East Midlands Gateway
Phase 2 (EMG2)

Document [6.15]
ENVIRONMENTAL STATEMENT

Volume 1 Main Statement

Chapter 14

Ground Conditions

[January] 2025

14

The East Midlands Gateway Phase 2 and Highway Order 202X and The East Midlands Gateway Rail Freight and Highway (Amendment) Order 202X

SEGRO.COM/SLPEMG2

SEGRO

14. Ground Conditions

14.1. Introduction

14.1.1. This chapter of the ES assesses any potential effects relating to the existing ground conditions, geological setting, hydrogeology and land contamination aspects of the **Scheme**. This chapter describes the methodology of assessment, the current baseline conditions, any likely significant environmental impacts, the mitigation measures intended to avoid, minimise or remedy the identified impacts, and the residual effects post implementation of these measures.

14.1.2. This chapter should be read in conjunction with the Fairhurst Phase 1 Geo-environmental and Geotechnical Preliminary Risk Assessment (**Appendix 14a** and its appendices), the Fairhurst Ground Investigation Report (**Appendix 14b**), the Fairhurst Minerals Safeguarding Assessment and Addendum Assessment (**Appendix 14c** and **14d**, respectively), which supported the decision by Leicestershire County Council to scope mineral safeguarding out of the ES (**Appendix 14e**) and RSK Environment Ltd Factual and Interpretative Ground Investigation Reports (**Appendix 14f and 14g**, respectively).

14.1.3. The three interrelated components of the **Scheme** are presented within **Chapter 1: Introduction and Scope** and **Chapter 3**: **Proposed Development**. Paragraph 1.1.2 of **Chapter 1** defines the **Scheme** to comprise the **EMG2 Main Site**, **Highway Works** and **EMG1 Works**. At this preliminary stage, the study area for this Chapter's assessment comprises the **EMG2 Main Site** and **EMG1 Works** (Plot 16 only), as set out on the Parameters Plans [Documents 2.5 and MCO 2.5] provided as **Figures [xx and xx].** [Section to be updated].

14.2. Scope and Methodology of the Assessment

14.2.1. To inform the assessment, the existing land use, soil, geological, hydrological and hydrogeological conditions have been reviewed, utilising both the Preliminary Risk Assessment report and the Ground Investigation Report for the **EMG2 Main Site**, as well as the separate Preliminary Ground Investigation Interpretative and Factual Reports for the **EMG1 Works** in order to assess Plot 16**.**

14.2.2. The process of Land Contamination Risk Management (LCRM) has been adhered to, where a ground investigation has been undertaken to characterise potential contaminant linkages identified at the Desk Study stage, and subsequent refinement of the assessment completed through intrusive investigation to further characterise the ground conditions and present associated mitigation.

Scoping Consultation

14.2.3. Delta Planning compiled a Scoping Report on behalf of the Applicant in August 2024 (Delta Planning EMG Phase 2, EIA Scoping Report, August 2024), in which Fairhurst proposed the 'scoping out' of ground conditions / contamination pertaining to the **EMG2 Main Site**. This report was provided to the Secretary of State (SoS) under EIA Regulation 10 (3).

14.2.4. Table 5.1 of Paragraph 5.10 of the Scoping Report presents the "scoped out factors" alongside the reasons for scoping out. Fairhurst provided the following justification for the scoping out of ground conditions pertaining to the **EMG2 Main Site**:

- "A Ground Investigation has been prepared and is included as Appendix 5 to this EIA Scoping Report;
- It shows that the site is undeveloped agricultural land with no previous development;
- The historic use of the site for agriculture makes the presence of significant concentrations of potential contaminants or hazardous ground gases highly unlikely with no expected risks to sensitive receptors such as site workers; and
- The proposed development is not expected to result in significant indirect effects relating to ground contamination and hazardous ground gases when assessed against human health, the environment and/or proposed structures."

14.2.5. Various consultations were conducted as part of the **Scoping Opinion**, which was adopted by PINS in September 2024.

14.2.6. The Inspectorate did not agree with the proposal to scope out ground conditions / contamination at the **EMG2 Main Site**, for the reason(s) stated within Section 3.0.2 of Table 5.1 of the Scoping Opinion:

> *"The Scoping Report does not provide evidence of the land use history of the Main Site nor is any information provided in relation to land required for the rail freight expansion or highway network improvements, which already are stated to be in industrial use. The Ground Investigation Report also identifies made ground within areas currently identified as agricultural land within the Main Site indicating that infilling may have occurred in these areas."*

14.2.7. Therefore, taking into consideration the above consultation, this Chapter assesses the **EMG2 Main Site** and Plot 16 of the **Scheme**. The following remaining components of the **Scheme** have currently been screened out of this Chapter as they are considered to be of unlikely contaminative potential, due to the fact they are presently considered to have minimal effect on ground conditions [section to be reviewed on receipt of further ground information] :

- Increases to the maximum height of previously approved gantry cranes by 4 m to 24 m overall within **EMG1 Works**;
- Minor works around the EMG1 Public Transport Interchange within the EMG1 Works; and
- **Highway Works** (stated within Paragraph 1.4.2 of **Chapter 1** as comprising "new highway infrastructure and works to the existing highways network – including a new off-slip lane from the M1 northbound at J24 to provide a direct link to the A50 westbound, widening of the A50 eastbound link at Junction 24 and other related works and traffic management measures."

Determination of Baseline

14.2.8. The site baseline conditions have been established using information presented within the following reports:

EMG2 Main Site:

- Fairhurst, East Midlands Gateway Phase 2, Phase 1 Geo-environmental and Geotechnical Preliminary Risk Assessment, August 2024 (**Appendix 14a**) (referred to as PRA);
- Fairhurst, East Midlands Gateway Phase 2, Ground Investigation Report, August 2024 (**Appendix 14b**) (referred to as GIR); and
- Fairhurst, East Midlands Gateway Phase 2, Minerals Safeguarding Assessment, July 2024 (**Appendix 14c**).

Plot 16 (within the EMG1 Works):

- Fairhurst, East Midlands Gateway Phase 2, Addendum Minerals Safeguarding Assessment, November 2024 (**Appendix 14d**);
- Leicestershire City Council Mineral and Waste Planning Authority (MWPA), correspondence decision to scope out minerals safeguarding from the ES chapter, December 2024 (**Appendix 14e**);
- RSK Environment Ltd, East Midlands Gateway Strategic Rail Freight Interchange - Zone 1 Main Development and Rail Freight Terminal, Factual Ground Investigation Report, December 2013 (**Appendix 14f**); and
- RSK Environment Ltd, East Midlands Gateway Strategic Rail Freight Interchange - Zone 1 Main Development and Rail Freight Terminal, Preliminary Ground Investigation Interpretative Report, December 2013 (**Appendix 14g**).

Prediction Methodology

14.2.9. The sensitivity of potentially affected receptors will be considered on a scale of high, moderate or low, with the associated definitions as follows:

- High sensitivity: the receptor / resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
- Moderate sensitivity: the receptor / resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
- Low sensitivity: the receptor / resource is tolerant of change without detriment to its character, or is of low or local importance.

