



EARTH ENVIRONMENTAL
& GEOTECHNICAL

Phase 1 GeoEnvironmental Desk Study

Eastlands Primary

ENWL

May 2024

On behalf of



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PHASE I GEOENVIRONMENTAL DESK STUDY
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FOR
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Scope

1.5 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.
- Manchester City Council Planning Portal.

2.0 SITE LOCATION AND DESCRIPTION

- 2.1 The site is located off Rowsley Street, Manchester, approximately 2.6km to the east of Manchester City Centre.
- 2.2 The approximate National Grid Reference for the centre of the site is SJ 86468 98655 (X: 386468, Y: 398655) with the closest postcode being M11 3FF.
- 2.3 The maximum dimensions of the site are 17m north to south, and 14m east to west. The site occupies an area of approximately 0.03 hectares.
- 2.4 The site is an irregularly shaped parcel of land with current access from Rowsley Street to the east of the site. Currently the site is accessed via a locked gate.
- 2.5 The land is surfaced with a mixture of soft and hard cover, with some areas used for storage. The site is currently bound by palisade fencing.
- 2.6 The site is surrounded by a mixture of industrial and commercial land use with a small industrial estate directly to the east and the Etihad Campus Stadiums directly to the west. Two trainlines also run adjacent to the site, directly to the east and north.
- 2.7 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

- 2.8 Site service plans have not been obtained for the site by 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 underlain by artificial deposits of Made Ground associated with a void (former canal).
- 3.4 Records indicate that 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 Upper Coal Measures Formation comprising mudstone, siltstone, and sandstone.
- 3.6 There are 5no. records of linear features within 500m of the site boundary. The closest record refers to an inferred coal seam located 134m to the northeast of the site.
- 3.7 There are no records of landslips within 500m of the site boundary.
- 3.8 There are 139no. borehole records identified within 250m of the site. The closest record refers to an onsite trial pit record ref: SJ89NE1554. The trial pit was terminated at a depth of 4.50m bgl and comprised:
- Bitmac surfacing to a maximum depth of 0.20m.
 - MADE GROUND of various lithologies to a maximum depth of 2.10m.
 - Stiff CLAY with occasional cobbles to base of trial pit at a depth of 4.50m.
- 3.9 The site is in an area where the hazard rating is moderate with regards to landslides; very low with regards to shrink swell clays, running sands, compressible deposits, collapsible deposits, and landslides; Negligible with regards to ground dissolution.

Ground Workings

- 3.10 There are 53no. records of historical surface ground working feature identified within 250m of the site boundary. The closest record refers to a colliery, dated 1968, located approximately 24m to the southeast of the site. Other records in the vicinity refer to ponds, cuttings, reservoirs, brick fields etc.
- 3.11 According to the BGS, there is 1no. record of a British Pit within 500m of the site. This record refers to Glenden Hall Brick Field located 313m to the northwest of the site.

Mining and Other Underground Workings

- 3.12 The site is located within the specified search distance (1km) of an identified coal mining area. Reference to the Coal Authority interactive online viewer shows the site is not located within a Development High Risk Area.
- 3.13 There are no records for non-coal mining areas located onsite.
- 3.14 There are no areas of brine extraction, gypsum extraction, tin mining or clay mining within 1km of the site.
- 3.15 There are no records for non-coal cavities or natural cavities identified within 1km of the site.
- 3.16 There are 7no. records for historical underground working features within 1km of the site. The closest record refers to a colliery, dated 1923, located approximately 496m to the east of the site.

Radon Potential

- 3.17 The property is not located in a Radon Affected Area as less than 1% of the properties are above the Action Level.

Hydrogeology and Hydrology

- 3.18 The Artificial Ground recorded as Made Ground has a mixed flow type with very high to low permeability.
- 3.19 The underlying superficial deposits of Devensian Till (Diamicton) is classified by the Environment Agency (EA) as a Secondary Undifferentiated Aquifer with a mixed flow type and low to high permeability.

