EARTH ENVIRONMENTAL
& GEOTECHNICAL

# Phase 1 GeoEnvironmental Desk Study

## Queens Road

## Manchester

## October 2022

## On behalf of

## Skyview Construction Ltd

Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business Centre
Houldsworth Street
Stockport
SK5 6DA

Tel : 01619756088

Email
headoffice@earthenvironmental.co.uk

www.earthenvironmental.co.uk

# QUEENS ROAD

# MANCHESTER

# PHASE I GEOENVIRONMENTAL DESK STUDY

# FOR

# SKYVIEW CONSTRUCTION LTD

Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business & Arts Centre
Houldsworth Street
Stockport
SK5 6DA

www.earthenvironmental.co.uk

Tel: 0161 975 6088

**Report No. A5027/22** **OCTOBER 2022**

| | |
|---|---|
| **Report Title:** | **Queens Road, Manchester**<br>**Phase I GeoEnvironmental Desk Study** |
| **Report Reference:** | **A5027/22** |
| **Client:** | **Skyview Construction Ltd** |
| **Issue Date:** | **9th October 2022** |
| **Drafted By:** | **B Garratty** |
| **Reviewed By:** | **A Czarnecki** |
| **Authorised By:** | **A Czarnecki** |

This document has been prepared for the titled project (or named part thereof) and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authorisation being obtained from Earth Environmental & Geotechnical. Earth Environmental & Geotechnical accepts no responsibility or liability for the consequences of the use of this document, wholly or in part, for any other purpose than that for which it was commissioned. Any persons so using or relying upon this document for such other purpose do so at their own risk.

This report was prepared for the sole use of the Client and shall not be relied upon or transferred to any other party without the express written authorisation of Earth Environmental & Geotechnical. It may contain material subject to copyright or obtained subject to license; unauthorised copying of this report will be in breach of copyright/license.

The findings and opinions provided in this document are given in good faith and are subject to the limitations imposed by employing site assessment methods and techniques, appropriate to the time of investigation and within the limitations and constraints defined within this document. The findings and opinions are relevant to the dates when the assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date.

The findings and opinions conveyed in this report are based on information obtained from a variety of sources as detailed and which Earth Environmental & Geotechnical assumes to be reliable but have not been independently confirmed. Therefore, Earth Environmental & Geotechnical cannot and does not guarantee the authenticity or reliability of third-party information it has relied upon.

Where opinions expressed in this report are based on current available guidelines and legislation, no liability can be accepted by Earth Environmental & Geotechnical for the effects of any future changes to such guidelines and legislation.

The limitations of liability of Earth Environmental & Geotechnical for the contents of this document have been agreed with the Client, as set out in the terms and conditions of offer and related contract documentation.

EARTH ENVIRONMENTAL & GEOTECHNICAL

## CONTENTS


**1.0 INTRODUCTION ..... 1**
Appointment ..... 1
Objective ..... 1
Scope ..... 2
**2.0 SITE LOCATION AND DESCRIPTION ..... 3**
Site Utility Services ..... 4
**3.0 ENVIRONMENTAL SETTING ..... 5**
Geology ..... 5
Ground Workings ..... 5
Mining and Other Underground Workings ..... 6
Radon Potential ..... 6
Hydrogeology and Hydrology ..... 6
Landfill & Waste Management Activity ..... 7
Industrial Land Use Information ..... 7
Environmental Permits, Incidents and Registers ..... 9
Environmentally Sensitive Sites ..... 9
Ecology ..... 9
Archaeology ..... 10
Potential Flood Risks ..... 10
Previous Site Investigations ..... 10
**4.0 SITE HISTORY ..... 11**
**5.0 WALKOVER SURVEY ..... 16**
**6.0 PRELIMINARY CONTAMINATION RISK ASSESSMENT ..... 18**
Introduction ..... 18
Potential Sources ..... 19
Potential Receptors ..... 19
Potential Pathways ..... 20
**7.0 GEOTECHNICAL HAZARDS ASSOCIATED WITH THE DEVELOPMENT ..... 23**
**8.0 CONCLUSIONS & RECOMMENDATIONS ..... 25**
Conclusions ..... 25
Recommendations ..... 25

## FIGURES


| | |
|---|---|
| Figure 1 | Proposed Development Plan |
| Figure 2 | Site Location Plan |
| Figure 3 | Site Photograph |
| Figure 4 | OS Map Extract: 1850 |
| Figure 5 | OS Map Extract: 1908 |
| Figure 6 | OS Map Extract: 1975 - 1977 |
| Figure 7 | OS Map Extract: 2003 |
| Figure 8 | Aerial Photograph 2021 |
| Figure 9 | Site Features Plan |
| Figure 10 | Site Walkover Photo Locations |


## TABLES


| | |
|---|---|
| Table 1 | Environmental Permits, Incidents and Registers within 500m of the Site |
| Table 2 | Summary of Site History |
| Table 3 | Consequence, Probability and Risk |
| Table 4 | Estimation of Level of Risk by Comparison of Consequence and Probability |
| Table 5 | Preliminary Conceptual Model |
| Table 6 | Summary of Geotechnical Hazards |


## APPENDICES


| | |
|---|---|
| Appendix 1 | GroundSure Reports |
| Appendix 2 | Site Photographs |
| Appendix 3 | Site Walkover Notes |
| Appendix 4 | Report Limitations |

# 1.0 INTRODUCTION

## Appointment

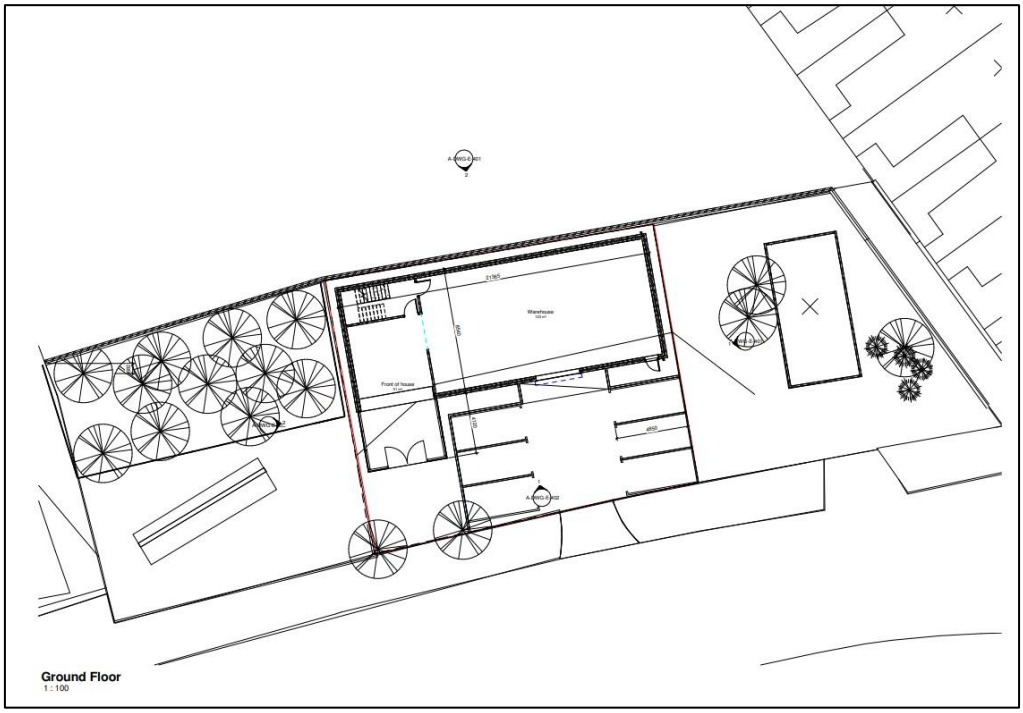
1.1 Earth Environmental & Geotechnical Ltd has been commissioned by SEED Architects Ltd on behalf of Skyview Construction Ltd (the Client) to undertake a Phase I GeoEnvironmental Desk Study for the proposed development on the land at Queens Road, Manchester.

