

Tritax Symmetry (Hinckley) Limited

HINCKLEY NATIONAL RAIL FREIGHT INTERCHANGE

The Hinckley National Rail Freight Interchange Development Consent Order

Project reference TR050007

Environmental Statement Volume 1: Main Statement

Chapter 16: Geology, soils and contamination

Document reference: 6.1.16

Revision: 03

November 2022

Planning Act 2008

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

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Regulation 14

This document forms a part of the Environmental Statement for the Hinckley National Rail Freight Interchange project.

Tritax Symmetry (Hinckley) Limited (TSH) has applied to the Secretary of State for Transport for a Development Consent Order (DCO) for the Hinckley National Rail Freight Interchange (HNRFI).

To help inform the determination of the DCO application, TSH has undertaken an environmental impact assessment (EIA) of its proposals. EIA is a process that aims to improve the environmental design of a development proposal, and to provide the decision maker with sufficient information about the environmental effects of the project to make a decision.

The findings of an EIA are described in a written report known as an Environmental Statement (ES). An ES provides environmental information about the scheme, including a description of the development, its predicted environmental effects and the measures proposed to ameliorate any adverse effects.

Further details about the proposed Hinckley National Rail Freight Interchange are available on the project website:



The DCO application and documents relating to the examination of the proposed development can be viewed on the Planning Inspectorate’s National Infrastructure Planning website:

<https://infrastructure.planninginspectorate.gov.uk/projects/east-midlands/hinckley-national-rail-freight-interchange/>

Chapter 16 ◆ Geology, soils and contamination

INTRODUCTION

- 16.1. This ES Chapter considers the likely significance of the environmental impact of the Hinckley National Rail Freight Interchange (HNRFI) development and contiguous road connections (i.e. the A47 Link Road), as well as off-site highway and railway works on the geology, soils and contaminated land beneath the Main Order Limits Site and on sensitive receptors within a 500m buffer. The ES has been undertaken in accordance with the requirements as set out within the National Policy Statement for National Networks, and with reference to relevant local plans and mineral safeguarding policies.
- 16.2. The ES Chapter is supported by the following appendices:
- ES Appendix 15.1 Phase 1 Geo-Environmental Assessment. Document reference 6.2.15.1.
 - ES Appendix 15.2 Preliminary Ground Investigation Report. Document reference 6.2.15.2.

METHODOLOGY AND DATA SOURCES

- 16.3. The ES assesses the likelihood of existing contamination being encountered during the construction process, such that it could cause significant environmental or health effects if not addressed adequately at the construction and/or operational stages. The construction would entail bringing materials onto site (such as fuel) which if spilt or leaked could result in land or groundwater contamination. Impairment and sterilisation of geological and mineral resources would likewise be addressed.
- 16.4. A risk-based approach in accordance with Defra¹ and the Environment Agency² (EA) guidance has been taken to assess contamination which may have a significant effect upon the construction and operation of the Proposed Development, or upon the wider environment as a consequence of the Proposed Development.
- 16.5. A desk study has been completed covering the Main Order Limits area and a preliminary ground investigation has been undertaken at the Main HNRFI Site. Further ground investigation would be undertaken to support detailed earthworks and foundation design and to investigate areas that are currently inaccessible, for example operational

¹ *Department for Environment, Farming and Rural Affairs; Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance; April 2012*

² *Land Contamination Risk Management (<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>)*

areas with farmyards and adjacent to the railway and M69. Based on the predominantly greenfield nature of the Main HNRFI Site there are unlikely to be significant contaminant linkages present that would impact on the viability of the Proposed Development. Additional investigations would be completed following the making of any DCO and prior to construction works commencing on site in order to provide additional data to inform detailed design and associated mitigation. However, the preliminary GI undertaken is sufficient to allow adequate assessment for the purposes of the EIA Regulations.

16.6. With regards to sites of geological interest, information has been obtained from Natural England, the British Geological Survey, The Coal Authority, Blaby District Council, Leicestershire County Council and Hinckley and Bosworth Borough Council who hold information on such sites.

General approach and data sources

16.7. The general methodology for assessing effects followed standard procedures and involved the following desk-based and intrusive processes:

- Review of local, regional and national planning strategies and development plan policies (including, but not limited to, land contamination, aquifer protection, mineral resources).
- Review of published documents, current standards, and current best practice guidance.
- A reconnaissance of the Main HNRFI Site including the M69 junction area within the Main Order Limits, was completed in February 2018 and updated in August 2018, and the area of the A47 link corridor in May 2019 to confirm desk-based information and identify and confirm the current state and use of land within the Main Order Limits. A further site visit was made in August 2022 confirming no significant changes within the Main Order Limits had occurred since the previous visits.

16.8. A review of the following reports and information sources to provide site specific factual data regarding geology, soils and groundwater and where available and relevant has been used to support the development of the baseline ground model and assessment of baseline conditions.

- Groundsure reports, reference GSIP-2021-10711-3797 and HMD-214-7439283 included within the Phase 1 Reports (Appendix 15.1 (document reference 6.2.15.1));
- 1:2,500 and 1:10,000 scale Historical Ordnance Survey Mapping,;
- Historical aerial photographs (Google Earth) and other imagery (Groundsure Report);
- British Geological Survey (BGS) 1:50 000 Scale, 'Coventry', Sheet 169, Solid and

Drift, (1994);

- BGS online geological maps and exploratory hole records (www.bgs.ac.uk);
- MAGIC website (www.natureonthemap.naturalengland.org.uk/magicmap);
- Coal Authority Interactive Map Viewer (<http://mapapps2.bgs.ac.uk/coalauthority/home.html>).
- Regional unexploded bomb risk maps, (<https://zeticauxo.com/downloads-and-resources/risk-maps/>).
- ‘*Preliminary Desk Study – Hinckley Strategic Rail Freight Interchange*’; by Hydrock for db Symmetry Ltd; ref. 07700-HYD-XX-XX-RP-GE-1001-S2-P1; dated 16th April 2019.
- ‘*Phase 1 Desk Study - Hinckley National Rail, Freight Interchange – A47 Link Road*’; by Hydrock for db Symmetry Ltd; ref: 07700-HYD-XX-XX-RP-GE-1006; dated 12th June 2019.
- ‘*Preliminary Ground Investigation Report – Hinckley Rail Freight Interchange*’; by Hydrock for db Symmetry Ltd; ref. 07700-HYD-XX-XX-RP-GE-1002; dated 14th June 2019. Document reference 6.2.15.2.

- 16.9. The Environment Agency (EA) groundwater protection team, Blaby District Council, Leicestershire County Council, Hinckley and Bosworth Borough Council, Nuneaton and Bedworth Borough Council contaminated land and mineral safeguarding officers and other relevant stakeholders were consulted prior to and as part of the submission of the Preliminary Environmental Information Report (PEIR).
- 16.10. The assessment of effects has been undertaken using Qualitative Risk Assessment Matrices set out in Table 16.3 to 16.5 developed from the baseline condition ground model and updated to reflect the effect during both construction and operational phases.
- 16.11. The earthworks construction phase of the Proposed Development to be assessed would comprise a phased enabling works package to prepare development platforms, comprising the demolition of existing buildings, stripping of topsoil and bulk earthworks using site won materials and provision of primary infrastructure. Construction of buildings would follow in a number of phases. It is likely that the earthworks would be completed in a single phase including the earthworks for the M69 J2 improvements and the A47 Link Road, rail sidings and rail port and construction of development platforms. Offsite Highway works such as Junction and signalling changes are not expected to require significant groundworks and are not likely to require further ground investigation.
- 16.12. The key activities of the operational phase would comprise road and rail logistics, storage, loading and unloading of goods as reported in Chapter 3: *Project description*

(document reference 6.1.3).

- 16.13. Where necessary suitable mitigation options are detailed, and their residual effect measured in the same manner using updated and extended qualitative risk assessment matrices to demonstrate the residual effect after mitigation.
- 16.14. Cumulative effects have been considered in accordance with the principles set out in Chapter 20: *Cumulative effects* where other committed or proposed schemes developments are planned or being progressed that might affect the same receptors.

Consultation

- 16.15. A request for a scoping opinion was submitted to PINS in November 2020 (document reference 6.2.6.1), with an opinion returned in December 2020 (document reference 6.2.6.2). Comments relating to Geology, Soils and Contaminated Land that were received are summarised in Table 16.1 below.

Table 16.1: Summary of scoping opinion and responses

Source	ID/Ref	Scoping Comments	Response
PINS	4.10.2 15.10	Scoping Report lists the policies against which the assessment will be prepared. Hinckley and Bosworth Borough Council (HBBC) notes that ‘Policy DM7: Preventing Pollution and Flooding’ of the Site Allocations and Development Management Policies is also relevant.	Hinckley and Bosworth Borough Council were consulted as part of the Phase 1 assessment. The assessment looks at potential for pollution of controlled waters from the Proposed Development in sections 16.112 to 16.113 and 16.125 to 16.129.
PINS	4.10.3 15.12	The Inspectorate notes that the assessment will be supported and informed through consultations with various stakeholders. It should be clear in the ES how consultees comments have informed the assessment.	A list of stakeholder responses is presented in Table 16.2
PINS	4.10.4	The Scoping Report states that additional surveys will be undertaken	The Phase 1 Report (Appendix 15.1

Source	ID/Ref	Scoping Comments	Response
	15.15	for the link roads. The ES must describe the baseline environment surrounding all relevant proposed works (including the works to the M69 Junction 3 /M1 Junction 21).	(document reference 6.2.15.1)) covers the M69 Junction and A47 Link Road Corridor
PINS	4.10.5 15.14 – 15.18	A figure or figures should be included in the ES to depict the location of any known areas of contamination and any geological sites of interest.	ES Figure 15.1 (document reference 6.3.15.1) shows areas of potential contamination
PINS	4.10.6 15.22 15.55	The Scoping Report states that remediation of contaminated land and other construction activities can lead to secondary effects and any such effects would be controlled through use of the Construction Environmental Management Plan (CEMP). The ES should set out how the CEMP would manage any mitigation required with respect to potential adverse effects from construction of the Proposed Development. The ES should provide details of how any adverse effects on soils can be minimised.	This is noted. The CEMP is discussed in Sections 16.125 to 16.129
PINS	4.10.7 15.23	The Scoping Report states that major operational sources of contamination are to be reviewed, and any appropriate mitigation measures proposed would be in line with the Land Contamination Risk Management (LCRM) assessment methodology. During the operational period, monitoring works may continue in order to demonstrate the effectiveness of any remedial works. The ES should demonstrate how mitigation and monitoring measures detailed in the ES would be secured	This is noted. If required, a Remediation Strategy would incorporate any required long term monitoring and verification.

Source	ID/Ref	Scoping Comments	Response
		through the DCO.	
PINS	4.10.8 5.25-15.42	The ES should fully explain how the risk assessment including the Conceptual Site Model approach has been applied to identify potential impacts and any likely significant effects derived from construction and operation of the Proposed Development.	The methodology is set out in Sections 16.21 to 16.31 and 16.91 to 16.103 of the ES
PINS	4.10.9 15.43	The study zone extending to 250m from the site boundary should be fully justified in the ES following consultation and agreement with relevant consultees where possible. The water resources study that will aid consideration of groundwater resources over a larger area for assessment of groundwater contamination effects should be clearly referenced and a clear explanation of the results should be provided to show how this has formed part of the assessment.	This is noted and the groundwater CSM is cross referenced with the Hydrogeology Chapter (document reference 6.1.15) and Surface Water and Flood Risk Chapter (document reference 6.1.14). Environmental searches have been undertaken up to 2km from the Main Order Limits Site. Significant effects beyond the 500m buffer are unlikely considering the absence of significant contamination sources and the underlying Secondary Aquifer. The Main Order Limits Site is not within 1km of a Source Protection Zone.

