T J BOOTH ASSOCIATES

CONSULTING CIVIL & GEOTECHNICAL ENGINEERS

ENVIRONMENTAL AUDIT STAGE I REPORT.
Land at Pembroke St.
Cheetham Hill.
Salford.

Client:	Styal Properties Ltd
	177 Styal Rd
	Heald Green
	Cheadle
	Cheshire
	SK8 3TX.
Date:	Mar 10.
Reference:	rep-tjba-baker-pembroke st-stage I enviro-190310.docx

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ENVIRONMENTAL AUDIT STAGE I REPORT.

Land at Pembroke St.

Cheetham Hill.

Salford.

INTRODUCTION.

T. J. Booth Associates have been appointed by Styal Properties Ltd to undertake a Stage I Environmental Audit of a proposed residential housing development at land off Pembroke St, Cheetham Hill.

PROPOSED DEVELOPMENT.

The development comprises a detached and a pair of semi detached properties. They are of conventional masonry and or timber frame construction with access drives, footways and garden areas as per the plan in the appendix.

HISTORY & DESCRIPTION OF THE SITE.

.

Review of Historic Maps.

A review of historic maps at nominally 1:10000 scale of the Site and the surrounding area was undertaken in the data search. They are reviewed and tabulated below.

Date	On Site	Off Site
1848		193 m W, quarrying & clay brick / tile manufacture.
1895		57 m SE, infilled pond, marsh, stream. 200 m S, unspecified factory, infilled quarrying.

Review of Present Day Maps.

Referring to present day 1:25000 OS map and digital map data.

Site boundaries, outlines of structures and building lines.

The maps indicate the Site to be an area of open land containing private garages bounded by the edges of St James Rd and Pembroke St to the NE & NW sides respectively, private gardens on the SE side with an electrical substation on the NE corner and public open space to the SW.

Ground contours and natural drainage features.

The Site region appears to slope down to the S towards the City Centre (river Irwell).

RECONNAISSANCE OF THE SITE

The Site was inspected 16th Mar 10, the weather was mild, dry with broken cloud and occasional sunny intervals.

Details of the reconnaissance are reproduced on the existing Site plan in the appendix.

Records and details of existing structures.

The site contained the remains of former private garage bases and access ramps of brick and concrete construction cleared down to ground level. Partially made footpaths extended across the NW side of the Site linking to St James Rd (N corner) and Melrose St at the SE corner.

Records of adjacent properties.

The surroundings were predominantly urban residential. Those to St James Rd were circa 1900, to the SE side were c 1940's with a few as recent as 1980's. To the S the properties were c 1960 / 70's. Across Pembroke St to the NW was a church and vicarage dating back to C 1850 / 1900.

Records of any obvious or immediate hazards to health or safety.

The Site was open and unfenced, was used for limited fly tipping and did not contain any obvious evidence of hazards to health or safety.

Records of areas of discoloured soil, polluted water, vegetation, significant odours.

The unpaved areas of the Site had a covering of grass and perennial weeds / shrubs. There was the occasional willow sapling growing into the gaps between the garage bases and the a 600 diameter tree stump (unidentified species) to the NE end.

Record where relevant ground water levels, positions of wells and springs.

The Site sloped downwards approx S at 1:50. Drainage was urbanised with no evidence of watercourses noted.

SITE SETTING.

Introduction.

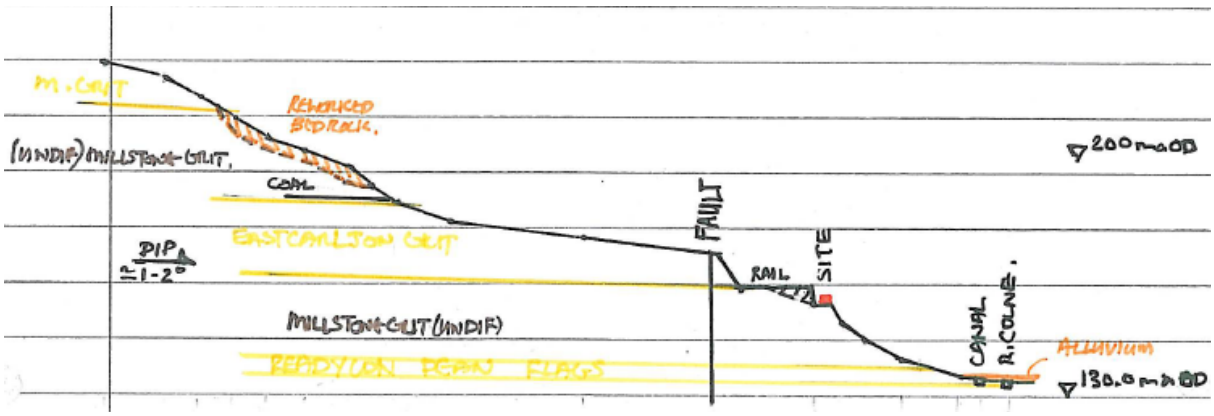
An environmental data search was made using Landmark Envirosearch Residential ref RS30368491_1_1. In addition a Ground Stability Report (ref 30368491_2) was obtained from Landmark.