1.2 It is understood that the Client wishes to construct a warehouse building with associated car park.

1.3 Vehicle access will be gained from Queens Road to the south of the site.

1.4 A proposed development plan for the site is shown in Figure 1 below.

**Figure 1 Proposed Development Plan**




## Objective

1.5 The purpose of the Desk Study is to collate available geological and environmental data for the site (and its environment) and provide a preliminary geotechnical and geo-environmental appraisal, with a site-specific conceptual model. This enables a preliminary assessment of geo-environmental risks to be undertaken and, if necessary, provides information for the design of a Phase 2 Ground Investigation.

**Scope**

1.6 The Phase I Environmental Desk Study comprises of a site reconnaissance visit and a review of the following information sources, some of which was provided by the client.

- British Geological Survey online maps.
- Google Earth imagery.
- Environment Agency online mapping data.
- Historical Ordnance Survey maps.
- The site and surrounding areas environmental, geological, and mining data presented in the site specific GroundSure Reports (Appendix 1).
- Coal Authority Interactive Viewer.

## 2.0 SITE LOCATION AND DESCRIPTION

2.1 The site is located in Smedley, Greater Manchester approximately 1.9km from Manchester City Centre. The approximate National Grid Reference for the centre of the site is SD 85090 00646 (X: 385090, Y: 400646) with the closest postcode being M8 0JL.

2.2 The site is a rectangular shaped parcel of land with current access via Queens Road to the south of the site. The maximum dimensions of the proposed site are 19m north to south and 25m west to east. The site occupies an area of approximately 0.04 hectares.

2.3 The site is currently vacant with a wooden fence running through the centre of the site.

2.4 The general surrounding area comprises predominantly of residential dwellings, with a railway line situated 40m to the west of the site.

2.5 A location plan is shown below as Figure 2, together with a recent site photograph as Figure 3 (overleaf).

**Figure 2 Site Location Plan**

**Figure 3 Site Photograph**

**Site Utility Services**

2.6 Site service plans have not been obtained for the site on behalf of the client. The status of all services should be checked prior to any development (including site investigation) commencing.

## 3.0 ENVIRONMENTAL SETTING

3.1 The geology of the site is covered by British Geological Survey (BGS) online data and the site specific GroundSure Enviro+Geo Insight report (Appendix 1).

3.2 Environmental conditions are covered by Environment Agency (EA) and British Geological Survey (BGS) online data, and the site specific GroundSure Enviro+Geo Insight report (Appendix 1).

### Geology

3.3 The BGS states that the site is not underlain by artificial deposits.

3.4 The site is underlain by superficial deposits of Devensian Till comprising diamicton.

3.5 The solid geology beneath the site is shown to be the Pennine Middle Coal Measures Formation, comprising mudstone, siltstone, and sandstone.

3.6 There are 3 records of linear features within 500m of the site boundary. The closest record refers to a marine band fossil horizon, located 254m southwest of the site.

3.7 There is 1 record of landslip within 500m of the site. This record refers to landslide deposits located 91m northeast of the site.

3.8 There are 34 borehole records identified within 250m of the site. The closest accessible record is located 45m west of the site (BGS Reference; SD80SE85) and records:

- Clay to 0.46m
- Sand to 5.33m
- Sandy Loam to 7.01m
- Marl to 10.36m

3.9 The site is in an area where the hazard rating is very low with regard to running sands, shrink swell clays, collapsible deposits, and landslides. The hazard rating is negligible with regard to compressible deposits and the dissolution of soluble rocks.

### Ground Workings

3.10 There are 69 records of historical surface ground working features identified within 250m of the site boundary. The closest record off site refers to cuttings located 21m west of the site, dated 1980. Other records in the vicinity refer to further cuttings, unspecified heaps, brick work, unspecified ground workings, unspecified pits, and ponds.

3.11 According to the BGS, there are 4 records of a British Pit within 500m of the site. The closest record refers to Smedley Road, a ceased surface mineral working for the commodity sandstone, located 114m east of the site.

**Mining and Other Underground Workings**

3.12 The site is located within an identified coal mining area. Reference to the Coal Authority Interactive viewer shows the site is not located within a Development High Risk Area.

3.13 There are no records of non-coal mining areas located within 1km of the site.

3.14 There are no areas of brine extraction, gypsum extraction, tin mining or clay mining on the site.

3.15 There are no records of natural cavities within 500m of the site.

3.16 There are no records for non-coal cavities identified within 1km of the site.

3.17 There are 20 records for historical underground working features identified within 1km of the site. The closest record refers to a railway tunnel located 347m southeast of the site, dated 1980.

**Radon Potential**

3.18 The site is not located in a Radon Affected Area, less than 1% of the properties are above the Action Level. Therefore, radon protection measures are not required.

**Hydrogeology and Hydrology**

3.19 The superficial deposits are classified by the Environment Agency (EA) as a Secondary Undifferentiated Aquifer. The Glaciofluvial Sheet Deposits of Devensian Till have a mixed flow type and a high to low permeability. The BGS states the following:

> ***Secondary Undifferentiated Aquifer*** *'Assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.'*

3.20 The Pennine Middle Coal Measures Formation is classified by the Environment Agency (EA) as a Secondary A Aquifer. The Pennine Middle Coal Measures Formation has a fracture flow type and moderate to low permeability. The BGS states the following:

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

3.21 The groundwater vulnerability and soil leaching potential of the site has been classified as a low vulnerability. The BGS states:

> *'Low vulnerability- Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.'*

3.22 There are 28 ground water abstraction licence records within 2km of the site. The closest record refers to a historical ground water source for general cooling at Packaging Products Ltd, located 538m south of the site.

3.23 There are no surface water abstraction licence records within 2km of the site.

3.24 There are 10 potable water abstraction licence records within 2km of the site. The closest record refers to a historical groundwater source for drinking, cooking, sanitary and washing located Lancashire Dairies Ltd, located 1.44km southwest of the site, dated February 1966.

3.25 The site is not located within 500m of a Source Protection Zone or Source Protection Zone within a confined aquifer.

3.26 There is 1 water network entry within 250m of the site. The record refers to the River Irk, an inland river, located 113m northeast of the site.

3.27 There are two surface water features identified within 250m of the site. The closest feature refers to the River Irk, an inland river, located 113m northeast of the site.

3.28 There is 1 record of a Water Framework Directive (WDF) surface water body located 125m northeast of the site. The record refers to River catchment in the Irk (Wince to Irwell). The water body was a fail chemical rating and moderate ecological rating in 2019.