16.16. Consultations with the regulatory authorities were made prior to, and following submission of the PEIR. The following regulatory responses were received:

Table 16.2: Summary of section 42 consultation (2021) responses

Consultee	ID/Ref	Consultee Comment	Response
Environment Agency		<p>PEIR review recommended conditions.</p> <p><i>"No stage of the authorised development must commence until a remediation strategy to deal with the risks associated with contamination of the site in respect of controlled waters has, for that stage and after consultation with the Environment Agency, been submitted to and approved by the relevant planning authority. This strategy will include the following components:</i></p> <ol style="list-style-type: none"> <i>1. A preliminary risk assessment which has identified:</i> <ul style="list-style-type: none"> <i>• all previous uses</i> <i>• potential contaminants associated with those uses</i> <i>• a conceptual model of the site indicating sources, pathways and receptors</i> <i>• potentially unacceptable risks arising from contamination at the site</i> <i>2. A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off-site.</i> <i>3. The results of the site investigation and the detailed risk assessment referred to in (2) and, based on these, an options appraisal and remediation strategy</i> 	<p>The approach undertaken in the ES follows the recommendations of the EA. A preliminary risk assessment accompanies the application (Appendix 15.1 (document reference 6.2.15.1))</p>

Consultee	ID/Ref	Consultee Comment	Response
		<p><i>giving full details of the remediation measures required and how they are to be undertaken.</i></p> <p><i>4. A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy in (3) are complete and identifying any requirements for longer-term monitoring of contaminant linkages, maintenance and arrangements for contingency action.</i></p> <p><i>Any changes to these components require the written consent of the relevant planning authority. The scheme shall be implemented as approved.</i></p> <p><i>Reason for the Requirement 1</i></p> <p><i>To ensure that the development does not contribute to, and is not put at unacceptable risk from or adversely affected by, unacceptable levels of water pollution in line with paragraph 174 of the National Planning Policy Framework.</i></p> <p><i>Requirement 2</i></p> <p><i>Prior to each phase of development being brought into use, a verification report demonstrating the completion of works set out in the approved remediation strategy and the effectiveness of the remediation shall, after consultation with the Environment Agency, be submitted to and approved by the relevant planning authority</i></p> <p><i>The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the</i></p>	

Consultee	ID/Ref	Consultee Comment	Response
		<p><i>site remediation criteria have been met.</i></p> <p><i>Reason for the Requirement 2</i></p> <p><i>To ensure that the site does not pose any further risk to the water environment by demonstrating that the requirements of the approved verification plan have been met and that remediation of the site is complete. This is in line with paragraph 174 of the National Planning Policy Framework."</i></p>	
National Highways		Noted that the NH hold ground conditions information on the M69. HD622 geotechnical reporting will be required for geotechnical design of highway improvements.	Noted for Future Geotechnical Design Work
Forestry Commission		No relevant response received	N/A
DEFRA		No response received	N/A
Historic England		No specific information held	N/A
Blaby District Council		Noted historic land uses and current land uses such as railway activities, fuel storage on existing farms and made ground which is associated with development of M69 and associated bridges.	Covered in Phase 1 Assessment (Appendix 15.1 (document reference 6.2.15.1) and in Sections 16.91 to 16.92 of the ES
		<p>The approach to considering contamination and the proposed remediation of the site in general is accepted.</p> <p>Appropriate measures to control the</p>	Typical Measures will include interceptors, wet stock monitoring controls, sealed drainage in service yards and

Consultee	ID/Ref	Consultee Comment	Response
		proposed use can be put in place to offer greater protection against contamination and any leaching into water courses from these sources.	maintenance areas. All tanks to be bunded to 110% capacity.
		There are a number of potential contamination sources on the site. The District Council has not declared any of the land under its District as contaminated land; however, the Council has a responsibility for monitoring and reviewing such land. If during development works any contamination should be encountered including migrating landfill gas which was not previously identified or is derived from a different source and/or of a different type to those considered under the contamination proposals; then the LPA shall be notified immediately, and remediation proposals formulated/amended for consideration by the LPA.	Noted, contingency measures for unforeseen contamination are part of the remediation strategy and earthworks proposals for the site.
Leicestershire County Council		Searches confirmed no significant issues with respect to contaminated land associated with the site.	None
Hinckley and Bosworth Borough Council		Noted that Burbage Common is identified as an area of interest due to historical use as a rifle range between 1885 and 1931. Burbage common is now not contained within the Main Order Limits boundary.	Not within the Main Order Limits. Noted on historical mapping west of Area 2.
		No further comments on the PEIR	
Burbage Parish Council		No additional requirements above those set out in the scoping report	N/A

Consultee	ID/Ref	Consultee Comment	Response
Elmesthorpe Parish Council		No relevant response received	N/A

Section 47 Consultation

- 16.17.** On the theme of geology, Section 47 responses related to the cut and fill drawing reference and the potential for the cut and fill quantity to alter following further survey works.
- 16.18. The earthworks model has been updated and further surveys completed and is appended as ES Figure 16.1 (document reference 6.3.2.1). Significant further changes are not expected, and an approximate cut and fill balance is achievable at the site.

Study Area

- 16.19. The extent of the Study Area is the land within the proposed Main Order limits, A47 link road and M69 Junction 2 works, plus a buffer, extending to 500m from the boundary including land required for construction of compounds, construction/storage sites and other land required for the works. Ground and surface water abstractions and environmentally sensitive sites have been assessed within a 2km buffer from the Main Order Limits Site. The extent of this zone has been developed using professional judgement on the basis that contamination migration beyond this distance is likely to be minimal or could be mitigated and off-site sources beyond this zone are unlikely to affect the DCO Site. Groundwater resources including abstractions and source protection zones within a 2km buffer have been considered in the assessment of groundwater contamination effects.
- 16.20. For the purposes of the assessment, the Main Order Limits Site has been split into three sections as shown on ES Figure 2.1 (document reference 6.3.2.1) Area 1 in blue comprising the Main HNRFI site area, Area 2 in orange comprising the A47 Link Road and Area 3 in green consisting of the M69 Junction 2 improvements. There are additional areas within the order limits that would be subject to offsite highway and rail crossing works but would not require any significant physical works which are likely to affect ground conditions.

Identifying risks

- 16.21. In line with the *Land Contamination Risk Management*³, the Preliminary Risk Assessment includes a geo-environmental Hazard Identification ('HAZID'), which seeks to list all the

³ *Land Contamination Risk Management* (<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>) is the governments primary guidance on the assessment and management of the risks from land contamination.

suspected contaminant sources, the receptors that might be harmed by those sources and the pathways via which the sources might reach the receptors to cause the harm. The source-pathway-receptor concept is known as a contaminant linkage (formerly a pollutant linkage) and only when a linkage is complete is there any possibility of risk of harm arising. The source-pathway-receptor concept is assessed through production of a Conceptual Site Model ('CSM').

- 16.22. Beneficial and adverse impacts have been identified, and options have been outlined for mitigating any potential adverse effects from the construction and operation. Cumulative effects of the Proposed Development in relation to other known committed or proposed schemes is also be addressed in accordance with the principles in Chapter 20: *Cumulative effects* where necessary.

Determining the significance of effects

- 16.23. The approach described above forms the basis of the methodology used in the assessment. For contamination to present a significant potential effect a link must first be established within the CSM. The likelihood of a contaminant linkage must be demonstrated with an identifiable source (onsite or off site), a receptor and a viable pathway.
- 16.24. Potential sources have been identified from an assessment of current site uses and activities, review of historical mapping for former uses and a review of regulatory permits, consents and authorisations contained within the Groundsure report for the Main Order Limits Site for potentially contaminative sites such as landfills, environmental permits, pollution controls.
- 16.25. Pathways would be specific to the receptor type. For example, they could be:
- ingestion, inhalation, dermal contact for human health receptors;
 - infiltration and contaminant migration through permeable strata such as the unsaturated zone for groundwater;
 - a secondary pathway from groundwater contamination to surface water;
 - migration of ground gases and vapours such as permanent gases, landfill gas and volatile hydrocarbons into buildings; and
 - direct contact and uptake by plants.
- 16.26. The sensitivity of potential receptors can be described qualitatively according to the categories shown in Table 16.3.

Table 16.3: Criteria for assessing receptor sensitivity

Receptor sensitivity/ Value of Resource	Explanation	Receptor/ Resource
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or is of national importance.	<p>Human health of users of residential areas, schools and playing fields,</p> <p>Surface water bodies of high quality e.g., main rivers and primary tributaries with good biological and/or chemical quality and/or Principal Aquifers.</p> <p>Nationally designated areas e.g., Burbage Wood and Aston Firs SSSI, Aston Firs, Freeholt Wood and Sheepy Wood Ancient woodland.</p> <p>Major strategic mineral resource areas, e.g., areas associated with a particularly high grade or quality resource or rare minerals.</p> <p>Grade 1 (Best and most versatile) Agricultural land.</p>
Moderate	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.	<p>Human health of users of retail and business parks (public and workplaces)</p> <p>Allotments and market gardens</p> <p>Surface water bodies of moderate quality, and/or Secondary A Aquifers</p> <p>Regionally designated areas e.g., Burbage Common & Woods local nature reserves or Local Geological Sites (LGS).</p> <p>Regionally or locally important mineral resource areas (MPA or MSA)</p> <p>Grade 2 (Best and most versatile) Agricultural land.</p>

Receptor sensitivity/ Value of Resource	Explanation	Receptor/ Resource
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	Human health of users of Commercial or industrial development. Mineral Areas of Search/ Consultation Areas (MCA). Secondary B and undifferentiated aquifers. Grade 3a (Best and most versatile) Agricultural land.

16.27. The magnitude of land contamination effects are assessed by comparing all contaminant linkages at a baseline value (existing condition) to those during construction and operational circumstances. This provides a way of assessing adverse and beneficial effects through the project lifecycle. The magnitude is assessed using a four-point scale as shown in Table 16.4.

Table 16.4: Effect magnitude criteria

Effect Magnitude	Criteria
High	Results in total loss of attribute and/or likely to cause exceedance of statutory objectives and/or breach of legislation.
Moderate	Results in effect on integrity of attribute/or loss of part of attribute, and/or possibly cause exceedance of statutory objectives and/or breach of legislation.
Low	Results in minor effects on attribute e.g., measurable effect but below a level that would breach legislative or statutory limits.
Negligible	Results in no change or effect on attribute

16.28. The assessment of significance is based on the magnitude of the effect and the

importance or sensitivity of the receptors as set out below in Table 16.5. The significance of the potential effects is identified, as well as those of the residual effects for geological and mineral effects. Appropriate mitigation measures will be recommended in order to reduce/control any significant adverse effects on sensitive receptors. Once remediated, there should be no residual effects with respect to land contamination issues.

Table 16.5: Significance of effect matrix

Magnitude of Change	Sensitivity of Receptor				
		High	Medium	Low	Negligible
	High	Major	Major / Moderate	Moderate	Slight
	Medium	Major / Moderate	Moderate	Moderate / Slight	Slight
	Low	Moderate	Moderate / Slight	Slight	Negligible
	Negligible	Slight	Slight	Negligible	Negligible

16.29. Effects have the potential to be adverse, beneficial, or neutral and temporary or permanent. For example, in terms of beneficial effects, the Proposed Development may remove a source of contamination, or it may break a pathway that currently links a source to a receptor. The effects criteria are presented in Table 16.6.

16.30. The Duration of the effect is also considered.

- Short-term: Temporary effects related to a specific construction event of no more than a year’s duration – such as the construction of an individual building or a specific element of infrastructure such as a section of road.
- Medium-term: Temporary effects of longer duration, such as those arising over an extended period of construction ranging from one year to the full construction period, envisaged to be ten years.
- Long-term: Permanent effects arising from the operation of the HNRFI or from the permanent presence or removal of physical features.

16.31. Effects of moderate or greater significance are considered to be significant in terms of the EIA. Where effects are considered as marginal, i.e., moderate/slight a precautionary approach has been adopted depending on the severity or likelihood of the effect., and further consideration given as to whether mitigation is necessary.

Table 16.6: Significance effect criteria

Significance	Description
Major adverse	Short term (acute) risk to human health likely to result in “significant harm” as defined by the Environment Protection Act 1990, Part IIA. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings/ property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.
Moderate adverse	Chronic damage to Human Health (“significant harm”). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.
Slight adverse	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.
Neutral	Effects, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by measures such as protective clothing etc.). Easily repairable effects of damage to buildings, structures and services.
Slight beneficial	Minor reduction in risk (slight, short or highly localised effect).
Moderate beneficial	Moderate reduction in risk, improvement in water quality.
Major beneficial	Major reduction in risk.

Limitations and assumptions

16.32. Intrusive ground investigation has only been completed within Area 1, the Main HNFRI Site and was limited to shallow trial pits and boreholes. Investigation of deeper strata

and areas 2 and 3 would be completed as part of detailed design following submission of the ES. Areas 2 and 3 would be of a low level of risk because of subsequent use for highway works, although there will be significant earthworks in relation to the J2 works. The investigations confirmed the published geology and did not identify any significant sources of contamination or difficult ground conditions that could impact upon the feasibility of the development. The investigations completed are sufficient in scope to inform the assessment for the purposes of the EIA Regulations.

RELEVANT LAW, POLICY AND GUIDANCE

16.33. The applicable legislative framework for Contaminated Land is set out in Part IIA of the Environment Act 1990 and associated statutory guidance. Non statutory Guidance on management of Contaminated Land (Land Contamination Risk Management) is issued by the Environment Agency.

Part IIA of the Environmental Protection Act (1990)⁴

16.34. Part IIA of the Environmental Protection Act, (1990) and the supporting statutory guidance describes a regulatory role for Local Authorities in dealing with contaminated land.

16.35. The Environment Act 1995, creates a system whereby Local Authorities must identify, and if necessary, arrange for the remediation of contaminated sites. The provisions are set out in Section 57, which inserts Part IIA into the Environmental Protection Act, 1990. In addition to these requirements, the operation of the regime is subject to regulation and statutory guidance.

16.36. The Act provides a definition of what constitutes ‘contaminated land’ and sets out the responsibilities of the Local Authority and the EA in the identification and management of contaminated land. Under the Regulations, contaminated land is defined as:

- ‘Land which is in the opinion of the Local Authority to be in such a condition by reason of substances in or under the land that;
- significant harm is being caused or there is significant possibility of significant harm being caused; and
- significant pollution of controlled waters is being caused or there is a significant possibility of significant pollution of controlled waters being caused’.