Geology.

Review of the Manchester solid and superficial geology maps. .

The superficial geology map indicated that the area is underlain by glacial boulder clays. To the north (500 m) are deposits of glacial sands & gravels over the boulder clay and to the south & west (1000 m) are fluvial river terrace deposits incised into the boulder clays associated with the valley containing the river Irwell.

The solid geology comprised Triassic Sherwood (Bunter) sandstones beneath the area. A subfracture of the Ardwick fault transects in a NW-SE direction 150 m SW of the Site.



The depths of the glacial boulder clays varies from a few to tens of metres and comprise low permeability silts / clays with lenses of sands & gravels.

Hydrogeology.

The superficial deposits are likely to be low permeability acting as aquicludes with perched water tables within S&G lenses.

Natural or manmade and subsequently infilled hollows within the superficial deposits can contain perched water.

The underlying (Triassic) sandstones are a functional water abstraction aquifer used for industrial and public water supplies.

Hydrology.

The regional drainage is generally to the south towards the river Irwell. The historic urbanisation of the region has culverted former watercourses and surface water is conveyed within piped systems.

Mining Report.

The underlying solid geology does not contain coal deposits.

A review of the ground stability data search did not reveal records of cavities, mine entries or shafts on or local to the Site.

Landfill Search.

A search was made with Manchester City Council Regulatory & Enforcement Services for records of landfills on or close to the Site. Refer to appendix for letter report and plan.

The search indicated that an extensive area south of the Site (Fairy lane landfill) was utilised for excavation of clays for brick making in the late 1800 to early 1900's. This was subsequently landfilled pre COPA 74 with a mixture of unregulated domestic & commercial wastes from the early part of the last century.

The boundary to the clay pit / landfill is not well defined in the records, but the nearest proximity is possibly 100 m S of the Site.

Site investigations records held by MCC into the known landfill area have revealed contamination and elevated ground gases.

INDUSTRY PROFILE.

The Site or immediate locality has no recorded contaminative industry, so a profile is not proposed.

DISCUSSION AND CONCLUSIONS FROM THE DESK STUDY & FIELD WORK.

Potential Sources.

Current Land Use (within 250 m of the Site).

Waste & Landfill Sites.
The Site is adjacent to known historic landfills with records of gas generation and containing contaminated soils.

Statutory Authorisations.
None recorded.

Discharge Consents.
None recorded.

Industrial Processes.
Non recorded.

Storage of Hazardous Substances.
Non recorded.

Contraventions.
Non recorded.

Potentially Contaminative Uses.
Non recorded.

Miscellaneous.
The Site is adjacent to an electricity substation building dating back to 1950's.

The Site has been used for private motor vehicle garaging for many decades and would have been subject to spillage of fuels and lubricants.

It also has been open to fly tipping and could contain residual contaminants contained in tipped material.

Historical Land Use.

Potentially Contaminative Uses.
Clay, brick / tile manufacture (clay pit / quarry), newspaper printing 200 m away in the late 1800's.

Potentially Infilled Land.
Infilled pond or stream 60 m SE and infilled quarry / pit upto 1980's 200 m W & S (Fairy lane landfill).

Potential Pathways.

The model considers aerial, surface water, ground water and ground gas pathways between sources and receptors.

The development will have formal garden or planting and some paved areas, so ingestion of contaminated soils and vegetables will be included.

Principal potential pathways associated with human health from soil contamination are ingestion, dermal and inhalation. The CLR104 document recognises ten such pathways comprising four ingestion, two dermal and four inhalation. These are listed as follows:

- Ingestion of soil
- Dermal contact with soil
- Inhalation of soil-derived outdoor dust
- Ingestion of soil-derived indoor dust
- Dermal contact with soil-derived indoor dust
- Ingestion of contaminated vegetables
- Ingestion of soil attached to vegetables
- Inhalation of vegetable-derived indoor dust
- Inhalation of vapours outside
- Inhalation of vapours inside

Offsite Pathways.

Groundwater, Geology, Historical & Present Flood Liabilities.
Surface water and groundwater are principal mechanisms for the migration of contaminants, with rainwater infiltrating through contaminated material and contamination possibly going into solution. Contaminated water may then find preferential pathways to surface waters and the underlying aquifer. Culverts, ditches, drains may provide preferential pathways off site. The site reconnaissance did not indicate drains were present on the study site.

The Site is underlain by low permeability glacial CLAY deposits overlying the sandstone bedrock.