14.2.10. Typical examples of sensitivity are listed in **Table 14.1** below and specific site sensitivities of site specific receptors are listed within **Table 14.2**.

Table 14.1: Receptor Sensitivity Criteria

Receptor Sensitivity	Human Health	Built Environment / Infrastructure	Controlled Waters
High	On-site users, off-site residential, youth, construction workers assuming no use of PPE.	Residential, gas/oil infrastructure / pipelines, mainline railway lines, power transmission lines, A roads, dual carriageway, B roads, local power lines.	Aquifers currently in use or are suitable for use, as public potable supplies (Principal Aquifers, EA designated SPZs), waters of national designated areas (SSSI, RAMSAR, SAC).
Moderate	Non-residential off-site users, POS users, construction workers assuming PPE use.	More minor C roads, local services.	Secondary Aquifer which supports abstraction for agricultural (irrigation) or industrial use, controlled waters of regionally designated areas (e.g. local nature reserves).
Low	Limited access / exposure / unoccupied land.	Non-permanent / temporary structures.	Low quality aquifers; Secondary B, Undifferentiated and Unproductive Stratum, undesignated site or controlled water features which considerable enrich the local habitat.

14.2.11. The magnitude of change will be qualitatively described and categorised based on the terminology set out in **Chapter 1: Introduction** of this ES.

14.2.12. The construction and operational phases will be considered in the assessment of any potential impacts and likely effects. The level of significance allocated to each identified effect will be assessed on the basis of the magnitude of change and the sensitivity of the affected receptor to that change.

14.2.13. The assessment of significance is based on the 'Effect Significance Matrix' presented within **Chapter 1**. Effects which are 'Moderate' or greater are considered to be significant in the view of the EIA Regulations.

14.2.14. The below terms will be used to define the significance of the identified effects:

- Major beneficial or adverse effect – where the effects would result in a large enhancement (or deterioration) to the current environment;
- Moderate beneficial or adverse effect – where the effects would result in a medium enhancement (or deterioration) to the current environment;

- Minor beneficial or adverse effect – where the effects would result in a small enhancement (or deterioration) to the current environment; and

- Negligible – where the effects will not result in a noticeable enhancement or deterioration.

14.2.15. The anticipated effects can be of differing duration; short term, medium term or long term. The duration of impacts is anticipated within the below sections of this chapter, with the definitions of each duration presented within **Chapter 1**.

14.2.16. The prediction methodology associated with ground conditions and contamination will be completed by comparing the baseline conditions (based on Ground Investigation information) with the conditions during the construction phase as well as the conditions post-development, incorporating the potential magnitude of change and the sensitivity of receptors. To start with, the assessment will evaluate the significance of the likely effect, considering both inherent (i.e. the implementation of mitigation measures which would be incorporated into the design and incorporated (i.e. mitigation which would be expected to be achieved through adhering to best practise and the requirements set out within the DCO) mitigation measures that would be applied.

Limitations and Assumptions

14.2.17. This Chapter has been prepared in accordance with good general practise and guidance and is based upon ground investigation data which is available at the time of writing only. Consideration should be given to any changes in industry practises or legislation subsequent to the date of issue of this Chapter.

14.3. Policy, Guidance and Legislative Context

14.3.1. The Ground Conditions and Contamination assessment has been undertaken considering relevant planning policies and published guidance documentation and legislation. These are summarised below.

Legislation and Regulation

14.3.2. The below legislation has been reviewed in light of the assessment within this Chapter:

- Part 2A of the Environmental Protection Act (EPA) 1990;
- The Town and Country Planning Act 1990;
- The Water Resources Act 1991;
- The Planning Act 2008 (as amended);
- The Contaminated Land (England) (Amendment) Regulations 2012;
- The Control of Asbestos Regulations 2012; and
- The Water Framework Directive 2017.

Planning Policy

14.3.3. The below national level planning policy documents are relevant and have informed the assessment.

National Planning Policy Framework (NPPF) 2024

14.3.4. The National Planning Policy Framework, (NPPF) provides the following with reference to contamination and ground conditions:

Paragraph 187: "*Planning policies and decisions should contribute to and enhance the natural and local environment by:*

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

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, waterer 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.*"

Paragraph 196: "*Planning policies and decisions should ensure that:*

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 assessment*."

Paragraph 197: "*Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner*."

National Policy Statement National Networks (NPS)

14.3.5. NPS Guidance (March 2024), presented to Parliament pursuant to Section 9 (8) of the Planning Act, includes various general impacts and corresponding mitigations of national road, rail and strategic rail freight interchange (SRFI) developments. Impacts and mitigations relevant to this assessment are discussed below.

Land Contamination and Instability:

14.3.6. Paragraph 5.154: *"Where necessary, land contamination and instability should be considered in respect of new development. Specifically, the proposals should be appropriate for the location, including preventing unacceptable risks from land contamination or instability. If land instability and/or land contamination may be an issue, applicants should seek appropriate technical and environmental expert advice from a competent person to prepare and carry out the appropriate assessments. Applicants should consult with the Coal Authority, Environment Agency and Local Authority if necessary."*

14.3.7. Paragraph 5.155: *"For developments on previously developed land, applicants should ensure and demonstrate that they have considered the risks posed by land contamination in accordance with the Land Contamination Risk Management guidance115. A preliminary assessment of land contamination and/or ground instability should be carried out at the earliest possible stage before a detailed application for development consent is prepared."*

14.3.8. Paragraph 5.156: *"Applicants should ensure that any necessary investigations are undertaken, in accordance with Land Contamination Risk Management guidance, to ascertain the risk from contamination and identify sensitive receptors and 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 the 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."*

14.3.9. The following land contamination and instability mitigation measures are stated within the guidance:

Instability

14.3.10. Paragraph 5.157: *"Applicants have a range of mechanisms available to mitigate and minimise risks of land instability. These include:*

- *establishing the principle and layout of new development, for example avoiding mine entries and other hazards*
- *ensuring proper design of structures to cope with any movement expected, and other hazards such as mine and/or ground gases*
- *requiring ground improvement techniques, usually involving the removal of poor material and its replacement with suitable inert and stable material, for development on land previously affected by mining activity, this may mean prior extraction of any remaining mineral resource"*

14.3.11. Paragraph 5.158: *"Applicants should submit a coal mining risk assessment as part of their application in specific Development High Risk areas."*

Land Contamination

14.3.12. Paragraph 5.159: *"Applicants have a range of options available to mitigate and minimise risks of land and groundwater contamination:*

- *these options should include sustainable remediation, sustainable remediation can provide the opportunity to manage unacceptable risks to human health and the environment, it can help to ensure that the benefit of doing the remediation is greater than its impact*

- *in accordance with the Environmental Improvement Plan, disposal of soils to landfill should be minimised."*

National Planning Practice Guidance (PPG)

14.3.13. Paragraph 002 (Ref ID. 33-002-20190722) of the National Planning Practice Guidance on Land Affected by Contamination (2019) lists the actions to be taken by local planning authorities in order to determine planning applications with regards to land affected by contamination.

