamination on future site users

Construction phase

11.9.2 Future site users will not be present as part of the construction phase, therefore there is no viable source-pathway-receptor linkage involved during this period.

Operation and maintenance

11.9.3 During the operational period it is envisaged that there will be periodic site access for maintenance staff to undertake routine inspection, maintenance, repairs and adjust equipment as necessary.

Sensitivity of the receptor

11.9.4 The sensitivity of future site users as a receptor is considered to be **Medium** as per a commercial or industrial land use scenario, albeit exposure to residual soils is likely to be limited in duration and undertaken in accordance with use of PPE suitable for tasks undertaken in accordance with Health and Safety Regulations:

Magnitude of impact

11.9.5 Mitigation measures implemented during the construction phase would ensure any contaminated and natural materials left *in situ*/reused within the Project would not pose an unacceptable risk to human health or the environment

during the operational phase. Following completion of the mitigation measures identified within **Table 11.17**, including any remediation deemed necessary, the magnitude of the impact for impacts on future site users for maintenance operations during operation is:

- direct; and
- short term.

11.9.6 The overall magnitude of impact is therefore **Negligible (adverse)**

Significance of effect

11.9.7 Overall, the magnitude of the impact is **Negligible (adverse)** and the sensitivity of the receptor is **Medium**. The effect will, therefore, be of **Negligible (adverse)** significance, which is not significant.

Further mitigation and residual effects

11.9.8 No significant effects have been identified which would require further (secondary) mitigation during the operational stage. Therefore, no further measures are proposed.

Decommissioning

11.9.9 Future site users will not be present as part of the construction phase, therefore there is no viable source-pathway-receptor linkage involved during this period.

Impacts from ground contamination on off-site land users

11.9.10 Off-site land users include nearby residents of residential properties, or workers on farms or other nearby development. The Project area is mainly of low density residential land use and with limited contamination source potential there is not considered to be a viable risk over the majority of the Study Area, however there is residential development at Hensington on the eastern edge of Woodstock which is within 50 m of the proposed cable route crossing of the historical landfill site. Disturbance of historical landfill material has the potential to mobilise ground gas along preferential pathways through granular or faulted bedrock, if present. It has also been established that the landfill has been used for disposal of asbestos containing waste materials that could be mobilised via airborne migration of fibres if disturbed The potential for gaseous or airborne contaminants to be associated with the infilled Purwell Farm sand pits also cannot be discounted, however this location is in an area of low density occupation and a reduced magnitude of impact is applicable.

11.9.11 Across the majority of the Project, outside of these locations, where trenches are to be backfilled on completion of cable installation using materials identified as suitable for purpose, there is unlikely to be exposure of contaminated materials that could migrate via airborne pathways or via shallow groundwater and a low risk is considered applicable.

Construction phase

Sensitivity of the receptor

11.9.12 The sensitivity for nearby residents/off-site land users as a receptor is considered to be **very high**:

Magnitude of impact

11.9.13 The magnitude of impact for off-site land users during construction is:

- direct; and
- long-term.

11.9.14 The overall magnitude of the impact is **Negligible (adverse)** for the majority of the Project or **Medium (adverse)** for the crossing point of the cable route at the historical landfill site and the development proposed on the potentially infilled sandpits.

11.9.15 Following completion of the mitigation measures identified within Table 11.16, including implementation of control measures in line with the CoCP, the magnitude is considered to be **Negligible (adverse)** to **Low (adverse)**.

Significance of effect

11.9.16 Overall, the magnitude of the impact is **Negligible/Low (adverse)** and the sensitivity of the receptor is **Very High.** The effect will, therefore, be of **Minor (adverse)** significance, increasing to **Moderate (adverse)** for the cable route crossing of the landfill site and development of the potentially infilled sand pits, which is considered significant in EIA terms.

