GROUNDTECH
CONSULTING

113-117 NORTH ROAD, MANCHESTER

GEO-ENVIRONMENTAL APPRAISAL

BARRATT AND DAVID WILSON HOMES
YORKSHIRE WEST

JULY 2024

GROUNDTECH CONSULTING

Document Control Form		
PROJECT	*113-117 NORTH ROAD, MANCHESTER*	
REPORT NAME	*GEO-ENVIRONMENTAL APPRAISAL*	
REPORT REFERENCE	*GRO-23050-4802*	
STATUS	*FINAL*	
ISSUE DATE	*22 JANUARY 2024*	
REVISION	*18 JUNE 2024*	*1.1*
	16 JULY 2024	*1.2*
CLIENT	*BRINDLE AND YAM SOLICITORS*	
CLIENT CONTACT	*LISA YAM*	
For and Behalf of Groundtech Consulting		
SIGNATURE		
AUTHOR	Emma Lucy Welch MSc (Hons)	
SIGNATURE		
CHECKED	Connor Hastings BSc (Hons) FGS	
SIGNATURE		
REVIEWED	John Taylor BSc (Hons)	

SUMMARY

Site Details	
Site Location	*The site is located circa 2.5 miles east of Manchester City Centre and is approximately centred on National Grid Reference 388011, 398691*
Site Area	*The site is roughly rectangular in shape and encompasses an area of approximately 0.03 hectares. The topography of the site is generally flat lying, however a small grass-surfaced mound is present in the north-western corner.* *The site currently stands disused and overgrown. Hard surfacing is present in the north-eastern corner of the site as part of a relic driveway from the previous development. The east of the site is surrounded by Heras fencing and is surfaced by rubble which is overgrown with grass and shrubs. The west of the site is surfaced by overgrown grass.* *A large bush is located in the north of the site, and another is present adjacent to the site to the east.*
Ground Model	
Made Ground Soils	*Surfacing at the site comprised dark brown slightly clayey sandy gravelly topsoil with rootlets and minor constituents of brick to a maximum depth of 0.30m bgl.* *Dark brown grey gravelly sand with minor constituents of brick, tarmac, and concrete was encountered within WS01 to WS03 from depths of between 0.15m and 0.30m bgl to depths of between 0.60m and 0.70m bgl.*
Natural Soils	*Firm brown mottled grey sandy clay was encountered in all exploratory holes from depths between 0.25m bgl to 4.00m bgl. Rare angular to rounded fine to medium gravel of sandstone was encountered within the Clay.* *Medium dense to dense light brown fine to coarse sand was encountered in all exploratory holes from depths between 3.00m bgl to 4.00m bgl.*
Bedrock	*Bedrock was not encountered during the investigation.*
Groundwater	*Groundwater seepages were encountered in WS01 and WS04 at 3.00m bgl within the natural strata.*
Ground Engineering Assessment	
Foundations	*The most suitable foundations for the proposed dwellings are considered to be traditional strip/trench fill foundations constructed in the firm Clay at a minimum depth of 1.00m bgl. Foundations should be deepened through all Made Ground which has been encountered across the site to a maximum depth of 0.70m bgl.*
Concrete	*The results of laboratory pH and sulphate content indicate that ACEC Class AC-1^{s} and sulphate class DS-1 conditions prevail in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005.*
Highways	*CBR values of greater than 5% are likely to be achieved in undisturbed natural soils for pavement design purposes, unless proven otherwise by in-situ testing at sub-base level by a specialist geotechnical engineer.*

SuDS	*The use of SuDS drainage within the natural ground is not likely to be feasible at the site due to the presence of cohesive soils which are capable of poor soil infiltration rates.* *If drainage of the highway to soakaways is to be considered it is suggested that this is discussed with the Local Authority at the earliest opportunity, to confirm the adequacy of proposed testing and to allow their inspection of any testing.*
Constraints	*The main constraints at the site include:* • *The hard surfacing within the eastern portion of the site associated with the previous use as driveways and garages.* • *The large bushes and areas of vegetation.* • *Access from Barrington Street as it is a small residential road.*
GQRA and Revised (PL) Assessment	
Human Health	*The risk to Human Health is considered to be Low as only two elevated concentrations of Dibenzo(ah)anthracene have been encountered within the Made Ground. No other elevated Contaminants of Concern have been detected, and no asbestos has been detected however a cover system should be installed within the proposed areas of soft landscaping which will break the pathway to site end users.*
Controlled Waters	*The Risk to Controlled Waters is Low as no mobile contamination has been encountered.*
Permanent Ground Gas	*The risk from Permanent Ground Gases is Low and the site is not in an area requiring Radon precautions within foundations.*
Final Appraisal	