North West Leicestershire Local Plan

14.3.14. The site baseline conditions have also considered the local plan pertaining to North West Leicestershire District Council which sets out current planning policies for the District from 2011 to 2031 (adopted in 2017 and underwent partial review in 2021). Policy En6 (Land and Air Quality) is relevant to, and thus has informed this Chapter and is discussed below.

14.3.15. Policy En6 – Land and Air Quality:

"*Proposals for development on land that is (or is suspected of being) subject to land instability issues or contamination, or is located within the defined Development High Risk Area or within or close to an Air Quality Management Area or close to a known source of noise will be supported where:*

(a) A planning application is accompanied by a detailed investigation and assessment of the issues; and

(b) Appropriate mitigation measures are identified which avoid any unacceptably adverse impacts upon the site or adjacent areas, including groundwater quality.

Development should avoid any unacceptably adverse impact upon soils of high environmental value (for example wetland or other specific soils) and ensure that soil resources are conserved and managed in a sustainable way."

14.3.16. Paragraph 10.45 states that *"North West Leicestershire has a long history of coal mining and heavy industry. This has left a legacy of potential land instability and contamination issues. The Coal Authority has defined a 'Development High Risk Area' that covers most of the district. In this area the potential land instability and other safety risks associated with former coal mining activities are likely to be greatest. They include, for example, areas of known or suspected shallow coal mining, recorded mine entries and areas of former surface mining. Other than householder developments and those exceptions as identified on the Coal Authority's exemptions list, all new development proposals within the defined Development High Risk Area must be supported by a Coal Mining Risk Assessment, or equivalent, in order to identify any potential risks to the new development and any required remediation measures. These assessments must be carried out by a suitably qualified person to the current British Standards and approved guidance."*

14.3.17. Paragraph 10.47 notes that *"Groundwater provides a third of our drinking water in England and Wales, and it also maintains the flow in many of our rivers. It is crucial that we look after these sources and ensure that water is completely safe to drink".*

Technical Standards and Guidance

14.3.18. Technical documents produced by the British Standards Institute (BSI) and of relevance include standards for the investigation of potentially contaminated sites in order that appropriate actions can be taken:

- BS10175:2011+A2:2017. Investigation of Potentially Contaminated Sites – Code of Practice;
- BS8485:2015:A1:2019. Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings; and
- BS5930: 2015+A1:200. Code of Practice for Site Investigations.

14.3.19. CIRIA provides a plethora of technical guidance documents to assess the potential risks to new structures and encourage safe site working. Documents which may be relevant to this ES Chapter include:

- CIRIA C665: Assessing risks posed by hazardous ground gases to buildings;
- CIRIA C552:2001: Contaminated Land Risk Assessment: A Guide to Good Practice;
- CIRIA C681: Unexploded Ordnance (UXO): A Guide for the Construction Industry.
- CIRIA C733: Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks;
- CIRIA C762: Environmental good practice on site pocked book; and
- CIRIA Report R13D: A Guide for Safe Working on Contaminated Sites.

14.3.20. The Environment Agency's Pollution Prevention Guidance (PPG) note series with additional related documents supply advice pertaining to the principles of pollution prevention, means to prevent contamination and guidance on responding to pollution incidents. Although the guidelines were withdrawn in 2015, they are still considered as good practice. The below PPGs and related documents are of relevance and thus have informed the assessment

- PPG 1 – Understanding Your Environmental Responsibilities – Good Environmental Practices;
- PPG 2 – Above Ground Storage Tanks;
- PPG 6 – Working at Construction or Demolition sites;
- PPG 21 – Pollution Incident Response Planning;
- Pollution Prevention Pays;
- Prioritisation and categorisation procedure for sites which may be contaminated CLR 6; and

- Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

14.3.21. The Environment Agency also provides guidance pertaining to the risk based assessment / quantitative refinement of the initial site conceptual model for contaminated sites. The below documents and guidance are considered vital to this refinement and have informed this assessment:

- Updated Technical Background to the CLEA Model. Science Report SC050021/SR2;
- Human Health Toxicological Assessment of Contaminants in Soil. Science Report SC050021/SR2;
- The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. Science Report P5-080/TR3;
- Verification of Remediation of Land Contamination. Report SC030114; and
- Land Contamination Risk Management webpage, formerly CLR11 (LCRM) (2023).

14.4. Baseline Conditions

EMG2 Main Site

Desktop Review

14.4.1. Review of the aforementioned PRA (**Appendix 14a**) informs the historical setting of the **EMG2 Main Site**. Historically, the **EMG2 Main Site** comprises of agricultural fields, with the presence of a stream in the south-eastern site area, ponds within the north-east and south-east of the site and a drainage ditch which extended into the western site area. By 1921, a potential pump was identified at the pond in the north eastern site area, with the addition of further smaller ponds on site. By 1955, one of the ponds (adjacent to the south eastern site corner) previously identified no longer features on available historical maps, and thus is assumed to have been infilled at desk study stage. A further pond was identified in available historical maps dated 1966 – 1969, located within the north eastern site area. From 1972 – 2021, no additional significant changes were identified.

14.4.2. Historically, the surrounding site area featured agricultural land, with various commercial/light and industrial/heavy uses. The earliest available historical map dated 1883 indicates the presence of a brick yard located 100 m south west (present until 1921), small ponds within a 200 m radius and the Diseworth Brook 100 m south west. In 1955, an airfield is identified 400 m north of the **EMG2 Main Site**, subsequently extending to within 50 m north west of the site by 1962, and labelled as East Midlands Airport in maps post 1966. By 1966, the construction of the M1 motorway was completed, located 100 m north-east of the **EMG2 Main Site**. Tanks were identified in available historical maps dated 1972, located 260 m north west of the **EMG2 Main Site.** From the 1980s, there is an evident increase in industrial use with the development of commercial / light industrial land uses within a 250 m radius. These land uses included a depot (250 m north west), unspecified works (190 m south west), Donnington Park Service Station (adjacent north east) and additional unnamed buildings. By 2021, two sewage pumping stations are identified 240m west and 50m north east.

14.4.3. The PRA assessed the following potential sources of contamination based on available information at the time of writing:

- On-site sources (**EMG2 Main Site**)
    - Two Infilled clay pits in the northern site area;
    - Former diesel generator in the southern site area; and
    - Waste Transfer Site in the centre of the northern site area.
- Off-site sources (Surrounding the **EMG2 Main Site**)
    - Service station and associated amenities, 67 – 90 m north east;
    - Numerous works associated with East Midlands Airport, 80 – 160 m north;
    - Historical / current landfill site, 254 m north west

14.4.4. During the site reconnaissance on 1st July 2022, no evidence of the associated infrastructure of a Waste Transfer Station having historically been on site were noted. Therefore, it is suspected that this location record may be a geo-referencing error and is more likely associated with the handling of airport waste, on the East Midlands Airport site. As a result, the potential source of contamination associated with a Waste Transfer Site on the **EMG2 Main Site** was discounted at the desk study stage.

14.4.5. Figure 3 of the initial PRA (**Appendix 14a** of this Chapter) provides a visual representation of the identified potential sources of contamination on site and in the surrounding site area.

14.4.6. Due to the initial PRA classifying the majority of complete pollutant linkages as Moderate/Low or Low risk, Fairhurst recommended further investigation through intrusive methods, to enable refinement of the Initial Conceptual Site Model (CSM), and thus refinement of the site baseline conditions.