Secondary Undifferentiated *'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 Upper Coal Measures is classified by the Environment Agency (EA) as a Secondary A Aquifer with a fracture flow type and moderate to low permeability. The BGS states the following:

Secondary A *'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 low vulnerability with a low leaching potential. The BGS states:

Low – *'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 26no. groundwater abstraction licence records within 2km of the site. The closest active licence refers to a borehole for Hanson Quarry Products Europe, located 1.1km north of the site.
- 3.23 There are 6no. surface water abstraction licence records within 2km of the site. The closest licence refers to a historical supply for general cooling sourced from Ashton Canal, Manchester located 1.1km to the east of the site.
- 3.24 There are no potable abstraction licence records within 2km of the site.
- 3.25 The site is not located within 500m of a Source Protection Zone.
- 3.26 There are 10no. water network entries within 250m of the site. The closest record refers to a canal (manmade water course for inland navigation).
- 3.27 There are 4no. surface water features identified within 250m of the site. The closest refers to the aforementioned canal.
- 3.28 There are 2no. records of a Water Framework Directive (WFD) surface water body located within 250m of the site. The closest record refers to Ashton Canal and Peak Forest Canal, lower section, located 100m north of the site. This water body received a failed chemical rating in 2019.
- 3.29 There is 1no. record of a Water Framework Directive (WDF) groundwater body located on-site. The record refers to the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers located on site. The aquifer had 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 are 3no. records of historic Environment Agency/Natural Resource Wales landfill sites within 500m of the site. The closest historical record refers to Bradford Road Works, Cheshire for inert, industrial, and special waste, located 114m north of the site.
- 3.32 There are no records of BGS/DoE non-operational landfill sites within 500m of the study site.
- 3.33 There are no records of a historical landfill site from the Local Authority and Historical Mapping Records within 500m of the site.
- 3.34 There are 21no. records of historical waste sites from the Local Authority and Historical Mapping Records within 500m of the site. The closest record refers to a refuse destructor located 141m to the northwest of the site.
- 3.35 There are 8no. record of current Environment Agency/Natural Resources Wales licensed waste sites within 500m of the site. The closest record refers to a special waste transfer station for 25,000 tonnes, at P McGuinness & Co Ltd, located 224m west of the site.

- 3.36 There are 34no. records of a waste treatment, transfer, or disposal site within 500m of the study site. The closest record refers to a treating waste exemption for aerobic composting associated prior treatment at Phillips Park Road, located 223m southwest of the site.

Industrial Land Use Information

- 3.37 There are 311no. records of potentially contaminative historical land uses identified within 500m of the site. The closest record refers to onsite Fustian Mills, dated 1851. Other onsite records refer to unspecified mills, dated 1891-1938 and an unspecified factory, dated 1985-1991.
- 3.38 There are 13no. records of current potentially contaminative land uses identified within 250m of the site. The closest record refers to an electricity substation located 16m north of the site.
- 3.39 There are 225no. records of a historical tanks identified within 500m of the site. The closest record refers to an unspecified tank located 21m to the north of the site, dated 1908.
- 3.40 There are 87no. records of historical energy features identified within 500m of the site. The closest record refers to an electricity substation located 19m north, dated 1989.
- 3.41 There are no records for current petrol or fuel sites within 500m of the site.
- 3.42 There are no records of historical petrol or fuel sites within 500m of the site.
- 3.43 There are 5no. records of historical garages identified within 500m of the site. The closest record refers to a garage located 142m south of the site, dated 1986.
- 3.44 There are no records of a high voltage underground electricity transmission cables within 500m of the site.
- 3.45 There are no records of high-pressure underground gas transmission pipelines within 500m of the site.
- 3.46 There are 61no. historical railway and tunnel features identified within 250m of the site. The closest refers to a railway located 3m west of the site, dated 1922.
- 3.47 There are 2no. historical railway lines identified within 250m of the site. The closest record refers to a Razed railway line located 90m southeast of the site.
- 3.48 There are 31no. current active railway line records identified within 250m of the site. The closest record refers to the Phillips Park and Ashburys Rail Branch located 8m west.
- 3.49 There are no underground railway lines or tunnels identified within 250m of the site.
- 3.50 The site is not within 5km of the route of the High Speed 2 rail project.
- 3.51 The site is not within 500m of the route of the Crossrail 1 rail project.

Environmental Permits, Incidents and Registers

- 3.52 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	2
Category 3 or 4 Radioactive Substance Authorisations	0
Licensed Discharge Consents	13
Planning Hazardous Substance Consents and Enforcements	3
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)	12
Pollution Inventory Substances, Wastes and Radioactive Wastes	0

- 3.53 There are 2no. records of Part A(2) and Part B Activities and Enforcements within 500m of the study site. The closest historical record refers to Timber Manufacture at J and F Brooks Ltd, located approximately 83m southwest of the site.
- 3.54 There are 13no. records of Licensed Discharge Consents to controlled waters within 500m of the study site. The closest record refers to sewage discharge into a sewer storm overflow located 275m to the west of the site.
- 3.55 There are 12no. records of substantiated pollution incidents within 500m of the study site. The closest record refers to smoke released 259m to the northwest of the site. The incident had a Category 4 (no impact) on water and a Category 3 (Minor Impact) on air and land.