16.37. Harm is defined in relation to harm to the health of living organisms or other interference with the ecological systems of which they form a part, and in the case of man includes harm to property. The potential for harm to occur requires three conditions to be

⁴ Department for Environment Food and Rural Affairs, *Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance; April 2012*, <https://www.gov.uk/government/publications/contaminated-land-statutory-guidance>

satisfied:

- Presence of substances (potential contamination/pollutants) that may cause harm (source of pollution);
- the presence of a receptor which may be harmed e.g. the water environment or humans, buildings, fauna and flora (the receptor); and
- the existence of a linkage between the source and receptor (the pathway).

16.38. Therefore, the presence of measurable concentrations of contaminants within the ground and subsurface environment do not automatically imply that a contamination problem exists, since contamination must be defined in terms of contaminant linkages and unacceptable risk of harm.

16.39. The nature and importance of both pathways and receptors which are relevant to a particular site would vary according to the intended use of the site, its characteristics, and surroundings.

National Policy Statement for National Networks (NPSNN) (2014)⁵

4.46 'Issues relating to discharges or emissions from a proposed project which affect air quality, water quality, land quality, and the marine environment, or which include noise and vibration, may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes. Relevant permissions will need to be obtained for any activities within the development that are regulated under those regimes before the activities can be operated.

4.50 In deciding an application, the Examining Authority and the Secretary of State should focus on whether the development itself is an acceptable use of the land and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. They should assess the potential impacts of processes, emissions or discharges to inform decision making, but should work on the assumption that in terms of the control and enforcement, the relevant pollution control regime will be properly applied and enforced. Decisions under the Planning Act should complement but not duplicate those taken under the relevant pollution control regime.

4.55 The Secretary of State should be satisfied that development consent can be granted taking full account of environmental effects. This will require close cooperation with the Environment Agency and/or the pollution control authority, and other relevant bodies,

⁵ National Policy Statement for National Networks (NPSNN) 2014, Presented to Parliament pursuant to Section 9(8) and Section 5(4) of the Planning Act 2008, December 2014 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/npsnn-web.pdf

such as the MMO, Natural England, Drainage Boards, and water and sewerage undertakers, to ensure that in the case of potentially polluting developments:

the relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework; and

the effects of existing sources of pollution in and around the project are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits.

5.117 Where necessary, land stability should be considered in respect of new development, as set out in the National Planning Policy Framework and supporting planning guidance. Specifically, proposals should be appropriate for the location, including preventing unacceptable risks from land instability. If land stability could be an issue, applicants should seek appropriate technical and environmental expert advice to assess the likely consequences of proposed developments on sites where subsidence, landslides and ground compression is known or suspected. Applicants should liaise with the Coal Authority if necessary.

5.118 A preliminary assessment of ground instability should be carried out at the earliest possible stage before a detailed application for development consent is prepared. Applicants should ensure that any necessary investigations are undertaken to ascertain that their sites are 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. This could be in the form of a land stability or slope stability risk assessment report.

5.168 Applicants should take into account the economic and other benefits of the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification). Where significant development of agricultural land is demonstrated to be necessary, applicants should seek to use areas of poorer quality land in preference to that of a higher quality. Applicants should also identify any effects, and seek to minimise effects, on soil quality, taking into account any mitigation measures proposed. Where possible, developments should be on previously developed (brownfield) sites provided that it is not of high environmental value. For developments on previously developed land, applicants should ensure that they have considered the risk posed by land contamination and how it is proposed to address this.'

5.169 Applicants should safeguard any mineral resources on the proposed site as far as possible.'

National Planning Policy Framework (NPPF) (2021)⁶

⁶ The National Planning Policy Framework (NPPF) was first published on 27 March 2012 and updated on 24

16.40. The National Planning Policy Framework (NPPF) (2021) sets out the Government's planning policies for England. It makes the following reference to Contaminated Land and ground conditions in the section entitled Conserving and enhancing the natural environment:

'174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.'

16.41. It also makes the following references to ground conditions and pollution:

'Planning policies and decisions should ensure that:

183 a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.

184. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.'

16.42. Assessment of the impact of the Proposed Development is also be undertaken in accordance with, but not limited to, the below policies:

- Blaby District Local Plan (Core Strategy) Development Plan, February 2013;
- Blaby District Local Plan (Delivery) Development Plan Document (DPD) Adopted February 2019;

July 2018 and 19 February 2019. This sets out the government's planning policies for England and how these are expected to be applied. <https://www.gov.uk/guidance/national-planning-policy-framework>

- Hinckley and Bosworth Local Plan;
- District of Harborough, Harborough Local Plan 2011 to 2031, Adopted 30 April 2019; and
- Rugby Borough Council Local Plan 2011-2031 June 2019.

16.43. Assessment of the impact of the Proposed Development is also be undertaken in accordance with, national guidance published by the Environment Agency:

- EA Guidance on Land Contamination Risk Management (LCRM); and
- EA Groundwater Protection Guidance.

Blaby District Council Local Plan Core Strategy⁷

Policy CS19 – Bio-diversity and Geo-diversity

Strategic objectives

vi) To protect the important areas of the District’s natural environment (species and habitats), landscape and geology and to improve biodiversity, wildlife habitats and corridors through the design of new developments and the management of existing areas by working with partners.

Blaby District Local Plan Delivery DPD (Adopted February 2019)

Policy DM13 Land Contamination and Pollution

Land Contamination and Pollution

Development proposals will be required to clearly demonstrate that any unacceptable adverse impacts related to land contamination, landfill, land stability and pollution (water, air, noise, light and soils) can be satisfactorily mitigated.

⁷ Blaby District Local Plan, Local Plan (Delivery) Development Plan Document Adopted February 2019
<https://www.Blaby.Gov.Uk/Planning-And-Building/Local-Plan/Local-Plan-Delivery-Dpd/>

Local Plan (Core Strategy) Development Plan Document Adopted February 2013
<https://www.Blaby.Gov.Uk/Media/4107/Adopted-Core-Strategy.Pdf>

For the following circumstances, development proposals will be supported where they are accompanied by a detailed investigation of the issues and appropriate mitigation measures are identified to avoid any adverse impact upon the site or adjacent areas:

- a) Land that is (or has the potential to be) subject to land contamination or land stability issues;*
- b) close to an aquifer or surface water feature that may result in groundwater or surface water pollution;*
- c) close to or within an air quality management area or key transport corridors that may be affected by air quality;*
- d) close to a source of noise or light pollution and/or the proposal may be a source of noise or light pollution;*
- e) soils of high environmental value, including best and most versatile agricultural land.*

This policy seeks to ensure that development proposals are not affected by or cause land contamination or pollution.

Land contamination, landfill and land stability

4.62 The NPPF encourages the effective use of land by re-using land that has previously been developed. However, to prevent unacceptable risks from pollution and land.

4.63 The NPPF makes it clear that, where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

4.64 It is important that such sites are reclaimed to a level that is suitable for the future intended use and also that there is no contamination of water resources during the reclamation and redevelopment.

4.65 The geology of the District has resulted in mineral workings, with important resources of igneous rock, sand and gravel and clays. Currently, there is one extraction site, at Croft Quarry, which provides high quality granite. The legacy of mineral extraction has resulted in a number of disused quarries and workings, several of which have been reclaimed via landfill. A number of these were filled prior to the 1974 Control of Pollution Act and few records exist as to the nature of infill materials. Other sources of potential pollution or land contamination include historical industrial sites, current industrial sites and other previously developed contaminated sites. As a general rule, development proposals within 250m of a landfill or contaminated site will require investigation.

Water Quality

4.66 The Water Framework Directive requires member states, among other things, to prevent deterioration of aquatic ecosystems and protect, enhance and restore water

bodies to 'good' status. It applies to all surface waters and underground water storage. The Humber River Basin Management Plan provides a holistic framework to protect and enhance the benefits of the water environment to people, the economy and wildlife. It sets out the actions needed to tackle problems that are affecting water quality.

Hinckley and Bosworth Site Allocations and Development Management Policies DPD Plan (Adopted July 2016)⁸

Policy DM7

Preventing Pollution and Flooding

Adverse impacts from pollution and flooding will be prevented by ensuring that development proposals demonstrate that:

- a) It will not adversely impact the water quality, ecological value or drainage function of water bodies in the borough;*
- b) appropriate containment solutions for oils, fuels and chemicals are provided;*
- c) all reasonable steps are taken through design, siting and technological solutions to ensure the abatement of obtrusive light to avoid sky glow, glare and light intrusion;*
- d) it would not cause noise or vibrations of a level which would disturb areas that are valued for their tranquillity in terms of recreation or amenity;*
- e) appropriate remediation of contaminated land in line with minimum national standards is undertaken;*
- f) it will not contribute to poor air quality;*
- g) it will not result in land instability or further intensify existing unstable land; and*
- h) the development doesn't create or exacerbate flooding by being located away from areas of flood risk unless adequately mitigated against in line with National Policy.*

District of Harborough, Harborough Local Plan 2011 to 2031 (Adopted 30 April 2019)⁹

GD8 Good design in development

- 1. Development will be permitted where it achieves a high standard of design, including meeting the following criteria:*

⁸ *Hinckley and Bosworth Borough Council, Local Plan 2006-2026, Site Allocations and Development Management Policies DPD, adopted July 2016.*

⁹ *District of Harborough, Harborough Local Plan 2011 to 2031, Adopted 30 April 2019*

n. where the site has previously been developed:

i. identifying the need for any decontamination and implementing this to an agreed programme; and

ii. ensuring that any contamination is not relocated elsewhere to a location where it could adversely affect the water environment or other wildlife habitats.

GI5 Biodiversity and geodiversity

1. Nationally and locally designated biodiversity and geodiversity sites, as shown on the Policies Map, will be safeguarded.

2. Development will be permitted where:

a. there is no adverse impact on:

iii nationally designated sites;

iv. locally designated sites;

unless, in all cases, the need for, and benefits of, the development in that location clearly outweigh the impact.

b. there is no loss of any 'best and most versatile agricultural land' unless this is demonstrably necessary to facilitate the delivery of sustainable development;

c. there is no net loss or sterilisation of natural resources;

IN4 Water resources and services

Water resources will be protected and water services provided. Development will be permitted where it would: b. not adversely affect ground water quality by preventing potential sources of water pollution within Source Protection Zones (as identified on the Policies Map);

e. ensure the removal of any contamination from the site and that the development would not result in the migration of any contamination to a location where it could have an adverse effect upon the water environment;

Rugby Borough Council Local Plan 2011-2031 (Adopted June 2019)¹⁰

Policy SDC7: Protection of the Water Environment and Water Supply

Development will not be permitted where proposals have a negative impact on water quality, either directly through pollution of surface or ground water.

¹⁰ Rugby Borough Council Local Plan 2011-2032 June 2019

Development will not be permitted where the sensitivity of the groundwater environment, or the risk posed by the type of development is deemed to pose an unacceptable risk of pollution of the underlying aquifers.

BASELINE CONDITIONS

Site description

- 16.44. The Main Order Limits Site comprises an irregular shaped plot of land which is currently primarily utilised for agricultural purposes, comprising fields and farm buildings, and includes sections of the local road and rail network. A number of small businesses also operate within the site including boarding kennels, stables and a farm shop.
- 16.45. The topography is variable with elevation ranging between c. 83m above Ordnance Datum (AOD) in the north beside the railway to c. 110m AOD at the M69 J2 motorway roundabout in the south, with levels of c. 93m AOD to 99m AOD in the A47 Link Road Corridor west of the Main Order Limits Site, c. 91m AOD in the east and c. 100m AOD in the centre of the Main HNRFI Site. The topography generally increases in elevation from northeast to southwest, with a slight ridge feature through the centre of the Main HNRFI Site orientated broadly in a southwest to northeast direction.
- 16.46. For the purposes of this section, the Main Order Limits Site has been split into three sections; Area 1 comprising the Main HNFRI Site, Area 2 comprising the arm to the north west containing the A47 Link Road Corridor, and Area 3 consisting of the M69 Junction 2 arm. The Areas are set out on ES Figure 2.1 (document reference 6.3.2.1). Detailed walkover was completed in 2018 and a further visit in August 2022 to confirm any significant changes to the Main Order Limits Site and to cover redline changes to Main Order Limits.
- 16.47. Offsite highway works within the Order Limits but outside of the Main Order Limits area are anticipated to require minimal groundworks and any impact on ground conditions is likely to be negligible and therefore the ES chapter relates primarily to the development site, A47 link road and M69 improvements.

Area 1 – Main HNRFI Site Area

- 16.48. Area 1 comprises a large area of agricultural land, with Woodhouse Farm at the centre. The farm complex comprises several residential premises, agricultural outbuildings and barns, and small commercial premises including a farm shop and . Three oil tanks, a diesel tank and a propane tank were noted on site during a walkover with several corrugated roofs indicated to have been constructed from potentially asbestos containing materials (ACMs).
- 16.49. A small property utilised for kennelling services is located to the northwest of 'Woodhouse Farm'. 'Hobbs Hayes Farm' is located to the south of Woodhouse Farm, with additional farm buildings, labelled 'Freeholt Lodge', located towards the southern extent of Area 1. Two tanks were identified at Hobbs Hayes Farm utilised for diesel and heating oil storage. ACMs were tentatively identified in four barn rooves. Freeholt Lodge

appeared to be disused with static caravans, tanks, and abandoned vehicles noted. A propane tank was noted, and ACMs also identified.