The regional groundwater is table is located in the sandstone aquifer with the possibility of perched tables within and in recent deposits above the glacial clays.

The Site is not within or close to a flood risk zone, all surface water is managed in piped drainage systems.

Potential Receptors.

The potential receptors are considered to be the site construction operatives, future occupants of the dwellings, users of the surrounding areas.

Potential receptors with respect to human health and hazards present on the site include residents of the proposed development and future site construction workers. Depending on the nature and concentration of the potential contaminants, the underlying Major Aquifer may also be considered as potential receptor along with building materials and services.

The nearest water course is approximately 500 m south of the study site and is therefore not considered a viable receptor given the environmental setting and distance from the study site.

Environmentally Sensitive Receptors.

Non noted on or close to the Site.

Protected Countryside Areas.

Non noted close to the Site.

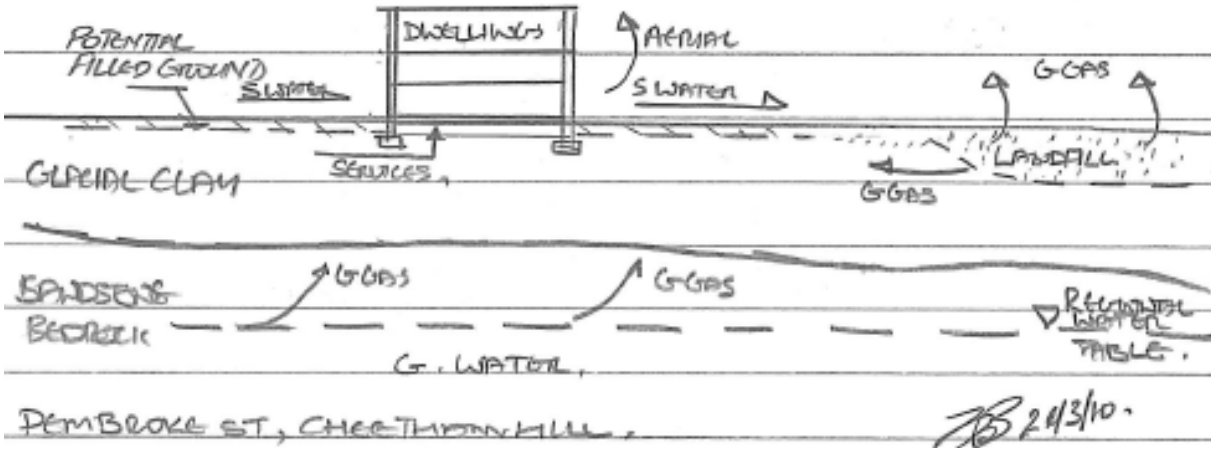
Preliminary Conceptual Model.

Introduction.

The aim of the conceptual model is to provide an assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway and receptor.

The conceptual model can be used to make an informed decision on the contamination risks associated with the site and whether further site investigation work is required.

The sections below are therefore divided into potential contaminant, potential pathway and potential receptor as described in CLR113. The final section provides an assessment of the potential pollutant linkages that may still be present on the site if redevelopment were to occur.



Local Conceptual Model.

The conceptual model is illustrated above and is based upon the local geological model given earlier.

Preliminary Contamination Conceptual Model.

The preliminary conceptual model for the Site is illustrated in the table below and has identified six potential pollutant linkages, all of which are considered possible.

Each linkage is discussed below along with an assessment of the likelihood of each linkage considering the available data and the nature of the development.

Pollutant linkages 1 refers to the anticipated heavy metals and organic compounds coming into direct contact with future site residents and site construction workers. This is considered possible in areas of proposed gardens and landscaping for future site users and construction workers who may come into contact with the soils during site work.

Potential pollutant linkage 2 refers to potential vapours present on the site affecting the future site residents and nearby site residents. This linkage is considered possible given the potential for organic contaminants.

Potential pollutant linkage 3 refers to potential hazardous and ground gas on the site affecting the future site residents and nearby site residents. This linkage is considered possible given that there are a number of areas within 250m of the study site boundary which may have been infilled.

Potential pollutant linkage 4 refers to the possible deleterious effects that sulphate, organic compounds and landfill gas may have on building materials such as concrete, water pipes and building structures.

Potential pollutant linkage 5 refers to the possible contaminants and the underlying Aquifer. This linkage is considered possible given the potential for inorganic and organic contamination at the site.

Potential pollutant linkage 6 refers to the potential contaminants permeating potable water pipes and consumption by the future residents of the tainted water supply. This linkage is considered possible given the potential for inorganic and organic contamination at the site.

