

Chapter 14: Ground Conditions

Table of Contents

14.	Ground Conditions.....	1
14.1	Introduction.....	1
14.2	Legislation, Policy and Guidance.....	3
14.3	Consultation.....	6
14.4	Assessment Methodology.....	11
14.5	Project-Wide Environmental Design, Standards and Management	28
14.6	Part 1a: Minworth AWTP.....	37
14.7	Part 1b: Minworth to Atherstone Pipeline.....	48
14.8	Part 2: Works to the Coventry, Oxford and Grand Union canals.....	62
14.9	Part 3: Works to Daventry and Drayton Reservoirs	77
14.10	Part 4a: Abstraction, Storage and Treatment.....	87
14.11	Part 4b: Pipeline to Underground Reservoir near Luton	97
14.12	Combined Effects between Proposed Development Parts	111
14.13	Summary and Next Steps.....	117
14.14	References	118

Tables

Table 14-1: Supporting documentation.....	1
Table 14-2: Summary of ground conditions assessment scope.....	8
Table 14-3: Summary of baseline ground conditions studies and surveys ..	13
Table 14-4: Receptor sensitivity.....	20
Table 14-5: Magnitude of impact and descriptions.....	24
Table 14-6: Classification of effects	27
Table 14-7: Part 1a: Potential areas of contamination with baseline risk scores of three and above	39
Table 14-8: Summary of residual effects – Part 1a	45
Table 14-9: Geological sites within Part 1b of the Proposed Development and the study area.....	49
Table 14-10: Mineral Safeguarding Areas within Part 1b	50
Table 14-11: Part 1b: Potential areas of contamination with baseline risk scores of three and above	51
Table 14-12: Summary of residual effects – Part 1b.....	58
Table 14-13: Geological sites within Part 2 of the Proposed Development and the study area.....	64
Table 14-14: Mineral Safeguarding Areas within Part 2	65
Table 14-15: Summary of residual effects – Part 2	73
Table 14-16: Part 3: Potential areas of contamination with baseline risk scores of three and above	79

Table 14-17: Summary of residual effects – Part 3	84
Table 14-18: Part 4a: Potential areas of contamination with baseline risk scores of three and above	89
Table 14-19: Summary of residual effects – Part 4a	94
Table 14-20: Geological sites within Part 4b of the Proposed Development and the study area.....	99
Table 14-21: Mineral Safeguarding Areas within Part 4b	99
Table 14-22: Part 4b: Potential areas of contamination with baseline risk scores of three and above	101
Table 14-23: Summary of residual effects – Part 4b	108
Table 14-24: Potential for combined effects between Parts 1a and 1b	111
Table 14-25: Summary of potential combined effects between Parts 1a and 1b	112
Table 14-26: Potential for combined effects between Parts 1b and 2	112
Table 14-27: Summary of potential combined effects between Parts 1b and 2	113
Table 14-28: Potential for combined effects between Parts 2 and 3	114
Table 14-29: Summary of potential combined effects between Parts 2 and 3	114
Table 14-30: Potential for combined effects between Parts 2 and 4a	115
Table 14-31: Summary of potential combined effects between Parts 2 and 4a	115
Table 14-32: Potential for combined effects between Parts 4a and 4b	116
Table 14-33: Summary of potential combined effects between Parts 4a and 4b	116

14. Ground Conditions

14.1 Introduction

- 14.1.1 This Preliminary Environmental Information (PEI) Report chapter presents the preliminary assessment of likely significant environmental effects arising from the Proposed Development in relation to ground conditions. This preliminary assessment follows the methodology outlined within the EIA Scoping Report and Scoping Opinion (provided in **Appendices 5-PD-1** and **5-PD-2** in PEI Report **Volume 4**) and is based on the environmental information obtained to date and the description of the Proposed Development as presented in **Chapter 3: The Proposed Development** in PEI Report **Volume 2**. Further review of the potential for significant ground conditions effects will be undertaken at the Environmental Statement (ES) stage and assessed if required.
- 14.1.2 The ground conditions assessment presented in this PEI Report chapter covers geology, geological designated sites, mineral resources Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA), hydrogeology, and land contamination.
- 14.1.3 Supporting information, including figures and appendices, are listed in **Table 14-1**.

Table 14-1: Supporting documentation

Reference	Title
<i>Figures (provided in PEI Report Volume 3)</i>	
Figure 14-PD-1	Parts 1, 2, 3 & 4 Proposed Development Sections and Study Areas
Figure 14-PD-2	Parts 1, 2, 3 & 4 Superficial Geology and BGS Boreholes
Figure 14-PD-3	Parts 1, 2, 3 & 4 Bedrock Geology and Morphological Features
Figure 14-PD-4	Parts 1, 2, 3 & 4 Geologically Designated Sites
Figure 14-PD-5	Parts 1, 2, 3 & 4 Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA)
Figure 14-PD-6	Parts 1, 2, 3 & 4 Potential Areas of Contamination
<i>Appendices (provided in PEI Report Volume 4)</i>	
Appendix 14-PD-1	Consultation

Reference	Title
Appendix 14-PD-2	Geo-Environmental Desk Based Assessment ¹
Appendix 14-PD-3	Land Contamination Methodology
Appendix 14-PD-4	Potential Areas of Contamination
Appendix 14-PD-5	Ground Engineering Risk Assessment
Appendix 14-PD-6	Part 2 Potential Areas of Contamination with baseline risk scores of three and above

14.1.4 There are interrelationships between the potential effects on ground conditions and other environmental topics. Therefore, please also refer to the following:

- a. Effects on agriculture and soils arising from the construction and operation (including maintenance) phases of the Proposed Development are considered in **Chapter 7: Agriculture and Soils** in PEI Report **Volume 2**;
- b. Groundwater, surface water and ecological receptors are discussed within this chapter as they are assessed as potential receptors to any land contamination. Groundwater and surface water as strategic resources and/or discharge points, and hydrogeological response to dewatering and flooding are considered in **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**; and ecological receptors are considered in more detail in **Chapter 12: Ecology – Aquatic** and **Chapter 13: Ecology – Terrestrial** in PEI Report **Volume 2**;
- c. Pollution related impacts from the construction and operation (including maintenance) phases of the Proposed Development are covered in **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**;
- d. Air pollution related impacts from increased dust during construction are covered in **Chapter 8: Air Quality and Odour** in PEI Report **Volume 2**;
- e. Excavated materials and waste management are covered in **Chapter 18: Materials and Waste** in PEI Report **Volume 2**. Should contaminated soils or groundwater be encountered as part of the

¹ The Geo-Environmental Desk Based Assessment presented in **Appendix 14-PD-2** in PEI Report **Volume 4** is for Parts 2, 3, 4a and 4b only. A Geo-Environmental Desk Based Assessment is not currently available for Parts 1a and 1b at the time of writing this PEI Report, therefore, the potential for land contamination and the relevant assessment will be considered in the ES.

construction phase of the Proposed Development, there is the potential that it may need to be removed from the works areas as a waste, if it is deemed to represent an unacceptable risk to the identified sensitive receptors. This has been considered as part of the assessment set out within **Chapter 18: Materials and Waste** in PEI Report **Volume 2**; and

- f. An In-Combination Climate Change Impact (ICCI) Assessment, which includes an evaluation of whether climate change has the potential to alter the significance of risks identified for ground conditions is included in **Chapter 10: Climate** in PEI Report **Volume 2**.

14.2 Legislation, Policy and Guidance

14.2.1 Legislation, policy², and standards and guidance relating to ground conditions and pertinent to the Proposed Development comprises of the documents listed below.

Legislative Framework

14.2.2 Relevant legislation comprises:

- a. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (Ref. 4);
- b. The Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2017 (Ref. 5);
- c. European Waste Framework Directive 2008 (Ref. 6);
- d. Environmental Protection Act 1990 (Ref. 7);
- e. Water Act 2003 (Ref. 8);
- f. Water Resources Act 1991 (Ref. 9);
- g. Building Act 1984 (Ref. 10);
- h. The Building Regulations 2010 (Ref. 11);
- i. Environment Act 1995 (Ref. 12);
- j. Environment Act 2021 (Ref. 13);
- k. The Planning Act 2008 (Ref. 14);

² For the purposes of this PEI Report an overview of relevant policy is provided to show how relevant policy has informed the scope, method and in some cases mitigation. It is not the purpose of the PEI Report (or the ES) to present a review of the compliance of the Proposed Development with the requirements of policy. The Planning Statement, to be submitted as part of the ES, will present an assessment of the extent to which the Proposed Development accords with policy.

- g. The Environmental Permitting (England and Wales) Regulations 2016 (Ref. 15);
- h. The Hazardous Waste (England and Wales) Regulations 2005 (Ref. 16);
- i. The Waste (England and Wales) Regulations 2011 (Ref. 17);
- j. Contaminated Land (England) Regulations 2006 (Ref. 18);
- k. The Anti-Pollution Works Regulations 1999 (Ref. 19);
- l. The Construction (Design and Management) Regulations 2015 (Ref. 20); and
- m. The Control of Asbestos Regulations 2012 (CAR-SOIL) (Ref. 21).

National Policy

14.2.3 National policy that has been considered includes:

- a. National Policy Statement for Water Resources Infrastructure (NPSWRI) (Ref. 1); and
- b. National Planning Policy Framework (NPPF) (Ref. 2).

Local Policy

14.2.4 Local policy has been considered includes relevant Local Plans (both adopted and emerging) and other adopted policy documents produced by the ten local authority administrative areas within which the Proposed Development is situated (refer to Table 1-4 in **Chapter 1: Introduction** in PEI Report **Volume 2**).

National Guidance

14.2.5 National guidance that has been considered includes:

- a. Planning Practice Guidance – including ‘Land affected by contamination’, ‘Land stability’, ‘Minerals’, ‘Natural environment’, ‘Waste’ and ‘Water supply, wastewater and water quality’ (Ref. 3);
- b. Environment Agency’s online guidance for the management of land contamination ‘Land Contamination: Risk Management’ (LCRM) (Ref. 22);
- c. The Environmental Protection Act: Part 2A Contaminated Land Statutory Guidance (2012) (Ref. 23);
- d. British Standard (BS) 10175 (2011 +A2 2017), Investigation of Potentially Contaminated Sites – Code of Practice (Ref. 24);
- e. BS 5930 (2015 +A1:2020), Code of Practice for Ground Investigations. (Ref. 25);

- f. BS 8576 (2013), Guidance on Investigations for Ground Gas. Permanent Gases and Volatile Organic Compounds (VOCs) (Ref. 26);
- g. BS 8485 (2019), Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings (Ref. 27);
- h. Construction Industry Research and Information Association (CIRIA) C665, Assessing Risks Posed by Hazardous Ground Gases to Buildings, 2007 (Ref. 28);
- i. CIRIA C811, Environmental Good Practice on Site Guide (fifth edition), 2023 (Ref. 29);
- j. Contaminated Land: Applications in Real Environments (CL:AIRE), Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention, 2025 (Ref. 30);
- k. Design Manual for Roads and Bridges (DMRB), LA109 Geology and Soils (2019) (Ref. 31);
- l. DMRB, LA104 Environmental Assessment and Monitoring (2020) (Ref. 32);
- m. DMRB, LA113 Road Drainage and the Water Environment (2020) (Ref. 33);
- n. Department for Transport (DfT) (2022) Transport Analysis Guidance (TAG) Unit A3: Environmental Impact Appraisal (Section 10) (Ref. 34);
- o. Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for ecological impact assessment in the UK and Ireland: Terrestrial, Freshwater (Ref. 35);
- p. National House Building Council (NHBC), Environment Agency and Chartered Institute of Environmental Health (CIEH) report R&D66 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (Ref. 36);
- q. CL:AIRE, Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010) (Ref. 37);
- r. CL:AIRE, CAR-SOIL 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials, 2016 (Ref. 38);
- s. CL:AIRE, Definition of Waste: Development Industry Code of Practice (DoWCoP), 2011 (Ref. 39);
- t. Environment Agency Guidance for Pollution Prevention (GPP) or where GPP are yet to be published, Pollution Prevention Guidance (PPG) notes (withdrawn but widely considered good practice) (Ref. 40);

- u. Environment Agency's Technical Guidance WM3 (Ref. 41); and
- v. British Geological Survey (BGS), GeoSure User Guide v8, Report OR/17/050, Appendix 1 GeoSure Legends (2018) (Ref. 42).

14.3 Consultation

- 14.3.1 This section provides an overview of consultation undertaken to date in relation to ground conditions.

Phase One Public Consultation

- 14.3.2 Below is a summary of key topics raised from Phase One Public Consultation undertaken between 11 September to 25 October 2024 with regards to ground conditions:

- a. Further research required into the geology in Mancetter; and
- b. Consideration of the protection of local residents from the proposed works, including any potential contamination.

- 14.3.3 These topics have been taken into consideration for the Proposed Development and assessment³.

EIA Scoping

- 14.3.4 **Appendix 14-PD-1** in PEI Report **Volume 4** provides a summary of the key comments raised in the EIA Scoping Opinion (provided in **Appendix 5-PD-2** in PEI Report **Volume 4**) such as amending the original scope or request for further justification / evidence to agree the EIA scope. It also and outlines how and where these issues have been addressed within the PEI Report or will be later addressed within the Environmental Statement (ES) to ensure they are taken account of as part of the ground conditions assessment.
- 14.3.5 Where the EIA Scoping Opinion has resulted in amendment to the scope of the ground conditions assessment (or where further justification or evidence is required to confirm an effect can remain scoped out), this has been presented in section 0.
- 14.3.6 The scope of the ground conditions assessment is presented in **Table 14-2**.

Other Consultation

- 14.3.7 Further consultation has been carried out outside of the EIA Scoping process. The details are reported in Table 2 in **Appendix 14-PD-1** in PEI

³A Phase One Public Consultation Report has been made available at Phase Two Public Consultation, which sets out activities undertaken to deliver the consultation and provides a summary of the key themes and issues raised, and how the Proposed Development has considered these.

Report **Volume 4**, with the outcomes and additional data requested included in this chapter.

Scope of Assessment

- 14.3.1 This section identifies the scope of the ground conditions assessment following EIA Scoping and subsequent consultation, design refinement, surveys / studies and assessment.
- 14.3.2 **Table 14-2** provides a summary of all matters scoped in, and out, of the ground conditions assessment on the basis of whether they were considered to have the potential to result in significant effects during the EIA Scoping process. The table uses the following coding:
- a. In = refers to likely effects that are considered potentially significant and therefore do require further assessment;
 - b. Out = refers to likely effects that are not considered potentially significant and therefore do not require further assessment; and
 - c. n/a = refers to where there is no prospect of an effect from a particular Proposed Development Part(s), either due to the particular nature or location of the Proposed Development Part and/or the absence of a receptor within the study area for that particular Proposed Development Part.

Table 14-2: Summary of ground conditions assessment scope

Likely significant impact	Receptor(s)	Parts of the Proposed Development					
		1a	1b	2	3	4a	4b
Construction Phase							
Damage, disturbance or removal of geological features of interest (geological Sites of Special Scientific Interest (SSSI), Local Geological Sites (LGS) (previously referred to as Regionally Important Geological and Geomorphological Sites (RIGS)) and Geological Conservation Review (GCR) sites).	Geology / Geologically Designated Sites ⁴ .	In	In	In	In	In	In
Temporary mineral severance or sterilisation.	MSA / MCA ⁵ .	In	In	In	In	In	In
Mobilisation and migration of existing potential sources of contamination, due to: Ground disturbance during earthworks, excavations, trenching and other techniques; Open excavations; Uncovered stockpiles; and Dewatering. Historical and current land use has the potential to have caused a legacy of contamination which may	Groundwater, surface water, ecological and geological sites, human health (adjacent and/or nearby users).	In	In	In	In	In	In
	Human health (construction and maintenance workers).	Out ⁶	Out ⁶	Out ⁶	Out ⁶	Out ⁶	Out ⁶

⁴ Further stakeholder engagement has been undertaken with all local authorities and local geological groups to identify and confirm geological sites within the Preliminary Order Limits and study area.

⁵ Further stakeholder engagement has been undertaken with all local authorities to confirm and identify the presence or absence of MSA and MCA within the Preliminary Order Limits.

⁶ As part of the Scoping Opinion, the Inspectorate agreed this matter may be scoped out from further assessment (see **Appendix 14-PD-1** in PEI Report **Volume 4**).

Likely significant impact	Receptor(s)	Parts of the Proposed Development					
		1a	1b	2	3	4a	4b
pose a risk to the receptors within and in proximity of the Proposed Development during construction.							
Introduction of new sources of contamination, such as fuels, oils and other fluids used in construction plant.	Groundwater, surface water, ecological and geological sites, human health (adjacent and/or nearby users).	In	In	In	In	In	In
Land contamination (from existing potential sources of contamination located within the Preliminary Order Limits): Post-construction ⁷ : Any contamination removed, remediated, or mitigated leading to removal of contaminant sources from the source – pathway – receptor linkage.	Groundwater, surface water, ecological and geological sites, human health (adjacent and/or nearby users), property (buildings and infrastructure).	In	In	In	In	In	In
Ground instability.	Existing geological structure, existing canal infrastructure, and the Proposed Development.	In	In	In	In	In	In
Operational Phase							

⁷ Note that in this chapter, a post-construction stage is introduced which recognises that the potential beneficial effect from any soil and/or groundwater remediation undertaken is realised upon completion of construction, but it is not an effect related to the operation of the Proposed Development.

Likely significant impact	Receptor(s)	Parts of the Proposed Development					
		1a	1b	2	3	4a	4b
Indirect and direct impacts as a result of the disturbance of ground for maintenance works and leakage / spillages of stored materials during the operational phase.	Groundwater, surface water and human health.	Out ⁶	Out ⁶	Out ⁶	Out ⁶	Out ⁶	Out ⁶
Permanent mineral severance or sterilisation.	MSA and MCA ² .	In	In	In	In	In	In
Ground instability.	Existing geological structure, existing canal infrastructure, and the Proposed Development.	In	In	In	In	In	In

14.4 Assessment Methodology

14.4.1 This section presents the methodology used to assess the potential effects on ground conditions during the construction and operational phases of the Proposed Development.

Defining the Study Area

14.4.2 This section sets out the study areas adopted for the Proposed Development. For Parts 2 and 3 this only includes the Indicative Work Areas. The Indicative Non-Work Areas have been excluded from the assessment as there will be no works / ground disturbance in this area; the ground conditions will remain the same and undisturbed by the Proposed Development.

14.4.3 The study areas are presented in **Figure 14-PD-1** provided in PEI Report **Volume 3**. For the ground conditions assessment, the study areas for each Proposed Development part are the same. The use of these study areas is standard practice, and it has been acceptable on many projects, including those that are within very sensitive environments. Furthermore, the Environment Agency have agreed with these study areas (see **Appendix 14-PD-1** in PEI Report **Volume 4**).

14.4.4 The study areas and justification are as follows:

- a. Impacts from the Proposed Development on geological features, MSA and MCA, will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors;
- b. For the purposes of determining the wider geological context, geodiversity and to support the conceptual understanding of the ground model, the geology baseline will consider an extended 250 m study area from the Preliminary Order Limits;
- c. For the purposes of determining the local baseline conditions with respect to land contamination, a study area that also extends 250 m from the Preliminary Order Limits will be adopted;
- d. A 250 m study area has been used for hydrogeology. However, this study area will be extended to 1 km from the Preliminary Order Limits in areas where there are higher permeability aquifers (e.g. Principal aquifers and Source Protection Zones (SPZs)). This is appropriate to assess the hydrogeological setting, and any influence that potential land contamination might have on the Proposed Development or local receptors (taking into consideration the pathways for contaminant migration); and
- e. Note that the study area will also be extended to 1 km where Secondary A aquifers are present for parts of the Proposed

Development in which trenchless crossings are proposed. As not all trenchless crossings have yet been identified, this will be the subject of ongoing assessment and will be reported in the ES.

Determining Baseline Conditions

14.4.5 This section sets out how baseline conditions were determined for the Proposed Development.

14.4.6 **Table 14-3** provides an overview of the baseline studies and surveys undertaken to inform the ground conditions assessment. The table uses the following coding:

- a. ✓ = Completed;
- b. O = To be completed for the ES; and
- c. n/a = Baseline study / survey is not applicable for that Part of the Proposed Development.