Further mitigation and residual effects

11.9.17 Secondary mitigation could be required to mitigate against possible creation of migration pathways for ground gases through excavation into the former landfill site on the cable route. This could involve use of sealed trenches and dust/fibre suppression although likely to also result in generation of hazardous waste for disposal. Alternatively, where more cost effective, secondary mitigation by way of alteration to design methodologies to avoid excavation (such as use of HDD or other forms of trenchless drilling beneath the feature) may be considered as a suitable method.

11.9.18 With the further mitigation described above the magnitude of the impact is assessed as **Negligible (adverse)** and the sensitivity of the receptor is **Very High**. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant in EIA terms.

Operation and maintenance

Sensitivity of the receptor

11.9.19 The sensitivity for nearby residents/off-site land users as a receptor is considered to be **very high**.

Magnitude of impact

11.9.20 In line with mitigation presented within Table 11.17, a ground investigation will be completed within areas where potentially significant sources of contamination are identified under a discovery strategy. Where ground investigation identifies potential risks to sensitive receptors from any contamination identified, then a remediation strategy would be prepared and remediation and/or mitigation measures will be implemented in accordance with the strategy.

11.9.21 The overall magnitude of impact is therefore **Negligible (adverse)**.

Significance of effect

11.9.22 Overall, the magnitude of the impact is **Negligible (adverse)** and the sensitivity of the receptor is **Very High**. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant.

Further mitigation and residual effects

11.9.23 No significant effects have been identified which would require further (secondary) mitigation during the operational stage. Therefore, no further measures are proposed.

Decommissioning

11.9.24 The magnitude during decommissioning may be considered less than during the construction phase given that identified risks will be remediated/avoided. The magnitude of impact is therefore considered **negligible (adverse)** at worst and the sensitivity of the receptor is **Very High**. The effect will, therefore, be of **Minor (adverse)** significance, which is not significant in EIA terms.

Future monitoring

11.9.25 Future monitoring is not anticipated to be required as a result of the construction/operation or decommissioning phases unless there are requirements for such under an agreed remediation strategy or as a result of the discovery of any unexpected areas of ground contamination as measures adopted as part of the project and included in **Table 11.17**.

11.9.26 No monitoring to test the predictions made within the impact assessment is considered necessary.

11.10 Cumulative Effects

11.10.1 The Ground Conditions CEA methodology has followed the methodology set out in Volume 1, Chapter 4: Approach to Environmental Assessment. As part of the assessment, all projects and plans considered alongside the Project have been allocated into ‘tiers’ reflecting their current stage within the planning and development process.

- Tier 1
  - Under construction
  - Permitted application
  - Submitted application
  - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact
- Tier 2
  - Scoping report has been submitted
- Tier 3
  - Scoping report has not been submitted
  - Identified in the relevant Development Plan
  - Identified in other plans and programmes.

11.10.2 This assessment is followed by all other relevant projects, identified by tier.

11.10.3 This tiered approach is adopted to provide a clear assessment of the Project alongside other projects, plans and activities.

11.10.4 The specific projects, plans and activities within 1 km of the Study Area scoped into the CEA, are outlined in **Table 11.18**.

Table 11.18: List of other projects, plans and activities considered within the CEA

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
Tier 1						
Salt Cross Garden Village (20/01734/OUT)	Pending	Adjacent	2,200 dwellings and 40ha of employment land	N/A	N/A	No
Land east of Woodstock (16/01364/OUT)	Under Construction	Adjacent	300 residential dwellings, up to 1100sqm of A1/A2/B1/D1 floorspace;	2024-2034	N/A	No
Land south east of Pinsley Farm (17/03155/RES)	Operational	Adjacent	120 dwellings	Unknown	Unknown	No
Land Between Woodstock Sewage Works And B4027 - Solar Farm (20/01817/FUL)	Permitted	Adjacent	5MW generating capacity on 9.1ha of land	Unknown	N/A	No
West of Rutten Lane Yarnton (21/03522/OUT)	Pending	Adjacent	The erection of up to 540 dwellings (Class C3), up to 9,000sqm GEA of elderly/extra care residential floorspace (Class C2), a Community Home Work Hub (up to 200sqm)(Class E), alongside the creation of two locally equipped areas for play, one NEAP, up to 1.8 hectares of playing pitches and amenity space for the William Fletcher Primary School, two vehicular	N/A	N/A	No