- 16.50. The Main HNRFI Site is crossed by Burbage Common Road, a rural lane running between B4668 at Burbage Common and the B581 Station Road near Elmesthorpe. It crosses the central-northern area of the Main HNRFI Site and provides access to Woodhouse Farm and Langton Farm. At the northwestern boundary Burbage Common Road crosses a bridge over the railway line. Smaller tracks also crossed Area 1 to the southwest of Woodhouse Farm and to the south away from Hobbs Hayes Farm.
- 16.51. Drainage ditches run along most field boundaries, with several small ponds located at various points around the field boundaries. A small stream flows across the south of Area 1. At the time of the August 2022 site visit much of the streams and ponds were dry.
- 16.52. Area 1 is bound to the southeast by the M69 and to the northwest by a railway line. To the southwest of the site there are three wooded areas known as Burbage Wood, Aston Firs (designated as Sites of Special Scientific Interest (SSSI)) and Freeholt Wood. Off Smithy Lane to the south of the Main HNRFI Site are two residential enclaves, Rosevale Caravan Park and Acorn Cottage, in fenced compounds – the Aston Firs Gypsy and Traveller site managed by LCC and the Castle Fields mobile home site, which is privately owned. Burbage Common and Woods are located to the west. Sporadic farm buildings and residential premises are located to the north of Area 1, mainly along Station and Stanton Road.

Area 2 – A47 Link Road Corridor

- 16.53. Area 2 comprises a strip of predominantly agricultural land to the northwest of Area 1, extending from the railway line to the B4668 (Leicester Road), with Burbage Common Road also crossing this location. The rest of Area 2 is occupied by fields, with a small densely vegetated stream crossing the north of Area 2 and a drain crossing the central area. Small farm outbuildings are present in some of the north-western fields.
- 16.54. Area 2 is bound by the railway line to the southeast and Leicester Road to the northwest. Immediately west of Area 2 are agricultural fields and Burbage Common, whilst fields and Bridge Farm are located to the east. A sports club is located to the northwest of Leicester Road.

Area 3 – M69 Junction 2 Improvements

- 16.55. Area 3 largely covers the road network around Junction 2 of the M69. Junction 2 provides access to the northbound M69, and egress from the southbound carriageway. The entry/exit ramps lead up to a raised roundabout over the M69 which involved two bridge crossings. Hinckley Road (B4669) joins the roundabout orientated in a west to east direction.
- 16.56. The boundary of Area 3 covers the roundabout, the northern slip roads, the access points to Hinckley Road, and extends to the southwest beyond the point where Aston Lane

crosses over the M69. The north-eastern extent to Area 3 incorporates a small bridge which provides access for pedestrians and farm vehicles to cross the M69.

- 16.57. The M69 was predominantly raised above site levels and increases in topography from northeast to southwest from c. 96m AOD to c. 100m AOD. South-west of M69 Junction 2 the M69 motorway falls gently to a height of c. 96m AOD at the southern extremity of the DCO Site. and.
- 16.58. A small stream was culverted under the M69 towards the south of Area 3. Also, a pond is located immediately west of the M69 south of Junction 2 which appears to have been constructed at the same time as the motorway and is likely to be an attenuation basin as part of the motorway drainage network.
- 16.59. The surrounding land use is predominantly agricultural, with a gypsy and traveller site and private mobile home sites located to the northwest of Junction 2 and Averley House Farm to the north east.

Site history

- 16.60. Historical Ordnance Survey (OS) mapping for the Main Order Limits Site area has been reviewed. These maps and plans date from 1886 to 2014. The key points of the historical development of the Main Order Limits Site and surrounding area are summarised in Table 16.7. All distances quoted are approximate.

Table 16.7: Key points of development history

Dates	On Site (Main Order Limits including HNRFI Site and A47, M69 slip roads)	Off-Site (outside Main Order Limits)
Potential SOURCES in bold and caps. Potential <i>Receptors</i> in bold and italics.		
1886 – 1938	The earliest site plans show the site as largely undeveloped, agricultural land, relatively similar to present day. WOODHOUSE FARM is present in the centre of the site with HOBBS HAYES FARM to the south. The RAILWAY LINE is mapped in the northwest of the site. Numerous small <i>ponds</i> are mapped across the site with small <i>streams</i> mapped in the north, central and south of site along the same course as	ELMESTHORPE RAILWAY STATION is mapped immediately northeast of Area 1, with several SIDINGS . <i>Old fishponds</i> are mapped c. 100m north of site and indicated to be excavations. A BRICK WORKS with associated KILNS are mapped adjacent to Hinckley Road immediately south east of Area 3, and also approximately 500m west of Area 1. Small scale associated clay pits are also indicated at the brick works. A rifle range is present immediately west of Area 2. <i>Burbage Common, Sheepy Wood, Burbage Wood, Aston Firs, and Freeholt Wood</i> are all located immediately west of Area 1 and 2. Both brick yards appear to be disused from 1901

Dates	On Site (Main Order Limits including HNRFI Site and A47, M69 slip roads)	Off-Site (outside Main Order Limits)
	present day.	plans, with the south-eastern clay pit indicated to have been reduced to a small pond by 1963.
1950 - 1968	<p>1963 plans show the B4669 (labelled as A5070) Hinckley Road as realigned.</p> <p>1962 plans label the track to Woodhouse Farm as Burbage Common Road for the first time.</p>	<p>Residential development is mapped along Station Road 200-600m northeast of Area 1. A TANK is indicated at the railway station from 1962 plans with a FACTORY mapped 200m northeast of site.</p> <p>A GARAGE is mapped 400m southwest of Area 3 on 1963 plans.</p>
1977 - 1994	No significant changes noted.	<p>The M69 and associated access bridges have been constructed. Hinckley Road in the south of Area 3 is realigned as part of the M69 works, and the attenuation pond is constructed.</p> <p>Elmesthorpe Railway Station and sidings are no longer mapped from 1983 plans. The buildings remain, but the tank is no longer labelled. 1984 plans show an ELECTRICITY SUBSTATION mapped 200m north of site.</p> <p>1994 plans indicate the former railway sidings site is occupied by a SCRAP YARD.</p>
2002 – Present day	No significant changes noted.	<p>The sports ground to the northwest of Area 2 has been developed by 2002 plans.</p> <p>The eastern traveler site appears on mapping from 2002 with the western site mapped from 2010.</p>

Ground conditions

Superficial deposits

16.61. Information published by the BGS has mapped localised Made Ground¹¹ at the Main

¹¹ Made Ground defined as anthropogenic (man made) ground in which the material has been placed

Order Limits Site. Made Ground is mapped along the M69 corridor and partially along the railway line, indicating areas which have been artificially raised. There are indicated areas of cut where the M69 passes under the roundabout, and the attenuation basin located to the west of Area 3.

- 16.62. The BGS data has recorded several superficial deposit¹² units across the Main Order Limits Site, and also some areas where superficial deposits are absent.
- 16.63. The Bosworth Clay Member, also known as Wolston Clay, and Thrussington Member are mapped underlying most of the Main Order Limits Site, with the latter present towards to the south and southeast of Area 1. The Bosworth Clay Member is typically encountered as variable grey and red-brown clays and silt, often without gravels, whilst the Thrussington Member is encountered as brown to reddish brown usually sandy silty clay with gravels present.
- 16.64. Deposits of the Wolston Sand & Gravel Member, also referenced as Glaciofluvial Deposits, are mapped in two locations in the centre of Area 1. These are younger deposits commonly encountered as yellow or red sand and gravel.
- 16.65. Localised Alluvium is mapped in the north and northeast of Area 1 along the line of the stream and also along the watercourses in Area 2.
- 16.66. Superficial deposits are locally absent in the southeast and east of Area 1, and across much of Area 2.
- 16.67. Small pockets of the Oadby Member are mapped in the central area. The Oadby member comprises Diamicton encountered as grey/ brown gravelly clay with subordinate lenses of sand and gravel, clay and silt.

Bedrock deposits

- 16.68. The bedrock underlying the main Main Order Limits site (Areas 1-3) is indicated to comprise the Edwalton Member of the Mercia Mudstone. Mercia Mudstone is commonly encountered as red, or occasionally green-grey, mudstones and subordinate siltstones. The bedrock contains thick halite-bearing units in some basinal areas and thin beds of gypsum/anhydrite are widespread.

Third party investigation logs

without engineering control and/or manufactured by man in some way, such as through crushing or washing, or arising from an industrial process.

¹² *Superficial deposits refer to geological deposits typically of Quaternary age. These geologically recent unconsolidated sediments may include stream channel and floodplain deposits, beach sands, talus gravels and glacial drift and moraine. All pre-Quaternary deposits are referred to as bedrock.*

- 16.69. The preliminary ground investigation conducted by Hydrock¹³ generally confirmed the published geological sequences, with Bosworth Clay was found across much of Area 1 (excluding the central areas) and across the south of Area 3, and the Thrussington Member was recorded predominantly in the centre of Area 1 and across the northern parts of Area 3.
- 16.70. Limited Made Ground was encountered, predominantly around the farm complexes.
- 16.71. Localised Alluvium was recorded near to the watercourse flowing through Area 1. The Wolston Sand & Gravel Member was not recorded. Mercia Mudstone was recorded under the Glacial Deposits in the eastern areas, but not to the west of Area 1 or in Area 3.

Aquifer designation

- 16.72. The EA classifies the Alluvium and the Wolston Sand and Gravel as 'Secondary A Aquifers'. Secondary A Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
- 16.73. The Bosworth Clay Member is an unproductive stratum, defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
- 16.74. The Thrussington Member is an undifferentiated Secondary Aquifer which has been assigned in cases where it has not been possible to attribute either a Secondary A or B category to a rock type.
- 16.75. The Mercia Mudstone is categorised as a Secondary B Aquifer which are defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons, and weathering.
- 16.76. The Main Order Limits Site is not located within an EA designated groundwater Source Protection Zone. The Main Order Limits Site lies within the Soar Secondary Combined Water Framework Directive Groundwater Body which recorded a good chemical and overall rating in 2015.
- 16.77. Significant groundwater ingress was not recorded during the ground investigation. Groundwater was not recorded in any trial pit and in only 4 of the window sampler boreholes during the investigation at depths of between 3.1m and 3.9m bgl within the Thrussington Member and Mercia Mudstone.
- 16.78. Post investigation monitoring of boreholes recorded sporadic groundwater across the

¹³ Hydrock Consultants Limited. December 2018. 'Hinckley strategic Rail Freight Interchange – Ground Investigation Report', Ref 07700-HYD-XX-XX-RP-GE-1002-P1-S2.

Main HNRFI Site within the Thrussington Member, Boswoth Clay Member and Mercia Mudstone at depths of 0.83m to 4.5m bgl.

Surface water features

- 16.79. Within Area 1, drainage ditches run along most field boundaries, with several small ponds located at various points around the field boundaries. A small stream flows across the south of Area 1, and two small streams are present in the north of Area 1, flowing off site to the north.
- 16.80. Within Area 2, three small watercourses cross the Main HNRFI Site, with the southernmost appearing to have been channelised.
- 16.81. Within Area 3, a small drain is culverted under the M69.
- 16.82. The River Soar is mapped 175m southeast of Main HNRFI Site .

Ground gas and radon

- 16.83. The localised Made Ground and Alluvium mapped across the Main HNRFI Site represent a possible source of ground gas, however, generation rates are likely to be low due to the limited extent of alluvium and low volumes of made ground. These materials may be relocated if present under proposed building footprints.
- 16.84. Ground gas monitoring completed between October and December 2018 (Appendix 15.2 (document reference 6.2.15.2) has indicated generally low concentrations across much of the Main HNRFI site, however, localised elevated carbon dioxide was recorded at one location. The assessment suggested that a Characteristic Situation 2 (CS2) classification would be appropriate around Woodhouse Farm where the carbon dioxide was encountered.
- 16.85. The Main HNRFI Site is located in an area where less than 1% of properties are affected by Radon and so is not considered a risk.

Mineral extraction

- 16.86. The Main Order Limits Site is not located within an area associated with coal mining or within a mineral safeguarding area.
- 16.87. Small clay pits have been recorded off site to the west of Area 2 and east of Area 3, however, no records indicate workings on site.
- 16.88. The Groundsure Report (included in Appendix 15.1 (document reference 6.2.15.1)) references numerous cuttings observed from historical mapping, relating to localised area of the M69 and railway line.
- 16.89. Limited historical development has occurred at the Main Order Limits Site over the reviewed mapping period. Several farms have been present on site since pre 1880s, with streams and fields crossing the Main Order Limit site. A railway station, electricity

substation, tank, scrap yard, small brickworks and two landfill sites have been recorded within 500m of the Main Order Limits site.