Environmentally Sensitive Sites

- 3.56 There are no records of Sites of Special Scientific Interest (SSSI) within 2km of the study site.
- 3.57 There are no records of Designated Ancient Woodland within 2km of the study site.
- 3.58 There is 1no. record of a Local Nature Reserve (LNR) within 2km of the study site. This record refers to Clayton Vale located 1.1km to the east of the site.

3.59 There is 1no. record of Green Belt land within 2km of the study site. This record refers to the Merseyside and Greater Manchester Greenbelt located in Manchester, 1.4km to the east of the site.

3.60 There are no further records of Environmental Designations within 2km of the site.

Ecology

3.61 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.

3.62 However, the site is classified as urban land.

Archaeology

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

3.64 However, there are no records of Listed Buildings, World Heritage Sites, National Parks, or Scheduled Ancient Monuments within 250m of the site.

Potential Flood Risks

3.65 Detailed assessment of flood risks is outside the scope of this report. However, an Environment Agency Flood Zone 2 and 3 are not located on site.

3.66 There are no records of flooding from rivers and sea (RoFRaS) within 50m of the site.

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

3.68 There are no record of areas benefitting from flood defences within 250m of the site.

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

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

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

Previous Site Investigations

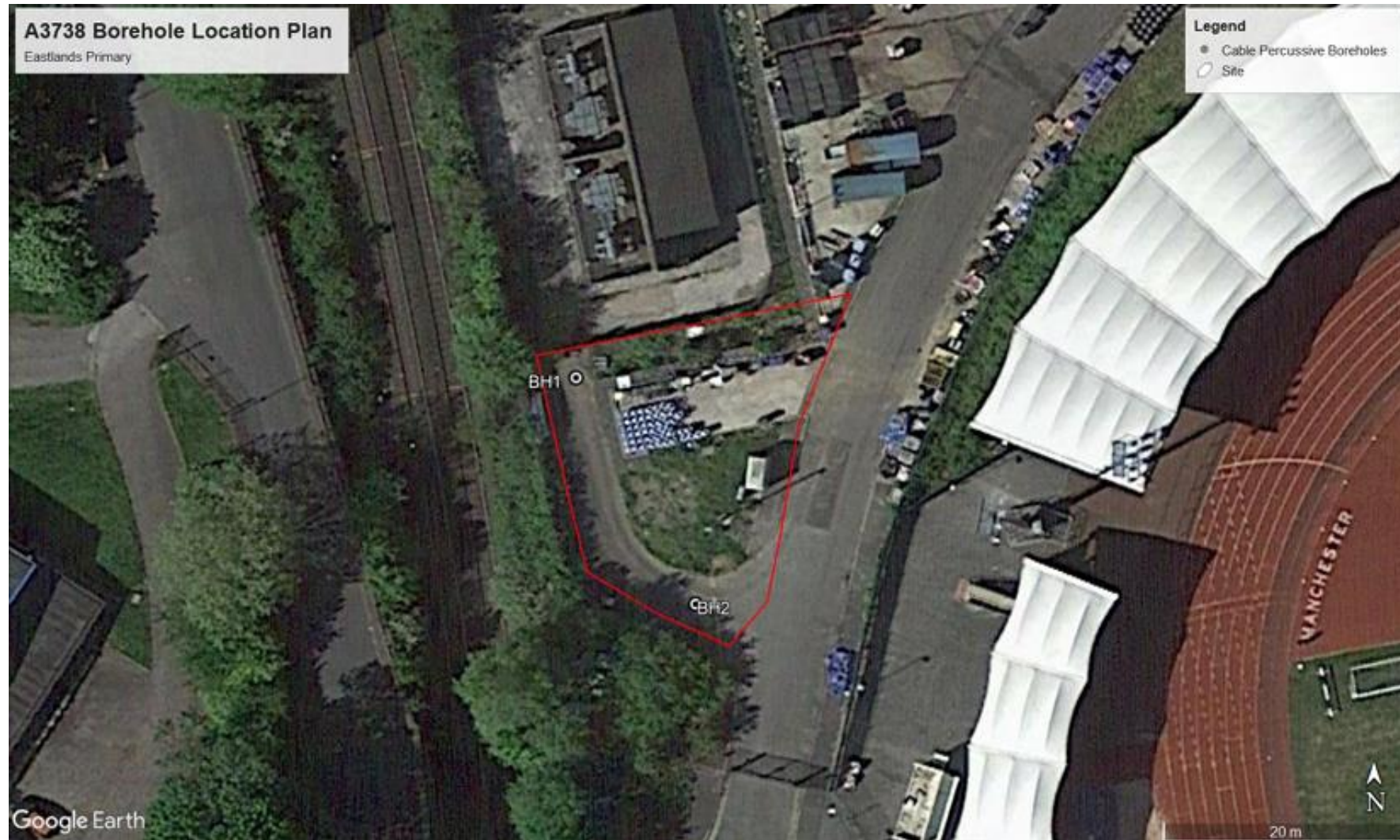
3.72 Earth Environmental & Geotechnical Ltd have previously (January 2021) conducted a site investigation at this site.