3.29 There is 1 record of a Water Framework Directive (WDF) groundwater body located on-site. The record refers to Manchester and East Cheshire Permo-Triassic Sandstone Aquifers which were a poor chemical rating in 2019.

**Landfill & Waste Management Activity**

3.30 There are no records for current Environment Agency/Natural Resource Wales landfill records within 500m of the site.

3.31 There is 1 record of historic Environment Agency/Natural Resource Wales landfill sites within 500m of the site. This record refers to Queens Road Tip located 84m southwest of the site.

3.32 There is 1 record of BGS/DoE non-operational landfill sites within 500m of the site. This record refers to Queens Road Tip, operated by H Evans Ltd, located 438m southwest of the site with no risk to aquifer.

3.33 There is 1 record of a historical landfill from the Local Authority and Historical Mapping records within 500m of the site. This record refers to Queens Road Tip with a waste type of inert, industrial, commercial, household, and liquid sludge, located 84m southwest of the site and last recorded in December 1970.

3.34 There are 7 records of a waste treatment, transfer, or disposal site within 500m of the site. The closest record refers to treating waste for the treatment of waste wood and plant matter at Collinghurst Sidings located 127m southwest of the site.

3.35 There are no records of historical waste sites within 500m of the site.

**Industrial Land Use Information**

3.36 There are 249 records of potentially contaminative historical land uses identified within 500m of the site. The closest record refers to cuttings located 21m west of the site, dated 1980. Other

records in the vicinity refer to further cuttings, railway sidings, unspecified heaps, brick works, unspecified ground workings, sandstone quarries, pumps, wire works, unspecified pits etc.

3.37 There are 4 records of current potentially contaminative land uses identified within 250m of the site. The closest record refers to an electricity substation located onsite. The closest offsite record refers to the Manchester Metrolink at Queens Road, located 61 southwest of the site.

3.38 There are 34 records of historical tanks identified within 500m of the site. The closest record refers to an unspecified tank located 197m east of the site, dated 1987.

3.39 There are 32 records of historical energy features identified within 500m of the site. The closest record refers to an electricity substation, located onsite, dated 1908-1949.

3.40 There is 1 record for current petrol or fuel sites within 500m of the site. The closest record refers to an obsolete garage on Queens Road, located 319m southwest of the site.

3.41 There are no records of historical petrol or fuel sites within 500m of the site.

3.42 There are 13 historical garage and motor vehicle repair site records identified within 500m of the site. The closest record refers to a garage located 258m west of the site, dated 1975-1984.

3.43 There are no National Grid high voltage underground electricity transmission cables within 500m of the site.

3.44 There are no National Grid high-pressure gas transmission pipelines within 500m of the site.

3.45 There are 27 historical railway and tunnel features identified within 250m of the site. The closest record refers to railway sidings located 37m west of the site, dated 1963.

3.46 There are no historical railway lines identified within 250m of the site.

3.47 There are 39 current active railway line records identified within 250m of the site. The closest record refers to light rail located 42m west of the site.

3.48 There are no underground railway lines or tunnels identified within 250m of the site.

3.49 The site is not within 500m of the route of the High Speed 2 rail project.

3.50 The site is not within 500m of the route of the Crossrail 1 rail project.

### Environmental Permits, Incidents and Registers

3.51 The Groundsure Report includes records of environmental permits, incidents, and registers within 500m of the site, which are summarised in Table 1 below.

**Table 1: Environmental Permits, Incidents and Registers within 500m of the Site**

| Permit/Incident/Register | Number |
|---|---|
| Historical Licensed Industrial Activities (IPC) | 0 |
| Part A (1) and IPPC Authorised Activities | 0 |
| Pollutant Release to Surface Waters (Red List) | 0 |
| List 1 Dangerous Substances Inventory Sites | 0 |
| List 2 Dangerous Substances Inventory Sites | 0 |
| Part A (2) and Part B Activities and Enforcements | 0 |
| Category 3 or 4 Radioactive Substance Authorisations | 0 |
| Licensed Discharge Consents | 15 |
| Planning Hazardous Substance Consents and Enforcements | 0 |
| Dangerous or Hazardous (COMAH and NIHHS) Sites | 0 |
| Sites Determined as Contaminated Land under Part 2A EPA 1990 | 0 |
| Regulated Explosive Sites | 0 |
| Pollutant Release to Public Sewer | 0 |
| Substantiated Pollution Incidents (Category 1 and 2) | 0 |
| Pollution Inventory Substances, Wastes and Radioactive Wastes | 0 |

3.52 There are 15 records of Licensed Discharge Consents within 500m of the site. The closest record refers to sewage discharges in the River Irk, located 172m east of the site, issued in January 1995 and revoked in May 2005.

3.53 There are no other records of Environmental Permits, Incident or Registers within 500m of the site.

### Environmentally Sensitive Sites

3.54 There are no records of Sites of Special Scientific Interest (SSSI) within 2km of the site.

3.55 There are no records of Greenbelt land within 2km of the site.

### Ecology

3.56 An ecological assessment of the site falls outside the brief of this report. Where considered necessary, advice should be sought from an ecological specialist in this respect.

3.57 However, the site is classified as Urban Land.

**Archaeology**

3.58 An archaeological assessment falls outside the brief of this report. Where considered necessary, advice should be sought from an archaeological specialist in this respect.

3.59 However, there are no records of a Listed Building within 250m of the site.

3.60 There are no records of World Heritage Sites or Scheduled Ancient Monuments with 250m of the site.

**Potential Flood Risks**

3.61 Detailed assessment of flood risks is outside the scope of this report. However, the site does not lie within 50m of an Environment Agency Zone 2 or Zone 3 floodplain.

3.62 There is no risk of flooding from rivers and sea (RoFRaS) within 50m of the site.

3.63 There are no records of flood defences located within 250m of the site.

3.64 There are no records of areas benefitting from flood defences within 250m of the site.

3.65 There are no records of areas used for flood storage within 250m of the site.

3.66 The highest risk of surface water flooding occurring on-site is negligible.

3.67 The highest risk of groundwater flooding occurring on-site is low.

**Previous Site Investigations**

3.68 Earth Environmental & Geotechnical Ltd are not aware of any previous site investigations carried out for the site.

## 4.0 SITE HISTORY

4.1 The historical development of the site has been determined by reference historical plans and Google Earth imagery. The reviewed historical plans comprise only readily available records and may be limited; however, the information available to date indicates that additional searches are unlikely to add to our understanding of the site. The earliest available historical mapping covering the site dates back to 1848.