Site Investigation

14.4.7. A combined geo-environmental and geotechnical intrusive ground investigation between September 2022 and October 2022 was undertaken on the **EMG2 Main Site**. The investigation comprised:

- buried utility service clearance
- 27 No. cable percussive boreholes with rotary core follow on
- 28 No. cable percussive boreholes
- 38 No. mechanically excavated trial pits with 8 No. soakaway infiltration tests
- 2 No. variable head permeability tests
- 25 No. groundwater and ground gas monitoring well installations and 3 No. return visits for groundwater and ground gas monitoring

14.4.8. The GIR **(Appendix 14b)** indicates the ground conditions comprise:

- Topsoil (proven from the surface to a maximum depth of between 0.10 m and 0.85 m bgl);
- Isolated occurrences of Made Ground (proven to a maximum depth of 0.20 m and 3.00 m bgl), with the deeper Made Ground encountered within the northern site area (location of anticipated historically infilled clay pits – TP08 and BH04);
- Superficial deposits of The Oadby Member and Glaciofluvial Deposits (proven to maximum depths of 16.40 m bgl and 17.30 m bgl, respectively); and
- Bedrock geology of The Gunthorpe Member and Diseworth Sandstone (proven to a maximum depth of 18.50 m bgl for the former, with the maximum depth of the latter not proven)

14.4.9. Groundwater monitoring suggests that two groundwater bodies are present between depths of 1.25 m and 15.32 m bgl (84.90 m AOD and 52.7 m AOD) within the Glaciofluvial, Weathered Gunthorpe Member and Gunthorpe Member.

14.4.10. A total of 8No. different laboratory soil tests were completed on soil samples obtained during the investigation by Structural Soils Ltd. The soil contamination assessment indicates that all concentrations of contaminants were below the commercial end use generic assessment criteria, and thus the human health risk to future end users at the site was assessed by Fairhurst as low. Therefore, although evidently deeper Made Ground was encountered within the proximity of the previously anticipated infilled clay pits in the northern site area, laboratory soil chemical results suggests that the risk is low.

14.4.11. Soil concentrations recorded across the site were also compared against UKIWR "*Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites (Ref 10/WM/03/21)*". Results of the assessment indicated 2No. exceedances for Polyethylene (PE) pipe and 1 No. exceedance for Polyvinyl Chloride (PVC) pipe specification. However, the use of upgraded drinking water supply pipes is not considered necessary, due to these exceedances being identified within the Topsoil layer (likely stripped during the development as part of the cut and fill scheme) and the detection of a hotspot of contamination, whereby removal via excavation is recommended.

14.4.12. The initial PRA set out the preliminary hydrological and hydrogeological regime of the site. The report identified 2 No. watercourses within influential distance to the site, which are fed by on-site drainage ditches. Therefore, both groundwater and surface water samples were taken and sent for chemical analysis to refine the potentially complete contaminant pathway regarding groundwater migration beneath the site.

14.4.13. A total of 15No. groundwater samples were obtained from selected monitoring wells at depths of between 251 m bgl and 19.00 m bgl deep, and 2No. surface water samples were obtained from the drainage ditch located in the south eastern area, both of which submitted for chemical analysis.

14.4.14. The chemical results from the surface water samples were assessed against published values from the Environment Agency (Environmental Quality Standards (EQS)). Where assessment criteria was unavailable for certain chemical constituents, the UK Drinking Water Standards and World Health Organization Drinking Water Standards were used.

14.4.15. The chemical results from the groundwater samples were assessed against the UK Drinking Water Standards, or where unavailable, the World Health Organization Drinking Water Standards.

14.4.16. The groundwater assessment concluded elevated concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), notably Acenaphthylene, Naphthalene and Pyrene, compared to the relevant Generic Assessment Criteria (GAC). These exceedances were noted in samples from greater depth within the hydrogeological profile (up to 19.0 m bgl deep) and were generally noted within the northern site extent. This, combined with the lack of soil contamination detected, indicates that the PAH contamination is likely to have leached into the groundwater from an unknown off-site source. The overall risks to controlled water quality were assessed by Fairhurst as low, considering the absence of abstraction points within 1.0 km of the site and the proposed betterment through the managed drainage system and reduced infiltration post development.

14.4.17. The surface water assessment concluded 1No. surface water sample exceedance of the relevant GAC for Naphthalene. However this exceedance is marginal. Considering this, and the localised nature of the exceedance, the overall risk is likely to be low.

14.4.18. Three rounds of ground gas monitoring were also carried out in 2022. It was possible to conclude that in accordance with CIRIA 665, the gas screening values (GSVs) which were calculated corresponded to Characteristic Situation (CS) 1 conditions for both Type C and Type D Buildings and referenced within BS 8485. Therefore, given the CS of the site, Table 4 of BS 8485:2015+A1:2019 indicates that there is no requirement for gas protection measures for both Type C and Type D structures on the **EMG2 Main Site.**

EMG1 Works – Plot 16

14.4.19. Plot 16 is located within the north east of the **EMG1 Works** and therefore the information obtained from the ground investigation completed by RSK Environment Ltd within EMG1 between September 2013 and October 2013 has been reviewed to inform the baseline conditions (**Appendix 14f and 14g**). It is acknowledged that these assessments were conducted in support of the previous EIA for EMG1. It is also acknowledged that various key guidance (LCRM, BS10175, BS5930) have undergone iterations of updates, however the core principles of the guidance remains consistent, and given the Plot 16 site has not been altered since the assessments, they are considered current and relevant.

14.4.20. The entirety of the intrusive investigation at EMG1 included the below, with the exploratory locations located within and surrounding Plot 16 discussed within Paragraphs 14.4.21 and below:

- 27No. trial pits, with the completion of 6No. soakaway tests in general accordance to BRE365
- 19No. cable percussive boreholes
- 6No. rotary cored boreholes
- installation of 25No. combined groundwater/gas monitoring wells and piezometers to varying depths to facilitate 4No. subsequent groundwater levels/ gas monitoring visits.

14.4.21. Exploratory location CP219 is located within the Plot 16 boundary and has been reviewed to determine the ground conditions. Exploratory locations within 250 m of the Plot 16 boundary have also been reviewed for completeness. These exploratory positions are presented within **Appendix 14f** and **14g** and are listed below:

- TPS304, TP309, TP310, TP311, TP313, TP314, CP220 and CP221

14.4.22. Exploratory logs pertaining to CP219 indicate the Plot 16 ground conditions to comprise the following:

- Topsoil (with a thickness of 0.30 m);
- Superficial Deposits of the Thrussington Member (with a thickness of 1.50 m); and
- Bedrock of the Tarpoley Siltstone Formation underlain by the Edwalton Member (with thicknesses of 1.0 m and 4.90 m, respectively)

14.4.23. The surrounding exploratory hole logs indicate the ground conditions of the immediate Plot 16 surroundings to comprise:

- Topsoil / Subsoil (proven from surface to depths of between 0.25 m and 0.50 m bgl);
- Superficial Deposits of Eggington Common Sand and Gravel (locally encountered within TP310 with a thickness of 4.30 m), Head Deposits (proven to a maximum depth of between 0.45 m and 1.0 m bgl) and The Thrussington Member (locally encountered within TP309 with a thickness of 2.35 m); and
- Bedrock of the Tarpoley Siltstone and Edwalton Member (proven maximum thicknesses of 3.45 m and 6.25 m, respectively).