Agricultural Land Classification

16.90. The Main HNRFI Site is classified as Grade 3 (good to moderate) Quality Agricultural land which is further subdivided into 3a good quality and 3b moderate quality. Grade 3a is considered as best and most versatile (BMV) land. Detailed assessment of the agricultural land classification of the main order limits is presented in ES Appendix 11.3 (document reference 6.2.11.3). ES Figure 11.19 (document reference 6.3.11.19) shows the results of detailed assessment of Area 1 and Area 3 which shows the vast majority of the site is Grade 3b poor with a small pocket (approximately 2.9ha) of Grade 3a land in the north of the site.

Soil and groundwater contamination

16.91. The Phase 1 Assessments (Appendix 15.1 (document reference 6.2.15.1) and preliminary ground investigation (Appendix 15.2 (document reference 6.2.15.2) concluded that limited potential contamination sources had been identified at the Main Order Limits Site. The contamination source within each area are described below.

Area 1 Main HNRFI Site

- Made Ground predominantly located around farm complexes could contain heavy metals, hydrocarbons, asbestos and a potential source of hazardous ground gasses.
- Asbestos within farm buildings and in shallow soils around farm buildings.
- Hydrocarbons, lubricants and solvents located around tanks.
- Pesticides and herbicides within fields and along railway lines and in storage areas within farm complex.
- Organic rich Alluvium could represent a potential source of hazardous ground gasses.
- Biological contamination associated with cess pit (e.g., e-coli).

Area 2 A47 Link Road

- Made Ground predominantly located around farm buildings could contain heavy metals, hydrocarbons, asbestos and a potential source of hazardous ground gasses.
- Asbestos within farm buildings and shallow soils around farm buildings.
- Pesticides and herbicides within fields and along railway lines and in storage areas within farm complex.
- Organic rich Alluvium could represent a potential source of hazardous ground

gasses.

Area 3 M69 Junction 2 Improvements

- Made Ground at the site related to the construction of the road network could contain heavy metals, hydrocarbons, and a potential source of hazardous ground gasses.
- Organic rich Alluvium could represent a potential source of hazardous ground gasses.

Off Site within 500m from Main Order Limits Boundary

- Railway station and subsequently scrap yard - potential source of heavy metals, hydrocarbons, volatile compounds, and hazardous ground gasses.
- Landfill – potential for leachate migration towards site.
- Organic rich Alluvium could represent a potential source of hazardous ground gasses.
- Electricity substation located 200m north represents potential source of oils and Polychlorinated Biphenyls (PCBs), not a potential source if it dates from 1980s onwards.

16.92. The following potential sources are not included within the conceptual site model:

- Infilled brick pits - potential source of hazardous ground gasses, however, they are located near to the proposed road structures rather than buildings. They are located too far from proposed buildings to represent a risk.
- Landfill – Potential ground gas risk associated with landfills is discounted as they are located too far from proposed buildings to represent a risk.

Receptors

16.93. The following potential human health and environmental receptors have been identified at the Main Order Limits Site and surrounding area. Groundwater receptors are considered in Chapter 15: *Hydrogeology*.

On Site

- Underlying Secondary A Aquifer – Wolston Sand and Gravel.
- Underlying Secondary A Aquifer – Alluvium.
- Underlying undifferentiated Secondary Aquifer – Thrussington and Oadby Members.

- Underlying Secondary B Aquifer – Mercia Mudstone.
- Field drainage systems and streams.
- Ponds.
- Future site users.
- Ground Workers during construction.
- Intrusive maintenance works.
- Future Buildings.
- Flora and Fauna.

Off Site within 500m buffer

- Wider Secondary A Aquifer – Alluvium and Wolston Sand and Gravel.
- Wider undifferentiated Secondary Aquifer – Thrussington Member.
- Wider Secondary B Aquifer – Mercia Mudstone.
- Surface water receptors – off site, downstream watercourses including River Soar.
- SSSI, Ancient Woodlands and Local Nature Reserves comprising Burbage Wood and Aston Firs Site of Special Scientific Interest (SSSI) adjoining the south-western boundary of the Main HNRFI Site,

16.94. Three further SSSIs are found to the north-east of the Main HNRFI Site and outside the DCO Site, which are unlikely to be affected by ground conditions at the site as follows:

- Croft Pasture SSSI (2.8km from the nearest point of the Main Order Limits),
- Croft and Huncote Quarry SSSI (3.1km from the nearest point of the Main Order Limits), designated for geological reasons;
- Croft Hill SSSI (3.2km from the nearest point of the Main Order Limits),

16.95. There is a European-designated Special Area of Conservation (SAC) at Ensor's Pond, 11km to the south-west, which is considered to be beyond the foreseeable impact from the development.

16.96. The Conceptual Site Model presented in Table 16.13 recorded limited contaminant linkages with a low to very low risk to human health.

16.97. The methodology for risk evaluation is a qualitative method for interpreting the output for the risk estimation stage of the assessment. It involves the classification of the:

- Magnitude of the potential consequence (severity) of risk occurring.
 - Magnitude of the probability (likelihood) of the risk occurring.
- 16.98. The classification of consequence and probability are replicated in Table 16.8 and Table 16.9, respectively. Severe relates to short term (acute) risk while medium relates to long term (chronic) risk. Mild relates to significant harm but to less sensitive receptors. Minor classification relates to harm which is not significant but could have a financial cost.
- 16.99. The classification gives a guide as to the severity and consequence of identified risk when compared with other risk presented on the site. It should be noted that if a risk is identified it cannot be classified as “no risk” but as “very low risk”. Differing stakeholders may have a different view on the acceptability of a risk.
- 16.100. Once the consequence and probability have been classified these can be compared using a matrix to identify an overall risk category, as shown in Table 16.10. These categories and the actions required are categorised in Table 16.11.

Table 16.8: Classification of consequence

Classification	Definition	Examples
Severe (Sv)	Short term (acute) risk to human health likely to result in “significant harm” as defined by the Environment protection Act 1990, Part IIA. Short term risk of pollution of controlled waters. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium (Md)	Chronic damage to Human Health (“significant harm”). Pollution of controlled waters. A significant change in a particular ecosystem, or organism forming part of such ecosystem.	Concentrations of contaminants from site exceeding generic or site-specific screening criteria. Leaching of contaminants into a major or minor aquifer. Death of species within a designated nature reserve.
Mild (Mi)	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy. (e.g., foundation damage resulting in instability).
Minor (Mr)	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by measures such as protective clothing etc). Easily reparable effects of damage to buildings, structures and services	The presence of contaminants at such concentration that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

16.101. The classification of consequence does not take into account the probability of the

consequence being realised. Therefore, there may be more than one consequence for a particular contaminant linkage. Both a severe and medium classification can result in death. Severe relates to short term (acute) risk while medium relates to long term (chronic) risk. Mild relates to significant harm but to less sensitive receptors. Minor classification relates to harm which is not significant but could have a financial cost.

Table 16.9: Classification of probability

Classification	Definition
High likelihood (Hi)	There is a contaminant linkage and an event that either appears very likely in the short term and almost inevitable in the long term, or there is evidence at the receptor or harm or pollution
Likely (Li)	There is a contaminant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood (Lw)	There is a contaminant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the short term.
Unlikely (Ul)	There is a contaminant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table 16.10: Risk evaluation matrix

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High likelihood (Hi)	Very high risk (VH)	High Risk (H)	Moderate Risk (M)	Mod/low risk (M/L)
	Likely (Li)	High risk (H)	Moderate risk (M)	Mod/low risk (M/L)	Low risk (L)
	Low likelihood (Lw)	Moderate risk (M)	Mod/low risk (M/L)	Low risk (L)	Very low risk (VL)
	Unlikely (UI)	Mod/low risk (M/L)	Low risk (L)	Very low risk (VL)	Very low risk (VL)

Table 16.11: Risk categorisations

Very high risk (VH)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk (H)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be

risk (M)	severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk (L)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk (VL)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

- 16.102. The classification gives a guide as to the severity and consequence of identified risk when compared with other risk presented on the Main Order Limits Site. It should be noted that if a risk is identified it cannot be classified as “no risk” but as “very low risk”.
- 16.103. The risk to controlled waters was considered to be low based on the potential for contaminants associated with the Made Ground at the Main Order Limits Site to impact upon the underlying aquifer or on-site surface water receptors. This is discussed further in Chapter 6.1.15: *Hydrogeology*.

Table 16.13: Conceptual Site Model

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
Area 1 – Main HNRFI Site						
Made Ground at the site related to the construction of the road network and	Dermal contact with, and incidental ingestion or inhalation of soil	Future commercial site users	Mi	UI	VL	Preliminary ground investigation works have not recorded contaminants above commercial screening levels.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
around farm buildings could contain heavy metals, hydrocarbons, biological contamination (e.g., e-coli) and a potential source of hazardous ground gasses.	and/or dust.	Intrusive maintenance workers and ground workers	Mi	UI	VL	<p>The main Development will comprise hard cover, so a pathway to future site users is unlikely to be realised.</p> <p>In planned areas of amenity public open space and green corridors If contaminants are encountered at the site as part of more detailed investigation works, the risk to future site users could be mitigated by the incorporation of clean capping layers (likely to be derived from site won soils) in soft landscaped areas.</p> <p>The exposure of ground workers during development and intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
	Inhalation of vapours	Future commercial site users	Mi	UI	VL	A vapour risk has not been identified by the preliminary ground investigation data. If volatiles are identified in soils, a risk

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
		Intrusive maintenance workers and ground workers	Mi	UI	VL	<p>assessment would be undertaken to determine if mitigation is required.</p> <p>The exposure of ground workers during development and intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE)</p>
	Migration and accumulation of ground gases in enclosed spaces leading to asphyxiation (carbon dioxide) or explosion (methane).	Future commercial site users	Md	UI	L	<p>Preliminary ground investigation has identified low gas concentrations, with most of the site indicated to be CS1 whereby gas protection measures are not required. One isolated occurrence of elevated carbon dioxide was recorded.</p> <p>Further gas monitoring at detailed design stage is required to determine whether gas protection measures are required.</p>

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Leaching and permeation through soil profile.	Underlying Secondary Aquifers	Md	UI	L	<p>Preliminary ground investigation works have not identified a significant risk to controlled waters.</p> <p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
	Vertical and lateral migration of contaminants.		Md	UI	L	
	Lateral migration of contaminated groundwater.	Wider Secondary Aquifers	Md	UI	L	
	Surface run-off.	Field drainage system and streams	Mi	UI	VL	

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Lateral migration of contaminated groundwater and root uptake	Offsite SSSI, Ancient Woodlands and Local Nature Reserves	Md	UI	L	<p>The woodlands represent a sensitive receptor, however, Made Ground with potentially elevated contaminants has not been recorded near to the woodland receptors.</p> <p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
Asbestos within shallow soils around farm buildings;	Inhalation of dust and/or fibres	Future commercial site users	Mi	UI	VL	Preliminary ground investigation works recorded asbestos within 1 of 43 samples, with a quantification of <0.001%.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
		Groundworkers and Intrusive maintenance workers	Mi	UI	VL	<p>Asbestos containing materials on buildings should be removed from site by a competent asbestos removal contractor.</p> <p>The risk to future site users is minimal based on the predominantly hardstand nature of the Proposed Development.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
Hydrocarbons, lubricants and solvents located	Dermal contact with, and incidental ingestion or	Future commercial site users	Mi	UI	VL	Preliminary ground investigation works have not recorded contaminants above commercial screening levels.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
around tanks;	inhalation of soil and/or dust.	Groundworkers Intrusive maintenance workers	Mi	UI	VL	<p>The Proposed main Development will comprise hard cover, so a pathway to future site users is unlikely to be realised. In areas of amenity public open space and green corridors if contaminants are encountered at the site as part of more detailed investigation works, the risk to future site users could be mitigated by the incorporation of clean capping layers in soft landscaped areas.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
	Inhalation of vapours	Future commercial site users	Mi	UI	VL	A vapour risk has not been identified by the preliminary ground investigation data. If volatiles are identified in soils, a risk

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
		Intrusive maintenance workers	Mi	UI	VL	<p>assessment would be undertaken to determine if mitigation is required.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE)</p>
	Migration and accumulation of ground gases in enclosed spaces leading to asphyxiation (carbon dioxide) or explosion (methane).	Future commercial site users	Md	UI	L	<p>Preliminary ground investigation has identified low gas concentrations, with most of the site indicated to be CS1 whereby gas protection measures are not required. One isolated occurrence of elevated carbon dioxide was recorded.</p> <p>Further gas monitoring is required to determine whether gas protection measures are required.</p>
	Leaching and permeation through soil profile.	Underlying Secondary Aquifers	Md	UI	L	<p>Preliminary ground investigation works have not identified a significant risk to controlled waters.</p>

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Vertical and lateral migration of contaminants.		Md	UI	L	The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers. Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.
	Lateral migration of contaminated groundwater.	Wider Secondary Aquifers	Md	UI	L	
	Surface run-off.	Field drainage system and streams	Mi	UI	VL	