Table 14-3: Summary of baseline ground conditions studies and surveys

Study / survey	Overview	Date completed	Proposed Development Part					
			1a	1b	2	3	4a	4b
Geo-Environmental Desk Studies Parts 1a and 1b	Geo-Environmental Desk Studies have been completed for Part 1a of the Proposed Development (Ref. 44) and Part 1b of the Proposed Development (Ref. 45). These, along with the Groundsure reports contained within them, have been used to determine baseline conditions in this chapter, particularly with regards to land contamination. These reports identify and provide an assessment of potential hazards and constraints to the Proposed Development deriving from the ground conditions, including the potential for land contamination. The reports include an initial Conceptual Site Model (CSM) that identifies the potential for land contamination and potential contaminant pathways that might impact sensitive receptors in the study area. Note the following: • The Part 1a boundary is the same as the Preliminary Order Limits; • The Part 1b boundary varies significantly to the Preliminary Order Limits, particularly in the following areas: – south / south-east / east of the M42 Junction 9, with the alignment to the west of the A446 and then trending east of the M42 Junction 9; and – between east of Marston and Baxterley, with the alignment to the north of Hurley. • The remaining Part 1b boundary (the western and eastern extents) generally follow the alignment of the Preliminary Order Limits, however the Part 1b boundary included only	Part 1a – October 2025 Part 1b – January 2025	✓	✓	n/a	n/a	n/a	n/a

Study / survey	Overview	Date completed	Proposed Development Part					
			1a	1b	2	3	4a	4b
	the pipeline and a limited working area either side (which has generally been expanded for the Preliminary Order Limits). Where there are significant differences in the boundary (and therefore no full Groundsure environmental data or historical mapping available), the identification of potential contaminated land sites is based on a review of current mapping and landfill data provided by the Environment Agency. However, the absence of a full set of environmental data and historical mapping may present a data gap.							
Geo-Environmental Desk Based Assessment Parts 2, 3, 4a and 4b: Appendix 14-PD-2 in PEI Report Volume 4	A Geo-Environmental Desk Based Assessment (equivalent to a Stage 1, Tier 1 assessment as defined under LCRM (Ref. 22)) has been completed for Parts 2, 3, 4a and 4b of the Proposed Development and is presented in Appendix 14-PD-2 in PEI Report Volume 4. This report identifies and provides an assessment of potential hazards and constraints to the Proposed Development deriving from the ground conditions, including the potential for land contamination. The report includes an initial Conceptual Site Model (CSM) that identifies the potential for land contamination and potential contaminant pathways that might impact sensitive receptors in the study area of the Proposed Development. The results of the desk-based assessment and initial CSM will be used to assess data gaps and uncertainties and, if required, to develop an initial scope for site investigation to quantitatively assess the levels of contamination across the Proposed Development. Ground investigation would also support the detailed design and confirm the ground model. This tiered approach to land contamination assessment is consistent with the Environment Agency's LCRM guidance (Ref. 22). It is anticipated that the requirements for any	November 2025	n/a	n/a	✓	✓	✓	✓

Study / survey	Overview	Date completed	Proposed Development Part					
			1a	1b	2	3	4a	4b
	intrusive investigation will be discussed and agreed in advance with the Environment Agency and relevant local authorities.							
Walkover All Parts	A site walkover has been completed within key, potential higher-risk areas of potential land contamination within Parts 2, 3, 4a and 4b of the Proposed Development, to inform Appendix 14-PD-2 in PEI Report Volume 4. A site walkover has been completed for Part 1a and this is reported in the Geo-Environmental Desk Study (Ref. 44). As far as known, site walkovers have not been completed for Part 1b; these will be completed and reported in the ES.	November 2025 (Parts 2, 3, 4a and 4b) November 2024 and October 2025 (Part 1a)	✓	O	✓	✓	✓	✓
Geological designated sites and MSA / MCA identification All Parts	Geological designated sites and MSA / MCA have been identified from Local Planning Authority mapping available within the policies referenced in paragraph 14.2.4. Furthermore, geological groups have also been consulted to identify geological designated sites along with reference to Local Ecological Record Centre (LERC) data.	November 2025	✓	✓	✓	✓	✓	✓
Ground instability All Parts	A desk-based qualitative Ground Engineering Risk Assessment has been completed for Parts 1a, 1b, 2, 3, 4a and 4b of the Proposed Development and is presented in Appendix 14-PD-5 in PEI Report Volume 4. This report identifies and provides a qualitative assessment of potential ground engineering hazards within the working areas of the Proposed Development. The report highlights those areas to be considered as part of a future Geotechnical Investigation Report (GIR). This will be prepared during detailed design of the Proposed Development prior to construction.	November 2025	✓	✓	✓	✓	✓	✓

Assessment of Effects

14.4.7 This section sets out how the scoped in effects have been assessed.

Geologically Designated Sites Impact Assessment Methodology

14.4.8 Impacts from the Proposed Development on geologically designated sites will occur directly within the Preliminary Order Limits where construction activities would take place or interface directly with these receptors.

14.4.9 Construction effects may result in damage, disturbance or removal of geological features of interest.

14.4.10 The likely significance of effects during the construction stage to geologically designated sites have been assessed based on the sensitivity or importance of the resource (**Table 14-4**) and the magnitude of potential impact (**Table 14-5**).

Minerals Impact Assessment Methodology

14.4.11 Impacts from the Proposed Development on minerals will occur directly within the Preliminary Order Limits where construction activities would take place or interface directly with these receptors.

14.4.12 The construction (temporary) effects occur where temporary construction compounds and laydown areas are proposed within the MSA / MCA. In such cases, there will be a temporary sterilisation of the resource.

14.4.13 The operational (permanent) effects occur where the MSA / MCA is underlying the footprint of the permanent works of the Proposed Development, with area(s) of minerals becoming sterilised.

14.4.14 The likely significance of effects of the construction and operational stages to mineral resources will be assessed based on the sensitivity or importance of the resource (**Table 14-4**) and the magnitude of potential impact (**Table 14-5**).

Contaminated Land Impact Assessment Methodology

14.4.15 Further details on the contaminated land impact assessment methodology are presented in **Appendix 14-PD-3** in PEI Report **Volume 4**.

14.4.16 The approach to assessing the potential magnitude of impact of the Proposed Development from, and to land contamination, will be undertaken by following a risk-based approach which is consistent with LCRM (Ref. 22). This approach identifies potential hazards associated with land contamination and evaluates the likelihood and consequence. These risk ratings inform the determination of potential impacts on receptors, which are then assessed in terms of magnitude and sensitivity. The resulting effects are classified and their significance evaluated in accordance with **Chapter 6: Environmental Impact Assessment Methodology**, in PEI Report **Volume 2**. Further details are provided in the paragraphs below.

14.4.17 A qualitative assessment of the risks posed by land contamination within the study area has been undertaken by first assigning a 'baseline risk score' to each identified historical or current area of potential land contamination identified in the baseline review (**Appendix 14-PD-2** in PEI Report **Volume 4**). The baseline risk score has been determined using Tables 1 to 3 in **Appendix 14-PD-3** in PEI Report **Volume 4**. The baseline risk score is based partly on the relationship between the identified area of potential land contamination and its proximity to the Preliminary Order Limits (Table 1) together with the nature of the current and/or historical land use, as certain land uses typically result in a greater potential for contamination of the ground to have occurred (Table 2). The baseline risk score then considers the relationship between the proximity, potential contaminated land and whether cut or fill earthworks / embankments or trenchless crossings are planned as part of the Proposed Development design at its closest point (Table 3).

14.4.18 The lower the baseline risk score, the lower the perceived level of risk. Professional judgement has been applied in reviewing the generated baseline risk scores. Generally, baseline risk scores of two or less are not considered to pose an unacceptable risk and will not be considered for further assessment. Baseline risk scores of three or more will be considered for further risk and impact assessment (subject to a professional judgement check). Note that the further risk and impact assessment (as described in more detail below) will be the subject of ongoing work and reported in the ES.

14.4.19 The further risk and impact assessment will initially involve creating baseline CSMs for the potential contaminated land sites identified as part of the screening assessment (not the Proposed Development itself); broadly using the initial CSMs developed in **Appendix 14-PD-2** in PEI Report **Volume 4**. The assessment will be based on comparing the risk levels at baseline and assessed risk levels for the construction and post-construction⁸ stages, respectively, to evaluate the change in risk at each stage which defines the magnitude of impact in accordance with **Table 14-5**. This assessment approach will take into consideration the magnitude of impact guidelines presented in Table 6-2 of **Chapter 6: Environmental Impact Assessment Methodology** in PEI Report **Volume 2**.

14.4.20 Evaluation of the magnitude of impact (**Table 14-5**) and the sensitivity / value of the receptor (**Table 14-4**) defines the significance of the effects of land

⁸ As described previously, a post-construction stage is introduced which recognises that the potential beneficial effect from any soil and/or groundwater remediation undertaken is realised upon completion of construction, but it is not an effect related to the operation of the Proposed Development.

contamination (**Table 14-6**). Reference will be made to DMRB LA109 (Ref. 31), LA104 (Ref. 32), LA113 (Ref. 33), TAG Unit A3 (Ref. 34) and CIEEM (Ref. 35). Although the DMRB references are applicable to road projects and TAG is applicable to general transport projects, they provide a suitable framework within which to conduct EIA for ground conditions on schemes which include linear elements (including the Proposed Development). Furthermore, there is an absence of any other EIA guidance for this topic.

Ground Instability Assessment Methodology

- 14.4.21 Ground instability has been scoped into the ground conditions chapter as there is a requirement to consider this in the NPSWRI: *'Where required, a preliminary assessment of ground instability should be carried out at the earliest possible stage. Applicants should ensure that any necessary investigations are undertaken to ascertain that the site is and will remain stable, or can be made so, as part of the development. The site needs to be assessed in context of surrounding areas where subsidence, landslides and land compression could threaten the development during its anticipated life or damage neighbouring land or property. Risks to the quality and quantity of groundwater resources should also be assessed. This could be in the form of a land stability or slope stability risk assessment report. Planning practice guidance provides further advice on assessing land stability.'*
- 14.4.22 Furthermore, the Mining Remediation Authority indicated in the Scoping Opinion that they would expect the ground conditions chapter of the ES to consider risks posed by coal mining features, if development works are proposed in areas where these are recorded to be present.
- 14.4.23 Further details on the Ground Engineering Risk Assessment methodology are presented in **Appendix 14-PD-5** in PEI Report **Volume 4** with a summary indicated below.
- 14.4.24 A qualitative assessment of the risks posed by hazards associated with natural ground subsidence and historical resource exploitation has been undertaken by assigning a risk rating to each identified hazard within each section of the Proposed Development. Reference has been made to the BGS GeoSure Five Tier Classification system (Ref. 42) to quantify the risks identified.
- 14.4.25 There are no published impact assessment criteria to assess the environmental impact of ground instability. However, ground instability presents an engineering risk to the Proposed Development that will be managed through design development. Those sections of the Proposed Development where one or more identified ground engineering hazard has been assessed as 'high risk' are highlighted for consideration and further investigation as part of a future Geotechnical Investigation Report (GIR) with any required design solutions forming part of the Geotechnical Design

Report (GDR). These will be prepared during detailed design of the Proposed Development prior to construction.

Assessment Criteria

- 14.4.26 Definitions of magnitude of impact, sensitivity or importance of the receptor and significance of effect that will be used as part of the assessment are reported in the following sections. This takes into consideration the significance of effect criteria presented in **Chapter 6: Environmental Impact Assessment Methodology** in PEI Report **Volume 2**.

Sensitivity of Receptors

- 14.4.27 The criteria for assessing receptor sensitivity are defined in **Table 14-4** and is in general accordance with the DMRB LA109 (Ref. 31), LA104 (Ref. 32), LA113 (Ref. 33), TAG Unit A3 (Ref. 34) and CIEEM (Ref. 35).

Table 14-4: Receptor sensitivity

Sensitivity / value	Description / criteria
High	<u>Geology</u> Very rare and of international importance with no potential for replacement (e.g. United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites, UNESCO Global Geoparks, SSSI and GCR sites where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such. <u>Mineral resources</u>⁹ Presence of significant mineral reserves and within a Safeguarding Area. <u>Receptors of Contamination</u> <u>Human health:</u> Land use such as residential or allotments. <u>Surface water:</u> Watercourse having a WFD classification shown in a River Basin Management Plan (RBMP) and $Q95^{10} \geq 1.0 \text{ m}^3/\text{s}$. Critical social or economic uses such as water supply, navigation or mineral extraction. <u>Groundwater:</u> Principal aquifer providing a regionally important resource and/or supporting a site protected and UK legislation for Ecology and Nature Conservation. Groundwater locally supports Groundwater Dependent Terrestrial Ecosystems (GWDTE). SPZ 1.

⁹ Sensitivity of mineral receptors is not described as part of the referenced DMRB guidance. Therefore, professional judgement has been used.

¹⁰ The flow equalled or exceeded in a watercourse 95% of the time.

Sensitivity / value	Description / criteria
	<u>Ecology and Nature Conservation:</u> Sites of international importance (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site, salmonid water) or of high sensitivity.
Medium	<u>Geology</u> Rare and of national importance with little potential for replacement (e.g. geological SSSI, National Nature Reserves (NNR)). Geology meeting national designation citation criteria which is not designated as such. <u>Mineral resources</u>⁹ Within a Mineral Consultation or Safeguarding Area. <u>Receptors of Contamination</u> <u>Human health:</u> Land use such as public open space. <u>Surface water:</u> Watercourse having a WFD classification shown in a RBMP and Q95 <1.0 m³/s. Important social or economic uses such as water supply, navigation or mineral extraction. <u>Groundwater:</u> Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE. SPZ 2. <u>Ecology and Nature Conservation:</u> Sites of national importance (e.g. SSSIs, NNR) or of medium sensitivity.
Low	<u>Geology</u> Of regional importance with limited potential for replacement (e.g. RIGS). Geology meeting regional designation citation criteria which is not designated as such. <u>Mineral resources</u>⁹ Some mineral potential but not within a Mineral Consultation or Safeguarding Area.

Sensitivity / value	Description / criteria
	<u>Receptors of Contamination</u> <u>Human health:</u> Land use such as commercial or industrial. <u>Surface water:</u> Watercourses not having a WFD classification shown in a RBMP and Q95 >0.001 m³/s. Limited social or economic uses. <u>Groundwater:</u> Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ 3. <u>Ecology and Nature Conservation:</u> Sites of local importance (e.g. Local Wildlife Sites (LWS), Local Nature Reserves (LNR)) or of low sensitivity.
Very low	<u>Geology</u> Of local importance / little or low interest with potential for replacement (e.g. non-designated geological exposures, former quarries / mining sites). <u>Mineral resources</u>⁹ Limited potential for mineral reserves and site not within a Mineral Consultation or Safeguarding Zone. <u>Receptors of Contamination</u> <u>Human health:</u> Land use such as highways and rail. <u>Surface water:</u> Watercourses not having a WFD classification shown in a RBMP and Q95 ≤0.001 m³/s. Minimal economic or social uses. <u>Groundwater:</u> Unproductive strata. <u>Ecology and Nature Conservation:</u> Land with very low sensitivity and/or no designations.

Magnitude of Impacts

14.4.28 The magnitude of impact, or how considerable the change to ground conditions is in comparison to the baseline conditions as a result of the construction and operation of the Proposed Development, is classified as either being:

- a. High adverse or beneficial;
- b. Medium adverse or beneficial;
- c. Low adverse or beneficial; and
- d. Very low adverse or beneficial.

14.4.29 The criteria and their respective magnitude of impact classification which has been applied are presented within **Table 14-5** and based on the DMRB LA109 (Ref. 31), LA104 (Ref. 32), LA113 (Ref. 33), TAG Unit A3 (Ref. 34) and CIEEM (Ref. 35).

Table 14-5: Magnitude of impact and descriptions

Magnitude of Impact	Definition	Demonstrated in the construction and post-construction CSM as risk level changes defined as follows
High	<i>Geology and Mineral Resources</i> Loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features, or elements.	Not applicable ¹¹ .
	<i>Contamination</i> 1) human health: significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria (category 4 screening levels) within SP1010 (Ref. 43) with potential for significant harm to human health. Contamination heavily restricts future use of land; 2) surface water: refer to sensitivity criteria in LA113 (Ref. 33); 3) groundwater: refer to sensitivity criteria in LA113 (Ref. 33); and 4) ecological sites: refer to impact descriptions in CIEEM (Ref. 35).	<u>High adverse:</u> An increase in contamination risk of 4 or 5 risk levels in the risk matrix, e.g. land that has a very low contamination risk in the baseline becoming a high or very high risk. <u>High beneficial:</u> A reduction in contamination risk of 4 or 5 risk levels in the risk matrix, e.g. land that has a very high contamination risk in the baseline becomes a low or very low risk.
Medium	<i>Geology and Mineral Resources</i> Partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of / damage to key characteristics, features, or elements.	Not applicable ¹¹ .
	<i>Contamination</i> 1) human health: contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria (category 4 screening levels) in SP1010. Significant contamination can be present. Control and remediation measures are required to reduce risks to human health and make land suitable for intended use;	<u>Medium adverse:</u> An increase in contamination risk of 2 or 3 risk levels in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate or high risk. <u>Medium beneficial:</u> A reduction in contamination risk of 2 or 3 levels in the risk matrix, e.g. land that has a

¹¹ Relates only to the assessment of land contamination.

Magnitude of Impact	Definition	Demonstrated in the construction and post-construction CSM as risk level changes defined as follows
	2) surface water: refer to sensitivity criteria in LA113 (Ref. 33) and TAG Unit A3 (Ref. 34); 3) groundwater: refer to sensitivity criteria in LA113 (Ref. 33) and TAG Unit A3 (Ref. 34); and 4) ecological sites: refer to impact descriptions in CIEEM (Ref. 35).	high contamination risk in the baseline becomes a moderate / low or low risk.
Low	<i>Geology and Mineral Resources</i> Minor measurable change in geological feature and designation attributes, quality, or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features, or elements. <i>Contamination</i> 1) human health: contaminant concentrations are below relevant screening criteria (category 4 screening levels) in SP1010. 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: refer to sensitivity criteria in LA113 (Ref. 33) and TAG Unit A3 (Ref. 34); 3) groundwater: refer to sensitivity criteria in LA113 (Ref. 33) and TAG Unit A3 (Ref. 34); and 4) ecological sites: refer to impact descriptions in CIEEM (Ref. 35).	Not applicable¹¹. <u>Low adverse</u>: An increase in contamination risk of 1 risk level in the risk matrix, e.g. land that has a low contamination risk in the baseline becomes a moderate / low risk. <u>Low beneficial</u>: A reduction in contamination risk of 1 risk level in the risk matrix, e.g. land that has a moderate / low contamination risk in the baseline becomes a low risk.
Very low	<i>Geology and Mineral Resources</i> Very minor measurable change in geological feature and designation attributes, quality, or vulnerability; very minor loss of, or alteration to, one (maybe more) key characteristics, features, or elements. <i>Contamination</i> 1) human health: contaminant concentrations substantially below levels outlined in relevant screening criteria (category 4 screening	Not applicable¹¹. <u>Very low adverse</u>: An increase in contamination risk of none or 1 risk level in the risk matrix, e.g. land that

Magnitude of Impact	Definition	Demonstrated in the construction and post-construction CSM as risk level changes defined as follows
	levels) in SP1010. No requirement for control measures to reduce risks to human health and make land suitable for intended use; 2) surface water: refer to sensitivity criteria in LA113 (Ref. 33) and TAG Unit A3 (Ref. 34); 3) groundwater: refer to sensitivity criteria in LA113 (Ref. 33) and TAG Unit A3 (Ref. 34); and 4) ecological sites: refer to impact descriptions in CIEEM (Ref. 35).	has a low contamination risk in the baseline becomes a moderate / low risk, but only slightly worse. <u>Very low beneficial:</u> A reduction in contamination risk of none or 1 risk level in the risk matrix, e.g. land that has a moderate / low contamination risk in the baseline becomes a low risk, but only slightly better.

Significance of Effects

14.4.30 The classification and likely significance of the effect resulting from the magnitude of impact and receptor sensitivity will be evaluated in accordance with the matrix shown in **Table 14-6**.

Table 14-6: Classification of effects

Magnitude	Value and sensitivity of receptor			
	Very Low	Low	Medium	High
Very Low	Negligible	Negligible	Minor	Minor
Low	Negligible	Minor	Minor	Moderate
Medium	Minor	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

14.4.31 Short-term / temporary effects are anticipated during construction, and long-term / permanent effects are anticipated during operation.

14.4.32 Major effects are considered significant; moderate effects can be significant, or not significant, based on specific scenarios and/or professional judgement; and minor and negligible effects are considered not significant.

Assumptions, Limitations and Uncertainties

14.4.33 The construction phase will include enabling works required to facilitate the Proposed Development. The screening assessment undertaken to date assumes that during the construction phase, earthworks involving excavation of materials may be required anywhere within the Preliminary Order Limits ('worst-case' situation).

14.4.34 The assessment has been based on the collation and evaluation of readily available third-party information and documentation provided by Groundsure (Ref. 58), the Environment Agency, the BGS, existing reports for the Proposed Development, and other data sources made available. This information will be reviewed and updated as part of the assessment.

14.4.35 The identification of land contamination sites for the assessment of Parts 1a and 1b has been determined from Geo-environmental Desk Studies and associated Groundsure data (Ref. 44 and Ref. 45). It should be noted that the Preliminary Order Limits differ in places to the Part 1b boundary in the Geo-environmental Desk Study (Ref. 45) (see also **Table 14-3**). Where there are significant differences in the boundary (and therefore no full Groundsure environmental data or historical mapping available), the identification of potential contaminated land sites is based on a review of current mapping and landfill data provided by the Environment Agency. However, the absence of a full set of environmental data and historical mapping may present a data gap. The Part 1b Geo-environmental Desk Study will be updated and data gaps will be addressed in the ES.

- 14.4.36 Any data from BGS sources (Ref. 59) are included on the basis that *'The BGS do not guarantee that their website, or any content on it, will be free from errors or omissions'*.
- 14.4.37 A desk-based qualitative Ground Engineering Risk Assessment is included in **Appendix 14-PD-5** in PEI Report **Volume 4**. Further assessment of structural and engineering geology will be undertaken as part of a future GIR and GDR. These will be prepared during detailed design of the Proposed Development prior to construction.
- 14.4.38 The assessment should be read based on the legislation, statutory requirements and industry good practice applicable at the time of the assessment. Any subsequent changes in this legislation, guidance or design may necessitate the findings to be reassessed in the light of these circumstances.
- 14.4.39 Environmental Permit(s) (under the Environmental Permitting (England and Wales) Regulations 2016 (Ref. 15)) for the Proposed Development will control operational discharges as appropriate, such as Water Discharge Activity Permit, Groundwater Activity Permit and Flood Risk Activity Permit. There is a possibility that these consents may be sought directly through DCO. An Outline Operational Environmental Management Plan (Outline OEMP) will be developed (likely to be multiple bespoke OEMPs for particular elements of the Proposed Development) and submitted with the Development Consent Order (DCO) Application, this will set out the operational parameters for the Proposed Development, and how environmental effects, will be controlled, either through specific mitigation measures or through established licencing or permitting processes.
- 14.4.40 A Detailed OEMP(s) would be produced following grant of the DCO and prior to the start of operation (e.g. as part of a requirement attached to the DCO).

14.5 Project-Wide Environmental Design, Standards and Management

- 14.5.1 This section outlines embedded environmental design, standards and/or management measures in relation to ground conditions that are relevant for the whole area within the Preliminary Order Limits. Where embedded environmental design, standards and/or management measures are specific to a Proposed Development Part(s), these have been identified in the upcoming sections.

Construction Phase

Design of the Proposed Development

- 14.5.2 The Proposed Development has been designed, as far as reasonably possible, to:

- a. Avoid known sources of contamination, environmentally sensitive areas, groundwater and surface water abstractions, and historical and active landfills where practicable; and
- b. Consider and avoid important geological features or resources (where practicable).