3.73 The site investigation was conducted on the 12th to the 13th of September 2020 and comprised:

- 2no. Cable Percussion Boreholes were sunk to depth between 10.00m and 11.45m bgl.
- 50mm diameter standpipes were installed in both boreholes at a depth of 7.00m bgl.

- 3.74 The boreholes were not drilled within the development area due to the site being overgrown and presence of services, plant, and equipment.
- 3.75 Standard Penetration Tests (SPTs) were conducted in the cable percussive boreholes, and soil samples were retrieved from the exploratory holes at regular intervals for geotechnical and chemical analysis. Soils were logged by an on-site engineer.
- 3.76 An exploratory hole location plan is presented as Figure 4, overleaf.
- 3.77 The recorded ground conditions are summarised as follows:
- **Made Ground** was encountered in all exploratory holes, comprising:
 - MACADAM (BH1 and BH2).
 - Clayey gravelly SAND, containing quartzite, clinker and redbrick. (BH1).
 - CONCRETE cobbles (BH1).
 - Ashy clayey gravelly SAND, containing redbrick, clinker and concrete. (BH1).
 - Clayey sandy GRAVEL, containing concrete, redbrick and clinker. (BH2).
 - Gravelly CLAY, containing concrete, redbrick, sandstone and clinker. (BH2).
 - **Superficial Deposits** were encountered in all exploratory holes, comprising:
 - Gravelly CLAY, containing mudstone, sandstone, and anthracite (BH1, BH2).
 - Sandy CLAY (BH1).
 - Sandy Gravelly CLAY, containing mudstone, sandstone, and anthracite (BH1, BH2).
 - **Bedrock Deposits** were encountered in both exploratory boreholes, comprising:
 - Very weak red SANDSTONE recovered as clayey gravelly SAND. (BH2).

Figure 4: Exploratory Hole Location Plan



- 3.78 Eight soil samples were retrieved from the boreholes for chemical analysis.
- 3.79 Samples were analysed for the following suite of contaminants: Asbestos, Arsenic, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Soil Organic Matter and speciated Polyaromatic Hydrocarbons (PAH), and Speciated Petroleum Hydrocarbons.
- 3.80 One soil sample collected from the boreholes were found to contain concentrations of contaminants in exceedance of assessment criteria values relevant to a commercial end use. The exceedance is for benzo(b)fluoranthene which can be attributed to the presence of clinker in the soil matrix.
- 3.81 Asbestos fibres and fragments were not encountered in any of the samples tested.
- 3.82 Ground gas monitoring has been carried out on the site and identified the presence of slightly elevated gas levels from one borehole on site.
- 3.83 The Carbon Dioxide GSV was calculated to be 0.0063 litres/hour, with the Methane GSV calculated as 0.0002 litres/hour. These results suggested that the site can be given a Characteristic Situation 1, very low risk.
- 3.84 Based on the results of the chemical testing, a contaminant concentration was found in exceedance of the screening criteria relevant to a commercial end use in BH2 at a depth of 0.70m.

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.
- 4.2 The site history is summarised in Table 3, below, followed by selected extracts from maps and aerial photographs.

Table 3: Summary of Site History

Date	On-Site History	Surrounding Land Use History
1848 1:10,560	The site currently comprises predominantly vacant ground with a cotton mill (Reservoir Mill) encroaching in the eastern area of the site. A road linking to the onsite mill also transects the site through the centre.	The site is predominantly surrounded by industrial development including: Fustian Mill directly to the east. Manchester and Salford Water Works Reservoir approximately 100m southeast of the site. Pottery Mills approximately 50m west of the site. A coal pit and Brick Kiln located approximately 80m southwest of the site. Holt Town Reservoir is located approximately 300m west of the site. A series of canals including one with a dockyard associated with Fustian Mill is located approximately 90m north of the site. An engine house is located approximately 90m southeast of the site. Brick fields are located approximately 100m southwest of the site. Holt Town Cotton Mills are located approximately 400m west of the site. Railway sidings are located approximately 450m northwest of the site.
1891 1:2,500 1890-1891 1:10,560	Onsite Mill named changed to Reservoir Mill (Cotton), also encroaches over the majority of the site.	Ardwick Branch Railway is located directly west of the site. Holt Town Granite Works is located approximately 50m north of the site. Beswick Pottery is located approximately 30m west of the site. An increase of residential development to the south of the site including some residential terrace dwellings approximately 50m south of the site.