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Lateral migration of contaminated groundwater and root uptake	Offsite SSSI, Ancient Woodlands and Local Nature Reserves	Md	UI	L	<p>The woodlands represent a sensitive receptor, however, Made Ground with potentially elevated contaminants has not been recorded near to the woodland receptors.</p> <p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
Pesticides and herbicides within fields and along railway lines;	Dermal contact with, and incidental ingestion or inhalation of soil and/or dust.	Future commercial site users	Mi	UI	VL	Ground investigation should be undertaken to confirm the presence of pesticides and herbicides and assess the risk to flora and fauna.
		Intrusive maintenance workers	Mi	UI	VL	The Proposed main Development will comprise hard cover, so a pathway to future

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
		Flora and Fauna	Mi	Lw	L	<p>site users is unlikely to be realised.</p> <p>In areas of amenity public open space and green corridors if contaminants are encountered at the site as part of more detailed investigation works, the risk to future site users could be mitigated by the incorporation of clean capping layers in soft landscaped areas.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
	Leaching and permeation through soil profile.	Underlying Secondary Aquifers	Md	UI	L	As part of detailed design ground investigation should be undertaken to confirm the presence of pesticides and herbicides.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Surface run-off.	Field drainage system and streams	Mi	UI	VL	<p>The soils at the site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
	Lateral migration of contaminated groundwater and subsequent root uptake	Offsite SSSI, Ancient Woodlands and Local Nature Reserves	Md	UI	L	<p>Ground investigation should be undertaken to confirm the presence of pesticides and herbicides.</p> <p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
Organic rich Alluvium could represent a potential source of hazardous ground gasses.	Migration and accumulation of ground gases in enclosed spaces leading to asphyxiation (carbon dioxide) or explosion (methane).	Future commercial site users	Md	UI	L	<p>Preliminary ground investigation has identified low gas concentrations, with most of the site indicated to be CS1 whereby gas protection measures are not required. One isolated occurrence of elevated carbon dioxide was recorded.</p> <p>Further gas monitoring is required as part of detailed design to determine whether gas protection measures are required.</p>
Area 2 – Proposed A47 Link Road						
Made Ground at the site related to the realignment of water	Dermal contact with, and incidental ingestion or	Future commercial site users	Mi	UI	VL	Ground investigation works have not been undertaken in Area 2, and there is potential for localised Made Ground.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
courses could contain heavy metals, hydrocarbons and a potential source of hazardous ground gasses.	inhalation of soil and/or dust.	Ground workers and Intrusive maintenance workers	Mi	UI	VL	<p>The Proposed Development comprises an access road, so a pathway to future site users is unlikely to be realized in this area.</p> <p>If contaminants within the area of public open space are encountered at the site as part of more detailed investigation works, the risk to future site users could be mitigated by the incorporation of clean capping layers in soft landscaped areas.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
	Leaching and permeation through soil profile.	Underlying Secondary Aquifers	Md	UI	L	<p>Ground investigation works have not been undertaken in Area 2, and there is potential for localised Made Ground. However, a</p>

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Vertical and lateral migration of contaminants.		Md	UI	L	<p>significant contaminant source has not been identified.</p> <p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site will facilitate remedial works, which would reduce the risk to controlled waters.</p>
	Lateral migration of contaminated groundwater.	Wider Secondary Aquifers	Md	UI	L	
	Surface run-off.	Field drainage system and streams	Mi	UI	VL	

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Lateral migration of contaminated groundwater and root uptake	Offsite SSSI, Ancient Woodlands and Local Nature Reserves	Md	UI	L	<p>The woodlands represent a sensitive receptor.</p> <p>Ground investigation works have not been undertaken in Area 2, and there is potential for localised Made Ground. However, a significant contaminant source has not been identified.</p> <p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
Asbestos within shallow soils around farm buildings;	Inhalation of dust and/or fibres	Future commercial site users	Mi	UI	VL	Asbestos containing materials on farm buildings should be removed from site by a competent asbestos removal contractor.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
		Intrusive maintenance workers	Mi	UI	VL	<p>The risk to future site users is minimal based on the proposed end use and predominantly hardstand nature of the development.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
Pesticides and herbicides within fields and along railway lines;	Dermal contact with, and incidental ingestion or inhalation of soil and/or dust.	Future commercial site users	Mi	UI	VL	Ground investigation should be undertaken to confirm the presence of pesticides and herbicides and assess the risk to flora and fauna.
		Intrusive maintenance workers	Mi	UI	VL	The Proposed Development is likely to have limited areas of soft landscaping, so a pathway

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
		Flora and Fauna	Mi	Lw	L	<p>to future site users is unlikely to be realised.</p> <p>If contaminants are encountered at the site as part of more detailed investigation works, the risk to future site users could be mitigated by the incorporation of clean capping layers in soft landscaped areas.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
	Leaching and permeation through soil profile.	Underlying Secondary Aquifers	Md	UI	L	Ground investigation should be undertaken to confirm the presence of pesticides and herbicides.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Surface run-off.	Field drainage system and streams	Mi	UI	VL	<p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
Area 3 - M69 Junction 2 Improvements						
Made Ground at the site but predominantly located around road	Dermal contact with, and incidental ingestion or	Future commercial site users	Mi	UI	VL	Preliminary ground investigation works did not record elevated contaminant concentrations.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
networks - could contain heavy metals, hydrocarbons asbestos	inhalation of soil and/or dust.	Groundworkers and intrusive maintenance workers	Mi	UI	VL	<p>Within the road corridor the ground will be capped by hardstanding so a pathway to future site users is unlikely to be realised⁶¹.</p> <p>In areas of soft landscaping, if contaminants are encountered at the site as part of more detailed investigation works, the risk to future site users could be mitigated by the incorporation of clean capping layers in soft landscaped areas.</p> <p>The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, ⁶¹utilizing appropriate personal protective equipment (PPE) and maintaining good hygiene.</p>
	Leaching and permeation through soil profile.	Underlying Secondary Aquifers	Md	UI	L	Preliminary ground investigation works have not identified a significant risk to controlled waters.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Vertical and lateral migration of contaminants.		Md	UI	L	The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers. Development of the site will facilitate remedial works, which would reduce the risk to controlled waters.
	Lateral migration of contaminated groundwater.	Wider Secondary Aquifers	Md	UI	L	
	Surface run-off.	Field drainage system and streams	Mi	UI	VL	

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Lateral migration of contaminated groundwater and root uptake	Off site SSSI, Ancient Woodlands and Local Nature Reserves	Md	UI	L	<p>The woodlands represent a sensitive receptor.</p> <p>Ground investigation works have not been undertaken in Area 2, and there is potential for localised Made Ground. However, a significant contaminant source has not been identified.</p> <p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
Pesticides and herbicides within fields and in storage	Dermal contact with, and incidental ingestion or	Future commercial site users	Mi	UI	VL	Ground investigation should be undertaken to confirm the presence of pesticides and herbicides and assess the risk to flora and

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
areas within farm complex;	inhalation of soil and/or dust.	Intrusive maintenance workers	Mi	UI	VL	fauna. Within the road corridor the ground will be capped by hardstanding, so a pathway to future site users is unlikely to be realised.
		Flora and Fauna	Mi	Lw	L	IN areas of soft landscaping, if contaminants are encountered at the site as part of ground investigation works, the risk to future site users could be mitigated by the incorporation of clean capping layers in soft landscaped areas. The exposure of intrusive maintenance workers can be mitigated by the adoption of suitable working methods, utilising appropriate personal protective equipment (PPE) and maintaining good hygiene.
	Leaching and permeation through soil profile.	Underlying Secondary Aquifers	Md	UI	L	Ground investigation should be undertaken to confirm the presence of pesticides and herbicides.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Surface run-off.	Field drainage system and streams	Mi	UI	VL	<p>The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.</p> <p>Development of the site would facilitate remedial works, which would reduce the risk to controlled waters.</p>
Off Site Sources						
Railway station and subsequently scrap yard - potential source of heavy metals, hydrocarbons, volatile compounds and hazardous ground gasses.	Migration and accumulation of ground gases in enclosed spaces leading to asphyxiation (carbon dioxide) or explosion (methane).	Future commercial site users	Md	UI	L	<p>Made Ground adjacent to the site could represent a localised potential source of ground gas which could migrate onto site. Further gas monitoring at detailed design stage is required to determine whether gas protection measures are required.</p>

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
	Lateral migration of contaminated groundwater.	Underlying Secondary Aquifers	Md	UI	L	<p>Preliminary ground investigation information did not identify significantly elevated contaminants within groundwater at the site.</p> <p>The cohesive soils should prevent contaminant migration towards the site and prevent degradation of the aquifer on site.</p>
Landfill – potential for leachate migration towards site.	Lateral migration of contaminated groundwater/ leachate.	Underlying Secondary Aquifers	Md	UI	L	<p>Preliminary ground investigation information did not identify significantly elevated contaminants within groundwater at the site.</p> <p>The cohesive soils should prevent contaminant migration towards the site and prevent degradation of the aquifer on site.</p>

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
Organic rich Alluvium could represent a potential source of hazardous ground gasses.	Migration and accumulation of ground gases in enclosed spaces leading to asphyxiation (carbon dioxide) or explosion (methane).	Future commercial site users	Md	UI	L	Alluvium adjacent to the site could represent a localised potential source of ground gas which could migrate onto site. Further gas monitoring at detailed design stage is required to determine whether gas protection measures are required.
Electricity substation located 200m north represents potential source of oils and PCBs	Lateral migration of contaminated groundwater.	Underlying Secondary Aquifers	Mi	UI	VL	If the electricity substation dates to pre 1980s, it may represent a potential source of PCBs and oils. The cohesive soils should prevent contaminant migration towards the site, and prevent degradation of the aquifer on site, especially when considering the distance from site.

Source	Pathway	Receptor	Consequence	Probability	Risk	Potential Mitigation/Investigation Requirements
Made Ground associated with infilled clay pit adjacent to the site could contain heavy metals, hydrocarbons and/ or asbestos.	Lateral migration of contaminated groundwater.	Underlying Secondary Aquifers	Md	UI	L	The cohesive soils should prevent contaminant migration towards the site and prevent degradation of the aquifer on site.
<p>VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low</p> <p>KEY: Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor, Hi = High, Li = Likely, Lw = Low Likelihood, UI = Unlikely</p>						

POTENTIAL SIGNIFICANT ENVIRONMENTAL EFFECTS OF THE PROPOSALS

Construction phase

- 16.104. Based on the assessment below there are no moderate or above significant adverse effects identified across Areas 1 to 3. The following assessment therefore considers the Main Order Limits Site as a whole, with particular reference to the earthworks which are assumed would be completed as a site wide exercise.
- 16.105. The significant effects have been assessed assuming that the earthworks exercise would be completed at the Main Order Limits Site comprising a site strip to remove topsoil and a bulk earthworks cut and fill exercise to prepare development platform(s). We have estimated that the volume of cut would be 2,338,266 cubic metres of material and fill of 2,344,437 cubic metres. The principal of this scheme is to achieve a cut and fill balance to eliminate the generation of this waste. The earthworks has been designed to achieve a cut and fill balance, material quality would be assessed to ensure material is placed in a suitable location onsite, minimising the requirement to dispose of excavated material.
- 16.106. Organic material will be managed; volumes can be minimised by measurement of organic content of soils with depth. This will minimise the volume stripped. Topsoil quantities can be managed through the construction phase of the whole development by additional techniques introduced into the strategy to manage volume by creating additional uses. No cap will be considered until the grade / quality of soils is confirmed upon commencement of construction. This is addressed in the Site Waste and Materials Management Framework Plan (document reference 17.3).
- 16.107. The topography of the Main HNRFI Site and A47 and M69 Links would require a cut and fill exercise to produce two development plateaus. The majority of the cut would be generated from the southwestern end of the Main HNRFI Site redistributing material in the lower lying central area of the Main HNRFI Site. The more significant earthworks would be required around existing infrastructure, particularly the upgrades and links to Junction 2 of the M69 and around the railway where rail sidings and a new bridge and associated structures are to be constructed. Areas of cut and fill are shown on figure 16.1 (document reference 6.3.16.1) HRF-BWB-HGN-XX-DR-CH-0610 titled "Proposed Plateau levels Isopachytes".

Risks to human health

- 16.108. Localised contamination may be expected around demolition of farm buildings, likely to comprise asbestos, petroleum hydrocarbons and agrochemicals (pesticides, herbicides, insecticides). The preliminary ground investigation has not identified any significant contamination sources at the Main HNRFI Site, and based on the current and historical land use, there is a low risk of further significant contamination being identified during the groundworks.
- 16.109. There is a low risk of further contamination of soils from asbestos in existing buildings provided that the asbestos survey and removal is conducted in accordance with HSE guidance.

- 16.110. If unforeseen contamination is identified ground workers may be exposed through direct exposure, dermal contact and inhalation of dusts and particulates. Localised spillages of hydrocarbons could contaminate soils and generate vapours which have the potential to migrate into confined spaces within buildings.
- 16.111. The effect of contaminated soils on construction workers are considered to be of minor significance, confined to a localised area and of short duration and are not likely to be a significant effect under the assessment methodology.