Pollutant Linkage No	Contaminant			Pathway	Receptor
	Hazardous Gases	Inorganic	Organic		
1		Under site subsoil	Under site subsoil	Dermal contact, ingestion and inhalation of contaminated soil & dust.	Site operatives, future residents.
2	Under site subsoil			Inhalation of vapours	Site operatives, future residents.
3	Ground gas			Ground & hazardous gas migration.	Site operatives, future residents.
4		Under site subsoil	Under site subsoil	Contact with potential	Site buildings.

				hazards.	
5		Under site subsoil	Under site subsoil	Groundwater migration.	Major aquifer, local water bodies.
6		Under site subsoil	Under site subsoil	Ingestion of tainted water supply.	Future residents.

CONCLUSIONS.

Preliminary Contaminant Risk Assessment.

The preliminary conceptual model has identified the source, pathway and receptor risks associated with the Site. These are considered below in relation to the overall environment to determine the likely risks associated with the Site and its development.

Pollutant linkage 1, 2, 4, 5 & 6 associated with the contaminated made ground will require assessment by sampling and testing of surface soils and underlying natural soils for a range of common potential soil contaminants. The test suite will include, pH, common metallic elements, organic and inorganic compounds including PAH's and fuel oil derivatives.

The likely presence of ground gas from natural and man made sources can be assessed by undertaking trial holes / boreholes to determine the soil profiles and properties to determine if potential sources / pathways exist.

The sub soils encountered beneath the Site exhibited acceptable pH, sulphate and sulphide levels and as such will not present a risk to normal construction materials. Thus linkage 4 is also discounted.

Linkage 5 is discounted because; the SI did not reveal any groundwater at shallow depth beneath the Site and the contaminated soils were all within the upper soil profile above the water table. The proposed finishes will isolate contaminated material from potential surface water leaching thus it could not present a risk to off site receptors due to migration via ground water.

RECOMMENDATIONS.

A site investigation is commissioned to determine the subsoil stratigraphy and properties. The site area is nominally 500 sqm, so it is recommended that minimum of 4 exploratory holes are made. Refer to SI plan in appendix.

The SI can include sampling & testing of soils as required for contaminants as above.

The need for ground gas monitoring can be assessed from the outcome of the stratigraphical studies and soil properties and advised subsequently.

During construction operation vigilance should be maintained fro the presence of suspect contaminated pockets and appropriate guidance sought.

Signed……

T J Booth BSc (Hons), C. Eng. C. Env. MICE.

T J Booth Associates.

REFERENCES.

Landmark Envirosearch Residential Report, RS30368491_1_1, 3rd Mar 2010.

Landmark Ground Stability Report, HCS30368491_2, 3rd Mar 2010.

Letter Manchester City Council, Landfill Search, 16th Mar 2010.

APPENDICES.

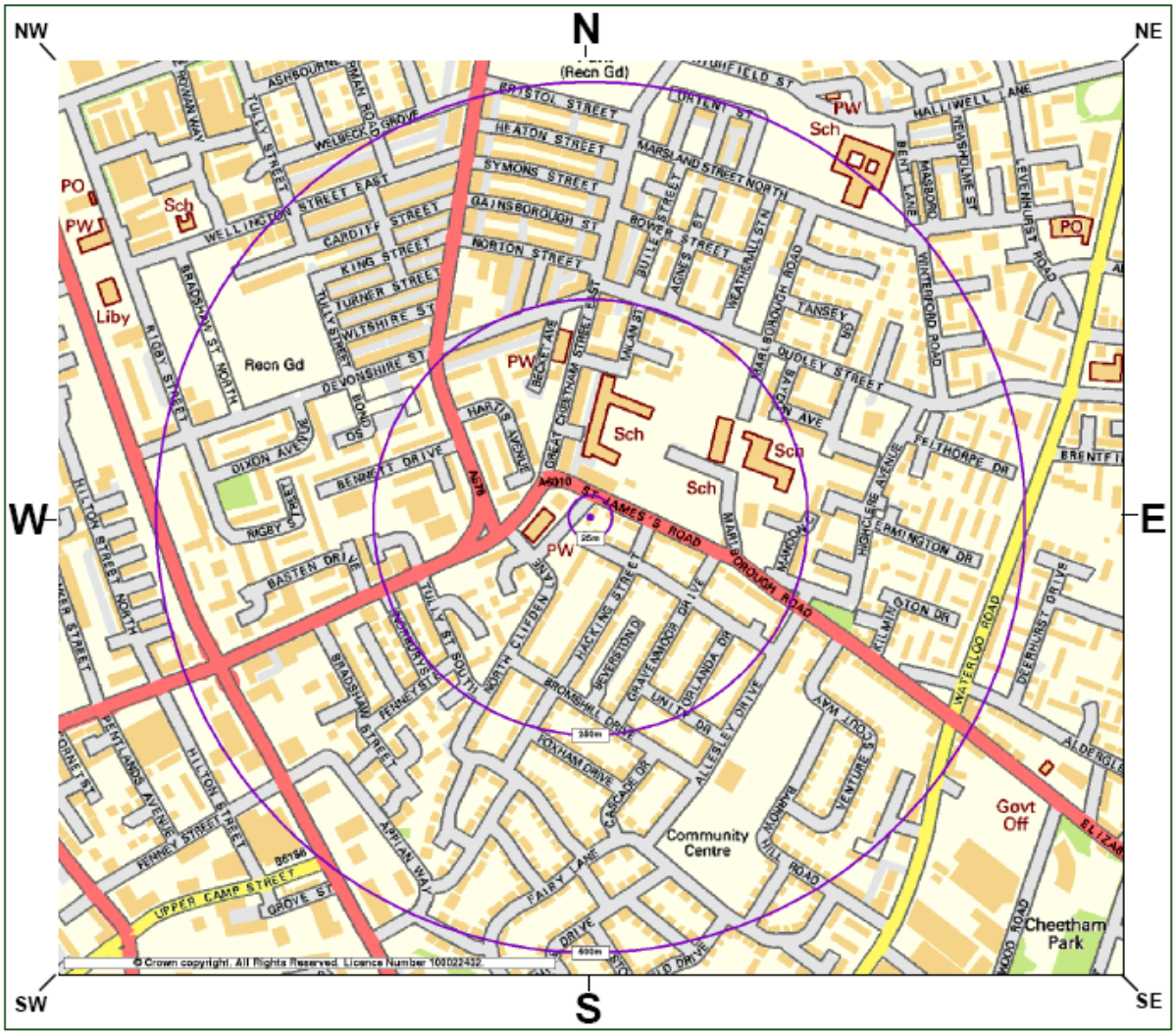
Photographs.