Date	On-Site History	Surrounding Land Use History
		A chemical works is located approximately 90m southwest of the site. Bradford Road Gas Works are located approximately 200m north of the site. Holt Town Reservoir no longer present on mapping records, increased industrial development as part of Bradford Road Gas Works.
1893 1:2,500	No Significant Change	Beswick Mineral Yard and Branch is located approximately 110m southeast of the site. An Iron Works is located approximately 90m east of the site.
1908, 1922 1:2,500 1905-1906, 1923 1:10,560	Ardley Street is now present onsite.	A row of terraced dwellings is located directly south of the site, an increase in residential development has also occurred approximately 100m east of the site. Beswick Mineral Yard development has increased in size. The site is currently almost entirely surrounded by a mixture of industrial and residential development.
1931, 1948- 1949, 1955- 1958 1:2,500 1933-1934, 1938, 1956, 1968 1:10,560	No Significant Change	Goods shed located at Beswick Mineral Yard increased in size. Progress Bakery is located approximately 90m northeast of the site. Tanks located at Reservoir Mill located approximately 80m north of the site. Pottery building no longer present directly west of the site. Reservoir located approximately 60m west of the site.
1978-1980, 1983-1987 1:1,250 1981, 1985, 1991, 2001 1:10,000	Ardley Street no longer present on mapping records. The encroaching factory has increased in size.	Terraced dwellings directly south no longer present, as are the dwellings approximately 80m northeast of the site. Industrial area directly west of the site has greatly reduced in size. Reservoir 60m west of the site no longer present. Industrial area directly north of the site no longer present.
2003 1:1,250 2021, 2024 1:10,000	Factory no longer present. An adjoining substation is located directly north.	A sports arena is located directly east/southeast of the site. Further sporting development is present approximately 400m southeast with the construction of Manchester

Date	On-Site History	Surrounding Land Use History
		City FC stadium. An adjoining 'Sport City' is also located around the vicinity. The industrial area directly west of the site has greatly reduced in size.
2000 Google Earth Satellite Imagery	The site is currently vacant and cleared for development.	Surrounding the site, immediately to the east/southeast, the area has been cleared for a relatively large building development. To the west there is a trainline immediately adjacent, further west there is a relatively small industrial development. Directly north is a separate trainline. A canal runs east to west to the north of the site. A gas works is located to the northwest of the site. Some residential development is located approximately 500m south of the site.
2003, 2005, 2009, 2013, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023 Google Earth Satellite Imagery	The site currently comprises a vegetated surface with an electricity substation directly north of the site,	The Etihad Campus, including Manchester Regional Arena, Manchester City Football Club Stadium, Manchester Tennis and Football Centre and Manchester Squash Centre has been developed directly east/southeast of the site.