Risks to controlled waters

- 16.112. Localised contamination may be mobilised during construction, where soils are excavated, and incident rainfall leaches soluble contaminants. In addition, earthworks in general have the potential to increase erosion and migration of particulate matter and suspended solids into water courses, running across the Main HNRFI Site. The works would be phased as set out in Chapter 3: *Proposed description*, with initial earthworks for the M69 J2 enhancement, and A47 link and road connected building completed in Stage 1 and the remaining earthworks in Stage 2. Based on the expected development timescales, development plots may be prepared but would remain undeveloped for a period of 3-5 years before development, therefore careful management of runoff and stockpiles would be required to prevent excessive suspended solids entering water courses. The effect on controlled waters during construction are considered to be of minor adverse significance, confined to a localised area and of short / medium duration.
- 16.113. The underlying strata are classified as Secondary A and B Aquifers Preliminary ground investigation works have not identified a significant risk to controlled waters. The soils at site are predominantly cohesive, so any contaminant hotspots are likely to be localised, and unable to freely migrate through the aquifers.

Risks to buildings and structures

- 16.114. The earthworks could require the cut and fill of approximately 2.3 million m³ of soils and shallow rock across the Main Order Limits Site to create development platforms, railbed and roadways. Earthworks have the potential to cause local instability, in particular around existing slopes and retaining structures associated with the rail mainline cutting and M69 embankment. The effect on buildings and structures during construction are considered to be of minor adverse significance, confined to a localised area but could be permanent duration, and not a likely significant effect.

Other risks

- 16.115. The majority of the Main HNRFI Site is classified as Grade 3b poor quality agricultural land. The Proposed Development would result in the permanent loss of approximately 2.9Ha of Grade 3a good quality agricultural land which is considered a slight adverse effect of minor significance and is below the threshold set by Natural England of being a likely significant effect.
- 16.116. Generation of dust during earthworks has the potential to affect the woodland to the south. Although the majority of soils are uncontaminated dust itself may have a detrimental effect on the ecologically sensitive sites to the south and west if not adequately controlled. These effects are likely to be short term and minor adverse in magnitude and is not considered as a likely significant effect. These effects are considered in detail in the Chapter 9: *Air quality* (document reference 6.1.9) and Chapter 12: *Ecology and biodiversity* (document reference 6.1.12) of this ES.

Operational phase

Risks to human health

16.117. The Main HNRFI site would be predominantly hard cover and therefore there is a low risk of future site users being exposed to any soil or groundwater contamination. Low concentrations of ground gas have been recorded and are not expected to be at significant levels beneath the Main HNRFI Site. The effect on human health during operation is considered to be of negligible significance and not a likely significant effect.

Risks to controlled waters

16.118. The presence of significant hardstanding would reduce the infiltration of rainfall and subsequent leaching of any soluble contamination in shallow soils into underlying groundwater (Secondary A and B Aquifers) and surface waters.

16.119. Runoff from goods vehicles using the Main HNRFI Site has the potential to be impacted by heavy metals and petroleum hydrocarbons.

16.120. Railway maintenance areas may involve storage of chemicals including fuels, lubricants and cleaning products. Temporary waste storage areas may be required. The effect on controlled waters during operation are considered to be of minor adverse significance, confined to a localised area and of short / medium duration and not a likely significant effect.

Risks to buildings and structures

16.121. Due to the depth of earthworks, buildings may be constructed on a significant thickness of engineered fill. Poorly compacted or uncontrolled earthworks could cause significant settlements which could cause damage to buildings. The effect on buildings are considered to be of minor adverse significance, confined to a localised area and of short / medium duration and not a likely significant effect.

PROPOSED MITIGATION

16.122. In terms of ES as previously outlined, significant effects of moderate effect or worse are considered to require mitigation. However, there are several less significant effects identified that would still be mitigated as best practice during construction and these measures have also been outlined.

Construction phase

Risks to human health

16.123. Demolition of existing buildings must be completed in accordance with Control of Asbestos Regulations 2012. Prior to demolition a full asbestos survey must be completed to identify all asbestos and enable a plan of work to be prepared to safely remove any asbestos.

16.124. Any asbestos contaminated soils may be retained on site beneath hardstanding subject to a risk assessment and preparation or a safe system of work under the Control of Asbestos Regulations 2012.

Risks to controlled waters

- 16.125. Detailed investigation of the Main Order Limits Site would be completed as part of detailed design to ensure that excavated materials are suitable for use and any areas of potential contamination fully characterised and remediation strategies prepared. The scale of the development would allow any required soil treatment such as bioremediation to be completed and soils retained for re-use. Any remediation would be completed under an Environmental Permit.
- 16.126. The CEMP sets out the requirements for management of dusts, odours and other sources of nuisance. There would be a particular focus on management of run off and protection of water courses from suspended solids in runoff and prevention of erosion and dust generation. This may include construction of temporary settlement ponds, silt fences and seeding of temporary stockpiles.
- 16.127. Designated fuelling areas for plant would be set up with suitable double bunding for tanks, spill kits available and an emergency plan in place for dealing with any spills. Plant operators would receive appropriate training to avoid spills. The revoked EA Pollution Prevention Guidance provides useful recommendations of best practice for refuelling, including regular testing and maintenance of storage tanks.
- 16.128. All fuel tanks would be bunded with a capacity of 110% of the tank volume. Spill kits should be available at all fuelling locations and regular training provided on dealing with spillages. Drip trays should be used under vehicles where appropriate to ensure that oil is collected and contained to prevent infiltration of contaminated waters.
- 16.129. To avoid infiltration of polluted water from vehicles or accidental spillage, vehicles should be inspected regularly and maintained to reduce the risk of leakages. Vehicle wash-down areas should be at least 10m from any surface waters and located in a designated bunded impermeable area. Any runoff should be treated through oil interceptors prior to discharge.

Risks to buildings and structures

- 16.130. The design would incorporate significant earthworks to prepare platforms for development. Where feasible a cut and fill balance would be obtained to avoid importation or export of materials. Topsoil would be stripped and stockpiled with a volume retained for use in soft landscaping, noise and visual bunds and within biodiversity net gain (BNG) areas. The site will be designed to reduce surplus topsoil by trying to use it on site where possible. The topsoil removed will first be used in the following hierarchy:
- Topsoil will be set aside for re-use in on site landscaping requirements (used in permanent works)
 - Topsoil will be used to create the various noise / visual bunds (used in permanent works)

- Topsoil requirements for offsite BNG areas will be taken from the site (used in permanent works)
- Topsoil will be placed back on plots for future development to protect the formation until they are ready to come forward (used in temporary works)
- Topsoil may be used to create surcharge loading if geotechnical conditions require ground improvement (pre-loading technique) (this will be a temporary use)

16.131. The residual topsoil that cannot be utilised in the above listed activities will be stockpiled for storage. Given that a balance of topsoil cannot be achieved on site, there are a number of options for movement of the excess:

- Reuse of the topsoil elsewhere, for use in agricultural or biodiversity uses or to meet the needs of developments in the region.
- The remainder will be transferred for re-use or recovery via a Waste Transfer Station or potentially for inert landfill cover and restoration if a suitable home cannot be found at the right time.

16.132. An earthworks specification would be prepared as part of detailed design setting out the methods by which materials would be handled and re-engineered and the verification requirements to demonstrate that works have been completed to an acceptable standard.

16.133. The timescales for the Proposed Development allow receiver sites to be found as the project progresses to avoid disposal of material to landfill. Re-use of soils materials would be facilitated under a Material Management Plan under the CL:AIRE Definition of Waste Code of Practice (DoWCoP)¹⁴ prepared prior to development commencing.

16.134. The CL:AIRE Definition of Waste Code of Practice to demonstrate that excavated soils that are re-used meet the criteria for:

- protection of human health and protection of the environment;
- suitable for use without further treatment;
- quantity of use; and
- certainty of use.

16.135. To mitigate the risks associated with the generation of contaminated dusts during the remediation (potentially required) and earthworks being undertaken at the Study Area, exposed areas would be dampened down during the construction work in order to reduce the amount of dust generated. In addition, the levels of dust generated would be monitored throughout the works. This would be set out within the CEMP.

¹⁴ CL:AIRE The Definition of Waste: Development Industry Code of Practice Version 2 March 2011

16.136. Works near to existing rail and road structures would be subject to detailed geotechnical design and assessment approval in accordance with Highways England Design Manual for Roads and Bridges, CD 622, Managing geotechnical risk in the case of the Highways Agency and to Network Rail Standards. Slopes would require detailed assessment and appropriate design, retaining and temporary shoring.

Operational phase

16.137. Further detailed investigation is required at the site to support design following DCO. If elevated ground gases are recorded, suitable gas protection measures may be incorporated into the building design. The requirement for ground gas protection measures would be assessed on a plot by plot basis. The measures may incorporate the floor slab, gas impermeable membrane and/or sub slab ventilation in accordance with current best practice. Monitoring to date has identified some elevated Carbon dioxide typical of characteristic situation CS2 conditions. Further monitoring may be required after completion of earthworks to assess whether the gas regime has changed.

16.138. Fuel storage facilities required for the railport would be bunded with appropriate wet stock management and spill management systems. Refuelling areas would be constructed on impermeable cover.

Risks to Buildings and Structures

16.139. The Groundsure report, site history, current site setting and geology setting have all been considered in order to provide an indication of the potential ground related constraints and opportunities in the context of the Proposed Development as set out in Table 16.14.

Table 16.14: Ground related constraints and opportunities

Potential Constraint / Opportunity	Explanation	Potential Mitigation Options
Topsoil	The preliminary GI indicated that Topsoil is present across most of the site and will require stripping prior to earthworks.	A volume of topsoil will be required for soft landscaping areas, noise and visual bunds and in BNG areas in the final development. Further testing will be required to confirm suitability for use in other developments. Following completion of earthworks the development plateaus would be covered by a protective layer of site won topsoil until construction. Topsoil may also be utilized for surcharge loading if required. Surplus topsoil may be used elsewhere or as a last resort transferred for re-use or recovery via a Waste Transfer Station or

Potential Constraint / Opportunity	Explanation	Potential Mitigation Options
		potentially for inert landfill cover and restoration if a suitable home cannot be found at the right time. There is a considerable length of time for the development which will maximize the opportunities for beneficial re-use of topsoil on other developments.
Preliminary Foundation Solution	<p>A significant earthworks operation will be required at the site to create development plateaus.</p> <p>Pad foundations are likely to be viable within engineered fill or natural deposits.</p>	<p>Ground investigation should be undertaken to confirm ground conditions at the site to inform detailed design.</p> <p>Made Ground, Alluvium and/or materials with high organic content to be relocated away from proposed building footprints.</p>
Buried Obstructions	Limited buried obstructions are likely to be present across the site given the lack of development across the area.	Buried obstructions such as building foundations should be removed during the demolition works.
Shrink/Swell Clay	The Groundsure report indicates that the Alluvium and the outcropping Mercia Mudstone are typically low plasticity and represent a very low shrink/swell risk. The Glacial deposits across the rest of the site are indicated to have medium plasticity (low risk).	Plasticity of soils to be assessed as part of ground investigation. Foundations would need to consider potential for heave, where located near to trees.
Running Sands	The majority of soils across the site are indicated to have a negligible or very low risk of running sands, however, the Alluvium is indicated to have a low risk of running sands.	The risk associated with running sands should be considered during detailed design stage. To date, the Alluvium has been found as cohesive, and running sands are not likely to represent an issue.
Compressible	The Bosworth Clay and Alluvium	The risk associated with compressible

Potential Constraint / Opportunity	Explanation	Potential Mitigation Options
Deposits	are indicated to have a moderate compressibility risk, with the other strata indicated to have a negligible risk.	deposits should be assessed during detailed design stage.
Collapsible Deposits	The site is indicated to have a very low/ negligible collapsible deposit risk.	N/A
Landslides	The site is indicated to have a very low risk of landslides, increased to low in a localised area around Junction 2 of the M69.	Slope stability assessments would be required to assess the potential for landslides to occur where slopes/cuttings form part of the Proposed Development plans.
Ground Dissolution of Soluble Rocks	Negligible risk recorded across the site.	N/A
Trees	Trees are present along field boundaries and watercourses, with woodland located immediately west of site.	Foundations in close proximity to new or existing trees may need to be locally deepened beyond the zone of influence of tree roots and/or heave precautions adopted.
Pyritic Geology	The Mercia Mudstone is indicated to be pyritic.	Preliminary investigation works indicated DS-1 AC1 conditions present at the site, increased to DS-2 AC2 where groundwater is encountered.
Retaining Walls	Retaining walls will be required as part of the Proposed Development	Retaining walls would need to be designed based on site specific data.
Drainage and Soakaways	Based on the cohesive nature of the majority of the soils across the site, infiltration-based	Infiltration testing in accordance with current guidance would be required to inform the permeability of the soils to

Potential Constraint / Opportunity	Explanation	Potential Mitigation Options
	drainage is unlikely to be viable.	inform drainage design.
Roads and Pavements	California Bearing Ratio (CBR) values should be sought for road, car park and pavement design.	Preliminary third-party investigation suggests that a CBR of 3% is adopted for all soils excluding alluvium where <2.5% is recommended.
UXO	Review of the unexploded ordnance risk maps available online indicates the site to be in an area of low risk from UXO.	No further assessment required.