Ground Investigations

- 14.5.3 An initial scope for preliminary ground investigation will be developed and undertaken prior to determination of the DCO consent in order to provide an initial indication of the concentrations of contaminants within key areas of the Proposed Development.
- 14.5.4 It is anticipated that any intrusive ground investigation additional to design-related ground investigation (to address any residual data gaps or better delineate identified potential contaminant linkages), quantitative risk assessment, remediation and validation, would be undertaken post-determination of the DCO consent (as part of detailed ground investigation).
- 14.5.5 The ground investigations will validate the assumptions made in the initial CSM and preliminary risk assessment (PRA) presented in **Appendix 14-PD-2** in PEI Report **Volume 4**, and provide site-specific data upon which to base a generic quantitative risk assessment (Stage 1, Tier 2 under LCRM (Ref. 22)).
- 14.5.6 As part of these ground investigations, groundwater and ground / mine gas monitoring will be undertaken. There is the potential for ground gas to accumulate within future buildings (including the Minworth AWTP (Part 1a), pumping stations and outfall structure (along Part 2) and the Water Treatment Works (WTW) (Part 4a)) based on the presence of nearby landfills, industrial land uses, potential Made Ground and the underlying Coal Measures geology. Where risks are deemed to be unacceptable, further detailed quantitative risk assessment and, if required, detailed remediation strategies will be developed accordingly (post- determination of the DCO consent).
- 14.5.7 A detailed assessment of structural and engineering geology will be undertaken as part of a GIR and GDR which will include further details regarding geotechnical and ground engineering considerations including ground stability, and with respect to the ground engineering hazards identified in **Appendix 14-PD-5** in PEI Report **Volume 4**. Whilst it is acknowledged that the ground investigation and subsequent risk assessments will be undertaken, it is important to indicate that the outcome of these investigations will define whether additional assessment or mitigation may be required.

Hydrogeological Assessment

- 14.5.8 A more detailed understanding of groundwater across the Preliminary Order Limits will be obtained from the ground investigation and monitoring to inform the baseline conditions.
- 14.5.9 The hydrogeological baseline and potential impacts from the Proposed Development on groundwater is provided in **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**. The pollution risk to groundwater during construction and operation of the Proposed Development is considered, as well as potential impacts on groundwater levels and flows from any excavations that may be required. Potential impacts on GWDTE, groundwater abstractions and any associated SPZ, and WFD groundwater bodies are considered, where relevant.
- 14.5.10 Based on a review of the current site information available, the preliminary conclusions (presented in **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**) on the groundwater conditions across the Preliminary Order Limits are considered to be in accordance with the requirements of the EIA regs. For any areas where ground investigation information on groundwater levels is not available, a worst-case assumption of the potential presence of shallow groundwater was considered as appropriate. However further update on the groundwater conditions will be required during the ES stage in light of additional site-specific information that will be available at that stage.
- 14.5.11 Appropriate mitigation measures in relation to hydrogeological receptors are identified in **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**, which may include measures such as an appropriate dewatering scheme to be developed prior to construction to demonstrate that there is an effective strategy to manage water arising from the construction operations and, where required, sufficient proposals to treat the water prior to controlled discharge. Any proposed discharges associated with the works will be in accordance with an approved Environmental Permit.
- 14.5.12 Monitoring during and after construction will be undertaken as dewatering has the potential to generate a cone of influence which could locally lower groundwater levels, alter flow regimes and potentially mobilise and spread existing contamination.

Geologically Designated Sites

- 14.5.13 Construction of the Proposed Development has the potential to affect geologically designated sites should they be within or adjacent to the Preliminary Order Limits. Engagement will be required prior to determination of the DCO consent with relevant parties, particularly for potential impacts associated with the construction phase.

Mineral Resources

- 14.5.14 Construction of the Proposed Development has the potential to affect existing mineral resources (MSA / MCA). This could occur through sterilisation of the resource through direct excavation or through temporary and/or permanent severance or isolation that may occur during the construction phase, possibly continuing through to its operational phase. Further consultation is planned with the mineral planning authorities prior to determination of the DCO consent to discuss the minerals assessment findings at this stage and any management or mitigation measures that may be required where mineral resources and potential impacts have been identified. Further to these discussions, the mineral assessments included in this chapter may be revised in the ES.

Construction Environmental Management Plan

- 14.5.15 An Outline Construction Environmental Management Plan (Outline CEMP) will form part of the ES, which will describe the mitigation measures identified in the ES to be followed and to be carried forward to a Detailed CEMP(s) prior to construction and would need to be approved with the relevant discharging authority(ies) prior to the commencement of construction.
- 14.5.16 The main mitigation measure to prevent adverse effects on ground conditions during all phases of the Proposed Development will be to ensure good site practice and management through the development and adherence to the CEMP. Measures contained within the CEMP will limit the potential for dispersal and accidental releases of potential contaminants, soil derived dusts and uncontrolled run-off to occur during construction. For example, the CEMP will set out how material is to be excavated, segregated, and stockpiled to minimise the potential for run-off, soil quality degradation and wind dispersal of dusts. The CEMP will also establish procedures for dealing with unexpected soil or groundwater contamination that may be encountered.

Soil and Groundwater Pollution Control Mitigation

- 14.5.17 Direct effects on the aquifers associated with the superficial deposits and bedrock geology, SPZ and any potential groundwater abstractions may occur due to the intrusive nature of earthworks, trenching, trenchless construction and piling (as required). The significance of the disturbance would be dependent on the depth of the aquifer unit in relation to the proposed depth of the intrusive works and the nature of any potential contaminated soil or groundwater in the area. The extent of the earthworks will be determined as part of the detailed design.
- 14.5.18 It is assumed that some works such as the bank raising works / weirs may require piling. There will be a requirement to avoid creating flow paths between potentially contaminated soils and/or groundwater in the underlying

superficial deposits and the bedrock aquifers. A preliminary Foundation Works Risk Assessment (FWRA) / piling risk assessment will be undertaken prior to determination of the DCO consent. Piling options will be defined during the detailed design stage and following completion of the Proposed Development specific ground investigations and a FWRA / piling risk assessment would be carried out.

- 14.5.19 A Pollution Prevention and Emergency Response Plan will be in place as part of the CEMP prior to the commencement of the construction phase. The plan will outline key pollution mitigation measures to be adopted including a Control of Substances Hazardous to Health (COSHH), fuel inventory and key contacts to be notified in the event of a significant pollution incident, which may subsequently lead to the contamination of controlled waters or soils. All bulk fuel and COSHH items will be stored in accordance with the relevant Environment Agency GPP or where GPP are yet to be published, PPG notes (Ref. 40) (withdrawn but widely considered good practice) and storage regulations – refer to **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**. Tanks and dispensing pumps will be locked when not in use to prevent unauthorised access.
- 14.5.20 Any hazardous materials will be stored in designated locations with specific measures to prevent leakage and the release of their contents. This will include a requirement for storage areas to be set back at an appropriate distance from surface water features / drains to prevent any uncontrolled discharge (and take into consideration the positions of any groundwater abstraction wells). Storage areas will also be on an impermeable base with an impermeable bund that has no outflow and is of adequate capacity to contain at least 110% of the contents.
- 14.5.21 Only well-maintained plant will be used during construction to minimise the potential for accidental pollution from leaking machinery or damaged equipment. Static machinery and plant are expected to be stored in hardstanding areas when not in use and, where necessary, to make use of drip trays beneath oil tanks / engines / gearboxes / hydraulics. Spill response kits containing equipment that is appropriate to the types and quantities of materials being used and stored during construction will be maintained within the Preliminary Order Limits for the duration of the works.
- 14.5.22 The design of the Proposed Development includes measures that would contain and control releases of contaminants to ground and the surface drainage network. A Drainage Management Strategy for the Proposed Development will be developed prior to construction and employed temporarily during the construction phase and required permanent measures will remain in place during the operational phase of the Proposed Development.

Dealing with Potential Contamination during Construction

14.5.23 Potential impacts specific to construction workers during site preparation and construction works have been scoped out as they would be controlled and mitigated by the following measures and through working in accordance with CIRIA C811(Ref. 29):

- a. Measures to minimise dust generation;
 - i. Provision of Personal Protective Equipment (PPE), such as gloves, barrier cream, overalls etc. to minimise direct contact with soils;
 - ii. Provision of adequate hygiene facilities and clean welfare facilities for all construction site workers;
 - iii. Monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces, i.e., to suitably trained personnel only, and use of specialist PPE, where necessary; and
 - iv. Preparation and adoption of a site and task specific health and safety plan as is required under Health and Safety legislation.

14.5.24 The Outline CEMP will set out procedures for dealing with unexpected soil or groundwater contamination that may be encountered and will be developed as part of the Detailed CEMP(s). This would typically require affected works to stop to enable appropriate people to be notified, and further characterisation and risk assessment to be undertaken before remediation or mitigation proposals are agreed with all stakeholders. In the event that unacceptable risks are identified, or encountered during construction, and routing through these areas is unavoidable, specific mitigation measures may be required in the form of treating / remediating contamination e.g. contamination that may be associated with potentially contaminative sites identified as part of the assessment, notably the areas of the Preliminary Order Limits in proximity to nearby landfilling activities, Made Ground and industrial areas. This will be confirmed based on information gathered through ground investigation. Any remediation works, or the removal of contaminated soils or waters associated with the construction of the Proposed Development would be expected to result in the enhancement of the local environment. Any such need will be defined by the ground investigations and interpretive assessments that follow.

14.5.25 There is potential for asbestos to be present in any Made Ground within the Preliminary Order Limits. Any Made Ground found to be contaminated with asbestos will require suitable management if it is to be retained on-site or removed (in line with the CL:AIRE, CAR-SOIL 2012 (Ref. 38)). As asbestos only presents a risk if it is disturbed, it is considered that the highest risk would be during the construction of the Proposed Development. Asbestos

management will be included within the Detailed CEMP(s) and the Site Waste Management Plan (SWMP).

Excavated Materials and Waste Management

- 14.5.26 Assumptions have been adopted as to how the earthworks stage of the construction of the Proposed Development will be undertaken (see **Chapter 3: The Proposed Development** in PEI Report **Volume 2**). Additional information will be included as part of the detailed design. Consideration will be given as part of the design process as to what excavated materials could be re-used or would be required for the various components of the Proposed Development, and what materials would be surplus and would require either disposal or onward management to ensure appropriate re-use. The overall aim of the earthworks design will be to achieve an optimal cut-fill balance, as far as practicable within the project constraints, to avoid or minimise the creation of surplus material. The volume of disposal of soil waste, contaminated or otherwise, to landfill sites would be mitigated by minimisation during design of the overall quantities of surplus material generated during construction, and by optimising the cut to fill balance as part of the design.
- 14.5.27 Re-use of excavated materials during construction of the Proposed Development will be governed by either a Materials Management Plan (MMP) developed in accordance with the CL:AIRE DoWCoP, 2011 (Ref. 39), Waste Framework Directive (Ref. 6), an environmental permit or a relevant exemption. The CL:AIRE DoWCoP is a voluntary framework for excavated materials management and re-use. Following this framework results in a level of information being generated that is sufficient to demonstrate to the regulator that excavated material can be re-used appropriately and is suitable for its intended use. It demonstrates that excavated material which has been used in a development is not waste. The MMP details the procedures and measures that will be taken to classify, test, excavate, track, store, verify, re-use and where necessary selectively dispose of excavated materials that will be encountered during the construction of the Proposed Development.
- 14.5.28 In order to manage and monitor waste, including any waste spoil generated on-site, an Outline SWMP will be developed and submitted as part of the Outline CEMP, setting out how waste streams would need to be estimated and monitored and goals set with regards to the waste produced. The contractor's Detailed CEMP would be required to incorporate the principles of the SWMP as appropriate.
- 14.5.29 Where there is a requirement to dispose of surplus excavated materials off-site as waste, the material will be characterised to determine firstly whether it is hazardous or non-hazardous waste in accordance with the Environment Agency's Technical Guidance WM3 (Ref. 41). Once this is established, the

appropriate disposal facility will be determined and Waste Acceptance Criteria (WAC) analysis undertaken, if required.

14.5.30 See also **Chapter 18: Materials and Waste** in PEI Report **Volume 2** for further information

Operational Phase

14.5.31 The following standard operational practices will be adopted and hence matters for operational phase have therefore been scoped out of the assessment:

- a. Operational materials, including chemicals, fuels and oils, will be stored within secure locations within operational facilities within the Proposed Development. In common with other modern infrastructure developments, secondary containment appropriate to the level of risk will be included in the detailed design;
- b. The design of the Proposed Development will include measures that would contain and control releases of contaminants to ground and surface and foul drainage network. Drainage control for the Proposed Development is considered further in **Chapter 22: Water Environment and Flood Risk** in PEI Report **Volume 2**;
- c. Any required Environmental Permit(s) under the Environmental Permitting (England and Wales) Regulations 2016 (Ref. 15) for the Proposed Development will control operational discharges as appropriate, such as Water Discharge Activity Permit, Groundwater Activity Permit and Flood Risk Activity Permit. There is a possibility that these consents may be sought directly through DCO. An Outline OEMP(s) will be developed and as part of the ES which will set out the operational parameters for the Proposed Development and how any environmental effects will be controlled – either through specific mitigation measures or through established licencing or permitting processes; and
- d. A Detailed OEMP would be produced following grant of the DCO and prior to the start of operation.

Part 1a: Minworth AWTP

14.6 Part 1a: Minworth AWTP

- 14.6.1 This section provides a focussed description of the environmental baseline, embedded environmental design, standards and management measures (if in addition to the aforementioned) and presents the preliminary assessment of likely significant effects in relation to ground conditions for Part 1a (Minworth AWTP) of the Proposed Development.

Baseline Conditions

- 14.6.2 This section describes the baseline environmental characteristics with specific reference to ground conditions.

Existing Baseline

- 14.6.3 Existing baseline information for Part 1a is detailed within the Geo-environmental Desk Study (Ref. 44). This includes information regarding the following:
- a. geology and geomorphological features, (and also mapped on **Figure 14-PD-2** and **Figure 14-PD-3**, provided in PEI Report **Volume 3**);
 - b. hydrogeology including aquifer classification, groundwater SPZ, groundwater abstractions;
 - c. hydrology including surface watercourses features, drainage, surface water abstractions and nitrate vulnerable zones;
 - d. radon;
 - e. identification of potentially contaminated sites (current and historical), including regulated activities within these sites (such as, but not limited to, regulated processes, waste management facilities, hazardous substances and pollution incidents); and
 - f. historical development.
- 14.6.4 An initial CSM and PRA (contamination risks) for Part 1a are included within the Geo-environmental Desk Study (Ref. 44).
- 14.6.5 A review of potential ground instability hazards and outline geotechnical constraints for Part 1a is included within **Appendix 14-PD-5** in PEI Report **Volume 4**.
- 14.6.6 Key baseline information for the ground conditions assessment is summarised below.

Geologically Designated Sites

- 14.6.7 Mapping available from online sources including the Department for Environment, Food and Rural Affairs (DEFRA) Multi-agency Geographic Information for the Countryside (MAGIC) Map (Ref. 46), the Local Development Plans detailed in section 14.2, Local Geological Groups and other websites (Ref. 47 and Ref. 52) and LERC data have been used to

identify geological SSSI, LGS (previously referred to as RIGS), and GCR sites within the study area.

- 14.6.8 No geological SSSI, LGS or GCR sites have been identified in the study area for Part 1a. Minworth Sewage Works has been identified from the LERC data to be a Potential Site of Importance (Ref. 47). However, further information provided in **Chapter 13: Ecology – Terrestrial** in PEI Report **Volume 2** indicates that this of ornithological interest, rather than of geological interest.
- 14.6.9 Further stakeholder engagement has been undertaken with the relevant local authorities and local geological groups to confirm and identify any additional geological sites within the Preliminary Order Limits and study area (see Table 2 in **Appendix 14-PD-1, Volume 4** of the PEI Report). No information was received from Birmingham City Council at the time of writing.

Mineral Resources

- 14.6.10 Mapping available in the Adopted Warwickshire Minerals and Waste Local Plan 2018-2032 (Ref. 60) (also covers Part 1a which is part of the Birmingham City Council area) has been used to identify MSA and MCA within Part 1a:
- 14.6.11 An unconsolidated sand and gravel MSA has been identified in Part 1a and the study area.
- 14.6.12 Further stakeholder engagement has been undertaken with local authorities to request Geographic Information System (GIS) plans of the MSA (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**). No plans were received from Warwickshire County Council at the time of writing.

Contaminated Land

Potential Land Contamination Sources

- 14.6.13 Potential areas of contamination have been identified from the Geo-environmental Desk Study for Part 1a (Ref. 44). These are also listed in **Appendix 14-PD-4** in PEI Report **Volume 4** and illustrated on **Figure 14-PD-6** in PEI Report **Volume 3**.
- 14.6.14 In accordance with paragraph 14.4.17 and the detailed methodology presented in **Appendix 14-PD-3** in PEI Report **Volume 4**, baseline risk scores have been calculated for each of the identified potential areas of contamination. Those that have a baseline risk score of three or more will be considered for further risk and impact assessment. This will be undertaken and presented within the ES.
- 14.6.15 Potential areas of contamination with baseline risk scores of three and above are presented in **Table 14-7**.

Table 14-7: Part 1a: Potential areas of contamination with baseline risk scores of three and above

ID reference	Potential area of contamination	Proximity	Land use class	Vertical alignment	Baseline risk score
P1a-CL01	Current sewage treatment plant, including historical tanks, tramway / railway	Zone 1	Class 2	Cut / at grade	4
P1a-CL02	Curdworth sludge beds; tramway/railway	Zone 1	Class 2	Cut / at grade	4
P1a-CL03	Minworth landfill and infilled gravel pit; former on-site sewage beds; infilled ponds; electricity substations and pumping stations; tramway / railway	Zone 1	Class 3	Cut / at grade	5
P1a-CL05	Curdworth drying beds	Zone 1	Class 2	Cut / at grade	4
P1a-CL06	Infilled watercourse / sewage carrier	Zone 1	Class 1	Cut / at grade	3
P1a-CL07	Infilled watercourse / sewage carrier	Zone 1	Class 1	Cut / at grade	3
P1a-CL08	Infilled watercourse / sewage carrier	Zone 1	Class 1	Cut / at grade	3
P1a-CL09	Tramway / railway	Zone 1	Class 2	Cut / at grade	4

Potential Pathways

14.6.16 Potential pathways for potential contamination associated with Part 1a of the Proposed Development have been identified in the Geo-environmental Desk Study for Part 1a (Ref. 44). These are summarised as follows:

- a. Ingestion of contaminants within soils and soil derived dust;
- b. Dermal contact with contaminants in soil and soil derived dust;
- c. Inhalation of contaminants in soil-derived dust;
- d. Inhalation of soil-derived and groundwater derived vapours and/or ground gas;
- e. Dermal contact with contaminated groundwater;
- f. Leaching and migration of contaminants from soil in the unsaturated zone into groundwater in the underlying aquifers;
- g. Migration of contaminants via preferential pathways to groundwater in the underlying aquifers;
- h. Lateral migration of contaminants in groundwater through soils and bedrock with discharge to surface water as base flow;
- i. Migration of contaminants along preferential pathways such as installed services followed by discharge to surface watercourses;
- j. Direct contact of on-site property with contaminants in soils, perched water, and/or groundwater;
- k. Direct contact of off-site property with contaminants in migrating groundwater; and
- l. Lateral / vertical migration through soils followed by accumulation in enclosed spaces and potentially explosive conditions.

Identified Receptors

14.6.17 Potential receptors which could be impacted upon by the potential contamination sources associated with Part 1a of the Proposed Development have been identified in the Geo-environmental Desk Study for Part 1a (Ref. 44). These are summarised as follows:

- a. Human health including:
 - i. Current and future on-site commercial / industrial users (current and future AWTP site personnel);
 - ii. Construction workers associated with proposed AWTP and future maintenance workers; however, the exposure of construction and maintenance workers is considered to be acute, while the land contamination risk assessment is based on chronic risks associated with exposure over a longer period of time, and

therefore risks to construction and maintenance workers are not considered in the CSM; and

- iii. Off-site residential users in village of Cudworth.
- b. Controlled waters including:
 - i. Superficial Secondary A aquifers;
 - ii. Bedrock Secondary B aquifers;
 - iii. Superficial Undifferentiated aquifer; and
 - iv. On-site and off-site surface water courses and features.
- c. Buildings and infrastructure including:
 - i. Proposed AWTP;
 - ii. Current Minworth treatment plant; and
 - iii. Off-site residential properties.

Ground Instability

14.6.18 A review of potential hazards that may give rise to ground instability associated with natural ground subsidence and historical resource exploitation has been undertaken for Part 1a. This is presented in **Appendix 14-PD-5** in PEI Report **Volume 4**.

Future Baseline

14.6.19 The ground conditions are unlikely to be altered over time without a significant change of land use.

14.6.20 With respect to land contamination, any future development within the study area is subject to the requirements of policy. This requires consideration of the potential for contamination to be present and where unacceptable risks are present, the developer will be required to carry out remediation to ensure the development is suitable for its proposed use.

14.6.21 Furthermore, natural attenuation processes have the potential to mitigate risks over time from any existing sources of contaminants present within soil and groundwater.

14.6.22 Changes in groundwater abstractions could affect the groundwater flow regime and climate change could influence the future baseline conditions, due to changes in the amount of rainfall, groundwater levels, recharge, and flow. However, these changes are long-term and are not predictable at this stage.

Environmental Design, Standards and Management

14.6.23 No further environmental design, standards and/or management in addition to those presented in section 14.5 have been identified.

Assessment of Effects and Significance

14.6.24 This section provides the preliminary assessment of likely significant effects, including determining the level of significance, for Part 1a (Minworth AWTP) of the Proposed Development. The assessments take into consideration the embedded mitigation indicated within section 14.5. Where applicable, the requirement for additional mitigation measures and/or monitoring is identified to avoid, prevent, reduce, or, if possible, offset any identified significant adverse effects on the environment.

Construction Phase

Geologically Designated Sites

14.6.25 No geologically designated sites have been identified within Part 1a. Therefore, no assessment is required.

Mineral Resources

14.6.26 Temporary compounds and laydown areas will be required at a number of locations within Part 1a within the identified MSA (paragraph 14.6.11).

14.6.27 In accordance with paragraphs 14.4.11 and 14.4.12 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be very low adverse as there will be a temporary sterilisation of the resource during construction works, but it is expected to be on a very local scale. The sensitivity of the mineral resource is medium based on the likelihood that 'significant' mineral reserves are not present in the limited development area.