Views of the Site Mar 10.



Figures.

Location Plan



Site

Pembroke st
Cheetham Hill
SALFORD

Grid Reference

Easting 383410

Northing 400800

Existing Site Plan



Proposed Plot Plan



Proposed Site Investigation Plan

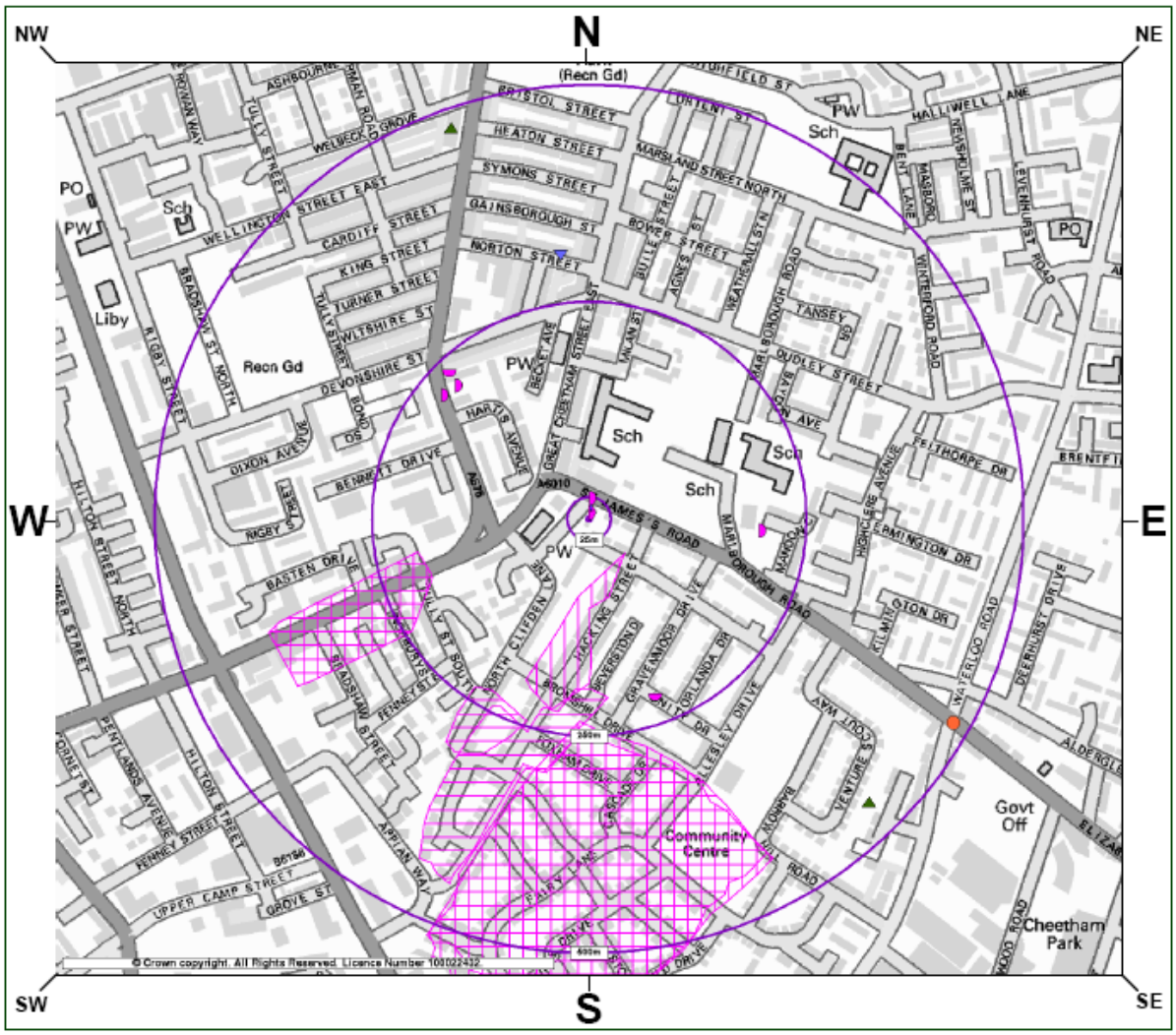


Solid & Drift Geology of the Region.





Search results of Environmental databases for a 250m radius of the site.



KEY

General

Centre of Search and Radii

Part 1

Q1.1a Potential Landfill Buffer
Q1.1a Registered Landfill Site
Q1.1a Point Location of Registered Landfill Site
Q1.1b BGS Recorded Landfill Site
Q1.1b Point Location of BGS Recorded Landfill Site
Q1.1c Licensed Waste Management Facility (Landfill)
Q1.1c Licensed Waste Management Facility (Locations)
Q1.1d Local Authority Recorded Landfill Site
Q1.1d Point Location of Local Authority Recorded Landfill Site

Q1.2 Waste Transfer, Treatment or Disposal Site
Q1.2 Point Location of Waste Transfer, Treatment or Disposal Site
Q1.3a Discharge Consent
Q1.3b Radioactive Substance
Q1.3c Industrial Process
Q1.4 Regulated Air Pollution
Q1.5 Storage of Hazardous Substance
Q1.6 Enforcement, Prohibition or Prosecution
Q1.7 Contaminated Land Register Entry or Notice
Q1.7 Point Location of Contaminated Land Register Entry or Notice

(Please refer to the Useful Information Section)