Figure 5 OS Map Extract 1891

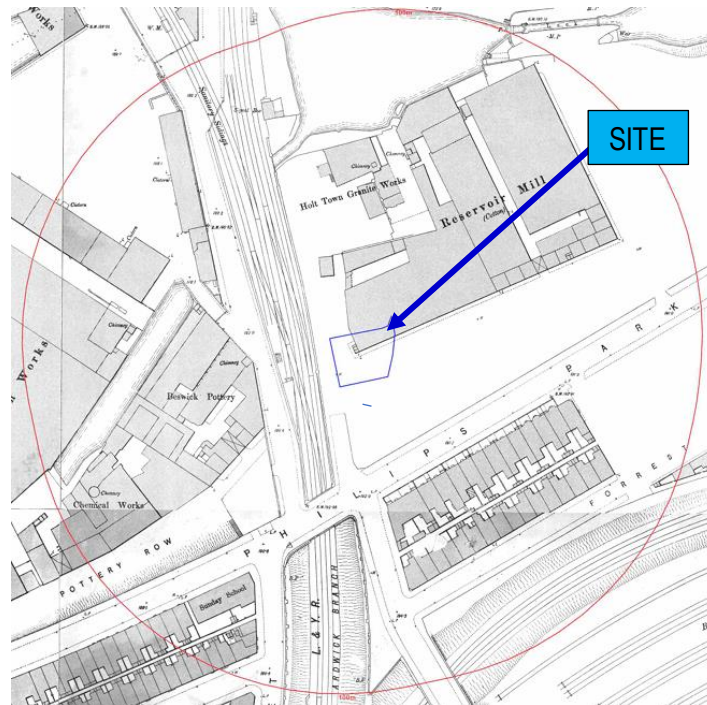


Figure 6 OS Map Extract 1955-1958

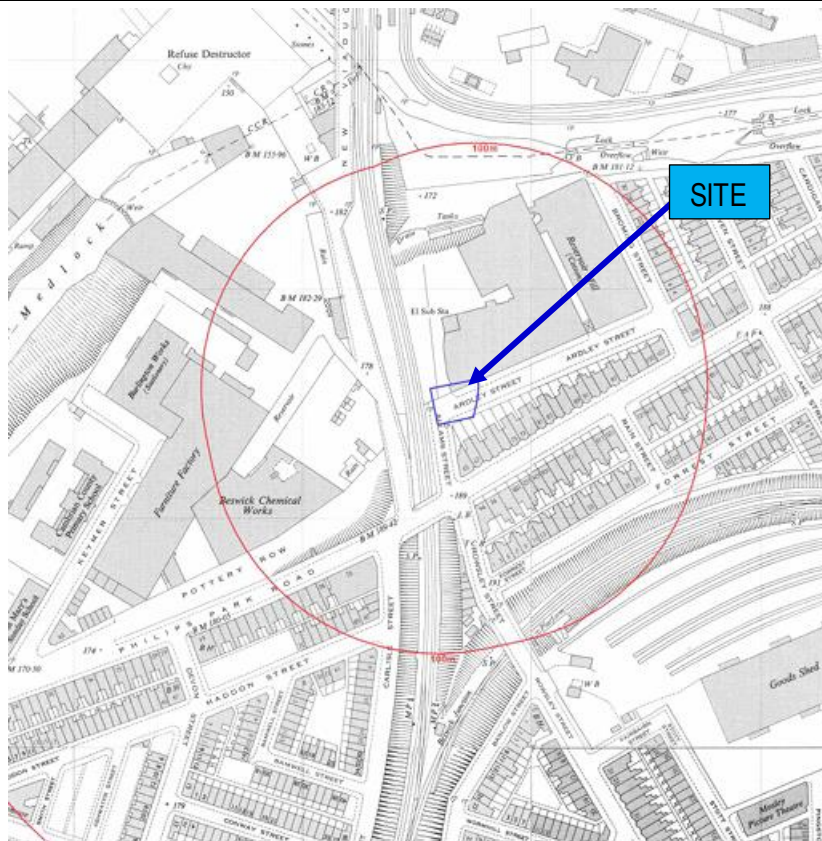


Figure 7 OS Map Extract 2010

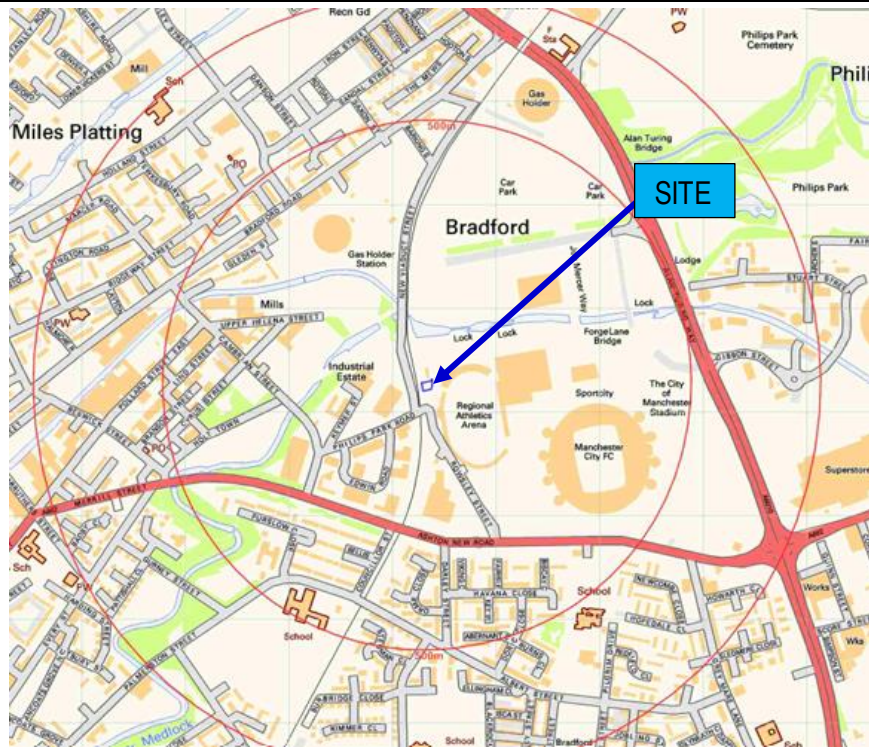


Figure 8 Aerial Photograph 2023



5.0 PRELIMINARY CONTAMINATION RISK ASSESSMENT

Introduction

- 5.1 The following paragraphs outline a Preliminary Risk Assessment (PRA) for the site based on the above desk study information as defined by Land Contamination Risk Management Environment Agency, July 2023.
- 5.2 Table 6 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 4 and Table 5 below. The assessment of probability, a modified risk table, and certain consequence definitions are based on CIRIA C552 and Land Contamination Risk Management Environment Agency, July 2023.
- 5.3 Table 6 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.
- 5.4 The PCM/PRA is based on a continued commercial end use.