RESIDUAL ENVIRONMENTAL EFFECTS

Construction phase

Risks to Human Health

16.140. There would be an increased potential for direct human exposure to potential contamination identified in shallow soils through ingestion, direct contact or inhalation of contaminated soil or dust by construction workers in the short-term during construction works. To mitigate against such risks, construction workers and services personnel shall follow guidance stated in ‘HSE 66 Protection of Workers and the General Public during Development of Contaminated Land’ during construction works. Adequate standard personal protective equipment and the development of basic hygiene measures would be undertaken. The residual effect would be negligible and not a significant effect.

Risks to Controlled Waters

16.141. Lubricants and refuelling facilities would be positioned away from the most sensitive receptors at the application site and operate in accordance with best practice. The residual effect would be negligible due to negligible magnitude of effect of a medium sensitivity resource and not a significant effect.

Risks to buildings and structures

16.142. The earthworks would be designed to deliver a cut and fill balance to eliminate the need for offsite disposal of surplus soils or import of soils. The residual effect would be negligible due to negligible magnitude of effect of a low sensitivity resource and not a

significant effect.

- 16.143. The CEMP sets out the various measures to manage the effects from earthworks, which may include seeding of stockpiles, silt traps and temporary drainage grips. The residual effect would be negligible magnitude of effect of a low to medium sensitivity of controlled water receptors and not a significant effect.
- 16.144. Stripped topsoil should be stored in separate resource bunds no more than 3m high and kept grassed and free from construction traffic until required for re-use. The Construction Code of Practice for Sustainable Use of Soils on Construction Sites (Defra, 2009) provides guidance on good practice in soil handling. The residual effect would be negligible due to negligible magnitude of effect of a medium sensitivity resource and not a significant effect.
- 16.145. Detailed foundation design, and the associated methodology remains subject to intrusive ground investigations, to be undertaken at the appropriate time. If required, piling should be undertaken in accordance with best practice, as agreed with the relevant parties ahead of commencement of the works. The residual effect would be negligible due to negligible magnitude of effect of a low sensitivity resource and not a significant effect.

Operational phase

Risks to Human Health

- 16.146. The Main HNRFI site has remained largely undeveloped and there is a low risk of soil or groundwater contamination being present. Completion of ground investigation, and implementation of any required remediation strategy would remove any unacceptable risk to future site users. The residual effect would be negligible due to negligible magnitude of effect of a medium sensitivity resource and not a significant effect.
- 16.147. Completion of a further period of gas monitoring would be undertaken at the Main HNRFI site which would inform appropriate ground gas risk assessment and allow design of appropriate protection measures that need to be installed into new buildings in accordance with BS8485: 2015 +A1: 2019. Preliminary gas monitoring completed in 2018 indicated that parts of the Main HNRFI Site would be classified as CS2 and others CS1. Gas sources may be associated with pockets of contamination which may be removed as part of the earthworks phase. Monitoring may therefore be required prior to and on completion of earthworks to demonstrate removal of gas sources. The residual effect would be negligible due to negligible magnitude of effect of a medium sensitivity receptor and not a significant effect.

Risks to Controlled Waters

- 16.148. There is a low risk of soil or groundwater contamination being present at the Main HNRFI Site and the Proposed Development would incorporate a predominantly hardstanding covering. This would minimise the infiltration of rainfall and recharge through the unsaturated zone thereby minimising potential contaminant mobility and reducing the

risk to the underlying aquifer. The residual effect would be negligible due to negligible magnitude of effect of a medium sensitivity resource and not a significant effect.

Risks to Buildings and Structures

16.149. Adequate design of earthworks, foundations and yards and floor slabs will provide a development with a suitable design life. No residual risk to the physical structure of the building is anticipated.

CUMULATIVE AND IN-COMBINATION EFFECTS

16.150. The proposed and committed schemes listed within Appendix 20.1: *Long List of Cumulative Sites* (document reference 6.2.20.1) have been reviewed and there are no current existing or permitted schemes that are relevant to, or would represent a cumulative impact with, the Proposed Development regarding Ground Conditions. Land contamination is subject to the same national guidance and all developments must meet a common standard for safe development with a requirement to undertake a phased investigation of the site including Phase 1 preliminary risk assessment, Phase 2 intrusive investigation remediation strategy, remediation implementation and verification. It is considered that there would be no significant cumulative effects on ground conditions and contamination resulting from the Proposed Development and the cumulative schemes considered as part of the assessment, as each development would incorporate appropriate mitigation measures to have overall negligible, or slight positive effects.

16.151. Consequently, it is considered that there are unlikely to be any cumulative effects on ground conditions. It is assumed that mitigation implemented for other committed developments would be undertaken to this standard, hence there should be no need for cumulative mitigation measures. Therefore, no cumulative effects are predicted with the relevant committed developments identified for consideration by this ES Chapter.

CLIMATE CHANGE

16.152. Consideration of the potential implications of future climate change has been incorporated into this assessment and is further explained in Chapter 18 (ES Document Reference 6.1.18). Specifically, the mitigation measures have been designed to ensure the Proposed Development would remain safe for its lifetime. Careful control and monitoring of earthworks would ensure that the engineered soils are placed in accordance with the earthworks specification.

SUMMARY AND CONCLUSIONS

16.153. This chapter assesses the potential effects of the Proposed Development on Ground Conditions and Land Contamination. It describes the methods used to assess the effects, the baseline conditions currently existing at the application site and surroundings, the

potential direct and indirect effects of the Proposed Development and the mitigation measures required to prevent, reduce or offset the potential effects and the residual effects.

- 16.154. The Chapter is supported by a Phase 1 Preliminary Risk Assessment for the Order Limits site (Appendix 15.1 (document reference 6.2.15.1) and preliminary Ground Investigation for the Main HNRFI Site (Appendix 15.2 (document reference 6.2.15.2) which are provided as technical appendices.
- 16.155. The Main HNRFI Site has predominantly remained undeveloped agricultural land with a number of farm buildings located on the Main HNRFI Site.
- 16.156. The Main HNRFI Site is indicated to be directly underlain by topsoil over drift deposits comprising glacial deposits of the Thrussington Member and Bosworth Clay Member. Localised deposits of Alluvium and the Wolston Sand & Gravel are mapped at the site. Bedrock is indicated to comprise the Mercia Mudstone. The site is predominantly classified as Grade 3b (poor quality) agricultural land, with approximately 2.9 hectares of Grade 3a land.
- 16.157. The natural undulating terrain inside the Main HNRFI Site will be remodelled to provide two level plateaux for development. The elevation and shape of these plateaux provide a suitable formation to deliver the development at, or below, the maximum finished floor levels (FFL). The earthworks required to provide the two plateaux require the movement of up to 2.35 million cubic metres of subsoil and have been designed to provide a cut and fill balance across the Main HNRFI Site, removing the need to import or export subsoil for earthworks. Re-use of soils would be completed under an earthworks specification and a Materials Management Plan in accordance with the DoWCoP to be prepared shortly prior to the start of works.
- 16.158. Organic material will be managed; volumes can be minimised by measurement of organic content of soils with depth. This will minimise the volume stripped. The site will be designed to reduce surplus topsoil by trying to use it on site where possible. Topsoil will be used within permanent works for on site landscaping, noise / visual bunds and for offsite BNG areas. Temporary works will include placement back on plots for future development to protect the formation until they are ready to come forward or it may be used to create surcharge loading if geotechnical conditions require ground improvement
- 16.159. The residual topsoil that cannot be utilised will be stockpiled for storage. Given that a balance of topsoil cannot be achieved on site, there are a number of options for movement of the excess:
- Reuse of the topsoil elsewhere, for use in agricultural or biodiversity uses or to meet the needs of developments in the region.
 - The remainder will be transferred for re-use or recovery via a Waste Transfer Station or potentially for inert landfill cover and restoration if a suitable home cannot be found at the right time.

- 16.160. Potential effects have been identified during construction associated with mobilisation of dusts and particulates, damage to excavated topsoil and from foundation works creating pathways.
- 16.161. The CEMP ensures that mobilisation of soils during the construction phase is minimised. The CEMP outlines detailed methodologies and monitoring requirements to prevent adverse effects on or from ground conditions.
- 16.162. No significant contamination of soils or groundwater is expected at the site. Sources of ground gas exist at shallow depth associated with alluvial soils and localised made ground around farm buildings.
- 16.163. Further intrusive ground investigation would be completed to support detailed design and confirm ground conditions, assess the presence of any soil or groundwater contamination and obtain information for foundation design. Ground gas monitoring would be undertaken, and a ground gas risk assessment completed to support the design of any required gas protection measures. Adequate ground investigation has been completed to demonstrate that there are limited adverse effects from ground contamination and geology at the site. Based on the historical use of the site, the low sensitivity to human health within the commercial development and low sensitivity of underlying aquifers there is negligible risk that unforeseen contamination would be identified that could affect the feasibility of the development.
- 16.164. Nearby developments are subject to the same national guidance, with a requirement to deliver a safe development, including remediation of contamination where necessary, therefore, there are unlikely to be any significant cumulative effects requiring mitigation.
- 16.165. Overall, it is considered that potential effects from the construction and operational phases of the development would be negligible following the implementation of appropriate mitigation measures.

Table 16.15 - Summary of effects

Description of impact	Inherent mitigation measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Residual effect	Proposed monitoring
Risk to demolition and groundworkers from contamination during demolition and enabling works	Detailed ground investigation to be completed to support design of earthworks and remediation. Asbestos surveys to be completed on all buildings prior to demolition. Asbestos to be removed by licenced contractor	Low	Medium	Minor adverse (not significant in ES terms)	Additional PPE to be specified if required in Construction Phase Plan.	Negligible	Air quality monitoring for dusts and particulates to be completed throughout earthworks and to be specified in the CEMP
Pollution of controlled waters from mobilisation of contaminants	Detailed ground investigation to be completed to support	Low to moderate	Medium	Minor adverse (not significant in ES terms)	Remediation of identified contamination prior to earthworks.	Negligible to minor beneficial from remediation of	Monitoring of surface water and groundwater during

	design of remediation.				Segregation of contaminated soils to be covered in the Site Waste and Materials Management Plan	contamination sources	construction and production of remediation verification report
Local instability around slopes and soft ground affecting buildings and other structures	Extensive groundworks to be completed to re-profile and reengineer the ground.	Moderate	Medium	Minor adverse (not significant is ES terms)	Detailed ground investigation to support development of an earthworks specification. Capping of completed platforms with site won topsoil until construction of each phase	Negligible	Verification report to be completed for the earthworks and remediation
Risk to human health from soil and groundwater contamination	Hardstanding will prevent exposure to contaminated soils	Moderate	Medium	Minor adverse (not significant is ES terms)	Detailed ground investigation of areas of suspected contamination and production of a	Negligible	Remediation Verification report

					remediation strategy		
Migration of hazardous ground gases into buildings	Low potential of gas generation from natural soils but could be pockets of gas from made ground. Large internal volume of buildings will disperse gas	Moderate	Medium	Minor adverse (not significant in ES terms)	Further gas monitoring to be completed as part of detailed design. Gas protection measures for buildings to be set out in a remediation strategy if required	Negligible	Verification report to demonstrate adequate installation of gas protection measures
Re-use of unsuitable soils and generation of waste soils requiring disposal	Earthworks model to provide a cut and fill balance for subsoil. Reuse of topsoil within permanent works for soft landscaping, noise/visual bunds and BNG areas.	Moderate	Medium	Minor adverse (not significant in ES terms)	Provision of an earthworks specification and Material Management Plan under DoWCoP Topsoil management is covered in the Site Waste and Materials Management Framework Plan (document reference 17.3)	Negligible	Verification Report

Table 16.16 – Summary of mitigation

Description of impact	Effect	Mitigation measures adopted as part of the project	Secured by	Responsible party
Risk to demolition and groundworkers from contamination during demolition and enabling works	Minor adverse	Detailed ground investigation, production of an earthworks specification, remediation strategy and verification report	Condition of DCO	Demolition and earthworks contractor
Pollution of controlled waters from mobilisation of contaminants	Minor adverse	Remediation of identified contamination prior to earthworks. Segregation of contaminated soils to be covered in the Material Management Plan	Condition of DCO	Environmental/geotechnical consultant and earthworks contractor
Local instability around slopes and soft ground affecting buildings and other structures	Minor adverse	Detailed ground investigation to support development of an earthworks specification. Capping of completed platforms with site won topsoil until construction of each phase	Required for detailed design	Geotechnical consultant and earthworks contractor
Risk to human health from soil and groundwater contamination	Minor adverse	Detailed ground investigation of areas of suspected contamination	Condition of DCO	Environmental consultant and remediation contractor

		and production of a remediation strategy		
Migration of hazardous ground gases into buildings	Minor adverse	Further gas monitoring to be completed as part of detailed design. Gas protection measures for buildings to be set out in a remediation strategy if required	Condition of DCO	Environmental consultant/ structural engineer and building contractor
Re-use of unsuitable soils and generation of waste soils requiring disposal	Minor adverse	Earthworks model with subsoil cut and fill balance. Provision of an earthworks specification and Material Management Plan under DoWCoP Topsoil management addressed in Site Waste and Materials Management Framework Plan (document reference 17.3)	Condition of DCO	Environmental/ geotechnical consultant and earthworks contractor