14.6.28 Based on the above, there is likely to be a temporary effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.6.29 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.6.30 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Contaminated Land

14.6.31 It is anticipated (prior to the full risk and impact assessment to be undertaken and reported in the ES, as detailed in **Appendix 14-PD-3** in PEI Report **Volume 4**, section 1.4) that there may be some potential for temporary adverse effects during the construction phase, particularly in areas where potential unacceptable contamination may be encountered, such as the landfill and industrial areas. Further assessment will be undertaken to evaluate whether these could be likely significant effects, or if they could be mitigated by the embedded and good practice measures.

14.6.32 It is anticipated that if any remediation is carried out on potentially contaminated sites identified within the Preliminary Order Limits, there will, in most instances, be overall permanent, long-term beneficial effects post-construction, which may be assessed to be significant (this will be determined through more detailed assessment as part of the ES). If required, (subject to ground investigation within the Preliminary Order Limits), site-specific permanent remediation measures, which will focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage. These measures will reduce risks to human health, controlled waters, buildings and infrastructure and ecological / geological sites from contamination, gas and vapours in the ground (the principal risks in this area), to an acceptable level.

Ground Instability

14.6.33 In **Appendix 14-PD-5** in PEI Report **Volume 4**, Made Ground and superficial deposits comprising alluvium indicated within Part 1a were identified as being potentially compressible and susceptible to uneven settlement which may affect the Proposed Development during the construction phase. However, this is an engineering consideration that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Operational Phase

Mineral Resources

14.6.34 Permanent works are required across Part 1a as described in **Chapter 3: The Proposed Development** in PEI Report **Volume 2** within identified MSA (paragraph 14.6.11).

14.6.35 In accordance with paragraphs 14.4.13 and 14.4.14 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be low adverse as although there will be a permanent sterilisation of the resource during operation, the Proposed Development is on a local scale compared to the large extent of the mineral resource area. Furthermore, mitigation identified in paragraph 14.5.14 will be adhered to. The sensitivity of the mineral resource is medium based on the likelihood that 'significant' mineral reserves are not present in the limited development area.

14.6.36 Based on the above, there is likely to be a permanent effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.6.37 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.6.38 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Ground Instability

14.6.39 In **Appendix 14-PD-5** in PEI Report **Volume 4**, Made Ground and superficial deposits comprising alluvium indicated within Part 1a were identified as being potentially compressible and susceptible to uneven settlement which may affect the Proposed Development. However, this is an engineering consideration that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Summary

14.6.40 **Table 14-8** summarises the residual ground conditions effects of Part 1a of the Proposed Development.

Table 14-8: Summary of residual effects – Part 1a

Description of impact	Sensitivity of receptor	Nature of effect / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
Construction Phase						
Mineral Resources: Effects occur where temporary construction compounds and laydown areas are proposed within the MSA / MCA. In such cases, there will be a temporary sterilisation of the resource.	Medium	Adverse, temporary, local	Very low adverse	Minor	None	Minor Adverse (Not Significant)
Contaminated Land: It is anticipated that there may be some potential for adverse effects during the construction phase, particularly in areas where there is a risk that contamination may be encountered (i.e. in and around potential areas of contamination identified as having a baseline risk score of 3 – 5 (see Table 14-7 and Figure 14-PD-6 in PEI Report Volume 3). A full risk and impact assessment will be	Very low to high sensitivity receptors including: Human health; Controlled waters; Buildings and infrastructure; and Ecological / geological sites. Subject to ongoing assessment	Adverse, temporary, local	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES

Description of impact	Sensitivity of receptor	Nature of effect / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
undertaken and reported in the ES to confirm this.	and reporting in the ES					
Ground Instability: Adverse uneven settlement effects may occur during the construction phase in areas underlain by potentially compressible soils.	Engineering consideration that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					
Operational Phase						
Mineral Resources: Effects occur where the MSA / MCA is underlying the footprint of the permanent works of the Proposed Development, with area(s) of minerals becoming sterilised.	Medium	Adverse, permanent, local	Low adverse	Minor	None	Minor Adverse (Not Significant)
Ground Instability: Adverse total and uneven settlement effects may occur during the operational phase in areas underlain by potentially compressible soils.	Engineering consideration that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					

Part 1b: Minworth to Atherstone Pipeline

14.7 Part 1b: Minworth to Atherstone Pipeline

- 14.7.1 This section provides a focussed description of the environmental baseline, embedded environmental design, standards and management measures (if in addition to the aforementioned) and presents the preliminary assessment of likely significant effects in relation to ground conditions for Part 1b (Minworth to Atherstone Pipeline) of the Proposed Development.

Baseline Conditions

- 14.7.2 This section describes the baseline environmental characteristics with specific reference to ground conditions.
- 14.7.3 It has been necessary to divide Part 1b of the Proposed Development into further subsections to effectively characterise the baseline conditions. Reference should be made to **Figure 14-PD-1** provided in PEI Report **Volume 3** for a visual representation:
- a. Part 1a and Part 1b Section A: Minworth to River Tame, Lea Marston ('Part 1a and Part 1b (Section A)');
 - b. Part 1B Section B: River Tame, Lea Marston to Hurley Lane, Hurley ('Part 1b (Section B)'); and
 - c. Part 1B Section C: Hurley Lane, Hurley to Atherstone ('Part 1b (Section C)').

Existing Baseline

- 14.7.4 Existing baseline information for some of the Preliminary Order Limits for Part 1b is detailed within the Geo-environmental Desk Study (Ref. 45). This includes information regarding the following:
- a. geology and geomorphological features, (and also mapped on **Figure 14-PD-2** and **Figure 14-PD-3**, provided in PEI Report **Volume 3**);
 - d. hydrogeology including aquifer classification, groundwater SPZ, groundwater abstractions;
 - e. hydrology including surface watercourses features, drainage, surface water abstractions and nitrate vulnerable zones;
 - f. radon;
 - g. identification of potentially contaminated sites (current and historical), including regulated activities within these sites (such as, but not limited to, regulated processes, waste management facilities, hazardous substances and pollution incidents); and
 - h. historical development.
- 14.7.5 An initial CSM and PRA (contamination risks) for Part 1b are included within the Geo-environmental Desk Study (Ref. 45).

14.7.6 A review of potential ground instability hazards and outline geotechnical constraints for Part 1b is included within **Appendix 14-PD-5** in PEI Report **Volume 4**.

14.7.7 Key baseline information for the ground conditions assessment is summarised below.

Geologically Designated Sites

14.7.8 Mapping available from online sources including DEFRA's MAGIC Map (Ref. 46), the Local Development Plans detailed in section 14.2, information from Local Geological Groups and other websites (Ref. 47, Ref. 48, Ref. 49, Ref. 50 and Ref. 52) and the LERC data have been used to identify geological SSSI, LGS and GCR within the study area.

14.7.9 LGS are detailed in **Table 14-9**. No geological SSSI or GCR sites have been identified in the study area for Part 1b.

14.7.10 Further stakeholder engagement has been undertaken with local authorities and local geological groups to confirm and identify any additional geological sites within the Preliminary Order Limits and study area (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**):

- a. Warwickshire Geological Conservation Group indicated that their database for SSSI and LGS can be used to find the relevant information (Ref. 48 and Ref. 49); and
- b. No information was received from Birmingham City Council, Warwickshire County Council or North Warwickshire Borough Council at the time of writing.

Table 14-9: Geological sites within Part 1b of the Proposed Development and the study area

Part	Geological site	Location
Part 1b (Section C)	Baxterley Quarry LGS (Ref. 48 and LERC)	5 m north of Part 1b (Section C), east of Baxterley.
	Purley Quarry LGS (Ref. 48 and LERC)	200 m south of Part 1b (Section C), south-west of Atherstone.
	Rawn Hill LGS (Ref. 48 and LERC)	130 m south-east of Part 1b (Section C), south of Atherstone.

14.7.11 The geologically designated sites are presented on **Figure 14-PD-4** in PEI Report **Volume 3**.

Mineral Resources

14.7.12 Mapping available on the adopted Warwickshire Minerals and Waste Local Plan 2018-2032 (Ref. 60) has been used to identify MSA and MCA within Part 1b.

14.7.13 **Table 14-10** summarises the MSAs located within Part 1b.

Table 14-10: Mineral Safeguarding Areas within Part 1b

Authority	Commodity	Location
Warwickshire County Council	Crushed rock	Eastern-most extent (east of Baxterley).
	Unconsolidated sand and gravel	Predominantly in the western-most extent, up to south east of Hurley. Locally in the central and eastern portion of Part 1b.
	Coal – shallow	Shallow coal localised in the eastern portion (east of Baxterley to west of Merevale Lake).
	Brick clay	Eastern and central extent of Part 1b – east of Marston to Atherstone.
	Building stone	Majority of the central and eastern extent of Part 1b – east of Marston to Atherstone.

14.7.14 Further stakeholder engagement has been undertaken with local authorities to request GIS plans of the MSA (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**). No plans were received from Warwickshire County Council at the time of writing.

Contaminated Land

Potential Land Contamination Sources

14.7.15 Potential areas of contamination have been identified from the Geo-environmental Desk Study for Part 1b (Ref. 45). These are also listed in **Appendix 14-PD-4** in PEI Report **Volume 4** and illustrated on **Figure 14-PD-6** in PEI Report **Volume 3**.

14.7.16 In accordance with paragraph 14.4.17 and the detailed methodology presented in **Appendix 14-PD-3** in PEI Report **Volume 4**, baseline risk scores have been calculated for each of the identified potential areas of contamination. Those that have a baseline risk score of three or more will be considered for further risk and impact assessment. This will be undertaken and presented within the ES.

14.7.17 Potential areas of contamination with baseline risk scores of three and above are presented in **Table 14-11**.

Table 14-11: Part 1b: Potential areas of contamination with baseline risk scores of three and above

ID reference	Potential area of contamination	Proximity	Land use class	Vertical alignment	Baseline risk score
P1b-CL01	Spring Farm; potentially infilled pond	Zone 1	Class 1	Cut / at grade	3
P1b-CL02	Dunton Island historical landfill; current aggregates facility	Zone 3	Class 3	Cut / at grade	3
P1b-CL03	Land West Of Hams Lane and Woodhouse Farm historic landfills	Zone 1	Class 3	Cut / at grade	5
P1b-CL04	Dog Kennel Belt historic landfill	Zone 2	Class 3	Cut / at grade	4
P1b-CL05	Land East Of Hams Lane historic landfill	Zone 1	Class 3	Cut / at grade	5
P1b-CL06	CEGB Site No.2, River Tame Purification Lake, ARC Lea Marston historic landfills	Zone 1	Class 3	Cut / at grade	5
P1b-CL07	Lea Farm	Zone 1	Class 1	Cut / at grade	3
P1b-CL08	Sewage works	Zone 1	Class 2	Cut / at grade	4
P1b-CL09	Birmingham Road historical landfill	Zone 1	Class 3	Cut / at grade	5
P1b-CL10	Infilled ground	Zone 1	Class 1	Cut / at grade	3
P1b-CL11	Birmingham Road historical landfills	Zone 2	Class 3	Cut / at grade	4
P1b-CL12	Coton Quarry and West of Coton Road historic landfill	Zone 2	Class 3	Cut / at grade	4
P1b-CL14	The Cedars light industrial facility; former concrete works	Zone 1	Class 2	Cut / at grade	4
P1b-CL15	Coton Hall Quarry No.2	Zone 3	Class 3	Cut / at grade	3
P1b-CL16	Saw Mill	Zone 2	Class 3	Cut / at grade	4
P1b-CL17	Infilled ground / Made Ground; opencast mining	Zone 1	Class 1	Cut / at grade	3
P1b-CL18	Infilled ground / Made Ground	Zone 1	Class 1	Cut / at grade	3
P1b-CL20	Biogen waste processing facility; infilled ground and former quarry	Zone 1	Class 3	Cut / at grade	5

ID reference	Potential area of contamination	Proximity	Land use class	Vertical alignment	Baseline risk score
P1b-CL23	Old Hall Farm	Zone 1	Class 1	Cut / at grade	3
P1b-CL25	Meadow Farms	Zone 1	Class 1	Cut / at grade	3
P1b-CL26	Brook End Farm	Zone 1	Class 1	Cut / at grade	3
P1b-CL29	Boult Bee's Farm, including tanks	Zone 1	Class 1	Cut / at grade	3
P1b-CL33	Potential farm	Zone 1	Class 1	Cut / at grade	3
P1b-CL34	Railway line	Zone 2	Class 2	Cut / at grade	3
P1b-CL35	Railway line	Zone 1	Class 1	Cut / at grade	3
P1b-CL36	National Grid Hams Hall Substation	Zone 2	Class 2	Cut / at grade	3
P1b-CL37	Light industrial estate	Zone 2	Class 2	Cut / at grade	3
P1b-CL38	Outwoods Golf Club historical landfill	Zone 1	Class 3	Cut / at grade	5
P1b-CL39	Garage	Zone 1	Class 2	Cut / at grade	4
P1b-CL40	Railway line	Zone 1	Class 2	Cut / at grade	4
P1b-CL41	Unspecified tank	Zone 1	Class 2	Cut / at grade	4
P1b-CL43	Old clay pit	Zone 1	Class 1	Cut / at grade	3
P1b-CL45	Unspecified tank	Zone 2	Class 2	Cut / at grade	3
P1b-CL49	Solar farm	Zone 1	Class 2	Cut / at grade	4

Potential Pathways

14.7.18 Potential pathways for potential contamination associated with Part 1b of the Proposed Development have been identified in the Geo-environmental Desk Study for Part 1b (Ref. 45). These are summarised as follows:

- a. Ingestion of contaminants in soil and soil-derived dust;
- b. Dermal contact with contaminants in soil and soil derived dust where soils (and contaminants) are exposed at the surface;
- c. Inhalation of contaminants in soil-derived dust from areas where soils (and contaminants) are exposed at the surface;
- d. Inhalation of soil-derived and groundwater derived vapours and/or ground gas;
- e. Dermal contact with contaminated groundwater;
- f. Ingestion of contaminated groundwater;
- g. Leaching and migration of contaminants from soil in the unsaturated zone into groundwater in the underlying aquifers;
- h. Migration of contaminants via preferential pathways to groundwater;
- i. Lateral migration of contaminants in groundwater through soils and bedrock with discharge to surface water as base flow;
- j. Migration of contaminants along preferential pathways such as installed services followed by discharge to surface watercourses;
- k. Direct contact of on-site property with contaminants in soils, perched water, and/or groundwater;
- l. Direct contact of off-site property with contaminants in migrating groundwater; and
- m. Lateral / vertical migration through soils followed by accumulation in enclosed spaces and potentially explosive conditions.

Identified Receptors

14.7.19 Potential receptors which could be impacted upon by the potential contamination sources associated with Part 1b of the Proposed Development have been identified in the Geo-environmental Desk Study for Part 1b (Ref. 45). These are summarised as follows:

- a. Human health including:
 - i. Members of the public using / accessing existing fields and highways, occupants / users of off-site residential, commercial and community properties; and
 - ii. Construction workers associated with proposed pipeline and future maintenance workers; however, the exposure of construction and maintenance workers is considered to be acute,

while the land contamination risk assessment is based on chronic risks associated with exposure over a longer period of time, and therefore risks to construction and maintenance workers are not considered in the conceptual site model.

- b. Controlled waters including:
 - i. Superficial secondary (undifferentiated) aquifers;
 - ii. Superficial unproductive strata;
 - iii. Bedrock Principal aquifers;
 - iv. Superficial and bedrock Secondary A aquifers;
 - v. Bedrock Secondary B aquifers;
 - vi. Surface water courses and features; and
 - vii. Surface water abstractions.
- c. Buildings and infrastructure including:
 - i. Proposed pipeline and associated infrastructure;
 - ii. Existing buildings and infrastructure and
 - iii. Foundations for all infrastructure and services.

Ground Instability

14.7.20 A review of potential hazards that may give rise to ground instability associated with natural ground subsidence and historical resource exploitation has been undertaken for Part 1b and this is presented in **Appendix 14-PD-5** in PEI Report **Volume 4**.

Future Baseline

14.7.21 As indicated in sections 14.6.19 to 14.6.22.

Environmental Design, Standards and Management

14.7.22 No further environmental design, standards and/or management in addition to those presented in section 14.5.

Assessment of Effects and Significance

14.7.23 This section provides the preliminary assessment of likely significant effects, including determining the level of significance, for Part 1b (Minworth to Atherstone Pipeline) of the Proposed Development. The assessments take into consideration the embedded mitigation indicated within section 14.5. Where applicable, the requirement for additional mitigation measures and/or monitoring is identified to avoid, prevent, reduce, or, if possible, offset any identified significant adverse effects on the environment.

Construction Phase

Geologically Designated Sites

14.7.24 Three LGS were identified within the study area of Part 1b.

14.7.25 Two of the LGS, Purley Quarry LGS and Rawn Hill LGS, are located 200 m south and 130 m south-east of Part 1b (Section C), respectively. These are considered too distant from the Proposed Development to be impacted¹².

14.7.26 Baxterley Quarry LGS is located 5 m north of Part 1b (Section C), east of Baxterley. Given its proximity to the Proposed Development, there may be a potential impact during construction, and this has been assessed further in the paragraphs below.

14.7.27 In accordance with paragraph 14.4.8 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be low adverse based on the proximity of Baxterley Quarry LGS to the Proposed Development, and that the Proposed Development in this part is related to only an access road and the likelihood of damage or disturbance of the LGS. The sensitivity of the LGS is low based on its designation of local importance. It should also be considered that development can lead to an opening of a geological formation or interest which in turn represents a beneficial effect (i.e. aiding understanding and interpretation). Further engagement will be required with relevant parties, particularly for potential impacts associated during the construction phases (paragraph 14.5.15).

14.7.28 Based on the above, there is potentially a permanent adverse effect which is considered to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.7.29 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.7.30 As there is no additional mitigation, enhancement or monitoring required the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Mineral Resources

14.7.31 Temporary compounds and laydown areas will be required at a number of locations within Part 1b that are within MSA (**Table 14-10**).

14.7.32 In accordance with paragraphs 14.4.11 and 14.4.12 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be very low adverse as

¹² As indicated previously, impacts from the Proposed Development on geological features will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors.

there will be a temporary sterilisation of the resource during construction works, but it is expected to be on a very local scale. The sensitivity of the mineral resource is medium based on the likelihood that 'significant' mineral reserves are not present in the development area.

- 14.7.33 Based on the above, there is likely to be a temporary effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

- 14.7.34 No additional mitigation, enhancement or monitoring is required.

Residual Effect

- 14.7.35 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Contaminated Land

- 14.7.36 As indicated in **Table 14-3**, a Geo-Environmental Desk Based Assessment is currently not available for Part 1b, therefore, the potential for land contamination and the relevant assessment will be undertaken in the ES.

Ground Instability

- 14.7.37 In **Appendix 14-PD-5** in PEI Report **Volume 4**, superficial deposits comprising alluvium and glaciolacustrine silts and clays within Part 1b were identified as having a high shrink-swell, compressibility and uneven settlement potential which may affect the Proposed Development during the construction phase. In addition, there are known and potential risk from historical surface and underground mining. However, this is an engineering consideration that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Operational Phase

Mineral Resources

- 14.7.38 Permanent works are required across Part 1b as described in **Chapter 3: The Proposed Development** in PEI Report **Volume 2** within MSA (**Table 14-10**).
- 14.7.39 In accordance with paragraphs 14.4.13 and 14.4.14 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be low adverse as although there will be a permanent sterilisation of the resource during operation, the Proposed Development is on a local scale (linear pipeline) across a large extent of the mineral resource areas. Furthermore, mitigation identified in paragraph 14.5.14 will be adhered to. The sensitivity of the mineral resource is considered to be medium based on the likelihood that 'significant' mineral reserves are not present in the development area.

14.7.40 Based on the above, there is likely to be a permanent effect which is considered to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.7.41 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.7.42 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Ground Instability

14.7.43 In **Appendix 14-PD-5** in PEI Report **Volume 4**, superficial deposits comprising alluvium and glaciolacustrine silts and clays within Part 1b were identified as having a high shrink-swell, compressibility and uneven settlement potential which may affect the Proposed Development. In addition, there are known and potential risk from historical surface and underground mining. However, this is an engineering consideration that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Summary

14.7.44 **Table 14-12** summarises the residual ground conditions effects of Part 1b of the Proposed Development.

Table 14-12: Summary of residual effects – Part 1b

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of effect (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
<i>Construction Phase</i>						
Geologically Designated Sites: Construction effects may result in damage, disturbance or removal of geological features of interest.	Baxterley Quarry LGS – low	Adverse, permanent, local	Low adverse	Minor	None	Minor Adverse (Not Significant)
Mineral Resources: Effects occur where temporary construction compounds and laydown areas are proposed within the MSA / MCA. In such cases, there will be a temporary sterilisation of the resource.	MSA – Medium	Adverse, temporary, local	Very low adverse	Minor	None	Minor Adverse (Not Significant)
Contaminated Land: It is anticipated that there may be some potential for adverse effects during the construction phase, particularly in areas where there is a risk that contamination may be encountered (i.e. in and around potential areas of contamination identified as	Very low to high sensitivity receptors including: Human health; Controlled waters;	Adverse, temporary, local	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of effect (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
having a baseline risk score of 3 – 5 (see Table 14-7 and Figure 14-PD-6 in PEI Report Volume 3). A full risk and impact assessment will be undertaken and reported in the ES to confirm this.	Buildings and infrastructure; and Ecological / geological sites. Subject to ongoing assessment and reporting in the ES					
Ground Instability: Uneven settlement and shrink-swell effects may occur during the construction phase in areas underlain by susceptible soils. Ground instability from historical mining may also occur.	Engineering consideration that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					
Operational Phase						
Mineral Resources: Effects occur where the MSA / MCA is underlying the footprint of the permanent works of the Proposed Development, with	Medium	Adverse, permanent, local	Low adverse	Minor	None	Minor Adverse (Not Significant)

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of effect (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
area(s) of minerals becoming sterilised.						
Ground Instability: Uneven settlement and shrink-swell effects may occur during the construction phase in areas underlain by susceptible soils. Ground instability from historical mining may also occur.	Engineering consideration that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					

Part 2: Works to the Coventry, Oxford and Grand Union Canals

14.8 Part 2: Works to the Coventry, Oxford and Grand Union canals

14.8.1 This section provides a focussed description of the environmental baseline, embedded environmental design, standards and management measures (if in addition to the aforementioned) and presents the preliminary assessment of likely significant effects in relation to ground conditions for Part 2 (Works to the Coventry, Oxford and Grand Union canals) of the Proposed Development.