Table 4: 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 5: 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

- 5.5 There is limited potential for contamination on the site. A site investigation has confirmed the absence of significant concentrations of ground gases or contaminants of concern.

Potential Receptors

- 5.6 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;
 - Groundwater within the underlying aquifer

Potential Pathways

- 5.7 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 shallow groundwater;
 - Vertical or lateral migration of ground gas.

Table 6: Preliminary Conceptual Model

Source	Pathway	Receptor	Probability	Consequence	Risk	Comment
Potential ground contamination E.g., Heavy Metals, PAH	Dermal contact, ingestion, and inhalation of soils dust	Current Site Users	Low Likelihood	Low	Low	The site currently comprises a semi-vacant plot of land with seemingly some areas used for storage. The site is predominantly surfaced with soft cover. There is also no current public access to the site. Therefore, the risk is considered LOW .
		Adjacent land users	Low Likelihood	Low	Low	The adjacent land comprises predominantly industrial and commercial land. Made Ground is recorded onsite; however, the surrounding areas are not constantly occupied. 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	Low	Low	The proposed development consists of a new primary substation with a switch control unit, no soft landscaping is included in the proposed development, and it is likely the site will be covered with hardstanding. Therefore, the risk to future site users via direct exposure is LOW .
		Construction Workers	Low Likelihood	Low	Low	Construction workers may be exposed to potentially contaminated soils during construction works, however exposure duration will be short-term only. There has been historic development on site, however given the age of the previous development, there is a low likelihood contamination. The risk to construction workers is considered LOW . Appropriate health and safety measures (in line with CDM and other relevant health and safety guidance) should be adhered to.
	Downward vertical migration of leachate to shallow groundwater	Groundwater within the Underlying Aquifer	Likely	Low	Moderate	Leachable contaminants are likely to be present on site due to the historic development and the recorded presence of Made Ground. Highly leachable soils are anticipated underlying the site. The recorded superficial soils underlying the site are Devensian Till, and the bedrock aquifer has a medium vulnerability with low leaching potential. The risk is therefore considered MODERATE .
	Lateral migration in surface waters	Surface water	Likely	Low	Moderate	Leachable contaminants are likely to be present on site due to the historic development. There is a surface water feature located north of the site. There are 10no. water network entries within 250m of the site, therefore the perceived risk to surface waters is MODERATE .
	Vertical or lateral migration of ground gas	Current Site Users	Low Likelihood	Low	Moderate to Low	The site currently comprises a semi-vacant parcel of land. Historically the site has had previous mill development, therefore Made

Source	Pathway	Receptor	Probability	Consequence	Risk	Comment
						Ground is anticipated, however due to the age of the Made Ground, any ground gas may have dissipated. There are no other significant sources of ground gas identified on site or within close proximity. Therefore, the risk to current site users from ground gas is considered MODERATE TO LOW .
		Adjacent land users	Unlikely	Low	Low	The adjacent land comprises of a mixture of industrial and commercial developments with limited current public access. Made Ground is anticipated onsite due to former structures, however given the age, there are likely no significant sources of ground gas identified on site. The risk to adjacent land users from ground gas is therefore considered LOW .
		Future land users	Low Likelihood	Low	Low	The proposed development consists of a new primary substation with associated switch station. The site is not located within a radon affected area with less than 1% of houses affected; it is unlikely any ground gas associated with previous structures is still present. Therefore, the risk is considered LOW .
		Construction Workers	Low Likelihood	Low	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 LOW .
Potential Asbestos Containing Material (ACM)		Current Site Users	Low Likelihood	Moderate	Moderate to Low	The proposed development site currently comprises a semi-vacant parcel of land with no current public access, however former structures may have contained ACMs. Therefore, asbestos may be present within the Made Ground, however, is only harmful when disturbed. The risk to current site users is MODERATE TO LOW .
		Adjacent land users	Low Likelihood	Moderate	Moderate to Low	The adjacent land comprises of industrial and commercial development with limited current public access. Given the historic onsite development, the presence of asbestos is likely within Made Ground soils. Dust control measures (dampening down) should be implemented as part of good site working practices to reduce the risk to MODERATE TO LOW .