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
			access points, green infrastructure, areas of public open space, two community woodland areas, a local nature reserve, footpaths, tree planting, restoration of historic hedgerow, and associated works. All matters are reserved, save for the principal access points.			
Land north of Hill Rise, Woodstock (21/00189/FUL)	Permitted	1.0	180 dwellings (Appeal allowed Oct 23)	Unknown	Unknown	No
Land north of Banbury Road, Woodstock (21/00217/OUT)	Pending	0.3	235 dwellings with community space and car barns	N/A	N/A	No
New Science Park West of junction with The Boulevard, Oxford Airport, Langford Lane (23/00517/F)	Permitted	Adjacent	Redevelopment of the site to include the demolition of existing buildings and development of new accommodation across 5 buildings for employment uses (Class E(g)(ii) and (iii)) plus ancillary amenity building, outdoor amenity space, car parking, cycle parking, landscaping and associated works	Unknown	Unknown	No
Multi-phased residential-led mixed used development.(23/02098/OUT	Unknown	Adjacent	Up to 215,000 square metres gross external area of residential floorspace (or	Unknown	Unknown	No

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
			c.1,800 homes which depending on the housing mix could result in a higher or lower number of housing units) within Use Class C3/C4 and large houses of multiple occupation (Sui Generis); Supporting social infrastructure including secondary school/primary school(s) (Use Class F1); health, indoor sport and recreation, emergency and nursery facilities (Class E(d)-(f)). Supporting retail, leisure and community uses, including retail (Class E(a)), cafes and restaurants (Class E(b)), commercial and professional services (Class E(c)), a hotel (Use Class C1), local community uses (Class F2), and other local centre uses within a Sui Generis use including public houses, bars and drinking establishments (including with expanded food provision), hot food takeaways, venues for live music performance, theatre, and cinema. Up to 155,000 net additional square metres (gross external area) of flexible employment uses including			

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
			research and development, office and workspace and associated uses (Use E(g)), industrial (Use Class B2) and storage (Use Class B8) in connection with the expansion of Begbroke Science Park; Highway works, including new vehicular, cyclist and pedestrian roads and paths			
Land south of Perdiswell Farm, Shipton Road (22/01150/OUT)	Pending	Adjacent	Outline planning application for the erection of up to 500 dwellings and commercial floorspace (Use Class E) with associated access, open space and infrastructure - All Matters Reserved except for Access	N/A	N/A	No
Land to the West of Red House Farm Eynsham Road Farmoor (P24/V2489/FUL)	Pending	Adjacent	Installation of ground mounted solar photovoltaic array with associated infrastructure, security fence, CCTV, cable route, landscaping, and onsite biodiversity net gain (Resubmission).	N/A	N/A	No
Goose Eye Farm (24/03069/FUL)	Pending	Adjacent	Construction of a single dwelling house with ancillary buildings comprising	N/A	N/A	No

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
		pavilion, garage and plant room, workshop and wildlife tower in lieu of the existing farmhouse and buildings together with associated landscape works to include lake extension, siting of solar array and tennis court. Provision of new vehicular access.				
Tier 2						
Farmoor Reservoir, Farmoor (P18/V2796/SCR)	Screening decision - negative	Adjacent	Proposal to install a floating solar generator on part of Farmoor Reservoir (may have been installed as PD?)	N/A	N/A	No
Primary substation (P25/V1685/SCR)	Screening	Adjacent	New 400kV gas-insulated electricity substation (GIS) (anticipated to be SF6 free) with ancillary equipment and associated infrastructure.	N/A	N/A	No
Tier 3						