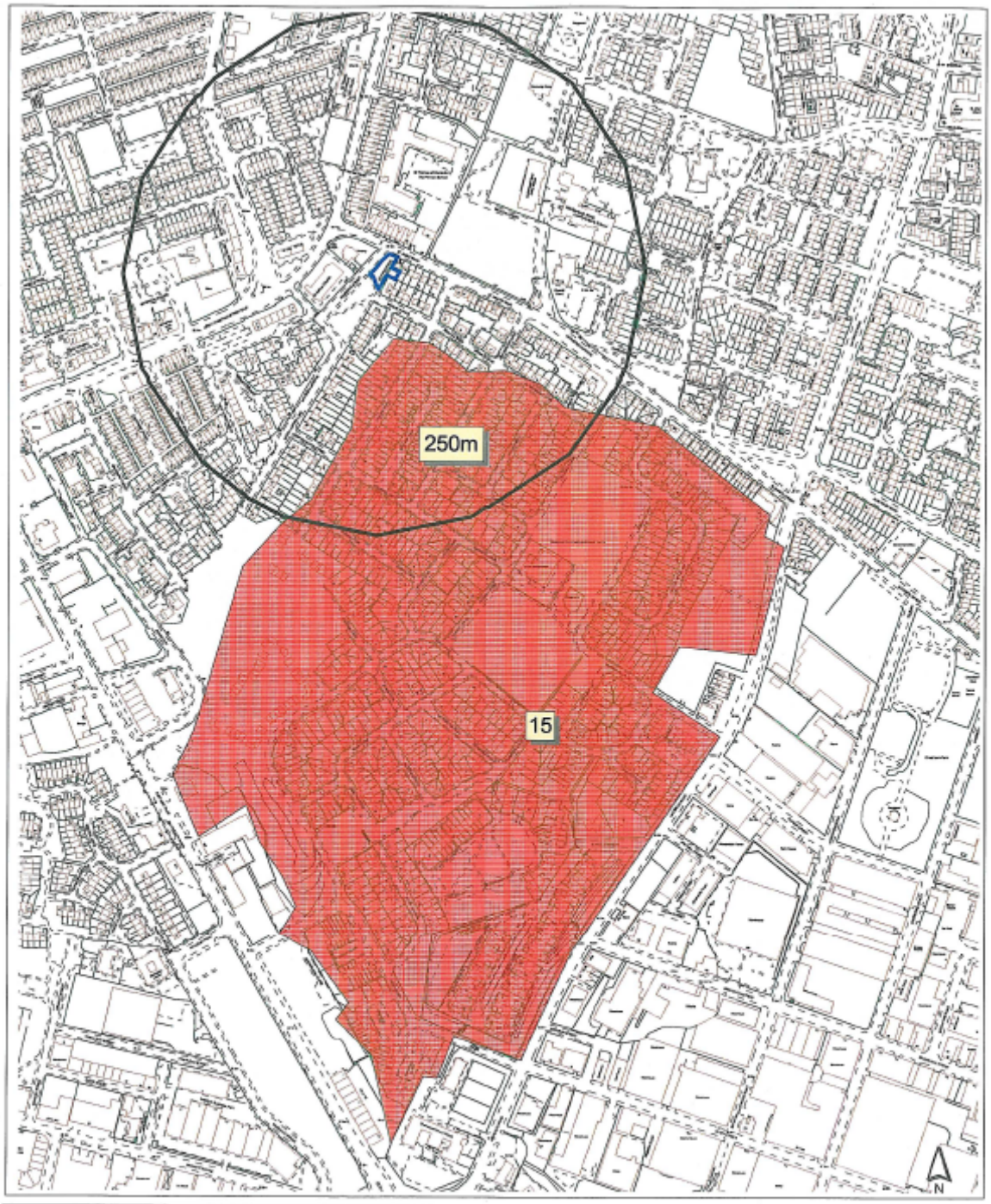
Part 2

Q2.2 Potentially Contaminative Use (Point Feature)
Q2.2 Potentially Contaminative Use (Line Feature)
Q2.2 Potentially Contaminative Use (Area Feature)
Q2.3 Potentially Infilled Land (Point Feature)
Q2.3 Potentially Infilled Land (Line Feature)
Q2.3 Potentially Infilled Land (Area Feature)
Q2.4 Historical Tank or Energy Facility

Part 4

Q4.2 Mast or Pylon
Q4.2 Overhead Transmission Line

Manchester City Council, Landfill Search Map.



MANCHESTER CITY COUNCIL
Contaminated Land Section
Environmental Services

Figure 1. Landfill sites within 250 Metres of the enquiry site

Enquiry site (based on information supplied)
Site Boundary

Printed scale: 1:5000

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CIRIA SP 78, TABLE 15, Contaminant hazards related to end use.

	Targets and associated hazards[1]						
	1 Site works	2 Water resources	3 Buildings and services	4 Buildings and services	5 Garden amenities	6 Allotments, agriculture	7 Plant growing
Critical Contamination[2]	Harm to workers[3]	Leachate pollution[4]	Fire and explosion	Corrosion or expansion damage[4]	Harm to children[5]	Crop uptake of contaminant[4]	Phyto-toxicity[4]
Arsenic	o	o			●	o	
Cadmium		o			●	●[15]	
Lead		o		o[11]	●	●[15]	
Cyanide	o	●			●[14]		
PAH[6]	●		o		●		o
Phenols	●	●		●	●		o
Copper		o		o[11]	o		●[16]
Nickel		o		o[11]			●[16]
Zinc		o		o[11]			●[16]
Sulphate		●		●[12]	●		o
Sulphide		o		●			
Chloride		o		●			o
Mineral oils	●[8]	o	o	●	o		
Ammonium ion				●			