Baseline Conditions

14.8.2 This section describes the baseline environmental characteristics with specific reference to ground conditions.

14.8.3 Part 2 of the Proposed Development (Indicative Work Areas only) has been divided into further subsections to effectively characterise the baseline conditions. Reference should be made to **Figure 14-PD-1** provided in PEI Report **Volume 3** for a visual representation:

- a. Section A: Coventry Canal – Atherstone to Nuneaton Road, Hartshill; ‘Part 2 (Section A)’;
- b. Section B: Coventry Canal – Nuneaton Road, Hartshill to Chilvers Rise, Nuneaton; ‘Part 2 (Section B)’;
- c. Section C: Coventry Canal – Chilvers Rise, Nuneaton to Oxford Canal - Hawkesbury Pumping Station; ‘Part 2 (Section C)’;
- d. Section D: Oxford Canal – Hawkesbury Pumping Station to Sowe Common Sports Ground; ‘Part 2 (Section D)’;
- e. Section E: Oxford Canal – Sowe Common Sports Ground to Brinklow Road, Ansty; ‘Part 2 (Section E)’;
- f. Section F: Oxford Canal – Brinklow Road, Ansty to Cathiron Lane, Hungerford; ‘Part 2 (Section F)’;
- g. Section G: Oxford Canal – Cathiron Lane, Hungerford to Brownsover Road, Newbold on Avon; ‘Part 2 (Section G)’;
- h. Section H: Oxford Canal – Brownsover Road, Newbold on Avon to Hillmorton Lane, Rugby; ‘Part 2 (Section H)’;
- i. Section I: Oxford Canal – Hillmorton Pumping Station to Crick Road (A428), Hillmorton; ‘Part 2 (Section I)’;
- j. Section K: Grand Union Canal – Junction of Oxford and Grand Union Canal to Norton Junction; ‘Part 2 (Section K)’;
- k. Section L: Grand Union Canal – Norton Junction to Diamond Bridge; ‘Part 2 (Section L)’;

- l. Section M: Grand Union Canal – Diamond Bridge to Weedon Sewage Treatment Works; 'Part 2 (Section M)';
- m. Section N: Grand Union Canal – Weedon Sewage Treatment Works to Camp Hill, Bugbrooke; 'Part 2 (Section N)';
- n. Section Q: Grand Union Canal – Stoke Road, Stoke Bruerne to Bozenham Mill Lane, Grafton Regis; 'Part 2 (Section Q)';
- o. Section S: Grand Union Canal – Station Road, Castlethorpe to Marsh Drive, Milton Keynes; 'Part 2 (Section S)';
- p. Section T: Grand Union Canal – Marsh Drive, Milton Keynes to Childs Way, Milton Keynes; 'Part 2 (Section T)';
- q. Section U: Grand Union Canal – Childs Way, Milton Keynes to A5, Milton Keynes; 'Part 2 (Section U)'; and
- r. Section V: Grand Union Canal – A5, Milton Keynes to A4146, Milton Keynes; 'Part 2 (Section V)'.

Existing Baseline

- 14.8.4 Existing baseline information for Part 2 is detailed within Section 2 of **Appendix 14-PD-2** in PEI Report **Volume 4**. This includes information regarding the following:
- a. geology and geomorphological features, including **Figure 14-PD-2** and **Figure 14-PD-3**, provided in PEI Report **Volume 3**;
 - b. soil chemistry;
 - c. hydrogeology including aquifer classification, groundwater vulnerability, groundwater SPZ, groundwater abstractions;
 - d. hydrology including surface watercourses / features, drainage, surface water abstractions and nitrate vulnerable zones;
 - e. radon (where buildings are present within the Preliminary Order Limits);
 - f. identification of potentially contaminated sites (current and historical), including regulated activities within these sites (such as, but not limited to, regulated processes, waste management facilities, hazardous substances and pollution incidents); and
 - g. historical development.
- 14.8.5 An initial CSM and PRA (contamination risks) for Part 2 are included within Section 2 of **Appendix 14-PD-2** in PEI Report **Volume 4**.
- 14.8.6 A review of potential ground instability hazards and outline geotechnical constraints for Part 2 is included within **Appendix 14-PD-5** in PEI Report **Volume 4**.
- 14.8.7 Key baseline information for the ground conditions assessment is summarised below.

Geologically Designated Sites

- 14.8.8 Mapping available from online sources including DEFRA's MAGIC Map (Ref. 46), the Local Development Plans detailed in section 14.2, Local Geological Groups and other websites (Ref. 48, Ref. 49, Ref. 50 and Ref. 52) and the LERC data have been used to identify geological SSSI, LGS and GCR within the study area.
- 14.8.9 Geological SSSI and LGS are detailed in **Table 14-13**. No GCR sites have been identified in the study area for Part 2.
- 14.8.10 Further stakeholder engagement has been undertaken with local authorities and local geological groups to confirm and identify any additional geological sites within the Preliminary Order Limits and study area (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**):
- Warwickshire Geological Conservation Group indicated that their database for SSSI and LGS can be used to find the relevant information (Ref. 48 and Ref. 49);
 - Nuneaton and Bedworth Borough Council and Rugby Borough Council confirmed that they do not hold information on geological sites; and
 - No information was received from Warwickshire County Council, North Warwickshire Borough Council, West Northamptonshire Council (specifically on geological sites), Milton Keynes City Council or Coventry City Council at the time of writing.

Table 14-13: Geological sites within Part 2 of the Proposed Development and the study area

Part	Geological site	Location
Part 2 (Section A)	Rawn Hill LGS (Ref. 48 and LERC)	5 m south of the northern-most area of Part 2 (Section A), Atherstone.
	Steppy Lane Section LGS (Ref. 48 and LERC)	90 m west from the central area of Part 2 (Section A), south of Atherstone.
Part 2 (Section B)	Jee's Quarry LGS (Ref. 48 and LERC)	95 m west of the northern area of Part 2 (Section B), north-west of Nuneaton.
	Judkins Quarry LGS (Ref. 48 and LERC)	Adjacent to the southern area of Part 2 (Section B), north-west of Nuneaton.
	Midland Quarry LGS (Ref. 48 and LERC)	15 m west of the southern area of Part 2 (Section B), within Nuneaton.

- 14.8.11 The geologically designated sites are presented on **Figure 14-PD-4** in PEI Report **Volume 3**.

Mineral Resources

- 14.8.12 Mapping available on the following plans has been used to identify MSA and MCA within Part 2:

- a. Adopted Warwickshire Minerals and Waste Local Plan 2018-2032 (Ref. 60);
- b. Coventry Development Plan Policies Map¹³ (Ref. 53);
- c. Northamptonshire County Council – Minerals and Waste Local Plan (Ref. 54); and

14.8.13 Milton Keynes Council – Minerals Local Plan (Ref. 55). Table 14-14 summarises the MSAs located within Part 2

Table 14-14: Mineral Safeguarding Areas within Part 2

Authority	Commodity	Location
Warwickshire County Council	Crushed rock	Northern-most extent of Part 2, from Atherstone to Nuneaton: Part 2 (Section A) and (Section B).
	Unconsolidated sand and gravel	Majority of Part 2 from Atherstone to Rugby: - Part 2 (Section A), (Section B), (Section F), (Section H) and (Section I). - Only locally in Part 2 (Section C), (Section D), (Section E) and (Section G).
	Coal – shallow	Shallow coal south-east of Nuneaton and north-east of Coventry: South of Part 2 (Section B) and locally along (Section D).
	Brick clay	Atherstone to north-east of Coventry: - In close proximity or slightly overlapping in northern / central area of Part 2 (Section A). - Southern portion of Part 2 (Section B). - Northern-most area of Part 2 (Section D).
	Building stone	From Atherstone to Nuneaton overlapping majority of Part 2: Part 2 (Section A), (Section B), (Section C), (Section D). North-west of Rugby:

¹³ Does not identify MSA within the Preliminary Order Limits for Part 2

Authority	Commodity	Location
		Eastern-most extent of Part 2 (Section F) and (Section G).
	Cement raw materials	North-west of Rugby: Part 2 (Section G).
West Northamptonshire Council	Sand and gravel	From north-west of Daventry to the west of Northampton: - Majority / all of Part 2 (Section K), (Section L), (Section M) and (Section N). North-west of Milton Keynes: - Southern extent of Part 2 (Section Q). - Western extent of Part 2 (Section S).
Milton Keynes Council	Sand and gravel	South-east of Milton Keynes: All / some of Part 2 (Section U) and (Section V).

14.8.14 Further stakeholder engagement has been undertaken with the local authorities to request GIS plans of the MSA (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**). West Northamptonshire Council has provided plans which are presented on **Figure 14-PD-5** in PEI Report **Volume 3**. No plans were received from Warwickshire County Council or Milton Keynes Council at the time of writing.

Contaminated Land

Potential Land Contamination Sources

14.8.15 Potential areas of contamination have been identified in Section 2 of **Appendix 14-PD-2** in PEI Report **Volume 4** for Part 2. These are also listed in **Appendix 14-PD-4** in PEI Report **Volume 4** and illustrated on **Figure 14-PD-6** in PEI Report **Volume 3**.

14.8.16 In accordance with paragraph 14.4.17 and the detailed methodology presented in **Appendix 14-PD-3** in PEI Report **Volume 4**, baseline risk scores have been calculated for each of the identified potential areas of contamination. Those that have a baseline risk score of three or more will be considered for further risk and impact assessment. This will be undertaken and presented within the ES.

14.8.17 Potential areas of contamination with baseline risk scores of three and above are presented in **Appendix 14-PD-6** in PEI Report **Volume 4**. A summary list of the potential areas of contamination identified includes the following:

- a. Current and former railway lines and sidings, cuttings;
- b. Current and historical canal infrastructure: wharfs, marinas, pumping stations and engine houses;
- c. Former Hawkesbury Power Station;
- d. Gas works and associated infrastructure;
- e. Industrial works and estates (including historical smithies, breweries, unspecified factories, brick works, depots, distribution centres, industrial yards and recycling centres);
- f. Historical landfill sites and refuse heaps;
- g. Commercial areas (including builders' merchants);
- h. Farms;
- i. Infilled land (old canal, pits, quarries, historical workings);
- j. Sewage works;
- k. Car garages and petrol filling stations;
- l. Tanks (standalone);
- m. Cemeteries;
- n. Electrical distribution centres and substations; and
- o. Historical rifle ranges.

Potential Pathways

14.8.18 Potential pathways for potential contamination associated with Part 2 of the Proposed Development have been identified in Section 2 of **Appendix 14-PD-2** in PEI Report **Volume 4**. These are summarised as follows:

- a. Direct contact / ingestion of contaminants within Made Ground / natural soils, in addition to soil derived dust, and groundwater;
- b. Inhalation of organic vapours from Made Ground / natural soils, soil derived dust and groundwater;
- c. Inhalation of asbestos fibres;
- d. Leaching of soluble contaminants and vertical / lateral migration of mobile contaminants into shallow groundwater;
- e. Vertical / lateral migration of groundwater through Made Ground and superficial deposits into underlying bedrock aquifer;
- f. Lateral groundwater migration and direct run-off to nearby surface waters;
- g. Vertical / lateral migration of ground gases to indoor and outdoor air and migration of ground gases into enclosed spaces (inhalation / asphyxiation / explosion);

- h. Direct contact of buried concrete (proposed upgraded pumping station and outfall structure) with contaminated Made Ground / natural soils and aggressive ground conditions (pH and sulphate) / direct contact of services and supply pipes with contaminated soils; and
- i. Mine gas - generation and migration through bedrock and superficial deposits and/or fissures, faults into confined spaces (asphyxiation / explosion).

Identified Receptors

14.8.19 Potential receptors which could be impacted upon by the potential contamination sources associated with Part 2 of the Proposed Development are detailed in Section 2 of **Appendix 14-PD-2** in PEI Report **Volume 4**. These are summarised as follows:

- a. Human health including:
 - i. Current and future on-site commercial / industrial users (including, but not limited to canal-side businesses);
 - ii. Current and future on-site public open space and agricultural users (including, but not limited to waterway users, towpath users, boaters, mooring¹⁴, marinas);
 - iii. Current and future on-site residential users;
 - iv. Off-site residential users;
 - v. Off-site public open space users; and
 - vi. Off-site industrial and commercial site users.
- b. Controlled waters including:
 - i. Bedrock Principal aquifers;
 - ii. Superficial and bedrock Secondary A aquifers;
 - iii. Bedrock Secondary B aquifers;
 - iv. Superficial and bedrock Secondary Undifferentiated aquifers;
 - v. Superficial and bedrock Unproductive strata;
 - vi. Groundwater abstractions;
 - vii. Surface water courses and features; and
 - viii. Surface water abstractions.
- c. Buildings and infrastructure including:
 - i. Proposed pumping stations, outfall structure and transfer locks; and

¹⁴ The glossary defines various types of moorings provided along the Trust's network. The types of moorings to be assessed as sensitive receptors for Ground Conditions will be considered and addressed in the ES.

- ii. Foundations for all infrastructure and services.
- d. Ecological / geological sites including
 - i. Local sites; and
 - ii. International / national / regional sites.

Ground Instability

14.8.20 A review of potential hazards that may give rise to ground instability associated with natural ground subsidence and historical resource exploitation has been undertaken for Part 2 and this is presented **Appendix 14-PD-5** in PEI Report **Volume 4**.

Future Baseline

14.8.21 As indicated in sections 14.6.19 to 14.6.22.

Environmental Design, Standards and Management

14.8.22 No further environmental design, standards and/or management in addition to those presented in section 14.5.

Assessment of Effects and Significance

14.8.23 This section provides the preliminary assessment of likely significant effects, including determining the level of significance, for Part 2 (Works to the Coventry, Oxford and Grand Union Canals) of the Proposed Development. The assessments take into consideration the embedded mitigation indicated within section 14.5. Where applicable, the requirement for additional mitigation measures and/or monitoring is identified to avoid, prevent, reduce, or if possible, offset any identified significant adverse effects on the environment.

Construction Phase

Geologically Designated Sites

14.8.24 Five geologically designated sites (LGS) were identified within the study area of Part 2.

14.8.25 Two of the LGS, Steppy Lane Section LGS and Jee's Quarry LGS, are located 90 m west from the central area of Part 2 (Section A), and 95 m west of the northern area of Part 2 (Section B), respectively. These are considered too distant from the Proposed Development to be impacted¹⁵.

¹⁵ As indicated previously, impacts from the Proposed Development on geological features will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors.

Three LGS are located in close proximity to the Proposed Development:

- a. Rawn Hill LGS is located 5 m south of the northern-most area of Part 2 (Section A), Atherstone;
- b. Judkins Quarry LGS is located adjacent to the southern area of Part 2 (Section B), north-west of Nuneaton; and
- c. Midland Quarry LGS is located 15 m west of the southern area of Part 2 (Section B), within Nuneaton.

14.8.26 There may be potential impacts during construction; these have been assessed further in the paragraphs below.

14.8.27 In accordance with paragraph 14.4.8 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be medium adverse based on the proximity to the Proposed Development and the likelihood of damage, disturbance or removal. The sensitivity of the LGS is assessed to be low based on their designation of local importance. It should also be considered that development can lead to an opening of a geological formation or interest which in turn represents a beneficial effect (i.e. aiding understanding and interpretation). Further engagement will be required with relevant parties, particularly for potential impacts associated during the construction phases (paragraph 14.5.15).

14.8.28 Based on the above, there is potentially an permanent effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.8.29 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.8.30 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Mineral Resources

14.8.31 Temporary compounds and laydown areas will be required at a number of locations within Part 2 within MSA (**Table 14-14**).

14.8.32 In accordance with paragraphs 14.4.12 and 14.4.12 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be very low adverse as there will be a temporary sterilisation of the resource during construction works, but it is expected to be on a very local scale. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that 'significant' mineral reserves are not present in the development area.

14.8.33 Based on the above, there is likely to be a temporary effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.8.34 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.8.35 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Contaminated Land

14.8.36 It is anticipated (prior to the full risk and impact assessment to be undertaken and reported in the ES, as detailed in **Appendix 14-PD-3** in PEI Report **Volume 4**, Section 1.4) that there may be some potential for temporary adverse effects during the construction phase, particularly in areas where potential unacceptable contamination may be encountered, such as the landfill and industrial areas. Further assessment will be undertaken to evaluate whether these could be likely significant effects, or if they could be mitigated by the embedded and good practice measures.

14.8.37 It is anticipated that if any remediation is carried out on potentially contaminated sites identified within the Preliminary Order Limits, there will, in most instances, be overall permanent, long-term beneficial effects post-construction, which may be assessed to be significant (this will be determined through more detailed assessment as part of the ES). If required, (subject to ground investigation within the Preliminary Order Limits), site-specific permanent remediation measures, which will focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage. These measures will reduce risks to human health, controlled waters, buildings and infrastructure and ecological / geological sites from contamination, gas and vapours in the ground (the principal risks in this area), to an acceptable level.

Ground Instability

14.8.38 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 2 underlain by alluvium, peat deposits or glaciolacustrine silts and clays were identified as having a high shrink-swell, compressibility and uneven settlement potential which may affect the Proposed Development during construction. Areas of potential slope instability in Part 2 were identified where there are embankments and cuttings of notable size and gradient, underlain by shale bedrock. In addition, there are known and potential risks from historical surface and underground mining. The canal, being over 200 years old and not built to modern engineering would also be susceptible to ground instability. These are engineering considerations that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Operational Phase

Mineral Resources

14.8.39 Permanent works are required across Part 2 as described in **Chapter 3: The Proposed Development** in PEI Report **Volume 2** within MSA (**Table 14-14**).

14.8.40 In accordance with paragraphs 14.4.13 and 14.4.13 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be low adverse as although there will be a permanent sterilisation of the resource during operations, the Proposed Development is on a local scale (linear development, along a large proportion of existing canal network) across the large extent of the mineral resource areas. Furthermore, mitigation identified in paragraph 14.5.14 will be adhered to. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that 'significant' mineral reserves are not present in the development area.

14.8.41 Based on the above, there is likely to be a permanent effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.8.42 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.8.43 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Ground Instability

14.8.44 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 2 underlain by alluvium, peat deposits or glaciolacustrine silts and clays were identified as having a high shrink-swell, compressibility and uneven settlement potential which may affect the Proposed Development. Areas of potential slope instability in Part 2 were identified where there are embankments and cuttings of notable size and gradient, underlain by shale bedrock. In addition, there are known and potential risks from historical surface and underground mining. These are engineering considerations that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Summary

14.8.45 **Table 14-15** summarises the residual ground conditions effects of Part 2 of the Proposed Development, following the implementation of any identified additional mitigation, enhancement and/or monitoring.

Table 14-15: Summary of residual effects – Part 2

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
Construction Phase						
Geologically Designated Sites: Construction effects may result in damage, disturbance or removal of geological features of interest.	Raw Hill LGS, Judkins Quarry LGS and Midland Quarry LGS – low	Adverse, permanent, local	Medium adverse	Minor	None	Minor Adverse (Not Significant)
Mineral Resources: Effects occur where temporary construction compounds and laydown areas are proposed within the MSA / MCA. In such cases, there will be a temporary sterilisation of the resource.	MSA – Medium	Adverse, temporary, local	Very low adverse	Minor	None	Minor Adverse (Not Significant)
Contaminated Land: It is anticipated that there may be some potential for adverse effects during the construction phase, particularly in areas where there is a risk that contamination may be encountered (i.e. in and	Very low to high sensitivity receptors including: Human health; Controlled waters;	Adverse, temporary, local	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
around potential areas of contamination identified as having a baseline risk score of 3 – 5 (see Table 14-14 and Figure 14-PD-6 in PEI Report Volume 3). A full risk and impact assessment will be undertaken and reported in the ES to confirm this.	Buildings and infrastructure; and Ecological / geological sites. Subject to ongoing assessment and reporting in the ES					
Ground Instability: Uneven settlement, shrink-swell, and slope instability effects may occur during the construction phase in areas underlain by susceptible geological materials. Ground instability associated with known and potential areas of historical mining may also occur.	Engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					
Operational Phase						
Mineral Resources: Effects occur where the MSA / MCA is underlying the	Medium	Adverse, permanent, local	Low adverse	Minor	None	Minor Adverse (Not Significant)

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
footprint of the permanent works of the Proposed Development, with area(s) of minerals becoming sterilised.						
Ground Instability: Uneven settlement, shrink-swell, and slope instability effects may occur during the construction phase in areas underlain by susceptible geological materials. Ground instability associated with known and potential areas of historical mining may also occur.	Engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					

Part 3: Works to Daventry and Drayton Reservoirs

14.9 Part 3: Works to Daventry and Drayton Reservoirs

- 14.9.1 This section provides a focused description of the environmental baseline, embedded environmental design, standards and management measures (if in addition to the aforementioned) and presents the preliminary assessment of likely significant effects in relation to ground conditions for Part 3 (Works to Daventry and Drayton Reservoirs) of the Proposed Development.

Baseline Conditions

- 14.9.2 This section describes the baseline environmental characteristics with specific reference to ground conditions.

Existing Baseline

- 14.9.3 Existing baseline information for Part 3 is detailed within Section 3 of **Appendix 14-PD-2** in PEI Report **Volume 4**. This includes information regarding the following;
- a. geology and geomorphological features, including **Figure 14-PD-2** and **Figure 14-PD-3**, provided in PEI Report **Volume 3**;
 - b. soil chemistry;
 - c. hydrogeology including aquifer classification, groundwater vulnerability, groundwater SPZ, groundwater abstractions;
 - d. hydrology including surface watercourses and features, drainage, surface water abstractions and nitrate vulnerable zones;
 - e. radon (where buildings are present within the Preliminary Order Limits);
 - f. identification of potentially contaminated sites (current and historic), including regulated activities within these sites (such as, but not limited to, regulated processes, waste management facilities, hazardous substances and pollution incidents); and
 - g. historical development.
- 14.9.4 An initial CSM and PRA (contamination risks) for Part 3 are included within Section 3 of **Appendix 14-PD-2** in PEI Report **Volume 4**.
- 14.9.5 A review of potential ground instability hazards and outline geotechnical constraints for Part 3 is included within **Appendix 14-PD-5** in PEI Report **Volume 4**.
- 14.9.6 Key baseline information for the ground conditions assessment is summarised below.