14.4.24. Made Ground was not encountered within any of the exploratory hole logs located within the Plot 16 boundary, or within the exploratory logs reviewed within the surrounding area.

14.4.25. No visual or olfactory evidence of evidence of soil or groundwater contamination was encountered during the site investigation.

14.4.26. Groundwater strikes were not observed during the drilling of CP219, located within Plot 16**.** Subsequent groundwater monitoring of CP219 indicated the maximum groundwater level at a depth of 7.32 m bgl (47.125 m AOD), within the Edwalton Member.

14.4.27. A total of 52No. chemical and contamination laboratory tests were undertaken on soils samples obtained throughout the whole of EMG1**.** The soil chemical results were compared against the commercial end use Generic Assessment Criteria (GAC) to assess human health linkages, the phytotoxicity GAC to assess vegetation linkages and the UK Water Industry Research (UKWIR) informed GAC to assess the potable water supply pipes linkage.

14.4.28. The results of the Conceptual Site Model (CSM) refinement for soil chemical results indicate that a potentially complete contaminant pathway is unlikely to exist for the human health or vegetation receptors. All soil contaminant results were below the relevant GACs. The visual laboratory inspection and screening did not identify any detectable fibres of asbestos within the samples of Made Ground which were scheduled.

14.4.29. The results of the potable water supply pipes assessment indicates that a relevant linkage is unlikely to exist associated with organic contaminants and therefore it is concluded that polyethylene (PE) and/or polyvinyl chloride (PVC) water supply pipes are likely to be suitable for use.

14.4.30. A total of 5No. different chemical laboratory tests were undertaken on groundwater samples obtained from within EMG1, the closest to Plot 16 being the sample obtained from CP220 (approximately 180 m south east of Plot 16). The groundwater chemical results were compared against the GAC for controlled waters. Groundwater laboratory results were all below the controlled waters GAC, and therefore it is considered that the risk to groundwater is low.

14.4.31. Four rounds of ground gas monitoring were also completed by RSK Environment Ltd at a frequency of one round per week for a period of five weeks, from 16th October 2013 to 11th November 2013. Assessment of the screening results, in accordance with CIRIA C665, classifies the whole of EMG1 (including Plot 16) as a Characteristic Situation (CS) 2 Low Risk. Therefore, a gas membrane of 2000 gauge with all joints and penetrations sealed and underfloor venting or pressurisation was recommended.

Summary of baseline conditions for EMG2 Main Site and Plot 16

14.4.32. Potentially complete contaminant linkages are unlikely to exist for the risk to human health, phytotoxic effects, water supply pipes, underlying aquifer and nearby surface waters.

14.4.33. Ground gas monitoring has indicated a CS1 scenario for the **EMG2 Main Site,** to which no ground gas protection measures are required, and a CS2 scenario for Plot 16, to which the typical protection comprises a gas resistant membrane of 2000 gauge and underfloor venting / pressurisation.

Key Receptors

14.4.34. Based on the PRA and GIR for the site, sensitive receptors to be considered within the Ground Conditions and Contamination assessment include the below:

- Future site users – Commercial users in the form of on-site staff, visitors and occasional building maintenance workers. They will be exposed to potential contamination via numerous pathways, however inhalation / ingestion / dermal contact of soil / dust from soils when outside and when inside have the potential to be exposed to hazardous ground gas. However, future site occupants are considered to be of moderate sensitivity, due to the proposed well-ventilated nature of the Type D Buildings.
- Construction / maintenance workers – These receptors may be exposed to potential contamination within soils and groundwater during the ground works for the proposed development. Construction workers are considered to be of high sensitivity, although this is thought to be reduced to moderate sensitivity due to the assumption that health and safety risk assessment and mitigation including basic hygiene and the correct use of personal protective equipment (PPE) / respiratory protective equipment (RPE) will be applied by all competent contractors.
- Off-site users (East Midlands Airport, Lockington, Hemington, Castle Donington and Public) – Potential contamination exposure to surrounding off-site users. Much of the

surrounding land is either occupied by commercial land use (such as Donnington Park Services), or vacant land, associated with low sensitivity. Due to the zonal nature of the development, commercial users occupying the buildings / offices within the completed zones of development will, in effect, become off-site users with respect to the construction of the following zones within the site boundary.

- Off-site users (residential) – Immediate High-sensitivity residential receptors are located along Grimes Gate and Cheslyn Crescent in Diseworth.
- Controlled waters, aquifers – including the superficial Glaciofluvial Deposits (Secondary A Aquifer) and Oadby Member (Secondary Undifferentiated Aquifer) and bedrock deposits of the Gunthorpe Member (Secondary B). Sensitivity is considered to be moderate due to the permeable nature of the overlying superficials, increasing viability for both vertical and lateral migration of potential contaminants. However, the site is not located within an Environment Agency designated Source Protection Zone (SPZ) and baseline conditions indicate no source of groundwater contamination.
- Controlled waters, surface water – nearby surface water courses / drainage ditches including the inland rivers identified south of the site (Diseworth Brook 320m south and Long Whatton Brook 500m south east of the site) and 2 No. drainage ditches which converge in the south eastern corner of the site. The regional groundwater flow direction is likely to be towards the south to south east. As such, the surface water receptors are largely associated with the ponds identified on site, the aforementioned drainage ditch and tributaries of the Diseworth Brook. Sensitivity is considered to be moderate due to the GIR proving that the drainage ditches are in hydraulic connectivity with the groundwater, and thus it is considered that they are a pathway for groundwater contamination identified on site to enter the two nearby watercourses.
- On-site and off-site buildings and associated infrastructure – could potentially be at risk from ground gas migration, particularly via preferential pathways, aggressive ground / groundwater conditions and contaminants (such as hydrocarbons) with the potential to permeate through underground services, such as water supply pipes. The receptor is considered to be of low sensitivity.
- Plants and vegetation – primarily at risk from phytotoxic contaminants such as copper, nickel and zinc. The sensitivity to proposed on-site plants and vegetation is considered to be low, due to the GIR revealing no soil exceedances of the relevant GAC for these phytotoxic contaminants.

14.4.35. The sensitivity of identified receptors is summarised in Table 14.2 below:

Table 14.2: Receptor Sensitivity

Receptor	Sensitivity
Future site users – commercial	Moderate
Construction / maintenance workers	Moderate
Off-site users – residential	High
Off-site users – commercial	Low
Controlled Waters – non-potable water aquifers	Moderate
Controlled Waters – surface waters	Moderate
On-site and off-site buildings and infrastructure	Low
Plants and vegetation	Low

Risks to Human Health

14.4.36. The findings of the ground investigation and subsequent geo-environmental assessment pertaining to both the **EMG2 Main Site** and Plot 16 indicate no exceedances of the commercial end use generic assessment criteria (GAC) with respect to human health. No visual or olfactory evidence of contamination was noted during either of the site investigations. Therefore, the associated risk to site end users is considered low, with no specific remediation required in this regard.