Methane	o[9]		●[9]				o
Sulphur			●	o[13]			
Combustibles	o		●[7]				
Oily, tarry substances	●	o	o	●			o
Asbestos	●	o[10]					
Radioactive materials	●	o			o	o	
Soluble metals		●		o	o		
pH	o	●		●		●	●
Solvents and organics	o	o	o				
Boron		o					o
Expansives				o[17]			

● Listed contamination hazards (from BS,DD 175 1988, and ICRCL Note 59/83 2nd edition 1987).

o Non-listed contamination hazards.

Notes.

1 Combinations of hazards may need investigation.
2 Local factors may involve other contaminants.
3 Workers at risk from contact, inhalation, explosion, fire and ground pH.
4 Soil pH affects incidence of these hazards.
5 Children at risk from inhalation, ingestion and contact.
6 PAH polynuclear aromatic hydrocarbons.
7 Combustibles include coal, oils, tars, refuse, rubber, etc Determine calorific value, loss on ignition, ash and volatile contents, total organic carbon.
8 Mineral oils are industrial hygiene problem, with or without PCB contamination.
9 Continuous on-site monitoring.
10 Hazard if run-off carries friable asbestos into streams.
11 Electrolytic action if free metal present.
12 Total and soluble sulphate (See also Section 1 1.4.4).
13 Corrosion induced by sulphur consuming bacteria.
14 'Free' cyanide.
15 Total and 'plant-available' metals.
16 Total, 'plant-available' and 'zinc equivalent' values.
17 Expansives include: blast-furnace and steel slags, mining spoils and pyritic materials. Determine: total sulphur and acid soluble sulphate, calcite, and calcium as CaO.