Geologically Designated Sites

- 14.9.7 Mapping available from online sources including DEFRA's MAGIC Map (Ref. 46), the Local Development Plans detailed in section 14.2, Local Geological

Groups and other websites (Ref. 52) and the LERC data have been used to identify geological SSSI, LGS and GCR within the study area.

14.9.8 No geological SSSI, LGS or GCR sites have been identified in the study area for Part 3.

14.9.9 Further stakeholder engagement has been undertaken with local authorities and local geological groups to confirm and identify any additional geological sites within the Preliminary Order Limits and study area (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**).

14.9.10 No information was received from West Northamptonshire Council (specifically on geological sites) at the time of writing.

Mineral Resources

14.9.11 Mapping available on Northamptonshire County Council – Minerals and Waste Local Plan (Ref. 54), has been used to identify MSA and MCA within Part 3.

14.9.12 An unconsolidated sand and gravel MSA has been identified across Part 3 and the study area, although it is absent generally in the south.

14.9.13 Further stakeholder engagement has been undertaken with local authorities to request GIS plans of the MSA (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**). West Northamptonshire Council have provided plans and these are presented on **Figure 14-PD-5** in PEI Report **Volume 3**.

Contaminated Land

Potential Land Contamination Sources

14.9.14 Potential areas of contamination have been identified in Section 3 of **Appendix 14-PD-2** in PEI Report **Volume 4** for Part 3. These are also listed in **Appendix 14-PD-4** in PEI Report **Volume 4** and illustrated on **Figure 14-PD-6** in PEI Report **Volume 3**.

14.9.15 In accordance with paragraph 14.4.17 and the detailed methodology presented in **Appendix 14-PD-3** in PEI Report **Volume 4**, baseline risk scores have been calculated for each of the identified potential areas of contamination. Those that have a baseline risk score of three or more will be considered for further risk and impact assessment. This will be undertaken and presented within the ES.

14.9.16 Potential areas of contamination with baseline risk scores of three and above are presented in **Table 14-16**.

Table 14-16: Part 3: Potential areas of contamination with baseline risk scores of three and above

ID reference	Potential area of contamination	Proximity	Land use class	Vertical alignment	Baseline risk score
P3-P2-SK-CL01	Dismantled railway and historical cuttings	Zone 1	Class 2	Cut / at grade	4
P3-P2-SK-CL02	Historical Landfill Site - Drayton Fields Farm	Zone 2	Class 3	Cut / at grade	4
P3-P2-SK-CL03	Historical Landfill Site – Ashby Road	Zone 1	Class 3	Cut / at grade	5
P3-P2-SK-CL04	Historical Landfill Site - Daventry Sewage Works	Zone 3	Class 3	Cut / at grade	3
P3-P2-SK-CL05	Wharf Farm	Zone 1	Class 1	Cut / at grade	3
P3-P2-SK-CL10	Heartlands Business Park, including tanks, electrical substations	Zone 1	Class 2	Cut / at grade	4
P3-P2-SK-CL11	Drayton Fields Industrial Estate	Zone 1	Class 2	Cut / at grade	4
P3-P2-SK-CL14	Current and historical wharf	Zone 1	Class 1	Cut / at grade	3
P3-P2-SK-CL15	Historical engine house and unspecified heap	Zone 1	Class 2	Cut / at grade	4
P3-P2-SK-CL16	Historical pump house, including historical tanks	Zone 1	Class 1	Cut / at grade	3
P3-P2-SK-CL17	Unspecified pit / old quarry	Zone 1	Class 1	Cut / at grade	3
P3-P2-SK-CL19	Rifle range	Zone 1	Class 2	Cut / at grade	4

Potential Pathways

14.9.17 Potential pathways for the potential contamination associated with Part 3 of the Proposed Development have been identified in Section 3 of **Appendix 14-PD-2** in PEI Report **Volume 4**. These are summarised as follows:

- a. Direct contact / ingestion of contaminants within Made Ground / natural soils, in addition to soil derived dust, and groundwater;
- b. Inhalation of organic vapours from Made Ground / natural soils, soil derived dust and groundwater;
- c. Inhalation of asbestos fibres;
- d. Leaching of soluble contaminants and vertical / lateral migration of mobile contaminants into shallow groundwater;
- e. Vertical / lateral migration of groundwater through Made Ground and superficial deposits into underlying bedrock aquifer;
- f. Lateral groundwater migration and direct run-off to nearby surface waters;
- g. Vertical / lateral migration of ground gases to indoor air (inhalation); and
- h. Direct contact of services and supply pipes with contaminated soils.

Identified Receptors

14.9.18 Potential receptors which could be impacted upon by the potential contamination sources associated with Part 3 of the Proposed Development are detailed in Section 3 of **Appendix 14-PD-2** in PEI Report **Volume 4**. These are summarised as follows:

- a. Human health:
 - i. Current and future on-site public open space and agricultural users (including, but not limited to waterway users, towpath users, boaters, mooring¹⁶, marinas);
 - ii. Off-site residential users;
 - iii. Off-site public open space users; and
 - iv. Off-site industrial and commercial site users.
- b. Controlled waters:
 - i. Superficial and bedrock Secondary A aquifers;
 - ii. Superficial and bedrock Secondary undifferentiated aquifers;
 - iii. Superficial and bedrock Unproductive strata;

¹⁶ The glossary defines various types of moorings provided along the Trust's network. The types of moorings to be assessed as sensitive receptors for Ground Conditions will be considered and addressed in the ES.

- iv. Groundwater abstractions;
 - v. Surface water courses; and
 - vi. Surface water abstractions.
- c. Buildings and infrastructure:
- i. Proposed structures; and
 - ii. Services and foundations.
- d. Ecological / geological sites:
- i. Local sites.

Future Baseline

14.9.19 As indicated in sections 14.6.19 to 14.6.22.

Environmental Design, Standards and Management

14.9.20 No further environmental design, standards and/or management in addition to those presented in section 14.5.

Assessment of Effects and Significance

14.9.21 This section provides the preliminary assessment of likely significant effects, including determining the level of significance, for Part 3 (Works to Daventry and Drayton Reservoirs) of the Proposed Development. The assessments take into consideration the embedded mitigation indicated within section 14.5. Where applicable, the requirement for additional mitigation measures and/or monitoring is identified to avoid, prevent, reduce, or if possible offset, any identified significant adverse effects on the environment.

Construction Phase

Geologically Designated Sites

14.9.22 No geologically designated sites have been identified within Part 3. Therefore, no assessment is required.

Mineral Resources

14.9.23 Temporary compounds will be required at some locations within Part 3 within identified MSA (paragraph 14.9.12).

14.9.24 In accordance with paragraphs 14.4.12 and 14.4.14 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be very low adverse as there will be a temporary sterilisation of the resource during construction works, but is expected to be on a very local scale. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that

'significant' mineral reserves are not present in the limited development area.

- 14.9.25 Based on the above, there is likely to be a temporary effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

- 14.9.26 No additional mitigation, enhancement or monitoring is required.

Residual Effect

- 14.9.27 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Contaminated Land

- 14.9.28 It is anticipated (prior to the full risk and impact assessment to be undertaken in the ES, as detailed in **Appendix 14-PD-3** in PEI Report **Volume 4**, Section 1.4) that there may be some potential for temporary adverse effects during the construction phase, particularly in areas where potential unacceptable contamination may be encountered, such as the landfill and industrial areas. Further assessment will be undertaken in the ES to evaluate whether these could be likely significant effects, or if they could be mitigated by the embedded and good practice measures.
- 14.9.29 It is anticipated that if any remediation is carried out on potentially contaminated sites identified within the Preliminary Order Limits, there will, in most instances, be overall permanent, long-term beneficial effects post-construction, which may be considered to be significant (this will be determined through more detailed assessment and reported in the ES, as detailed in **Appendix 14-PD-3** in PEI Report **Volume 4**, section 1.4). If required, (subject to ground investigation within the Preliminary Order Limits), site-specific permanent remediation measures, which will focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage. These measures will reduce risks to human health, controlled waters, buildings and infrastructure and ecological / geological sites from contamination, gas and vapours in the ground (the principal risks in this area), to an acceptable level.

Ground Instability

- 14.9.30 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 3 underlain by alluvium were identified as being potentially compressible and susceptible to uneven settlement during the construction phase. These are engineering considerations that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Operational Phase

Mineral Resources

- 14.9.31 Permanent works are required across Part 3 as described in **Chapter 3: The Proposed Development** in PEI Report **Volume 2** within identified MSA (paragraph 14.9.12).
- 14.9.32 In accordance with paragraphs 14.4.12 and 14.4.14 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be low adverse as although there will be a permanent sterilisation of the resource during operations, the Proposed Development is on a local scale compared to the large extent of the mineral resource area. Furthermore, mitigation identified in paragraph 14.5.14 will be adhered to. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that 'significant' mineral reserves are not present in the limited development area.
- 14.9.33 Based on the above, there is likely to be a permanent effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

- 14.9.34 No additional mitigation, enhancement or monitoring is required.

Residual Effect

- 14.9.35 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Ground Instability

- 14.9.36 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 3 underlain by alluvium were identified as being potentially compressible and susceptible to uneven settlement which presents a risk to the Proposed Development. However, these are engineering considerations that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Summary

- 14.9.37 **Table 14-17** summarises the residual ground conditions effects of Part 3 of the Proposed Development, following the implementation of any identified additional mitigation, enhancement and/or monitoring.

Table 14-17: Summary of residual effects – Part 3

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
Construction Phase						
Mineral Resources: Effects occur where temporary construction compounds and laydown areas are proposed within the MSA / MCA. In such cases, there will be a temporary sterilisation of the resource.	MSA – Medium	Adverse, temporary, local	Very low adverse	Minor	None	Minor Adverse (Not Significant)
Contaminated Land: It is anticipated that there may be some potential for adverse effects during the construction phase, particularly in areas where there is a risk that contamination may be encountered (i.e. in and around potential areas of contamination identified as having a baseline risk score of 3 – 5 (see Table 14-16 and Figure 14-PD-6 in PEI Report Volume 3). A full risk and impact assessment will be	Very low to high sensitivity receptors including: Human health; Controlled waters; Buildings and infrastructure; and Ecological / geological sites. Subject to ongoing assessment	Adverse, temporary, local	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
undertaken and reported in the ES to confirm this.	and reporting in the ES					
Ground Instability: Uneven settlement effects may occur during the construction phase in areas underlain by potentially compressible soils like alluvium.	Engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					
Operational Phase						
Mineral Resources: Effects occur where the MSA / MCA is underlying the footprint of the permanent works of the Proposed Development, with area(s) of minerals becoming sterilised.	Medium	Adverse, permanent, local	Low adverse	Minor	None	Minor Adverse (Not Significant)
Ground Instability: Uneven settlement effects may occur during the operational phase in areas underlain by potentially compressible soils like alluvium	Engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					

Part 4a: Abstraction, Storage and Treatment

14.10 Part 4a: Abstraction, Storage and Treatment

14.10.1 This section provides a focussed description of the environmental baseline, embedded environmental design, standards and management measures (if in addition to the aforementioned) and presents the preliminary assessment of likely significant effects in relation to ground conditions for Part 4a (Abstraction, Storage and Treatment) of the Proposed Development.

Baseline Conditions

14.10.2 This section describes the baseline environmental characteristics with specific reference to ground conditions.

Existing Baseline

14.10.3 Existing baseline information for Part 4a is detailed within the Section 4 of **Appendix 14-PD-2** in PEI Report **Volume 4**. This includes information regarding the following:

- a. geology and geomorphological features, including **Figure 14-PD-2** and **Figure 14-PD-3**, provided in PEI Report **Volume 3**;
- b. soil chemistry;
- c. hydrogeology including aquifer classification, groundwater vulnerability, groundwater SPZ, groundwater abstractions;
- d. hydrology including surface watercourses and features, drainage, surface water abstractions and nitrate vulnerable zones;
- e. radon (where buildings are present within the Preliminary Order Limits);
- f. identification of potentially contaminated sites (current and historic), including regulated activities within these sites (such as, but not limited to, regulated processes, waste management facilities, hazardous substances and pollution incidents); and
- g. historical development.

14.10.4 An initial CSM and PRA (contamination risks) for Part 4a are included within Section 4 of **Appendix 14-PD-2** in PEI Report **Volume 4**.

14.10.5 A review of potential ground instability hazards and outline geotechnical constraints for Part 2 is included within **Appendix 14-PD-5** in PEI Report **Volume 4**.

14.10.6 Key baseline information for the ground conditions assessment is summarised below.

Geologically Designated Sites

14.10.7 Mapping available from online sources including DEFRA's MAGIC Map (Ref. 46), the Local Development Plans detailed in section 14.2, Local Geological

Groups and other websites (Ref. 52) and the LERC data have been used to identify geological SSSI, LGS and GCR within the study area.

14.10.8 No geological SSSI, LGS or GCR sites have been identified in the study area for Part 4a.

14.10.9 Further stakeholder engagement has been undertaken with local authorities and local geological groups to confirm and identify any additional geological sites across the Proposed Development and study area (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**):

- a. Bucks Geology Group recommended contacting Environmental Records Centre who hold all Local Geology Sites information. The LERC data has been viewed for the relevant information; and
- b. No information was received from Milton Keynes City Council or Buckinghamshire Council (specifically on geological sites) at the time of writing.

Mineral Resources

14.10.10 Mapping available on the Buckinghamshire Council Minerals and Waste Local Plan 2016-2036 (Ref. 56) has been used to identify MSA and MCA within Part 4a:

14.10.11 A sand and gravel MSA has been identified for Part 4a and the study area.

14.10.12 Further stakeholder engagement has been undertaken with local authorities to request GIS plans of the MSA (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**). No plans were received from Buckinghamshire Council at the time of writing.

Contaminated Land

Potential Land Contamination Sources

14.10.13 Potential areas of contamination have been identified in Section 4 of **Appendix 14-PD-2** in PEI Report **Volume 4** for Part 4a. These are also listed in **Appendix 14-PD-4** in PEI Report **Volume 4** and illustrated on **Figure 14-PD-6** in PEI Report **Volume 3**.

14.10.14 In accordance with paragraph 14.4.17 and the detailed methodology presented in **Appendix 14-PD-3** in PEI Report **Volume 4**, baseline risk scores have been calculated for each of the identified potential areas of contamination. Those that have a baseline risk score of three or more will be considered for further risk and impact assessment. This will be undertaken and presented within the ES.

14.10.15 Potential areas of contamination with baseline risk scores of three and above are presented in **Table 14-18**.

Table 14-18: Part 4a: Potential areas of contamination with baseline risk scores of three and above

ID reference	Potential area of contamination	Proximity	Land use class	Vertical alignment	Baseline risk score
P4a-CL01	Current marina, vehicle repair shops and car wash	Zone 1	Class 2	Cut / at grade	4
P4a-CL02	Current vehicle wrapping service shop and Galleylane Farm	Zone 1	Class 2	Cut / at grade	4

Potential Pathways

14.10.16 Potential pathways for potential contamination associated with Part 4a of the Proposed Development have been identified in Section 4 of **Appendix 14-PD-2** PEI Report **Volume 4**. These are summarised as follows:

- a. Direct contact / ingestion of contaminants within Made Ground / natural soils, in addition to soil derived dust, and groundwater;
- b. Inhalation of organic vapours from Made Ground / natural soils, soil derived dust and groundwater;
- c. Inhalation of asbestos fibres;
- d. Leaching of soluble contaminants and vertical / lateral migration of mobile contaminants into shallow groundwater;
- e. Vertical / lateral migration of groundwater through Made Ground and superficial deposits into underlying bedrock aquifer;
- f. Lateral groundwater migration and direct run-off to nearby surface waters;
- g. Vertical / lateral migration of ground gases to indoor and outdoor air and migration of ground gases into enclosed spaces (inhalation / asphyxiation / explosion); and
- h. Direct contact of buried concrete (proposed upgraded pumping station and outfall structure) with contaminated Made Ground / natural soils and aggressive ground conditions (pH and sulphate) / direct contact of services and supply pipes with contaminated soils.

Identified Receptors

14.10.17 Potential receptors which could be impacted upon by the potential contamination sources associated with Part 4a of the Proposed Development are detailed in Section 4 of **Appendix 14-PD-2** in PEI Report **Volume 4**. These are summarised as follows:

- a. Human health:
 - i. Current on-site public open space and agricultural users (including, but not limited to waterway users and towpath users);
 - ii. Future on-site workers at Part 4a proposed development units including pumping stations and WTW;
 - iii. Off-site residential users;
 - iv. Off-site public open space users; and
 - v. Off-site industrial and commercial site users.
- b. Controlled waters:
 - i. Bedrock Principal aquifers;

- ii. Bedrock Unproductive strata;
 - iii. Superficial Secondary A aquifers;
 - iv. Superficial Secondary undifferentiated aquifers; and
 - v. Surface water courses.
- c. Buildings and infrastructure:
- i. Proposed pumping stations, abstraction structure, WTW, open air water storage and other structures; and
 - ii. Foundations and services.

Future Baseline

14.10.18 As indicated in sections 14.6.19 to 14.6.22.

Environmental Design, Standards and Management

14.10.19 No further environmental design, standards and/or management in addition to those presented in section 14.5

Assessment of Effects and Significance

14.10.20 This section provides the preliminary assessment of likely significant effects, including determining the level of significance, for Part 4a (Abstraction, Storage and Treatment) of the Proposed Development. The assessments take into consideration the embedded mitigation indicated within section 14.5. Where applicable, the requirement for additional mitigation measures and/or monitoring is identified to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment.

Construction Phase

Geologically Designated Sites

14.10.21 No geologically designated sites have been identified within Part 4a. Therefore, no assessment is required.

Mineral Resources

14.10.22 A temporary compound will be required within Part 4a within an identified MSA (paragraph 14.10.11).

14.10.23 In accordance with paragraphs 14.4.12 and 14.4.15 and **Table 14-4** and **Table 14-5**, the magnitude of impact is assessed to be very low adverse as there will be a temporary sterilisation of the resource during construction works, but it is expected to be on a very local scale. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that 'significant' mineral reserves are not present in the limited development area.

- 14.10.24 Based on the above, there is likely to be a temporary effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

- 14.10.25 No additional mitigation, enhancement or monitoring is required.

Residual Effect

- 14.10.26 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Contaminated Land

- 14.10.27 It is anticipated (prior to the full risk and impact assessment to be undertaken in the ES, as detailed in **Appendix 14-PD-3** in PEI Report **Volume 4**, Section 1.4) that there may be some potential for temporary adverse effects during the construction phase, particularly in areas where potential unacceptable contamination may be encountered i.e., It is anticipated (prior to the full risk and impact assessment to be undertaken in the ES, as detailed in **Appendix 14-PD-3** in PEI Report **Volume 4**, Section 1.4) that there may be some potential for temporary adverse effects during the construction phase, particularly in areas where potential unacceptable contamination may be encountered i.e., the industrial areas. Further assessment will be undertaken in the ES to evaluate whether these could be likely significant effects, or if they could be mitigated by the embedded and good practice measures.
- 14.10.28 It is anticipated that if any remediation is carried out on potentially contaminated sites identified within the Preliminary Order Limits, there will, in most instances, be overall permanent, long-term beneficial effects post-construction, which may be significant (this will be determined through more detailed assessment as part of the ES). If required, (subject to ground investigation within the Preliminary Order Limits), site-specific permanent remediation measures, which will focus on source removal, pathway breakage or receptor protection, will be developed during the detailed design stage. These measures will reduce risks to human health, controlled waters, buildings and infrastructure and ecological / geological sites from contamination, gas and vapours in the ground (the principal risks in this area), to an acceptable level.

Ground Instability

- 14.10.29 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 4a underlain by alluvium were identified as having a high shrink-swell potential. This is an engineering consideration that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Operational Phase

Mineral Resources

14.10.30 Permanent works are required across Part 4a as described in **Chapter 3: The Proposed Development** in PEI Report **Volume 2** within identified MSA (paragraph 14.10.11).

14.10.31 In accordance with paragraphs 14.4.13 and 14.4.14 and **Table 14-4** and **Table 14-5**, the magnitude of impact is considered to be low adverse as although there will be a permanent sterilisation of the resource during operations, the Proposed Development is on a local scale compared to the large extent of the mineral resource area. Furthermore, mitigation identified in paragraph 14.5.14 will be adhered to. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that 'significant' mineral reserves are not present in the limited development area.

14.10.32 Based on the above, there is likely to be a permanent effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.10.33 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.10.34 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Ground Instability

14.10.35 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 4a underlain by alluvium were identified as having a high shrink-swell potential which may be a risk to the Proposed Development. This is an engineering consideration that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Summary

14.10.36 **Table 14-19** summarises the residual ground conditions effects of Part 4a of the Proposed Development, following the implementation of any identified additional mitigation, enhancement and/or monitoring.

Table 14-19: Summary of residual effects – Part 4a

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
Construction Phase						
Mineral Resources: Effects occur where temporary construction compounds and laydown areas are proposed within the MSA / MCA. In such cases, there will be a temporary sterilisation of the resource.	MSA – Medium	Adverse, temporary, local	Very low adverse	Minor	None	Minor Adverse (Not Significant)
Contaminated Land: It is anticipated that there may be some potential for adverse effects during the construction phase, particularly in areas where there is a risk that contamination may be encountered (i.e. in and around potential areas of contamination identified as having a baseline risk score of 3 – 5 (see Table 14-18 and Figure 14-PD-6 in PEI Report Volume 3). A full risk and impact assessment will be	Very low to high sensitivity receptors including: Human health; Controlled waters; Buildings and infrastructure; and Ecological / geological sites. Subject to ongoing assessment	Adverse, temporary, local	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
undertaken and reported in the ES to confirm this.	and reporting in the ES					
Ground Instability: Shrink-swell effects may occur during the construction phase in areas underlain by susceptible geological materials.	Engineering consideration that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					
Operational Phase						
Mineral Resources: Effects occur where the MSA / MCA is underlying the footprint of the permanent works of the Proposed Development, with area(s) of minerals becoming sterilised.	Medium	Adverse, permanent, local	Low adverse	Minor	None	Minor Adverse (Not Significant)
Ground Instability: Shrink-swell effects may occur during the construction phase in areas underlain by susceptible geological materials.	Engineering consideration that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					

Part 4b: Pipeline to an Existing Underground Reservoir near Luton

14.11 Part 4b: Pipeline to an Existing Underground Reservoir near Luton

14.11.1 This section provides a focussed description of the environmental baseline, embedded environmental design, standards and management measures (if in addition to the aforementioned) and presents the preliminary assessment of likely significant effects in relation to ground conditions for Part 4b (Pipeline to an Existing Underground Reservoir near Luton) of the Proposed Development.