Project/Plan	Status	Distance from the Project (nearest point, km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Project
Salt Cross Garden Village Strategic Location for Growth (20/01734/OUT)	Approved	Adjacent	2,200 dwellings and 40ha of employment land	Unknown	Unknown	No
Land at Pinsley Wood	Pending	Adjacent	600 dwellings (call for sites - strategic promotion)	N/A	N/A	No
Land east of A44	Approved	Adjacent	1950 dwellings and associated infrastructure	Unknown	Unknown	No
Land west of Yarnton	Approved	Adjacent	540 dwellings and associated infrastructure	Unknown	Unknown	No
Land east of Woodstock	Approved	Adjacent	300 dwellings	Unknown	Unknown	No
Land north of Hill Rise, Woodstock	Approved	1.0	120 dwellings	Unknown	Unknown	No
Land north of Banbury Road, Woodstock	Approved	0.2	180 dwellings	Unknown	Unknown	No

Maximum design scenario – cumulative effects assessment

Table 11.19: Maximum design scenario for the assessment of cumulative effects

Potential cumulative effect	Phase			Maximum Design Scenario	Justification
	C	O	D		
Loss of identified safeguarded mineral reserves.	✓	✓	✘	Maximum design scenario as described for the Project (Table 11.16) assessed cumulatively with the following other projects/plans: **Tier 1** • All as shown in **Table 11.18** **Tier 2** • All as shown in **Table 11.18** **Tier 3** • All as shown in **Table 11.18**	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. As previously stated the inclusion of minerals will be dependent upon further discussions with Oxfordshire CC Minerals department and their assessment of the revised MRA produced for the Project. None of the additional developments considered under cumulative effects are indicated as falling within the MSA for sand and gravel.
Mobilisation of ground gases from infilled railway cutting landfill site on northern cable route (land parcel 15).	✓	✓	✓	Maximum design scenario as described for the Project (Table 11.16) assessed cumulatively with the following other projects/plans: **Tier 1** • All as shown in **Table 11.18** **Tier 2** • All as shown in **Table 11.18** **Tier 3** • All as shown in **Table 11.18**	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. None of the additional developments considered under cumulative effects encroach on the infilled railway cutting landfill site.
Mobilisation of leachate/leachable contaminants from potentially infilled sand pit in land parcel 9.	✓	✓	✓	Maximum design scenario as described for the Project (Table 11.16) assessed cumulatively with the following other projects/plans: **Tier 1**	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. None of the additional developments considered under

Potential cumulative effect	Phase C	Phase O	Phase D	Maximum Design Scenario	Justification
				• All as shown in **Table 11.18** **Tier 2** • All as shown in **Table 11.18** **Tier 3** • All as shown in **Table 11.18**	cumulative effects encroach on the site of the sand pits.
Potential for construction activity to cause soil or groundwater contamination	✓	✘	✘	Maximum design scenario as described for the Project (Table 11.16) assessed cumulatively with the following other projects/plans: **Tier 1** • All as shown in **Table 11.18** **Tier 2** • All as shown in **Table 11.18** **Tier 3** • All as shown in **Table 11.18**	As a conservative assessment all Tier 1, Tier 2 and Tier 3 projects have been considered. Assumption that other adjacent developments will be undertaken in accordance with best practice construction measures as in Table 11.12

[a] C=construction, O=operational and maintenance, D=decommissioning

11.11 Cumulative effects assessment

11.11.1 In the assessment of effects scenario set out in **section 11.9** above, the Geology, Hydrogeology and Ground Conditions cumulative effects are not considered to be significant. As on the basis of the information available, only negligible to minor adverse effects have been identified in relation to ground conditions and contamination associated with the proposed development. The proposed development is therefore not considered to represent a significant risk in terms of contaminated soil and/or groundwater. Therefore, it is not considered that the Project would contribute to any significant adverse cumulative effects in relation to ground conditions and contamination and no mitigation measures are required for managing cumulative effects.

11.12 Transboundary effects

11.12.1 As per the scoping report, it was concluded that the proposed development is unlikely to have a significant effect either alone or cumulatively on the environment in a European Economic Area State (EEA states) and therefore a transboundary assessment is not proposed in the ES.