CLR 8, table2.1.

Table 2.1 Potential inorganic contaminants for the assessment of industrial land and their receptors

Contaminants [a, b]	Receptors			
	Humans	Water	Vegetation and the ecosystem	Construction materials
Metals				
Barium		✓		
Beryllium	✓	✓	✓	
Cadmium	✓	✓	✓	
Chromium	✓	✓		
Copper		✓	✓	
Lead	✓	✓	✓	
Mercury	✓	✓	✓	
Nickel	✓	✓	✓	
Vanadium	✓	✓		
Zinc		✓	✓	
Semi-metals and non-metals				
Arsenic	✓	✓		
Boron		✓	✓	
Selenium	✓	✓	✓	
Sulphur	✓		✓	✓
Inorganic chemicals				
Cyanide (complex)	✓	✓	✓	✓
Cyanide (free)[c]	✓	✓	✓	
Nitrate		✓		
Sulphate		✓	✓	✓
Sulphide		✓	✓	✓
Other				
Asbestos	✓			
pH (acidity/alkalinity)	✓	✓	✓	✓

Notes

[a] The list should not be regarded as a comprehensive list that should be taken into account in any particular site investigation. Some contaminants will be of no importance on certain types of site, while some sites may be contaminated by elevated concentrations of particular substances, which may not be selected because of their infrequent occurrence generally.

[b] For references to synonyms of substances refer to Appendix C.

[c] Free cyanide is broadly equivalent to "easily liberatable cyanide", which covers compounds that can release hydrogen cyanide at pH 4 and 100°C (see paragraph B.15 in Appendix B).

CLR 8, table2.2.

Table 2.2 Potential organic contaminants for the assessment of industrial land and their receptors

Contaminants [a, b]	Receptors			
	Humans	Water	Vegetation and the ecosystem	Construction materials
Acetone	✓	✓		
Oil/fuel hydrocarbons	✓	✓	✓	✓[c]
Aromatic Hydrocarbons				
Benzene	✓	✓	✓	✓[c]
Chlorophenols	✓	✓	✓	✓[c]
Ethylbenzene	✓	✓	✓	✓[c]
Phenol	✓	✓	✓	✓[c]
Toluene	✓	✓	✓	✓[c]
o-Xylene	✓	✓	✓	✓[c]
m,p-Xylene	✓	✓	✓	✓[c]
Polycyclic Aromatic Hydrocarbons	✓	✓		
Chlorinated Aliphatic Hydrocarbons [d]				
Chloroform	✓	✓	✓	
Carbon tetrachloride	✓	✓	✓	✓[c]
Vinyl chloride	✓	✓		
1,2-Dichloroethane	✓	✓	✓	✓[c]
1,1,1-Trichloroethane	✓	✓	✓	✓[c]
Trichloroethene	✓	✓	✓	✓[c]
Tetrachloroethene	✓	✓	✓	✓[c]
Hexachlorobuta-1,3-diene	✓	✓	✓	
Hexachlorocyclohexanes	✓	✓	✓	
Dieldrin	✓	✓	✓	
Chlorinated Aromatic Hydrocarbons				
Chlorobenzenes	✓	✓	✓	
Chlorotoluenes	✓	✓	✓	
Pentachlorophenol	✓	✓	✓	
Polychlorinated biphenyls[e]	✓	✓	✓	
Dioxins and furans[f]	✓	✓	✓	
Organometallics				
Organolead compounds	✓		✓	
Organotin compounds	✓	✓		

Notes

[a] The list should not be regarded as a comprehensive list that should be taken into account in any particular site investigation. Some contaminants will be of no importance on certain types of site, while some sites may be contaminated by elevated concentrations of particular substances, which may not be selected because of their infrequent occurrence generally.

[b] For references to synonyms of substances refer to Appendix C.

[c] The impact of chlorinated hydrocarbons and other organic substances is probably limited to concentrations in the free phase.

[d] Some chlorinated aliphatic hydrocarbons are considered to be of secondary importance (see paragraphs B.16 and B.17 in Appendix B) and are therefore excluded because they are less toxic, highly volatile or have limited industrial use. However, some highly volatile substances may be significant due to their solubility and are not excluded on grounds of volatility alone.

[e] There are 209 polychlorinated biphenyl (PCB) congeners, the significance of which can be expressed using toxic equivalency factors (TEFs) relative to the best-characterised member of the group.

[f] There are 210 possible isomers of chlorinated dioxins and furans, of which the most studied and most toxic representative of the group is 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD). Other dioxins and furans could be expressed in terms of TEFs relative to 2,3,7,8-TCDD.