Risks to Drinking Water Supply Pipes

14.4.37. The findings of the ground investigation and geo-environmental assessment for Plot 16 concludes that all soil chemical results are below the UKWIR guidance, and therefore a relevant contaminant linkage is unlikely to exist associated with organic contaminants permeating drinking water supply pipes, corresponding to a low risk.

14.4.38. The findings of the ground investigation and geo-environmental assessment for the **EMG2 Main Site** recorded 2No. exceedances of the UKWIR threshold for polyethylene pipe and 1No. exceedance of the threshold for polyvinyl chloride pipe. Although these exceedances were observed, the use of upgraded drinking water supply pipes is not considered necessary, and therefore the risk is considered low. A WIR assessment may be required along the proposed drinking water pipe route to demonstrate material suitability, or the use of a barrier pipe may be considered to negate the need for further testing.

14.4.39. In both instances, for Plot 16 and the **EMG2 Main Site**, the local water company should be contacted to agree the chosen pipe material suitability.

Risks to Controlled Waters

14.4.40. The findings of the Plot 16 risk assessment indicated no exceedances of the controlled waters GAC (UK DWS / EQS or best equivalent), and therefore the overall risk to surface waters and groundwater is considered low.

14.4.41. Within the **EMG2 Main Site**, the groundwater samples were generally recorded as below the generic assessment criteria (UKDWS or WHO drinking water standards), with a small number of PAH exceedances. These exceedances were generally detected within samples obtained from a greater depth (<19 m bgl), with greater exceedances in the northern area of the **EMG2 Main Site** compared to the southern area. As a result, this PAH contamination of **EMG2 Main Site** is considered likely to have leached into groundwater from an off-site source and, considering the absence of abstraction points within 1 km, the overall risk to surface waters and groundwater is considered low.

14.4.42. Therefore, the results of the ground investigations and the geo-environmental assessments concluded that the overall risk to controlled waters at the **EMG2 Main Site** and Plot 16 is considered low.

Risks from Ground Gas

14.4.43. Based on the maximum flow rate and maximum concentrations recorded during the RSK Environment Ltd ground gas monitoring at Plot 16, gas screening values of 0.0l/hr were concluded for methane and 0.10l/hr for carbon dioxide. In accordance with CIRIA C665, these GSVs correspond to CS2 conditions, which indicate that the site is of Low Risk. CIRIA C665 recommends a minimum thickness of gas resistant membrane of 2000 gauge is provided.

14.4.44. Based on the maximum flow rate and maximum concentrations recorded during the Structural Soils Ltd ground gas monitoring at the **EMG2 Main Site**, a gas screening value of 0.2025l/hr was recorded at BH04, based on carbon dioxide concentrations. Review of this data indicates that the elevated flow was not representative of the overall **EMG2 Main Site** conditions, as it was only recorded on one occasion in one deep borehole. This, combined with site observations, classifies the **EMG2 Main Site** as being representative of CS1 conditions. Therefore, it is unlikely that a potentially complete contaminant linkage associated with ground gas exists at the **EMG2 Main Site.**

Risks to Plants and Vegetation

14.4.45. The risks to the proposed soft landscaping (predominantly within the **EMG2 Main Site**) from phytotoxic contaminants (copper, nickel, boron and zinc) is concluded as low, with a potentially complete contaminant linkage unlikely to exist.

Future Baseline Conditions

14.4.46. With the presumption that there is no future development on the **EMG2 Main Site**, Plot 16, or surrounding area that may introduce new sources of potential contaminants, it is expected that there would be no change in the current site baseline conditions at the time of preparing this ES Chapter. This, however, assumes that the risks from any additional potential contaminant sources are appropriately managed and mitigated adhering to the pertinent legislation.

14.5. Potential Impacts

14.5.1. This section provides an assessment of the proposed changes to the ground conditions throughout the development project, which are likely to generate effect.

14.5.2. **Chapter 1: Introduction** of this ES explains the definitions associated with short term, medium term and long term duration of impacts. This is taken into consideration in the below sections. The construction phase is anticipated to be of short to medium term duration and the operational phase is considered to be of long duration.

Construction Phase

14.5.3. The potential effects of construction at the site are listed below, with the consideration of these effects with reference to the identified receptors discussed in paragraphs 14.5.3 to 14.5.8 and below.

- The **EMG2 Main Site** will be subject to a cut and fill procedure to form a series of flat development platforms. **EMG2 Main Site** plateau level plans indicate the creation of

several plateau levels across the site, ranging from 66.250 m AOD in the far southern area to 89.590 m AOD in the far north eastern area. Therefore the cut and fill includes the stripping of the site topsoil and shallow soils, disturbing the natural in-situ strata.

- Construction plants and associated activities may affect the site ground conditions through contaminant introduction or mobilisation via spillages or leakages, e.g. from lubricants, oils, fuel and uncured concrete.

14.5.4. Construction / maintenance workers – The potential for contamination to be present on the **EMG2 Main Site** and Plot 16 is considered to be low, and the likely duration of construction is considered short to medium. This, combined with the moderate sensitivity of construction / maintenance workers and the Negligible magnitude of impact results in an overall Negligible significance of effect. This does not consider any potential contamination which has not been identified to date at the site.

14.5.5. Off-site users (East Midlands Airport, Lockington, Hemington, Castle Donington and Public) – It is unlikely that there are any potentially complete human health linkages at the site and therefore the magnitude of impact is considered Negligible. This, combined with the low sensitivity of off-site commercial users, and distances of the surrounding site users to the **EMG2 Main Site** and Plot 16 (associated with dust generation potential), results in an overall Negligible significance.

14.5.6. Off-site users (Residential) – it is unlikely that there are any potentially complete human health linkages at the site and therefore the magnitude of impact is considered Negligible. This, combined with the high sensitivity of off-site residents, also considering the distance of the surrounding site users to the **EMG2 Main Site** and Plot 16 (associated with dust generation potential), results in an overall Negligible significance.

14.5.7. Controlled waters, non potable aquifers – considering that no significant Made Ground or contamination has been encountered within the groundwater samples obtained from Plot 16 and the **EMG2 Main Site** (resulting in a likely Negligible magnitude of impact), the moderate sensitivity of non-potable aquifers, and the short to medium duration of the construction phase, the potential significance of effect of construction to groundwater is considered to be Negligible.

14.5.8. Controlled waters, surface waters – considering that no significant contamination has been encountered within the obtained surface water samples, the magnitude of impact is likely to be Negligible. This, combined with the moderate sensitivity of surface waters and the short to medium duration of the construction phase, results in a Negligible significance of effect.

14.5.9. If any significant contamination is encountered during the construction phase, this will need to be investigated with a risk assessment approach and, if required, remediation to be undertaken in consultation with the Local Planning Authority.

Operational Phase

14.5.10. The Illustrative Masterplan, included within **Figure 3.2** indicates the majority of the **EMG2 Main Site** and Plot 16 is to be covered with impermeable hardstanding consisting of warehouse areas, roads, staff amenity space, off plot pathways and on plot pathways. Therefore, any potential effects to the previously discussed baseline conditions which occurred during the construction phase would have been mitigated via a staged process ground investigation and

risk assessment, with any necessary remedial measures required to have been implemented at the site prior to its operation.