Source	Pathway	Receptor	Probability	Consequence	Risk	Comment
		Future land users	Low Likelihood	Moderate	Moderate to Low	The proposed development consists of a primary substation with associated switch station, the development will not comprise soft landscaping and will likely be predominantly covered with hardstanding, therefore reducing asbestos pathways from the soils to humans. Historic onsite property building development may have contained ACMs due to their age. The risk is therefore considered MODERATE TO LOW .
		Construction Workers	Low Likelihood	Moderate	Moderate to Low	Construction workers may be exposed to asbestos within the Made Ground due to the development history of the site, however, this will only be for a short amount of time. Therefore, the risk is considered MODERATE TO LOW .

6.0 GEOTECHNICAL HAZARDS ASSOCIATED WITH THE DEVELOPMENT

- 6.1 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 considering of ground conditions and land instability, including from natural hazards to former activities such as mining.
- 6.2 A summary of the geotechnical considerations is provided below in Table 7.

Table 7: Summary of Geotechnical Hazards

Geohazards:	
Highly Compressible Ground	Very low risk
Collapsible Soils	Very low risk
Swelling Clay	Very low risk.
Running Sand	Very low risk
Ground Dissolution	Negligible risk
Landslip	Ver 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 High Development Risk Area. Therefore, the risk from mining is LOW .
Geotechnical Design Considerations	
Site Clearance	The proposed development site currently comprises a semi-vacant parcel of land with some areas used for storage.
Trees	No standing trees are present on the site.
Existing Buildings/Obstructions	It is unknown if there are any obstructions on the site.
Foundations	The depth and type of proposed foundations would depend on the ground conditions present on site. The site is recorded to be underlain by superficial deposits of Devensian Till. If cohesive soils are encountered the depth of foundations will need to be adjusted for the effects of nearby trees in accordance with NHBC guidance. An intrusive ground investigation is recommended prior to any construction works taking place to discover the most suitable foundation options for the site and to make sure the ground conditions are the same across the entire site.
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 investigation would be needed. However, it is recorded that the site is underlain by a Secondary A Aquifer. The highest risk of groundwater flooding occurring on-site is NEGLIGIBLE .
Earthworks	Extensive earthworks are unlikely to be required for the proposed development.
Slopes	There are no slopes located directly on the proposed development site.
Retaining Walls	A retaining wall will not be utilised on this site.
Chemically aggressive ground conditions	Chemically aggressive ground conditions are not expected at this site. An intrusive geotechnical investigation would be necessary to confirm chemically aggressive ground.

7.0 CONCLUSIONS & RECOMMENDATIONS

Conclusions

- 7.1 The site has historically accommodated an encroaching mill which later reduced in size and Ardley Street later accommodated the site.
- 7.2 All onsite development ceased to be present onsite from 2001 and a electricity substation was built directly north of the site from 2003.
- 7.3 It is understood that the client wishes to construct a new primary substation with an associated switch station. The site will likely be covered in predominantly hardstanding.
- 7.4 There is potential for contamination on the site due to the development history of the site, however, the ground investigation concluded that a contamination exceedance in benzo(b)fluoranthene was encountered. This exceedance was attributed to the presence of clinker in the soil matrix.
- 7.5 The site is recorded to be underlain by superficial deposits of Devensian Till (Secondary Undifferentiated Aquifer). The solid geology consists of the Pennine Lower Coal Measures Formation comprising mudstone, siltstone, and sandstone (Secondary A Aquifer).
- 7.6 The site is located within the specified search distance of an identified coal mining area. However, the site is not located within a Coal Authority Development High Risk area.
- 7.7 The property is not located in a Radon Affected Area, as less than 1% of the properties are above the Action Level.
- 7.8 Given the development on site, the overall risk from soil contamination to end users and construction workers is **LOW**.
- 7.9 The overall risk to controlled waters is concluded to be **MODERATE** based on the potentially very high leaching potential of the Made Ground soils and nearby presence of surface water features.
- 7.10 The risk from ground gas to end users and construction workers is **MODERATE TO LOW** due to previous development history onsite and the recorded presence of onsite Made Ground.
- 7.11 An Environment Agency Flood Zone 2 and 3 are not located on site and the highest risk of groundwater flooding is **NEGLIGIBLE**.

Recommendations

- 7.12 No further investigative work or remedial measures are required on the site.

APPENDIX 1

GROUNDSURE REPORTS

APPENDIX 2

REPORT LIMITATIONS

LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd based on 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 2024 and should be read considering 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 of 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.