4.2 The site history is summarised in Table 2, below, followed by selected extracts from maps and aerial photographs.

**Table 2: Summary of Site History**

| Date | On-Site History | Surrounding Land Use History |
|---|---|---|
| 1848<br>1:10,560<br><br>1850<br>1:1,056 | The site is comprised of vacant fields with tracks running through the centre of the site.<br><br>Various mature trees are located within the site boundary. | Mount House residential building is located 40m northeast of the site.<br><br>A private road runs north to south located 50m east of the site.<br><br>Fresco Villa and associated pump is located 90m south of the site.<br><br>Smedley House is located 100m southeast of the site.<br><br>Smedley Quarry (sandstone) is located 120m northeast of the site.<br><br>A river runs north to south located 200m east of the site.<br><br>Collyhurst Paper Mill is located 300m east of the site.<br><br>A dye works is located 450m south of the site.<br><br>A sandstone quarry is located 500m south of the site.<br><br>Manchester General Cemetery is located 600m northeast of the site.<br><br>A reservoir is located 600m southeast of the site.<br><br>Collyhurst Chemical Works is located 725m south of the site. |
| 1891-1894<br>1:10,560<br><br>1891<br>1:1,000 | The tracks and trees are removed from the site, and it now remains vacant. | Queens Road is constructed, running east to west located adjacent to the southern site boundary.<br><br>Various terraced residential dwellings are constructed located 20m south of the site.<br><br>A railway line with associated embankments is constructed located 80m west of the site.<br><br>Further terraced dwellings are constructed located 80m northeast of the site.<br><br>A school is constructed located 100m southeast of the site.<br><br>Queens Park and associated museum/art gallery is developed located 400m northeast of the site. |

| Date | On-Site History | Surrounding Land Use History |
|---|---|---|
| | | Terraced dwellings are constructed located 450m west of the site.<br>Hendham Vale (dyeing and polishing works) is constructed located 450m north of the site.<br>A reservoir is developed located 520m north of the site. |
| 1906 - 1907<br>1:10,560<br>1908<br>1:2,500 | An electricity substation is constructed on site. | A tramway is constructed along Queens Road.<br>A brick works is constructed located 120m west of the site.<br>A wire works is developed located 225m southwest of the site.<br>Tramways Car Shed is constructed off Queens Road, located 500m west of the site.<br>A brick works is developed located 550m south of the site. |
| 1923<br>1:10,560<br>1922<br>1:2,500 | No significant change. | An area of the brickworks is now disused and has been converted into terraced residential properties, located 50m west of the site. |
| 1956<br>1:10,560<br>1949<br>1:2,500 | No significant change. | The embankment on the railway line is extended.<br>A paper mill is constructed located 225m east of the site.<br>The car shed associated with the tramways is now used as a depot.<br>The brickworks is now disused. |
| 1966-1968<br>1:10,560<br>1965<br>1:2,500 | No significant change. | No significant change. |
| 1972 - 1977<br>1:10,560<br>1975 - 1977<br>1:2,500 | The electricity substation located onsite is demolished.<br>A wooden fence intersects the site running east to west. | A small electricity substation is constructed located adjacent to the eastern site boundary.<br>A post office is constructed located 400m north of the site.<br>A playing field is developed located 550m south of the site. |
| 1993<br>1:2,500 | No significant change. | No significant change. |
| 2001<br>1:10,000 | No significant change. | No significant change. |
| 2022<br>1:10,000<br>2021<br>Aerial | The northern boundary of the site is largely overgrown with trees and shrubs. | No significant change. |