Baseline Conditions

14.11.2 This section describes the baseline environmental characteristics with specific reference to ground conditions.

14.11.3 It has been necessary to divide Part 4b of the Proposed Development into further subsections in order to effectively characterise the baseline conditions. Reference should be made to **Figure 14-PD-1** provided in PEI Report **Volume 3** for a visual representation:

- a. Section A: Galley WTW Site to A5 North Crossing; 'Part 4b (Section A)';
- b. Section B: East of A5 to A5 South Crossing; 'Part 4b (Section B)';
- c. Section C: A5 South Crossing to A4012; 'Part 4b (Section C)';
- d. Section D: A4012 to A505; 'Part 4b (Section D)';
- e. Section E: A505 to B489 Crossing; 'Part 4b (Section E)';
- f. Section F: B489 to A5183 including Dunstable Downs; 'Part 4b (Section F)'; and
- g. Section G: A5183 to Underground Reservoir Near Luton; 'Part 4b (Section G)'.

Existing Baseline

14.11.4 Existing baseline information for Part 4b is detailed within the Section 5 of **Appendix 14-PD-2** in PEI Report **Volume 4**. This includes information regarding the following;

- a. geology and geomorphological features, including **Figure 14-PD-2** and **Figure 14-PD-3**, provided in PEI Report **Volume 3**;
- b. soil chemistry;
- c. hydrogeology including aquifer classification, groundwater vulnerability, groundwater SPZ, groundwater abstractions;
- d. hydrology including surface watercourses and features, drainage, surface water abstractions and nitrate vulnerable zones;

- e. radon (where buildings are present within the Preliminary Order Limits);
- f. identification of potentially contaminated sites (current and historic), including regulated activities within these sites (such as, but not limited to, regulated processes, waste management facilities, hazardous substances and pollution incidents); and
- g. historical development.

14.11.5 An initial CSM and PRA (contamination risks) for Part 4b are included within Section 5 of **Appendix 14-PD-2** in PEI Report **Volume 4**.

14.11.6 A review of potential ground instability hazards and outline geotechnical constraints for Part 4b is included within **Appendix 14-PD-5** in PEI Report **Volume 4**.

14.11.7 Key baseline information for the ground conditions assessment is summarised below.

Geologically Designated Sites

14.11.8 Mapping available from online sources including DEFRA's MAGIC Map (Ref. 46), the Local Development Plans detailed in section 14.2, Local Geological Groups and other websites (Ref. 51 and Ref. 52) and the LERC data have been used to identify geological SSSI, LGS and GCR within the study area.

14.11.9 Geological SSSI, LGS and GCR sites for Part 4b are detailed in **Table 14-20**.

14.11.10 Further stakeholder engagement has been undertaken with local authorities and local geological groups to confirm and identify any additional geological sites within the Preliminary Order Limits and study area (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**):

- a. Central Bedfordshire Council indicated that they do not hold information on geological sites;
- b. Bedfordshire Geology Group indicated that the planned route does not pass any RIGS or LGS;
- c. Bucks Geology Group recommended contacting Environmental Records Centre who hold all Local Geology Sites information. The LERC data has been viewed for the relevant information; and
- d. No information was received from Milton Keynes City Council, Buckinghamshire Council (specifically on geological sites) or Luton Council at the time of writing.

Table 14-20: Geological sites within Part 4b of the Proposed Development and the study area

Part	Geological Site	Location
Part 4b (Section F)	Overlap of Dunstable & Whipsnade Downs LGS (Ref. 51 and LERC)	Overlap of Part 4b (Section F), south-west of Dunstable.
	Kensworth Nature Reserve LGS (Ref. 51 and LERC)	130 m north of Part 4b (Section F), south of Dunstable.
	Kensworth Chalk Pit SSSI (Ref. 46) and GCR (Ref. 52)	At its closest point, adjacent to the north of the Part 4b (Section F), south of Dunstable.

14.11.11 The geologically designated sites are presented on **Figure 14-PD-4** in PEI Report **Volume 3**.

Mineral Resources

14.11.12 Mapping available on the following plans has been used to identify MSA and MCA within Part 4b:

- Milton Keynes Council – Minerals Local Plan (Ref. 55);
- Buckinghamshire Council Minerals and Waste Local Plan 2016-2036 (Ref. 56); and
- Bedford Borough Council, Central Bedfordshire Council and Luton Borough Council – Minerals and Waste Local Plan (adopted 2014) (Ref. 57).

14.11.13 **Table 14-21** summarises the MSAs located within Part 4b.

Table 14-21: Mineral Safeguarding Areas within Part 4b

Authority	Commodity	Location
Buckinghamshire Council	Sand and gravel	West of Little Brickhill: Northwestern-most extent of Part 4b (Section A)
Central Bedfordshire Council	Woburn Sands	North-east of Leighton Buzzard: Adjacent to the west of Part 4b (Section B)
	Gault Clay	South of Dunstable, between B4541 and London Road: Within Part 4b (Section F)

14.11.14 Further stakeholder engagement has been undertaken with local authorities to request GIS plans of the MSA (see Table 2 in **Appendix 14-PD-1** in PEI Report **Volume 4**). Central Bedfordshire Council have provided plans and these are presented on **Figure 14-PD-5** in PEI Report **Volume 3**. No plans were received from Buckinghamshire County Council at the time of writing.

Contaminated Land**Potential Land Contamination Sources**

- 14.11.15 Potential areas of contamination have been identified in Section 5 of **Appendix 14-PD-2** in PEI Report **Volume 4** for Part 4b. These are also listed **Appendix 14-PD-4** in PEI Report **Volume 4** and illustrated on **Figure 14-PD-6** in PEI Report **Volume 3**.
- 14.11.16 In accordance with paragraph 14.4.17 and the detailed methodology presented in **Appendix 14-PD-3** in PEI Report **Volume 4**, baseline risk scores have been calculated for each of the identified potential areas of contamination. Those that have a baseline risk score of three or more will be considered for further risk and impact assessment. This will be undertaken and presented within the ES.
- 14.11.17 Potential areas of contamination with baseline risk scores of three and above are presented in **Table 14-22**.

Table 14-22: Part 4b: Potential areas of contamination with baseline risk scores of three and above

ID reference	Potential area of contamination	Proximity	Land use class	Vertical alignment	Baseline risk score
P4b-SA-CL01	Current Bryerley Springs Farm, fireplace shop and Bryerley Springs equestrian centre	Zone 1	Class 1	Cut / at grade	3
P4b-SA-CL06	Current Springfield Farm	Zone 1	Class 1	Cut / at grade	3
P4b-SA-CL10	Current Battle Hills Farm	Zone 1	Class 1	Cut / at grade	3
P4b-SB-CL01	Historical cuttings	Zone 1	Class 1	Cut / at grade	3
P4b-SB-CL05	Historical landfill site - Fox and Hounds Sandpit including historical sand pit/unspecified disused pit	Zone 2	Class 3	Cut / at grade	4
P4b-SB-CL06	Current pump house	Zone 1	Class 1	Cut / at grade	3
P4b-SB-CL08	Current pump house	Zone 1	Class 1	Cut / at grade	3
P4b-SB-CL10	Historical Sandhouse Quarry landfill sites, historical unspecified disused pits and sandpits	Zone 1	Class 3	Cut / at grade	5
P4b-SB-CL11	Historical filling station an historical garage	Zone 1	Class 3	Cut / at grade	5
P4b-SC-CL01	Current Grounds Farm	Zone 1	Class 1	Cut / at grade	3
P4b-SC-CL02	Current Grange Farm	Zone 1	Class 1	Cut / at grade	3
P4b-SD-CL01	Current Woodcock Hill Farm	Zone 1	Class 1	Cut / at grade	3
P4b-SE-CL01	Current Stanbridgeford Sewage Treatment Works including historical tanks	Zone 1	Class 2	Cut / at grade	4
P4b-SF-CL03	Historical landfill site - Shepherds Farm, historical cutting and unspecified pit	Zone 1	Class 3	Cut / at grade	5
P4b-SF-CL05	Current Icknield Way Business Park including historical tanks	Zone 1	Class 1	Cut / at grade	3
P4b-SF-CL08	Current pump house and tank associated with Dunstable Downs Golf Club	Zone 1	Class 1	Cut / at grade	3
P4b-SF-CL11	Current Grange Farm	Zone 1	Class 1	Cut / at grade	3

Potential Pathways

14.11.18 Potential pathways for potential contamination associated with Part 4b of the Proposed Development have been identified in Section 5 of **Appendix 14-PD-2** in PEI Report **Volume 4**. These are summarised as follows:

- a. Direct contact / ingestion of contaminants within Made Ground / natural soils, in addition to soil derived dust, and groundwater;
- b. Inhalation of organic vapours from Made Ground / natural soils, soil derived dust and groundwater;
- c. Inhalation of asbestos fibres;
- d. Leaching of soluble contaminants and vertical / lateral migration of mobile contaminants into shallow groundwater;
- e. Vertical / lateral migration of groundwater through Made Ground and superficial deposits into underlying bedrock aquifer;
- f. Lateral groundwater migration and direct run-off to nearby surface waters;
- g. Vertical / lateral migration of ground gases to outdoor air (inhalation); and
- h. Direct contact of services and supply pipes with contaminated soils.

Identified Receptors

14.11.19 Potential receptors which could be impacted upon by the potential contamination sources associated with Part 4b of the Proposed Development are detailed in **14-PD-3** in PEI Report **Volume 4**. These are summarised as follows:

- a. Human health:
 - i. Current and future on-site public open space and agricultural users (including, but not limited to waterway users, towpath users, boaters, mooring¹⁷, marinas);
 - ii. Off-site residential users;
 - iii. Off-site public open space users; and
 - iv. Off-site industrial and commercial site users.
- b. Controlled waters
 - i. Bedrock Principal aquifers and SPZ;
 - ii. Superficial Secondary A aquifers;
 - iii. Superficial Secondary undifferentiated aquifers;

¹⁷ The glossary defines various types of moorings provided along the Trust's network. The types of moorings to be assessed as sensitive receptors for Ground Conditions will be considered and addressed in the ES.

- iv. Superficial and bedrock Unproductive strata;
- v. Groundwater abstractions; and
- vi. Surface water courses.
- c. Buildings and infrastructure
 - i. Foundations and services.
- d. Ecological / geological sites
 - i. Local sites; and
 - ii. International / national / regional sites.

Future Baseline

14.11.20 As indicated in sections 14.6.19 to 14.6.22.

Environmental Design, Standards and Management

14.11.21 No further environmental design, standards and/or management in addition to those presented in section 14.5

Assessment of Effects and Significance

14.11.22 This section provides the preliminary assessment of likely significant effects, including determining the level of significance, for Part 4b (Pipeline to Underground Reservoir near Luton) of the Proposed Development. The assessments take into consideration the embedded mitigation indicated within section 14.5. Where applicable, the requirement for additional mitigation measures and/or monitoring is identified to avoid, prevent, reduce, or if possible offset, any identified significant adverse effects on the environment.

Construction Phase

Geologically Designated Sites

14.11.23 Three geologically designated sites (LGS and SSSI) were identified within the Proposed Development and study area of Part 4b.

14.11.24 One of the LGS: Kensworth Nature Reserve LGS is located 130 m north of Part 4b (Section F). This is considered too distant from the Proposed Development to be impacted¹⁸.

14.11.25 Two of the geologically designated sites are located in close proximity to the Proposed Development:

¹⁸ As indicated previously, impacts from the Proposed Development on geological features will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors.

- a. Dunstable & Whipsnade Downs LGS overlaps Part 4b (Section F), south-west of Dunstable; and
- b. Kensworth Chalk Pit SSSI and GCR is located (at its closest point), adjacent to the north of the Part 4b (Section F), south of Dunstable.

14.11.26 There may be potential impacts during construction; these have been assessed further in the paragraphs below.

14.11.27 In accordance with paragraph 14.4.8 and **Table 14-4** and **Table 14-5**, the magnitude of impact is assessed to be medium adverse on the Dunstable & Whipsnade Down LGS based on the overlap of only a small area of the LGS (less than 10%) with the Proposed Development and the likelihood of damage, disturbance or removal in this area only. The sensitivity of the LGS is considered to be low based on its designation of local importance. It should also be considered that development can lead to an opening of a geological formation or interest which in turn represents a beneficial effect (i.e. aiding understanding and interpretation). Further engagement will be required with relevant parties, particularly for potential impacts during the construction phases (paragraph 14.5.15).

14.11.28 Based on the above, there is potentially a permanent effect which is considered to be minor adverse and not significant.

14.11.29 In accordance with paragraph 14.4.8 and **Table 14-4** and **Table 14-5**, the magnitude of impact is assessed to be low adverse for the Kensworth Chalk Pit SSSI and GCR based on only a small area of this site being in proximity to the Proposed Development and the likelihood of damage, disturbance or removal. The sensitivity of the SSSI and GCR is considered to be high based on its designation. It should also be considered that development can lead to an opening of a geological formation or interest which in turn represents a beneficial effect (i.e. aiding understanding and interpretation). Engagement will be required with relevant parties which is to be undertaken prior to determination of the DCO consent, particularly for potential impacts associated during the construction phases (paragraph 14.5.15).

14.11.30 Based on the above, there is potentially a permanent effect which is assessed to be moderate adverse and not significant. This considers its location outside of the Proposed Development area and that the development in proximity to the SSSI / GCR site is limited to an underground pipeline. Engagement with relevant parties is to be undertaken prior to determination of the DCO consent.

Additional Mitigation, Enhancement and Monitoring

14.11.31 No additional mitigation, enhancement or monitoring is required.

Residual Effect

- 14.11.32 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which for the LGS is minor adverse and not significant and for the SSSI and GCR is moderate adverse and not significant.

Mineral Resources

- 14.11.33 Temporary compounds and laydown areas will be required at a number of locations within Part 4b within MSA (**Table 14-21**).
- 14.11.34 In accordance with paragraphs 14.4.12 and 14.4.14 and **Table 14-4** and **Table 14-5**, the magnitude of impact is assessed to be very low adverse as there will be a temporary sterilisation of the resource during construction works, but is expected to be on a very local scale. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that 'significant' mineral reserves are not present in the limited development area.
- 14.11.35 Based on the above, there is likely to be a temporary effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

- 14.11.36 No additional mitigation, enhancement or monitoring is required.

Residual Effect

- 14.11.37 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Contaminated Land

- 14.11.38 It is anticipated (prior to the full risk and impact assessment to be undertaken in the ES, as detailed in **Appendix 14-PD-3** in PEI Report **Volume 4**, section 14.4) that there may be some potential for temporary adverse effects during the construction phase, particularly in areas where potential unacceptable contamination may be encountered, such as the landfill and industrial areas. Further assessment will be undertaken in the ES to evaluate whether these could be likely significant effects, or if they could be mitigated by the embedded and good practice measures.
- 14.11.39 It is anticipated that if any remediation is carried out on potentially contaminated sites identified within the Preliminary Order Limits, there will, in most instances, be overall permanent, long-term beneficial effects post-construction, which may be considered to be significant (this will be determined through more detailed assessment as part of the ES). If required, (subject to ground investigation within the Preliminary Order Limits), site-specific permanent remediation measures, which will focus on

source removal, pathway breakage or receptor protection, will be developed during the detailed design stage. These measures will reduce risks to human health, controlled waters, buildings and infrastructure and ecological / geological sites from contamination, gas and vapours in the ground (the principal risks in this area), to an acceptable level.

Ground Instability

14.11.40 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 4b underlain by alluvium and bedrock mudstones were identified as having a high potential for shrink-swell, compressibility and uneven settlement during construction. In addition, the presence of soluble Chalk bedrock highlighted the potential for dissolution features and related ground instability. These are engineering considerations that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Operational Phase

Mineral Resources

14.11.41 Permanent works are required across Part 4b as described in **Chapter 3: The Proposed Development** in PEI Report **Volume 2** within MSA (**Table 14-21**).

14.11.42 In accordance with paragraphs 14.4.11 and 14.4.13 and **Table 14-4** and **Table 14-5**, the magnitude of impact is assessed to be low adverse as although there will be a permanent sterilisation of the resource during operations, the Proposed Development is on a local scale (thin linear pipeline) across the large extent of the mineral resource areas. Furthermore, mitigation identified in paragraph 14.5.14 will be adhered to. The sensitivity of the mineral resource is assessed to be medium based on the likelihood that 'significant' mineral reserves are not present in the limited development area.

14.11.43 Based on the above, there is likely to be a permanent effect which is assessed to be minor adverse and not significant.

Additional Mitigation, Enhancement and Monitoring

14.11.44 No additional mitigation, enhancement or monitoring is required.

Residual Effect

14.11.45 As there is no additional mitigation, enhancement or monitoring required / identified, the residual effect remains the same as that reported for the pre-additional mitigation scenario, which is minor adverse and not significant.

Ground Engineering

14.11.46 In **Appendix 14-PD-5** in PEI Report **Volume 4**, areas of Part 4b underlain by alluvium and bedrock mudstones were identified as having a high potential for shrink-swell, compressibility and uneven settlement which

presents a risk to the Proposed Development. In addition, the presence of soluble Chalk bedrock highlighted the potential for dissolution features and related ground instability. These are engineering considerations that will be further assessed through ground investigation, preparation of the GIR and GDR and addressed as part of the detailed design for the Proposed Development.

Summary

14.11.47 **Table 14-23** summarises the residual ground conditions effects of Part 4b of the Proposed Development, following the implementation of any identified additional mitigation, enhancement and/or monitoring.

Table 14-23: Summary of residual effects – Part 4b

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
Construction Phase						
Geologically Designated Sites: Construction effects may result in damage, disturbance or removal of geological features of interest.	Dunstable & Whipsnade Downs LGS – low	Adverse, permanent, local	Medium adverse	Minor	None	Minor Adverse (Not Significant)
	Kensworth Chalk Pit SSSI and GCR – high	Adverse, permanent, local	Low adverse	Moderate	None	Moderate Adverse (Not Significant)
Mineral Resources: Effects occur where temporary construction compounds and laydown areas are proposed within the MSA / MCA. In such cases, there will be a temporary sterilisation of the resource.	MSA – Medium	Adverse, temporary, local	Very low adverse	Minor	None	Minor Adverse (Not Significant)
Contaminated Land: It is anticipated that there may be some potential for adverse effects during the construction phase, particularly in areas where there is a risk that contamination may be	Very low to high sensitivity receptors including: Human health;	Adverse, temporary, local	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES	Subject to ongoing assessment and reporting in the ES

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
encountered (i.e. in and around potential areas of contamination identified as having a baseline risk score of 3 – 5 (see Table 14-22 and Figure 14-PD-6 in PEI Report Volume 3). A full risk and impact assessment will be undertaken and reported in the ES to confirm this.	Controlled waters; Buildings and infrastructure; and Ecological / geological sites. Subject to ongoing assessment and reporting in the ES					
Ground Instability: Potential for shrink-swell, compressibility and uneven settlement in alluvium and weathered mudstones and dissolution features in soluble Chalk.	Engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					
Operational Phase						
Mineral Resources: Effects occur where the MSA / MCA is underlying the footprint of the permanent works of the Proposed Development, with	Medium	Adverse, permanent, local	Low adverse	Minor	None	Minor Adverse (Not Significant)

Description of impact	Sensitivity of receptor	Nature of impact / geographic scale	Magnitude of impact	Initial classification of impact (with embedded control)	Additional mitigation, enhancement and/or monitoring	Residual impact significance
area(s) of minerals becoming sterilised.						
Ground Instability: Potential for shrink-swell, compressibility and uneven settlement in alluvium and weathered mudstones and dissolution features in soluble Chalk	Engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.					

14.12 Combined Effects between Proposed Development Parts

14.12.1 This section provides a review of the above findings of the individual Parts of the Proposed Development, to understand and interpret the potential combined effects on a shared receptor(s) that may be of greater significance when compared to individual effects arising from one of the six Parts of the Proposed Development. Where combined effects are identified, these are considered additively and qualitatively using professional judgement.

14.12.2 As further explained in **Chapter 6: Environmental Impact Assessment Methodology**, PEI Report **Volume 2**, the approach undertaken for this assessment is summarised in the following steps:

- a. **Step 1:** Review and identification of shared receptors from assessments undertaken for each technical chapter for interfacing Parts of the Proposed Development; and
- b. **Step 2:** Assessment of combined effects for any shared receptors identified under Step 1.

Part 1a and Part 1b Cumulative Effects

Step 1: Screening, review and identification of shared receptors

14.12.3 **Table 14-24** reviews the relevant receptor groups to consider the potential for a combined effect to occur across Parts 1a and 1b of the Proposed Development.

Table 14-24: Potential for combined effects between Parts 1a and 1b

Receptor groups	Potential for combined effects
Geologically Designated Sites	There are no shared designated sites where Parts 1a and 1b of the Proposed Development interface.
Mineral Resources	Impacts from the Proposed Development on MSA and MCA will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors. Therefore, Mineral Resources are not considered to be a shared receptor as the Preliminary Order Limits for Parts 1a and 1b do not overlap.
Receptors to Contaminated Land	There are a number of sources of contamination within the 250 m study area of Part 1a and Part 1b (Section A). There is therefore a theoretical linkage between Parts 1a and 1b of the Proposed Development that could potentially result in combined effect on receptors to contaminated land (including human health, controlled waters, buildings and infrastructure and ecological sites).

Step 2: Source-pathway-receptors identification

14.12.4 The assessment of combined effects described in this section considers the embedded, control and management measures, and mitigation measures identified earlier within this PEI Report chapter.