14.5.11. The potential effects of operation at the site are listed below, with the consideration of these effects with reference to the identified receptors discussed in paragraphs 14.5.11 to 14.5.14.

- The introduction of **EMG2 Main Site** and Plot 16 users to the development, within the indoor warehouse areas and outdoor landscaped space. This may increase the likelihood of contact with potentially contaminated soils, groundwater, and/or surface waters through ingestion, dust inhalation and dermal contact.
- The introduction of soft landscaped areas comprising plants and vegetation, particularly around the **EMG2 Main Site**, which may result in the uptake of phytotoxic contaminants.
- The introduction of the warehouse buildings, potentially resulting in ground gas accumulation and (worst case) asphyxiation.
- The risk to future building maintenance workers where breaking ground / excavations are required, increasing the likelihood of coming into contact with contaminated soils at the site.

14.5.12. Future site users / maintenance workers – the findings of the ground investigations and subsequent geo-environmental assessments for the **EMG2 Main Site** and Plot 16 have concluded that a potentially complete contaminant linkage with reference to human health is unlikely. Therefore, the magnitude of impact is considered Negligible. The Negligible magnitude of impact combined with the moderate sensitivity of future commercial users results in what is considered to be of Negligible significance. This does not take into consideration any potential contamination which was not encountered as part of the ground investigation / earthworks.

14.5.13. Off-site users – considering the low potential for contamination across the site and the limited dust generation potential, the magnitude of impact is considered Negligible. This, combined with low / high (off-site commercial users / residential users) sensitivity of users results in what is considered to be of Negligible significance.

14.5.14. Controlled waters – it is considered that the overall risk to groundwater and surrounding surface waters at the site will not change following the proposed development of the **EMG2 Main Site** and Plot 16, and therefore the magnitude of impact is considered Negligible. This, combined with the moderate / low sensitivity of controlled waters, relating to non-potable water aquifers and surface waters, respectively, results in an overall Negligible significance.

14.5.15. It is considered that the overall magnitude of impact associated with the ground gas risk on human health is Negligible at the **EMG2 Main Site** and Plot 16, due to the CS2 classification of Plot 16 resulting in a requirement of building gas protection measures, as recommended within CIRIA C665. This, combined with the moderate sensitivity of future site users, results in an overall Negligible significance.

14.6. Mitigation Measures

14.6.1. The below section of this ground conditions chapter provides a summary of the mitigation measures proposed to be implemented during the construction and operational phases of the proposed **EMG2 Main Site** and Plot 16.

Construction Phase

14.6.2. Based on the intrusive information and risk assessments, the following mitigation measures in the construction phase include:

- General construction phase mitigation, to mitigate the potential exposure to construction workers during the progression of the development, including the development of and adherence to a site health and safety plan, pre-approved RAMS, personal hygiene and welfare, correct PPE/RPE, decontamination measures if necessary, the safe and recorded storage of fuels/oils and any other potentially contaminative liquids, and regular cleaning of all site roads. These measures are detailed within the Construction Environmental Management Plan (CEMP) prepared for the **Scheme**, appended to **Chapter 3.**

14.6.3. The potential effects on construction and maintenance workers during the construction phase will be mitigated by appropriate compliant site practices, such as dust suppression, safe storage of potential contamination, and the correct utilisation of appropriate PPE / RPE, which is deemed to be suitable. **Table 14.2** identifies the sensitivity of construction and maintenance workers as moderate. Assuming appropriate mitigation, the impact magnitude is Negligible (approximating to a 'no change' situation), with an associated Negligible significance of the effect.

14.6.4. Should unexpected contamination be encountered during the construction phase, the works in the area are expected to stop and the Local Authority and appointed geo-environmental consultant should be contacted. The contamination should be sampled, tested and risk assessed and, if required, a remediation strategy should be agreed, implemented and verified. This, therefore should mitigate the potential effects to future site commercial users, who are of low to moderate sensitivity, as well as the proposed hardstanding.

14.6.5. Soils that are to be potentially re-used on site are to be tested for geo-environmental and geotechnical suitability, comprising part of the site materials and waste management plan (Document reference [xx] submitted as part of this application. Any soils which are to be imported would also be required to have certification of their chemical concentrations to ensure that the imported soils are not introducing additional contaminants. This may be confirmed by soil chemical testing by the contractor and the associated earthworks to be controlled by engineering site specific specification.

14.6.6. Further site specific soil contaminant mitigation measures during the construction phase may include, for example, the excavation of as yet undetermined contamination hotspots on site, supervised by the appointed geo-environmental consultant and undertaken in line with remedial strategies in correspondence with regulatory bodies.

14.6.7. The above mitigation measures will also mitigate the potential effects to off-site users (both residential and commercial), who may potentially be exposed to wind-blown dust during the construction phase. The effects on the high sensitivity off site residential users will be mitigated to negligible, provided the implementation of appropriate mitigation measures, such as dust suppression.

Operational Phase

14.6.8. Based on the baseline conditions described within Section 14.4, above, the below mitigation measures in the operational phase will include,:

- Installation of ground gas and vapour protection measures beneath the proposed development pertaining to Plot 16 to CS-2, as defined in BS8485, including a gas resistant membrane; and
- Selection of appropriate materials for buried water supply pipes across both the **EMG2 Main Site** and Plot 16**.**

14.6.9. Based on the implementation of the above mitigation measures during the operational phase, the low to moderate sensitivity of buildings and infrastructure and future commercial site users, respectively, the significance of the effect is considered to be Negligible.

14.7. Residual Effects

14.7.1. Following the effective implementation of the aforementioned mitigation measures (listed, but not limited to the above) during the construction and operational phases, no **significant negative** residual effects are expected to arise during the construction or operational phases of the proposed development.

14.8. Cumulative Effects

14.8.1. The two main components of cumulative effects comprise:

1. Inter-Project Effects – the interactions between all of the different developments (past and present) within the same area, which individually may not be significant, but when considered together could create a significant cumulative effect on a shared receptor.

2. Intra-Project Effects – the interaction between various impacts pertaining to the same development, affecting a single receptor.

14.8.2. Based on the implementation of the mitigation measures mentioned previously, and those listed within the CEMP (included within the appendices of **Chapter 3**), the cumulative effects (both intra-project and inter-project effects) with reference to geology, soils and contamination are considered negligible.

14.9. Summary of Effects and Conclusions

14.9.1. This chapter of the ES assesses any likely significant effects associated with Ground Conditions and Contamination at the **EMG2 Main Site** and Plot 16.

14.9.2. The baseline conditions have been determined following the LCRM Framework. The Fairhurst Phase 1 Geo-environmental and Geotechnical PRA (**Appendix 14a**) provided a review of available desk based information and available historical ground investigation to inform a preliminary conceptual model of the **EMG2 Main Site**. This conceptual model has been subsequently refined through intrusive investigation, with findings reported on within **Appendix 14b**.