**Figure 4 OS Map Extract 1850**

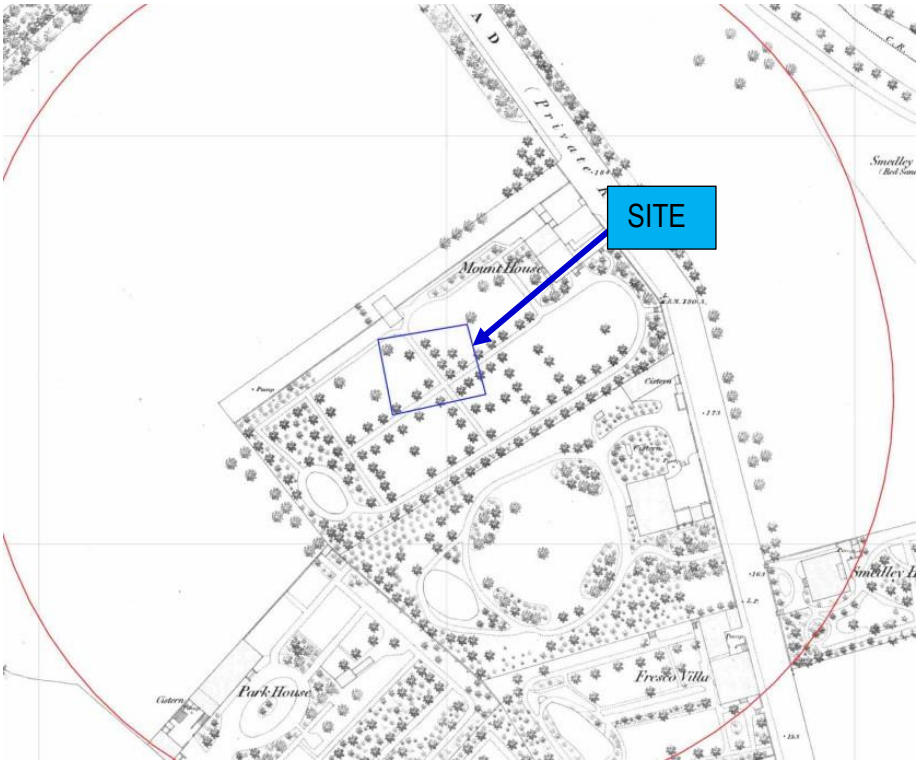



**Figure 5 OS Map Extract 1908**

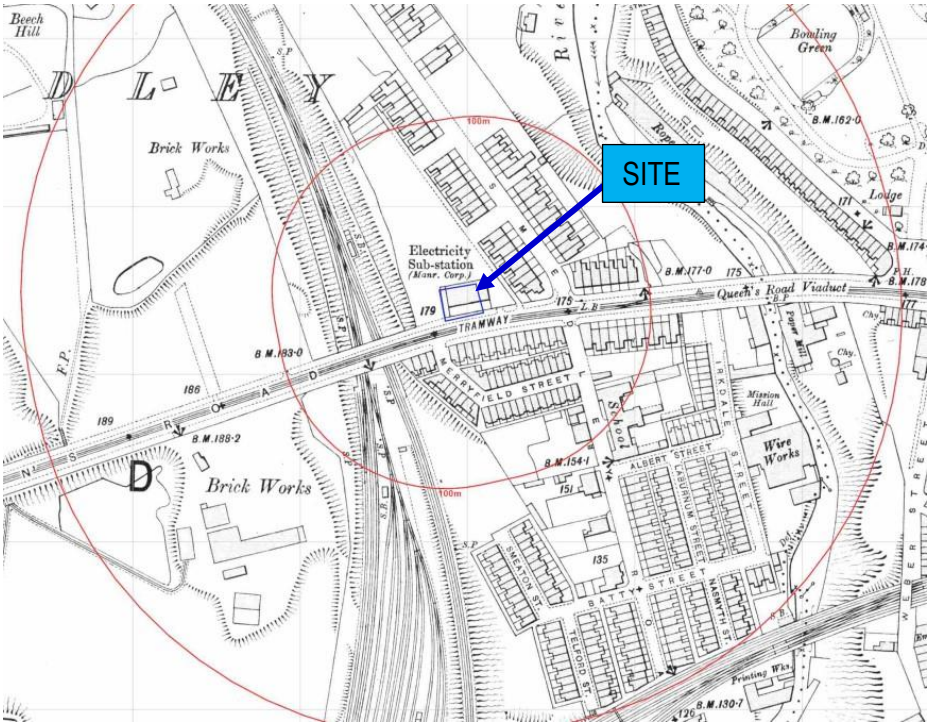


**Figure 6 OS Map Extract 1975 - 1977**

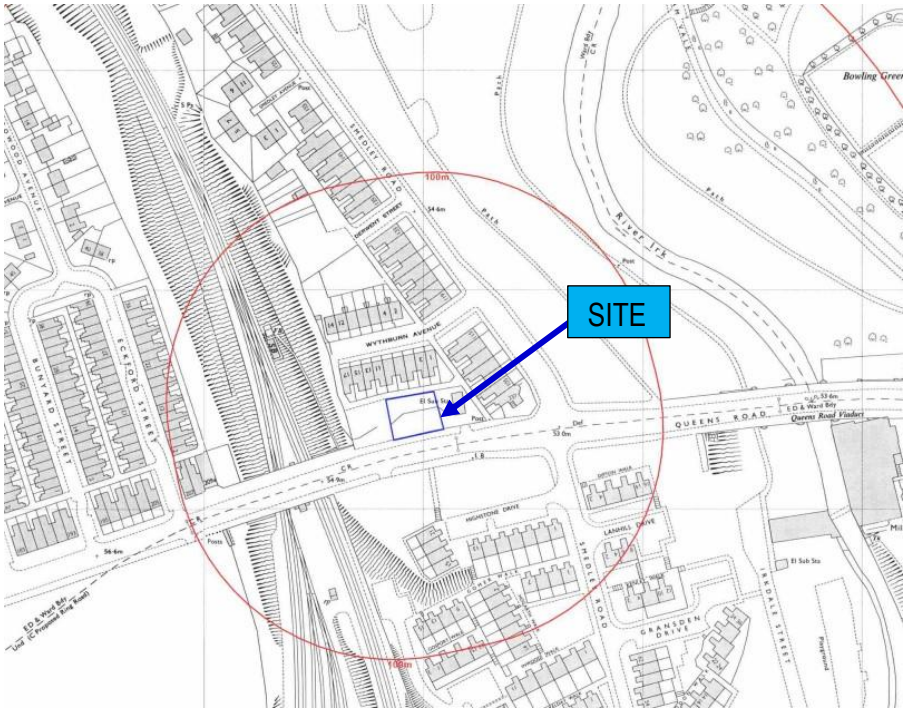



**Figure 7 OS Map Extract 2003**

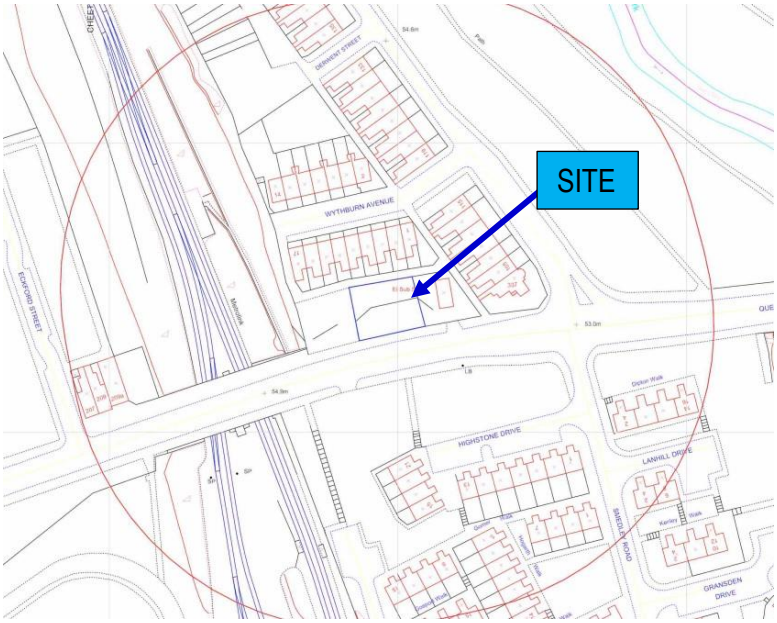


**Figure 8 Aerial Photograph 2021**

## 5.0 WALKOVER SURVEY

5.1 A walkover survey was completed on 30th September 2022. The photographs and notes from this survey are appended to this report as Appendix 2 and Appendix 3, respectively.

5.2 The site is currently accessed via Queens Road to the south of the site.

5.3 The site is currently vacant land with a wooden fence intersecting the site and significant amount of vegetation present north of the fence. The southern site boundary is also demarked by heras fencing.

5.4 The site lies flat throughout with a slight undulating surface along the vegetation.

5.5 There are no overhead cables on the site.

5.6 The site is surrounded by residential properties including an electricity substation located adjacent to the eastern site boundary.

5.7 A site features plan is presented as Figure 9 overleaf.

**Figure 9 Site Features Plan**

## 6.0 PRELIMINARY CONTAMINATION RISK ASSESSMENT

### Introduction

6.1 The following paragraphs outline a Preliminary Risk Assessment (PRA) for the site based on the above desk study information as defined by DEFRA and the EA Model Procedures for the Management of Land Contamination, CLR11(2004).

6.2 Table 5 provides a Preliminary Conceptual Model (PCM) which considers the source-pathway-receptor linkages present alongside the likelihood, severity and risk level as defined within Table 3 and Table 4 below. The assessment of probability, a modified risk table, and certain consequence definitions are based on CIRIA C552 and CLR11.

6.3 Table 5 considers whether a pollution linkage is potentially present and provides a preliminary qualitative assessment of risk based on the information currently available. Where a possible linkage is identified, it does not necessarily mean that a significant risk exists but indicates that further information is required through appropriate site investigation to substantiate the conceptual model.

6.4 The PCM/PRA is based on a commercial end use.

**Table 3: Consequence, Probability and Risk**

| Probability | Consequence, | Risk |
|---|---|---|
| High Likelihood- There is a pollution linkage and an event either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution | Very High – acute risk to the human health likely to result in significant harm. Risk of severe or irreversible effect on ground/surface water quality. Catastrophic damage to buildings / property. | Very High – there is a high potential that the source-pathway-receptor scenarios may give rise to harm to human health, or the environment and remedial action is likely to be required. |
| Likely – there is a pollution linkage, and all the elements are present, which means that it is probable 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. | High – Severe or irreversible effect on human health. Temporary severe or irreversible effect on ground/surface water quality. Reduction of water quality rendering groundwater or surface water unfit to drink and/or substantial adverse impact on groundwater dependant environmental receptors. | High – it is likely that the source-pathway-receptor scenarios may give rise to an impact on human health or the environment, which may require remediation and/or control measures to mitigate risks |
| Low likelihood– there is a pollutant linkage and circumstances are possible for 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 shorter term | Moderate – Long term or short-term moderate effect on human health. Moderate effect on ground/surface water quality, reversible with time. Reduced reliability of a supply at a groundwater or surface water abstraction source | Moderate – it is possible that the source-pathway-receptor scenarios may give rise to an impact on human health or the environment, however it is either relatively unlikely that such would be severe, or if any harm were to occur it is more likely that harm would be mild. |
| Unlikely – there is a pollution linkage, but circumstances are such that it is doubtful that an event would occur even in the very long term. | Low – Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.) Slight effect on ground/surface water quality, reversible with time. Marginal reduced reliability of a supply at a groundwater or surface water abstraction source. | Low – it is possible that harm could arise at the source, however it is likely that this would at worst be mild. |
| | | Very Low – it is unlikely that the source-pathway-receptor scenarios will give rise to an impact on human health or the environment. |