11.13 Inter-related effects

11.13.1 Inter-relationships are the impacts and associated effects of different aspects of the Project on the same receptor. These are as follows.

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Project (construction, operation and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g., construction noise effects from piling, operational substation noise, and decommissioning disturbance).
- Receptor led effects: Assessment of the scope for all effects (including inter-relationships between environmental topics) to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on Ground Conditions, such as water pollution, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

11.13.2 A description of the likely interactive effects arising from the Project on Ground Conditions is provided in Volume 1, Chapter 20: Cumulative Effects and Inter-relationships of the ES.

11.13.3 Potential effects on the water environment, including surface water, are considered within Chapter 10: Hydrology and Flood Risk, which provides a detailed assessment of the baseline water environment conditions.

11.13.4 The potential effects of the Project on Agricultural Land Use are presented in Chapter 17.

11.13.5 The design of the Project elements is discussed within Chapter 6: Project Description. The design aims for all surplus materials (excavations) generated by the Project to be reused within the Project, wherever possible.

11.13.6 The generation of construction dust is assessed within Volume 1, Chapter 19: Air Quality of the ES.

11.13.7 As only negligible to minor adverse effects have been identified in relation to ground conditions and contamination associated with the proposed development, it is not envisaged that there will be any significant inter-related effects resulting.

11.14 Summary of impacts, mitigation measures and monitoring

11.14.1 Information on Ground Conditions within the study area was collected through desktop review, and consultation with Oxfordshire County Council Minerals Department, the Environment Agency (Thames area), Environmental Protection & Enforcement Department of Cherwell District Council, Minerals and Waste Local Plan Principal Officer, Oxfordshire County Council and the Senior Contamination Officer, Publica Group on behalf of West Oxfordshire District Council.

11.14.2 **Table 11.20** presents a summary of the potential impacts, measures adopted as part of the Project and residual effects in respect to Ground Conditions. The impacts assessed include:

- Ground contamination of groundwater;
- Ground contamination on surface water;
- Ground contamination on future site users; and
- Ground contamination on off-site human health receptors.

11.14.3 The assessment has considered potential impacts on the underlying aquifers, surface watercourses, human health (construction workers and future site users), land instability and mineral resources. The significance of effect ranges from temporary minor/moderate adverse effects with regard to off-site human health, to no change during the operational phase, which are not considered significant.

11.14.4 Overall, it is concluded that there will be no significant cumulative effects from the Project alongside other projects/plans.

Table 11.20: Summary of potential environmental effects, mitigation and monitoring.

Description of impact	Phase [a] C	O	D	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
Ground contamination on soil/groundwater	✓	✓	✓	C: Negligible/Medium (adverse) O: Negligible (adverse) D: Low (adverse)	C: High O: High D: High	C: Minor/Moderate (adverse) O: Minor (adverse) D: Minor (adverse)	Yes None None	C: Minor (adverse) O: N/A D: N/A	None None None
Ground contamination on surface water	✓	✓	✓	C: Negligible (adverse) O: No change D: Negligible (adverse)	C: Medium/High O: Medium/High D: Medium/High	C: Minor (adverse) O:No change D: Minor (adverse)	None None None	C: N/A O: N/A D: N/A	None None None
Ground contamination on future users	✗	✓	✗	C: N/A O: Negligible (adverse) D: N/A	C: N/A O: Medium D: N/A	C: N/A O: Negligible (adverse) D: N/A	N/A None N/A	C: N/A O: N/A D: N/A	N/A None N/A
Ground contamination on off-site users	✓	✓	✓	C: Negligible/Low (adverse) O: Negligible (adverse) D: Negligible (adverse)	C: Very High O: Very High D: Very High	C: Minor/moderate (adverse) O: Minor (adverse) D: Minor (adverse)	Yes None None	C: Minor (adverse) O: N/A D: N/A	None None None

[a] C=construction, O=operational and maintenance, D=decommissioning

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