14.9.3. The proven ground conditions across the **EMG2 Main Site** comprise a variable thickness of Topsoil with isolated occurrences of Made Ground underlain by superficials of The Oadby Member and Glaciofluvial Deposits, further underlain by bedrock of the Gunthorpe Member and Diseworth Sandstone.

14.9.4. The proven ground conditions across Plot 16 comprise a variable thickness of Topsoil, underlain by superficial deposits of the Thrussington Member, further underlain by bedrock of the Tarpoley Siltstone Formation and the Edwalton Member.

14.9.5. The soil contamination assessments have indicated that all the chemical analysis of all soil samples obtained from Plot 16 and the **EMG2 Main Site** are below the human health GAC for commercial end use, and thus it is unlikely that a potentially complete contamination linkage is likely to exist. The groundwater contamination assessments have indicated that there is unlikely to be a potentially complete contaminant linkage, and thus the risk is classified as low.

14.9.6. The changes that may generate effects at the site during the construction phase include potential contaminant introduction or mobilisation via spillages or leakages and the disturbance of the natural strata through the cut and fill process.

14.9.7. The changes that may generate effects at the **EMG2 Main Site** and Plot 16 during the operational phase include the introduction of commercial site users which may experience direct exposure to soils via dermal contact and via indirect ingestion of wind-blown dust. Maintenance workers may also become exposed to potentially contaminated ground during groundworks.

14.9.8. The baseline conditions, informed through desk based and intrusive investigation information, have informed the mitigation measures which have been identified to reduce the potential risks.

14.9.9. The mitigation measures to be completed during the construction phase include:

- General construction phase mitigation, to mitigate the potential exposure to construction workers during the progression of the development, including the development of and adherence to a site health and safety plan, pre-approved RAMS, personal hygiene and welfare, correct PPE/RPE, decontamination measures if necessary, the safe and recorded storage of fuels/oils and any other potentially contaminative liquids, and regular cleaning of all site roads. These measures are detailed within the Construction Environmental Management Plan (CEMP) prepared for the **Scheme**, appended to **Chapter 3.**

14.9.10. The mitigation measures to be implemented during the operational phase include:

- Installation of ground gas and vapour protection measures beneath the proposed development pertaining to Plot 16 to CS-2, as defined in BS8485, including a gas resistant membrane; and
- Selection of appropriate materials for buried water supply pipes across both the **EMG2 Main Site** and Plot 16**.**

14.9.11. With reference to the sensitivity of identified receptors, magnitude of potential impacts and mitigation measures that may apply, the potential effects during the construction and operational phases are summarised within Table 14.3 below.

14.9.12. Potential effects of the proposed development during the construction phase include:

- The **EMG2 Main Site** will be subject to a cut and fill procedure to form a flat development platform through the creation of several plateau levels across the site, ranging from 66.250 m AOD in the far southern area to 89.590 m AOD in the far north eastern area. Therefore the cut and fill includes the stripping of the site topsoil and shallow soils, disturbing the natural in-situ strata.
- Construction plants and associated activities may affect the site ground conditions through contaminant introduction or mobilisation via spillages or leakages, e.g. from lubricants, oils, fuel and uncured concrete.

14.9.13. Potential effects of the proposed development during the operational phase include:

- The introduction of **EMG2 Main Site** and Plot 16 users to the development, within the indoor warehouse areas and outdoor landscaped space. This may increase the likelihood of contact with potentially contaminated soils, groundwater, and/or surface waters through ingestion, dust inhalation and dermal contact.
- The introduction of soft landscaped areas comprising plants and vegetation, particularly around the **EMG2 Main Site**, which may result in the uptake of phytotoxic contaminants.
- The introduction of the warehouse buildings, potentially resulting in ground gas accumulation and (worst case) asphyxiation.
- The risk to future building maintenance workers where breaking ground / excavations are required, increasing the likelihood of coming into contact with contaminated soils at the site.

14.9.14. Based on the implementation of the mitigation measures mentioned previously, and those listed within the CEMP (included within the appendices of **Chapter 3**), the cumulative effects (both intra-project and inter-project effects) with reference to geology, soils and contamination are considered negligible.

14.9.15. **Table 14.3** below summarises the Ground Conditions and Contamination residual effects at the **EMG2 Main Site** and Plot 16**.**

Table 14.3: Summary of Potential Effects

Receptor	Sensitivity	Activity	Effect	Mitigation	Magnitude of Impact	Significance of effect	Additional mitigation	Significance of residual effect
Construction / maintenance workers	Moderate	Groundworks	Potential human health exposure to contaminated soils and groundwater	Adhere to good working practice and correct and appropriate use of PPE / RPE*	Negligible	Negligible	None	Negligible
Surrounding off-site users (residential)	High		Exposure through indirect pathways, e.g. ingestion of air borne dust	Good site working practices, including dust suppression vents*.	Negligible	Negligible	None	Negligible
Surrounding off-site users (commercial)	Low							
Controlled surface waters: Diseworth Brook 320 m S and Long Whatton Brook, 500 m SE, on site drainage ditches	Moderate		Exposure to soil contamination and potential contamination pathway	Where unexpected contamination is encountered, the works should cease and LA and geo-environmental consultant to be contacted. The contamination to be sampled, tested and risk assessed and remedial strategy to be agreed, if required*.	Negligible	Negligible	None	Negligible
Controlled Waters (non-potable aquifers): Secondary A Aquifer within Glaciofluvial Deposits and Secondary B Aquifer within the Gunthorpe Member	Moderate				Negligible	Negligible	None	Negligible

Site maintenance workers	Moderate	Maintenance involving breaking ground / excavation	Exposure potential to residual contamination post construction	Much of the proposed development to be hard landscaping, use of correct PPE / RPE*	Negligible	Negligible	None	Negligible
Future commercial site users	Moderate	Presence on site / direct contaminant pathway	Introduction of new receptors to the site (commercial workers)	Ground gas protection measures to CS2 of BS848 (Plot 16) majority of proposed development comprises impermeable hardstanding	Negligible	Negligible	None	Negligible
Construction / maintenance workers	Moderate	Groundworks	Mitigation of off-site dust generation	Adhere to good working practice and correct and appropriate use of PPE / RPE*	Negligible	Negligible	Negligible	Negligible
Controlled Waters (non-potable aquifers): Secondary A Aquifer within Glaciofluvial Deposits and Secondary B Aquifer within the Gunthorpe Member	Moderate	Remedial activity in the surrounding site area	Improvement of surface water and aquifer quality	Where unexpected contamination is encountered, the works should cease and LA and geo-environmental consultant to be contacted. The contamination to be sampled, tested and risk assessed and remedial strategy to be agreed, if required*.	Negligible	Negligible	Negligible	Negligible
Future site users (commercial) Controlled Waters (non-potable aquifers): Secondary A Aquifer within Glaciofluvial Deposits and Secondary B	Moderate	Surrounding off-site construction	Indirect exposure to potential contamination	Requiring mitigation by surrounding site project personnel	Negligible	Negligible	Negligible	Negligible

Aquifer within the Gunthorpe Member								
Notes: *Mitigation method refers to the best / safe practices and measures which are outlined within the CEMP for the proposed **Scheme**, appended onto **Chapter 3.**								