**Table 4: Estimation of Level of Risk by Comparison of Consequence and Probability**

| | | Consequence | | | |
|---|---|---|---|---|---|
| | | **High** | **Moderate** | **Low** | **Very low** |
| **Probability** | **High Likelihood** | Very High | High risk | Moderate risk | Moderate to low risk |
| | **Likely** | High risk | Moderate risk | Moderate to low risk | Low risk |
| | **Low Likelihood** | Moderate risk | Moderate to low risk | Low risk | Very low risk |
| | **Unlikely** | Moderate to low risk | Low risk | Very low risk | Very low risk |

**Potential Sources**

6.5 Historically the site has comprised of vacant fields with mature trees. By 1908 an electricity substation was constructed onsite which remained present until 1975 in which the substation was demolished, and a smaller substation was constructed adjacent to the site.

6.6 Potential off-site sources of contamination include off-site developments, an electricity substation located 20m east of the site, railway sidings and cuttings associated with nearby railway line, brick works and quarries, past wire works and various refuse heaps.

6.7 There is potential for the presence of contamination associated with the following:

- Areas of Made Ground from on and off-site developments
- Ground gas associated with Made Ground and a nearby closed landfill site
- Polychlorinated biphenyls (PCBs) associated with electricity substation
- Leaks and spillages of fuels and oils associated with on site development

6.8 Contaminants may therefore include heavy metals, polycyclic aromatic hydrocarbons (PAH), total petroleum hydrocarbons (TPH), BTEX Compounds, asbestos, ground gases (carbon dioxide, methane), and polychlorinated biphenyls PCBs.

**Potential Receptors**

6.9 The following receptors have been considered for the construction and operational stages of the proposed redevelopment.

- Current site users;
- Adjacent land users;
- Future land users;
- Construction workers during site development works;
- Surface water and Groundwater within the underlying aquifer

### Potential Pathways

6.10 The following pathways have been considered for the construction and operational stages of the proposed redevelopment.

- Dermal contact, ingestion, inhalation pathways of potentially contaminated soils;
- Downward vertical migration of leachate to surface waters and shallow groundwater;
- Vertical or lateral migration of ground gas.

**Table 5: Preliminary Conceptual Model**

| Source | Pathway | Receptor | Probability | Consequence | Risk | Comment |
|---|---|---|---|---|---|---|
| Potential soil contamination<br><br>E.g., Heavy Metals, PAH, TPH, BTEX and ground gases. | Dermal contact, ingestion, and inhalation of soils dust | Current Site Users | Unlikely | Moderate | Low | The site is currently vacant with a wooden fence intersecting the site. The risk is therefore considered to be **LOW**. |
| | | Adjacent land users | Unlikely | Moderate | Low | Few residential properties are located to the south and north of the site along with a railway line to the west and a substation to the east. Usual dust control measures should be implemented as part of good site working practices during construction to reduce dust generation. Therefore, the risk is considered **LOW.** |
| | | Future land users | Low Likelihood | Moderate | Moderate to Low | The proposed development consists of constructing a new warehouse building with associated car park. Some of the site will be surfaced in hardstanding. The risk to future site users via direct exposure is considered to be **MODERATE to LOW.** This assessment is based on the potential for contamination to be present beneath the site. |
| | | Construction Workers | Low Likelihood | Moderate | Moderate to Low | Construction workers may be exposed to potentially contaminated soils during construction works due to the site history, however exposure duration will be short-term only. The risk to construction workers is considered **MODERATE** to **LOW.** Appropriate health and safety measures (in line with CDM and other relevant health and safety guidance) will reduce the risk. |
| | Downward vertical migration of leachate to shallow groundwater | Groundwater within the Underlying Aquifer | Low Likelihood | Moderate | Moderate | The underlying superficial soils are anticipated to be sand and gravels with a high to low permeability. There are 28 abstraction licences within 2km. The groundwater vulnerability is considered to be low. The risk to groundwater is therefore considered **MODERATE to LOW.** |
| | Lateral migration in surface waters | Surface water | Unlikely | Moderate | Low | The River Irk is the only surface water feature, located 113m to the northeast of the site. Therefore, the perceived risk to surface waters is considered to be **LOW.** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Vertical or lateral migration of ground gas | Current Site Users | Low Likelihood | Moderate | Moderate to Low | The site is currently vacant and only small areas of made ground are anticipated. There is no risk of radon therefore radon protection measures are not required. PCBs associated with the historical onsite substation and adjacent substation may create risk. This risk to current site users is therefore **MODERATE TO LOW.** |
| | | Adjacent land users | Low Likelihood | Moderate | Moderate to Low | Residential properties predominantly surround the site to the north and south. Areas of Made Ground are anticipated. Radon protection measures are not required. PCBs from adjacent substations have potential to cause risk, albeit unlikely. The risk to adjacent site users from ground gas is therefore considered **MODERATE TO LOW.** |
| | | Future land users | Low Likelihood | Moderate | Moderate to Low | The proposed development consists of constructing a warehouse building with associated car park. Radon protection measures are not required; therefore, the risk is considered **MODERATE TO LOW.** |
| | | Construction Workers | Low Likelihood | Moderate | Moderate to Low | Construction workers may be exposed to ground gas/depleted oxygen conditions in confined spaces and excavations; however, the duration will be short term. The risk to construction workers from ground gas is considered **MODERATE TO LOW.** |
| Asbestos Containing Material (ACM) | | Current Site Users | Unlikely | Moderate | Low | The site is currently unoccupied. Asbestos may be present in small areas of the site due to past development, albeit unlikely. Asbestos is only harmful when disturbed. The risk to current site users is considered to be **LOW.** |
| | | Adjacent land users | Unlikely | Moderate | Low | Residential properties predominantly surround the site with a railway line located to the west. Asbestos may be present in small areas of the site, albeit unlikely. Disturbance of soil during the construction phase may allow fibres to become airborne. Dust control measures (dampening down) should be implemented as part of good site working practices. Therefore, the risk is considered **LOW**. |
| | | Future land users | Low Likelihood | Moderate | Moderate to Low | The proposed development consists of constructing a new warehouse development. Some of the site will be surfaced in hardstanding. The risk is therefore considered **MODERATE TO LOW.** A contamination assessment of the existing on-site soils would be required to determine the level of risk and necessary mitigation measures. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Construction Workers | Low Likelihood | Moderate | Moderate to Low | Construction workers may be exposed to potential asbestos in Made Ground soils. However, this potential area is small. The risk is considered **MODERATE TO LOW.** A contamination assessment of the existing on-site soils would be required to determine the level of risk and necessary mitigation measures. |

## 7.0 GEOTECHNICAL HAZARDS ASSOCIATED WITH THE DEVELOPMENT

7.1 In addition to the environmental hazards there are also geotechnical hazards associated with the stability of the ground including load bearing capacity, slope stability and effects of ground mining activities. Local Authorities follow NPPF (2012) which requires that a site be suitable for its new use taking into account of ground conditions and land instability, including from natural hazards to former activities such as mining. A summary of the geotechnical considerations is provided below in Table 6.