Summary of potential combined effects on Part 1a and Part 1b

14.12.5 **Table 14-25** provides a summary of the potential combined effects review for Parts 1a and 1b of the Proposed Development.

Table 14-25: Summary of potential combined effects between Parts 1a and 1b

Receptor groups	Potential combined effect?	Significance of combined effects
Geologically Designated Sites	No	Not applicable
Mineral Resources	No	Not applicable
Receptors to Contaminated Land	Yes	The potential for land contamination and the relevant assessment will be undertaken in the ES.

Part 1b and Part 2 Cumulative Effects**Step 1: Screening, review and identification of shared receptors**

14.12.6 **Table 14-26** reviews the relevant receptor groups to consider the potential for a combined effect to occur across Parts 1b and 2 of the Proposed Development.

Table 14-26: Potential for combined effects between Parts 1b and 2

Receptor groups	Potential for combined effects
Geologically Designated Sites	Rawn Hill LGS is located 130 m south-east of Part 1b (Section C) and 5 m south of the northern-most area of Part 2 (Section A), Atherstone. This LGS is considered too distant from Part 1b (Section C) to be impacted from the Proposed Development as impacts will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors. There is therefore no potential for Parts 1b and 2 of the Proposed Development to result in a combined effect beyond those already identified for these Parts in isolation as no potential pathway for combined effects exists.
Mineral Resources	Impacts from the Proposed Development on MSA and MCA will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors. There are two areas where the Preliminary Order Limits overlap and where the crushed rock, unconsolidated sand and gravel, brick clay and building stone MSA are located.

Receptor groups	Potential for combined effects
	There is therefore a theoretical linkage between Parts 1b and 2 of the Proposed Development that could potentially result in combined effect on these receptors.
Receptors to Contaminated Land	There are a number of sources of contamination within the 250 m study area of Part 1b (Section C) and Part 2 (Section A). There is therefore a theoretical linkage between Parts 1b and 2 of the Proposed Development that could potentially result in combined effect on receptors to contaminated land (including human health, controlled waters, buildings and infrastructure and ecological sites).

Step 2: Source-pathway-receptors identification

14.12.7 The assessment of combined effects described in this section considers the embedded, control and management measures, and mitigation measures identified earlier within this PEI Report chapter.

Summary of potential combined effects on Part 1b and Part 2

14.12.8 **Table 14-27** provides a summary of the potential combined effects review for Parts 1b and 2 of the Proposed Development.

Table 14-27: Summary of potential combined effects between Parts 1b and 2

Receptor groups	Potential combined effect?	Significance of combined effects
Geologically Designated Sites	No	Not applicable
Mineral Resources	Yes	Significance of effect is no worse than those reported individually for each Part of the Proposed Development.
Receptors to Contaminated Land	Yes	The potential for land contamination and the relevant assessment will be undertaken in the ES.

Part 2 and Part 3 Cumulative Effects

Step 1: Screening, review and identification of shared receptors

14.12.9 **Table 14-28** reviews the relevant receptor groups to consider the potential for a combined effect to occur across Parts 2 and 3 of the Proposed Development.

Table 14-28: Potential for combined effects between Parts 2 and 3

Receptor groups	Potential for combined effects
Geologically Designated Sites	There are no shared designated sites where Parts 2 and 3 of the Proposed Development interface.
Mineral Resources	Impacts from the Proposed Development on MSA and MCA will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors. There are two areas where the Preliminary Order Limits (Indicative Work Areas) overlap and where the unconsolidated sand and gravel MSA is located. There is therefore a theoretical linkage between Parts 2 and 3 of the Proposed Development that could potentially result in combined effect on these receptors.
Receptors to Contaminated Land	There are a number of sources of contamination within the 250 m study area of Part 2 (Section K) and Part 3. There is therefore a theoretical linkage between Parts 2 and 3 of the Proposed Development that could potentially result in combined effect on receptors to contaminated land (including human health, controlled waters, buildings and infrastructure and ecological sites).

Step 2: Source-pathway-receptors identification

14.12.10 The assessment of combined effects described in this section considers the embedded, control and management measures, and mitigation measures identified earlier within this PEI Report chapter.

Summary of potential combined effects on Part 2 and Part 3

14.12.11 **Table 14-29** provides a summary of the potential combined effects review for Parts 2 and 3 of the Proposed Development.

Table 14-29: Summary of potential combined effects between Parts 2 and 3

Receptor groups	Potential combined effect?	Significance of combined effects
Geologically Designated Sites	No	Not applicable
Mineral Resources	Yes	Significance of effect is no worse than individually reported for each Part of the Proposed Development.
Receptors to Contaminated Land	Yes	The potential for land contamination and the relevant assessment will be undertaken in the ES.

Part 2 and Part 4a Cumulative Effects

Step 1: Screening, review and identification of shared receptors

14.12.12 **Table 14-30** reviews the relevant receptor groups to consider the potential for a combined effect to occur across Parts 2 and 4a of the Proposed Development.

Table 14-30: Potential for combined effects between Parts 2 and 4a

Receptor groups	Potential for combined effects
Geologically Designated Sites	There are no shared designated sites where Parts 2 and 4a of the Proposed Development interface.
Mineral Resources	Impacts from the Proposed Development on MSA and MCA will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors. Therefore, Mineral Resources are not considered to be a shared receptor as the Preliminary Order Limits (Indicative Work Areas) for Parts 2 and 4a do not overlap.
Receptors to Contaminated Land	The 250 m / 1 km study area for the Preliminary Order Limits (Indicative Work Areas) for Parts 2 and 4a do not interface and therefore receptors to contaminated land are not considered to be a shared receptor.

Step 2: Source-pathway-receptors identification

14.12.13 The assessment of combined effects described in this section considers the embedded, control and management measures, and mitigation measures identified earlier within this PEI Report chapter.

Summary of potential combined effects on Part 2 and Part 4a

14.12.14 **Table 14-31** provides a summary of the potential combined effects review for Parts 2 and 4a of the Proposed Development.

Table 14-31: Summary of potential combined effects between Parts 2 and 4a

Receptor groups	Potential combined effect?	Significance of combined effects
Geologically Designated Sites	No	Not applicable
Mineral Resources	No	Not applicable
Receptors to Contaminated Land	No	Not applicable

Part 4a and Part 4b Cumulative Effects

Step 1: Screening, review and identification of shared receptors

14.12.15 **Table 14-32** reviews the relevant receptor groups to consider the potential for a combined effect to occur across Parts 4a and 4b of the Proposed Development.

Table 14-32: Potential for combined effects between Parts 4a and 4b

Receptor groups	Potential for combined effects
Geologically Designated Sites	There are no shared designated sites where Parts 4a and 4b of the Proposed Development interface.
Mineral Resources	Impacts from the Proposed Development on MSA and MCA will typically occur directly within the Preliminary Order Limits where construction and operational activities would take place or interface directly with these receptors. Therefore, Mineral Resources are not considered to be a shared receptor as the Preliminary Order Limits for Parts 4a and 4b do not overlap.
Receptors to Contaminated Land	There are a limited number of sources of contamination within the 250 m study area of Part 4a and Part 4b (Section A). There is therefore a theoretical linkage between Parts 4a and 4b of the Proposed Development that could potentially result in combined effect on receptors to contaminated land (including human health, controlled waters, buildings and infrastructure and ecological sites).

Step 2: Source-pathway-receptors identification

14.12.16 The assessment of combined effects described in this section considers the embedded, control and management measures, and mitigation measures identified earlier within this PEI Report chapter.

Summary of potential combined effects on Part 4a and Part 4b

14.12.17 **Table 14-33** provides a summary of the potential combined effects review for Parts 4a and 4b of the Proposed Development.

Table 14-33: Summary of potential combined effects between Parts 4a and 4b

Receptor groups	Potential combined effect?	Significance of combined effects
Geologically Designated Sites	No	Not applicable
Mineral Resources	No	Not applicable
Receptors to Contaminated Land	Yes	The potential for land contamination and the relevant assessment will be undertaken in the ES.

14.13 Summary and Next Steps

14.13.1 The preliminary assessment of effects during construction has identified the following:

- a. Effects on geologically designated sites (LGS) identified across, or in close proximity to, Parts 1b, 2 and 4b: minor adverse (not significant);
- b. Effects on geologically designated sites (SSSI and GCR) identified adjacent to Part 4b: moderate adverse (not significant);
- c. Effects on mineral resources (MSA) identified across all parts: minor adverse (not significant);
- d. Effects on receptors to land contamination across all parts, subject to ongoing assessment and reporting in the ES:
 - i. It is anticipated that there may be some potential for adverse effects during the construction phase, particularly in areas where there is a risk that contamination may be encountered (i.e. in and around potential areas of contamination identified as having a baseline risk score of 3 – 5); and
 - ii. It is anticipated that if any remediation is carried out on potentially contaminated sites identified within the Preliminary Order Limits, there will, in most instances, be overall permanent, long-term beneficial effects post-construction, which may be considered to be significant (this will be determined through more detailed assessment as part of the ES).
- e. Ground instability: engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.

14.13.2 The preliminary assessment of effects during operation has identified the following:

- a. Effects on mineral resources (MSA) identified across all parts: minor adverse (not significant); and
- b. Ground instability: engineering considerations that will be further assessed through ground investigation, preparation of a GIR and GDR and addressed as part of the detailed design for the Proposed Development.

14.13.3 The information provided in this PEI Report is preliminary, with the final assessment of likely significant effects to be reported in the ES.

14.13.4 Further work to be undertaken to support the assessments presented in the ES includes:

- a. The study area for hydrogeological receptors will be extended to 1 km where Secondary A aquifers are present for parts of the Proposed Development in which trenchless crossings are proposed. As not all trenchless crossings have yet been identified, this will be the subject of ongoing assessment and will be reported in the ES;
- b. The Geo-Environmental Desk Study for Part 1b (Ref. 45) does not cover the full extent of the Preliminary Order Limits boundary. This will be updated, also to include walkovers to potential contamination areas across Part 1b;
- c. Contaminated land assessment: in accordance with **Appendix 14-PD-3** in PEI Report **Volume 4**, potential areas of contamination that have a baseline risk score of three or more will be considered for further risk and impact assessment in the ES;
- d. The screening assessment undertaken as part of this PEI Report assumes that during the construction phase, earthworks involving excavation / cut of materials may be required anywhere within the Preliminary Order Limits ('worst-case' situation). Further assessment will consider the detailed design, including where fill earthworks / embankments or trenchless crossings are proposed;
- e. Continued stakeholder engagement to gather further information and discuss preliminary assessment outcomes;
- f. Engagement with Local Planning Authorities / National Trust / Local Geological Groups to discuss potential impacts on the Geological Sites identified within and adjacent to the Preliminary Order Limits;
- g. Engagement with mineral planning authorities to discuss the assessment findings at this stage and any management or mitigation measures that may be required where mineral resources and potential impacts have been identified;
- h. A summary of walkover survey information for Parts 2, 3 and 4 will be included within **Appendix 14-PD-2** in PEI Report **Volume 4**; and
- i. Preliminary ground investigation will be undertaken for all Parts of the Proposed Development. A summary and consideration of initial ground investigation information will be included within the ES.

14.14 References

- Ref. 1 Department for Environment, Food & Rural Affairs (Defra) (2023) National Policy Statement for Water Resources Infrastructure. Available at: https://assets.publishing.service.gov.uk/media/6437e3a2f4d42000cd4a1a7/E02879931_National_Policy_Statement_for_Water_Resources.pdf [Accessed 20/10/2025].
- Ref. 2 Ministry of Housing, Communities and Local Government, Ministry of Housing, Communities & Local Government (MHCLG) (2018 to 2021) and

- Department for Levelling Up, Housing and Communities (DLUHC) (2025) National Planning Policy Framework – Last updated 7th February 2025. Available at:
<https://assets.publishing.service.gov.uk/media/675abd214cbda57cacd3476e/NPPF-December-2024.pdf> [Accessed 20/10/2025].
- Ref. 3 MHCLG (2018 to 2021) and DLUHC. (2024) Planning Policy Framework (NPPF) Planning Practice Guidance. Available at:
<https://www.gov.uk/government/collections/planning-practice-guidance> [Accessed 20/10/2025].
- Ref. 4 Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended). Available at:
<https://www.legislation.gov.uk/ukxi/2017/572/contents> [Accessed 20/10/2025].
- Ref. 5 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. Available at:
<https://www.legislation.gov.uk/ukxi/2017/407/contents> [Accessed 20/10/2025].
- Ref. 6 European Union (EU) (2008). Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (2008/98/EC). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098> [Accessed 10/11/2025].
- Ref. 7 Environmental Protection Act 1990 and Part 2A (the Contaminated Land Regime). Available at:
<https://www.legislation.gov.uk/ukpga/1990/43/contents> [Accessed 20/10/2025].
- Ref. 8 Water Act 2003. Available at:
<https://www.legislation.gov.uk/ukpga/2003/37/contents> [Accessed 20/10/2025].
- Ref. 9 Water Resources Act 1991. Available at:
<https://www.legislation.gov.uk/ukpga/1991/57/contents> [Accessed 20/10/2025].
- Ref. 10 Building Act 1984. Available at:
<https://www.legislation.gov.uk/ukpga/1984/55/contents> [Accessed 20/10/2025].
- Ref. 11 The Building Regulations 2010. Available at:
<https://www.legislation.gov.uk/ukxi/2010/2214/contents> [Accessed 20/10/2025].
- Ref. 12 Environment Act 1995. Available at:
<https://www.legislation.gov.uk/ukpga/1995/25/contents> [Accessed 20/10/2025].
- Ref. 13 Environment Act 2021. Available at:
<https://www.legislation.gov.uk/ukpga/2021/30/contents> [Accessed 20/10/2025].

- Ref. 14 Planning Act 2008. Available at: <https://www.legislation.gov.uk/ukpga/2008/29/contents> [Accessed 20/10/2025].
- Ref. 15 The Environmental Permitting (England and Wales) Regulations 2016. Available at: <https://www.legislation.gov.uk/uksi/2016/1154/contents/made> [Accessed 20/10/2025].
- Ref. 16 The Hazardous Waste (England and Wales) Regulations 2005. Available at: <https://www.legislation.gov.uk/uksi/2005/894/contents> [Accessed 20/10/2025].
- Ref. 17 The Waste (England and Wales) Regulations 2011 (as amended). Available at: <https://www.legislation.gov.uk/uksi/2011/988/contents> [Accessed 10/11/2025].
- Ref. 18 Contaminated Land (England) Regulations 2006. Available at: <https://www.legislation.gov.uk/uksi/2006/1380/contents> [Accessed 20/10/2025].
- Ref. 19 The Anti-Pollution Works Regulations 1999. Available at: <https://www.legislation.gov.uk/uksi/1999/1006/contents/made> [Accessed 20/10/2025].
- Ref. 20 Construction (Design and Management) (CDM) Regulations 2015. Available at: <https://www.legislation.gov.uk/uksi/2015/51/contents/made> [Accessed 20/10/2025].
- Ref. 21 The Control of Asbestos Regulations 2012. Available at: <https://www.legislation.gov.uk/uksi/2012/632/contents> [Accessed 20/10/2025].
- Ref. 22 Environment Agency's online guidance for the management of land contamination 'Land contamination: risk management' (LCRM) (2023). Available at: <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm> [Accessed 20/10/2025].
- Ref. 23 Department for Environment and Rural Affairs (1990). Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance. Available at: [Environmental Protection Act 1990: Part 2A - Contaminated Land Statutory Guidance \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/444444/Environmental_Protection_Act_1990_Part_2A_-_Contaminated_Land_Statutory_Guidance.pdf) [Accessed 20/10/2025].
- Ref. 24 British Standard (BS) 10175 (2011 + A2 2017), Investigation of Potentially Contaminated Sites – Code of Practice (2017).
- Ref. 25 BS 5930 (2015 + A1:2020), Code of Practice for Ground Investigations. (2020).
- Ref. 26 BS 8576 (2013), Guidance on Investigations for Ground Gas. Permanent Gases and Volatile Organic Compounds (VOCs) (2013).
- Ref. 27 BS 8485 (2019), Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings (2019).
- Ref. 28 Construction Industry Research and Information Association (CIRIA) C665, Assessing Risks Posed by Hazardous Ground Gases to Buildings (2007).

- Ref. 29 CIRIA C811, Environmental Good Practice on Site Guide (fifth edition) (2023).
- Ref. 30 CL:AIRE, Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (2025).
- Ref. 31 Design Manual for Roads and Bridges (DMRB), LA109 Geology and Soils (2019).
- Ref. 32 DMRB, LA104 Environmental Assessment and Monitoring (2020).
- Ref. 33 DMRB, LA113 Road Drainage and the Water Environment (2020).
- Ref. 34 Department for Transport (DfT) (2022) Transport Analysis Guidance (TAG) Unit A3: Environmental Impact Appraisal (Section 10).
- Ref. 35 Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2. Chartered Institute of Ecology and Environmental Management, Winchester.
- Ref. 36 National House Building Council (NHBC), Environment Agency and Chartered Institute of Environmental Health (CIEH) report R&D66, Guidance for the Safe Development of Housing on Land Affected by Contamination (2008).
- Ref. 37 Contaminated Land: Applications in Real Environments (CL:AIRE) Framework for Assessing the Sustainability of Soil and Groundwater Remediation (2010).
- Ref. 38 CL:AIRE, Control of Asbestos Regulations (CAR-SOIL) 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials. Available at: <https://claire.co.uk/projects-and-initiatives/asbestos-in-soil.html> [Accessed 20/10/2025].
- Ref. 39 CL:AIRE (2011). Definition of Waste Code of Practice (DoWCoP). Available at: <https://claire.co.uk/projects-and-initiatives/dow-cop.html> [Accessed 20/10/2025].
- Ref. 40 Environment Agency Guidance for Pollution Prevention (GPP). Available at: <https://www.gov.uk/guidance/pollution-prevention-for-businesses> [Accessed 20/10/2025].
- Ref. 41 Environment Agency Guidance on the classification and assessment of waste (1st Edition v1.2.GB) Technical Guidance WM3 (2021). Available at: https://assets.publishing.service.gov.uk/media/6152d0b78fa8f5610b9c222b/Waste_classification_technical_guidance_WM3.pdf [Accessed 20/10/2025].
- Ref. 42 BGS GeoSure User Guide v8, Report OR/17/050, Appendix 1 GeoSure Legends (2018). Available at: https://www.bgs.ac.uk/download/geosure_user_guide/ [Accessed 30/10/2025].
- Ref. 43 CL:AIRE (2014) SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report (Revision 2). Available at:

- <https://randd.defra.gov.uk/ProjectDetails?ProjectId=18341> [Accessed 20/10/2025].
- Ref. 44 PJA (October 2025). Minworth AWTP – Geo-environmental Desk Study. Project Code: 07522, Project Ref: 07522-OUT-001.
- Ref. 45 PJA (January 2025). Minworth GUC Pipeline – Phase 1 Geo-environmental Desk Study. Project Code: 07522, Project Ref: 07522-RPT-002.
- Ref. 46 Defra (2025) Magic Map Application. Available at: <https://magic.defra.gov.uk/MagicMap.html> [Accessed 07/10/2025].
- Ref. 47 Birmingham City Council Important Ecological or Geological Sites information. Available at: https://www.birmingham.gov.uk/info/20055/conservation_areas/1462/do_i_need_an_ecological_or_geological_assessment/3 [Accessed 07/10/2025].
- Ref. 48 Warwickshire Geological Conservation Group (2021) Warwickshire Local Geological Sites (LGS). Available at: <https://www.wgcg.co.uk/lgs/> [Accessed 07/10/2025].
- Ref. 49 Warwickshire Geological Conservation Group (2021) Warwickshire Geological Sites of Special Scientific Interest. Available at: <https://www.wgcg.co.uk/lgs/sssii/> [Accessed 07/10/2025].
- Ref. 50 Warwickshire County Council, University of York, Warwickshire Wildlife Trust, Warwickshire Habitat Biodiversity Audit (HBA), Green Infrastructure - Warwickshire, Coventry and Solihull. Available at: <https://maps.warwickshire.gov.uk/greeninfrastructure/> [Accessed 07/10/2025].
- Ref. 51 Bedfordshire Geology Group, Geological sites in Bedfordshire. Available at: <https://www.bedfordshiregeologygroup.org.uk/local-sites.html> [Accessed 07/10/2025].
- Ref. 52 OUGS Northumbria Branch Website, Geological Conservation Review (GCR) Site Reports. Available at: <https://ougs.org/northumbria/local-geology/193/geological-conservation-review-gcr-site-reports/> [Accessed 07/10/2025].
- Ref. 53 Coventry Development Plan Policies Map <https://maps.coventry.gov.uk/connect/analyst/mobile/#/main?mapcfg=localplan> [Accessed 09/10/2025].
- Ref. 54 West Northamptonshire Council, Northamptonshire Minerals and Waste Local Plan 2017 <https://www.westnorthants.gov.uk/minerals-and-waste-planning-policy/adopted-minerals-and-waste-local-plan> [Accessed 09/10/2025].
- Ref. 55 Milton Keynes Council, Minerals Local Plan 2017 <https://www.milton-keynes.gov.uk/planning-and-building/planning-policy/minerals-policy> [Accessed 09/10/2025].
- Ref. 56 Buckinghamshire County Council, Buckinghamshire Minerals and Waste Local Plan 2016 - 2036 <https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/local-development-plans-and-guidance/local-development-plans/> [Accessed 09/10/2025].

- Ref. 57 Bedford Borough Council, Central Bedfordshire Council and Luton Borough Council – Minerals and Waste Local Plan (adopted 2014)
https://www.centralbedfordshire.gov.uk/info/48/minerals_and_waste/450/development_framework/2 [Accessed 09/10/2025].
- Ref. 58 Groundsure Site Sensitivity Data (GIS format), Ref. GS-L4D-PCR-CHS-QF9, September 2025.
- Ref. 59 BGS Geoindex <https://mapapps2.bgs.ac.uk/geoindex/home.html> [Accessed 17/11/2025].
- Ref. 60 Warwickshire County Council (2018) Warwickshire County Council: Warwickshire Minerals and Waste Local Plan (2018 – 2032). Available at <https://www.warwickshire.gov.uk/mineral-waste-plans/minerals-development-framework> [Accessed 24/11/2025].