**Table 6: Summary of Geotechnical Hazards**

| **Geohazards:** | |
|---|---|
| Highly Compressible Ground | Negligible risk. |
| Collapsible Soils | Very low risk. |
| Swelling Clay | Very low risk. |
| Running Sand | Very low risk. |
| Ground Dissolution | Negligible risk. |
| Landslip | Very low risk. |
| Mining & Quarrying | No mining or quarrying is recorded as taking place on site. The site is located within a Coal Mining Reporting Area but not within a Development High Risk Area. Therefore, the mining risk is considered low. |
| **Geotechnical Design Considerations** | |
| Site Clearance | Various areas of litter and vegetation may need to be removed from the site to allow for a geotechnical investigation. |
| Trees | Multiple mature trees are present, generally around the northern site boundary. |
| Existing Buildings/Obstructions | There are no buildings currently located on the site. |
| Foundations | The depth and type of proposed foundations would depend on the ground conditions present on site. There are no artificial deposit records underlying the site and the underlying ground will be made up of superficial deposits of glacial till. There are various borehole records within the vicinity of the site, although none identify bedrock depth. |

| Geotechnical Design Considerations | |
|---|---|
| Floor Slabs | Again, an intrusive geotechnical investigation is recommended prior to any construction works to discover the most suitable floor slab design for the on-site ground conditions. |
| Groundwater | Exact groundwater conditions are not known at this stage. For more detailed knowledge of the groundwater regime, an intrusive geotechnical investigation would be needed. However, it is recorded that the site is underlain by Secondary A and Secondary Undifferentiated aquifers. The highest risk of groundwater flooding on site is recorded as low. |
| Earthworks | The site lies relatively flat so it is not expected that major earthworks will be required, providing the retaining wall is maintained. |
| Slopes | The site drops lower from the northern boundary via a retaining wall. |
| Retaining Walls | A brick retaining wall is present along the northern boundary, although it is in poor condition. |
| Chemically aggressive ground conditions | Chemically aggressive ground conditions are not expected at this site. However, an intrusive geotechnical investigation would be necessary to confirm this. |

## 8.0 CONCLUSIONS & RECOMMENDATIONS

### Conclusions

8.1 Historically the site has comprised of vacant fields with mature trees. By 1908 an electricity substation was constructed onsite which remained present until 1975 in which the substation was demolished, and a smaller substation was constructed adjacent to the site.

8.2 Potential on-site sources of contamination were identified to be Made Ground and ground gas associated with onsite development along with polychlorinated biphenyls (PCBs) associated with the onsite and adjacent electricity substations.

8.3 Potential off-site sources also include Made Ground and ground gas associated with off-site development; PCBs associated with an electricity substation are also a possible contaminative source. Contamination from cuttings and railway sidings associated with the nearby railway line may also be an issue.

8.4 The proposed development of the site is the construction of a small warehouse building with an associated car park.

8.5 The site is underlain by Devensian Till comprising diamicton (Secondary Undifferentiated Aquifer). The solid geology comprises the Pennine Middle Coal Measures (Secondary A Aquifer) comprising sandstone, siltstone, and mudstone.

8.6 The site is not located in a Radon Affected Area, as less than 1% of the properties are above the Action Level.

8.7 Given the potential contaminative land uses, the overall risk from soil contamination to end users and construction workers is concluded to be **MODERATE to LOW**.

8.8 The risk to controlled waters is concluded to be **LOW** based on the underlying granular superficial soils.

8.9 The risk from ground gas to end users and construction workers is considered to be **MODERRATE to LOW.**

8.10 The site is not located within a Zone 2 or Zone 3 floodplain. The risk of groundwater flooding is **LOW**.

### Recommendations

8.11 An intrusive investigation should be undertaken to ensure the most up to date geotechnical parameters for the design foundations, floor slabs and pavement construction for the proposed new structures and surrounding area are gained.

8.12 As part of the geotechnical investigation, it is recommended that the samples of soil and groundwater are recovered for contamination testing and to confirm whether these are still any potential risks.

8.13 As part of the site investigation a ground gas assessment should be carried out.

# APPENDIX 1

# GROUNDSURE REPORTS

# APPENDIX 2

# SITE PHOTOGRAPHS

| | |
|---|---|
| **Earth Environmental & Geotechnical Ltd**<br><br>**Tel:** 0161 975 6088<br>**Email**: info@earthenvironmental.co.uk<br>**Web**: www.earthenvironmental.co.uk | **SITE PHOTOGRAPHS** |
| **Job No.:** A5027/22 | **Site:** Queens Road, Manchester |
| **Plate 1 Viewing east showing access to the site via Queens Road. Note potential water supply located along the road/** | **Plate 2 Viewing northwest showing railway line located 40m west of the site.** |
| | |
| **Date:** 30th September 2022 | **Date:** 30th September 2022 |
| **Plate 3 Viewing north showing the electricity substation located adjacent to the eastern site boundary.** | **Plate 4 Viewing west showing heras fencing located around the northern and eastern site boundaries.** |
| | |
| **Date:** 30th September 2022 | **Date:** 30th September 2022 |

| | |
|---|---|
| **Earth Environmental & Geotechnical Ltd**<br><br>**Tel:** 0161 975 6088<br>**Email**: info@earthenvironmental.co.uk<br>**Web**: www.earthenvironmental.co.uk | **SITE PHOTOGRAPHS** |
| **Job No.:** A5027/22 | **Site:** Queens Road, Manchester |
| **Plate 5 Viewing north showing retaining wall located along the northern site boundary.** | **Plate 6 Viewing northwest showing mature trees and shrubs located along the northern section of the site.** |
| | |
| **Date:** 30th September 2022 | **Date:** 30th September 2022 |
| **Plate 7 Viewing north showing areas of litter located around the site.** | **Plate 8 Viewing northeast showing wooden fencing intersecting the centre of the site.** |
| | |
| **Date:** 30th September 2022 | **Date:** 30th September 2022 |

## Figure 10 Site Walkover Photo Locations

# APPENDIX 3

# SITE WALKOVER NOTES

EARTH ENVIRONMENTAL & GEOTECHNICAL

## WALK OVER SURVEY REPORT

**Site:** Queens Road, Manchester **Date:** 30th September 2022

**Job No:** A5027/22 **Undertaken By:** Bethany Garratty

**Purpose of Site Walkover:**
1) Provide further information for the Desk Study Report;
2) Identify potential contamination sources, pathways, and receptors;
3) Identify geotechnical features and potential geohazards;
4) Determine locations for exploratory boreholes.

| **Desk Study features checked during site visit** | **Feature and Information required** | **Present** | **Description / Comments** |
|---|---|---|---|
| Site Setting | Description required for:<br><br>Town/Country/Suburb Setting<br><br>Industrial/Residential/Retail Usage<br><br>Current Site use (if undertaking security and access to the site) | | <br><br>Suburban city setting<br><br>Surrounding areas are predominantly residential.<br><br>The site is currently vacant, although a wooden fence intersects the site. |
| Evidence of Past Activities | Are there:<br><br>Any relevant street names in area?<br><br>Features or relics which indicate past history? | <br><br>Yes/~~No~~<br><br>~~Yes~~/No | <br><br>The site is located to the north of Queens Road. |
| Geographic Setting | Description required for:<br>Low lying flood plain/dry valley/rolling hills etc. | | The site is located within rolling hills close to the River Irk. |
| Ground Conditions | Is there any evidence of:<br><br>Mining, Mine entries<br><br>Subsidence<br><br>Landslip/slope erosion<br><br>Former investigation works | <br><br>~~Yes~~/No<br><br>~~Yes~~/No<br><br>~~Yes~~/No<br><br>~~Yes~~/No | |

| Desk Study features checked during site visit | Feature and Information required | Present | Description / Comments |
|---|---|---|---|
| Topography | Description required for:<br><br>Are there apparent differences between site and surrounding area? (If yes describe the presence of retaining walls, and slopes).<br><br>Is there evidence of Made Ground / Fill on site? | Yes/~~No~~<br><br>Yes/~~No~~ | The site lies relatively flat and is similar to the surrounding area, although is significantly lower than housing along the northern boundary. A retaining brick wall was observed along the northern site boundary.<br><br>Concrete slabs are present across the site from past development. |
| Site Boundaries and Neighbours | Description required for:<br><br>Type of boundary demarcation (if any) on each side of site, usage of adjacent land and name of industrial/commercial occupiers.<br><br>Note any adjacent features such as water course and other potentially environmentally sensitive uses (residential, school, infirmary, SSSI etc) | | The site is demarcated by a mixture of boundaries including a brick retaining wall to the north and west and heras fencing along the southern boundary.<br><br>The site is predominantly surrounded by residential properties including an electricity substation to the east and a railway line to the west. |
| Vegetation | Are there any vegetation/trees on or close to site (if yes describe locations, type, maturity, etc)<br><br>Is there any evidence of poor health / distress? | Yes/~~No~~<br><br>~~Yes~~/No | Vegetation is located around the outside of the site, predominantly around northern boundary where various mature trees are present.<br><br>N/A |
| Ground Surface | Are there areas of hardstanding and estimate the split between hard and soft cover? (If yes describe locations, types, and conditions).<br><br>Is there any evidence of any spillages or staining? | Yes/~~No~~<br><br>~~Yes~~/No | 90% of the site is covered in vegetation. 10% is covered in made ground/concrete.<br><br>Nonvisible on the site walkover. |

| Desk Study features checked during site visit | Feature and Information required | Present | Description / Comments |
|---|---|---|---|
| Site Drainage | Are there any drain covers / soakaways (if yes describe locations)<br><br>Are there any outfalls/water courses on site (note the condition of water courses in open water courses. discolouration, odour, eutrophication, oily sheen, gas bubbling water, clear or cloudy)<br><br>Where a watercourse runs alongside or crosses a site are there any differences in visible water quality upstream and downstream of the site? | Yes/~~No~~<br><br>~~Yes~~/No<br><br>~~Yes~~/No | Drain covers were observed running parallel with southern boundary along Queens Road.<br><br>N/A |
| Electrical Equipment | Are there any electricity sub stations on or adjacent to the site? Are there any electrical transformers, capacitors, pylons etc on site? | Yes/~~No~~ | An electricity substation lies adjacent to the eastern site boundary. |
| Buildings | Is there any evidence of asbestos construction materials e.g., roofing, insulation materials.<br><br>Do any buildings have basements?<br><br>Do any buildings have a boiler room (if yes, describe fuel type and storage arrangements)? | ~~Yes~~/No<br><br>~~Yes~~/No<br><br>~~Yes~~/No | None visible on the site walkover, no buildings currently located on site. |

| Desk Study features checked during site visit | Feature and Information required | Present | Description / Comments |
|---|---|---|---|
| Landfilling | Is there any evidence of gas protection measures (gas membrane, gravel-filled trenches, venting pipes, etc)? | ~~Yes~~/No | N/A |
| Process Air Emissions | Point Source: Are there any stacks / vents / cooling towers / abatement equipment?<br><br>Fugitive Source: is there any stockpiled material / windblown dust / vapour process? | ~~Yes~~/No<br><br>~~Yes~~/No | N/A<br><br>N/A |
| Storage of fuels & Chemicals | Are there any drums / containers (if yes, describe quantity, full /empty, stored on hard standing / soft landscaping, bunding)?<br><br>Are there any above ground fuel tanks (if yes, describe locations, volumes, how many, bunding, used / disused, condition?)<br><br>Is there any evidence of underground fuel tanks (fuel pumps, covers, vent pipes, how many and how large, fill point, used / disused, and condition)? | ~~Yes~~/No<br><br>~~Yes~~/No<br><br>~~Yes~~/No | N/A<br><br>N/A<br><br>N/A |
| Accidents | In the event of a large spillage would runoff affect any vulnerable watercourse/culverts?<br><br>Are emergency procedures / equipment in place? | ~~Yes~~/No<br><br>~~Yes~~/No | |

| Desk Study features checked during site visit | Feature and Information required | Present | Description / Comments |
|---|---|---|---|
| Waste | Are there any waste skips present on site?<br><br>Are waste storage facilities adequate?<br><br>Is there any litter/fly tipped material? | ~~Yes~~/No<br><br>~~Yes~~/No<br><br>Yes/~~No~~ | N/A<br><br>Minimal litter located around the eastern boundary. |
| Atmospheric | Are there any fumes, odours originating from site or affecting site from neighbouring sites? | ~~Yes~~/No | N/A |
| Access / Further Investigations | If a Phase 2 Investigation is likely to be required, describe any access problems including headroom where relevant, services, overhead cables, restricted access areas, confined spaces, trafficked areas, etc that are likely to affect investigation scope/techniques.<br><br>Identify possible site office and storage locations.<br><br>Identify possible water supply | | The site is located off a main, busy road suggesting access and parking may be difficult for an investigation. Multiple mature trees are also present on site which may restrict the site area. Services associated with the substation are also likely to create issues.<br><br>On made ground on concrete along eastern boundary.<br><br>Water supply from a suspected water pipe located at the site entrance. |
| Site Environs | Are there any local features that could have a harmful influence e.g., landfill, industrial processes, railway land?<br><br>Are there any sensitive water features/courses near to the site? | ~~Yes~~/No<br><br>~~Yes~~/No | Railway line located 40m to the west of the site and electricity substation located 10m east of the site may have a harmful influence on underlying soils. |
| Local Knowledge / Anecdotal Evidence | | | N/A |
| Site Dimensions | Describe shape of Site in plan and measure dimensions. | | The maximum dimensions of the proposed site are 19.1m north to south and 25.8m west to east. The site occupies an area of approximately 0.04 hectares. |

# APPENDIX 4

# REPORT LIMITATIONS

## LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, and staff resources allocated to the project.

Other than that, expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2022 and should be read in light of any subsequent changes in legislation, statutory requirements, and industry best practices. Ground conditions can also change over time and further investigations, or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.