The following further work is considered necessary in order to progress the site to the construction phase:

- *Watching Brief required in areas of restricted access.*
- *Detailed foundation design.*
- *Confirmation of the recommendations made within this report with the regulators.*

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 PROJECT OBJECTIVES 1
1.2 DEVELOPMENT 1
1.3 LIMITATIONS 2
2.0 SITE SETTING 3
2.1 LOCATION 3
2.2 SITE DESCRIPTION 3
3.0 PREVIOUS REPORT SUMMARY 5
3.1 PRA SUMMARY 5
3.2 SITE HISTORY AND CONSULTATIONS 5
3.3 GEOLOGY AND HYDROGEOLOGY 5
3.4 COAL AUTHORITY CONSULTATION 6
3.5 PRELIMINARY CONCEPTUAL SITE MODEL 6
3.6 GROUND ENGINEERING 7
3.7 ADDITIONAL CONSIDERATIONS 7
4.0 SCOPE OF INVESTIGATION AND RATIONALE 8
4.1 PROJECT OBJECTIVES 8
4.2 SCOPE OF WORKS 8
4.3 SOIL SAMPLING 8
4.4 GEO-ENVIRONMENTAL TESTING 9
4.5 GEOTECHNICAL TESTING 9
4.6 GAS AND GROUNDWATER MONITORING 9
5.0 GROUND MODEL 11
5.1 MADE GROUND 11
5.2 NATURAL GROUND 11
5.3 BEDROCK 12
5.4 GROUNDWATER 12
5.5 WATCHING BRIEF 12
5.6 BOREHOLE PROGRESS 12
5.7 BOREHOLE STABILITY 12
6.0 GROUND ENGINEERING 13
6.1 GEOTECHNICAL TESTING RESULTS 13
6.2 ASSESSMENT BACKGROUND 13
6.3 GEOTECHNICAL PARAMETERS 14
6.4 PRELIMINARY FOUNDATION DESIGN 14
6.5 BUILDING NEAR TREES 15
6.6 FLOOR SLABS 15
6.7 CONSTRUCTION 15
6.8 CONCRETE CLASSIFICATION 15
6.9 HIGHWAY DESIGN 16
6.10 SUSTAINABLE URBAN DRAINAGE SYSTEM (SUDS) 16
6.11 SLOPE STABILITY/RETAINING 16
7.0 LAND QUALITY 17
7.1 GEO-ENVIRONMENTAL TESTING RESULTS - SOILS 17
7.2 GENERIC QUANTITATIVE RISK ASSESSMENT - SOILS 19
7.3 PERMANENT GROUND GASES 20

7.4 Revised Pollution Linkage Assessment 21
7.5 Outline Remedial Strategy 27
7.6 Asbestos in Soils 28
7.7 Health and Safety - Construction and Ground Workers 28
7.8 Waste Classification by Assessment 28
7.9 Waste Acceptance Criteria (WAC) Results 29

8.0 FINAL APPRAISAL 31

8.1 Land Quality 31
8.2 Ground Engineering 31
8.3 Required Supplementary Investigation 31

9.0 RELEVANT INDUSTRY REFERENCES 33

APPENDIX 1 – Plans
APPENDIX 2 – Site Photographs
APPENDIX 3 – Exploratory Hole Logs
APPENDIX 4 – Geo-Environmental Testing Results
APPENDIX 5 – Geotechnical Testing Results
APPENDIX 6 – Interim Permanent Gas Monitoring Results
APPENDIX 7 – Generic Screening Values (Residential End Use)
APPENDIX 8 – Statistical Analysis
APPENDIX 9 – Waste Classification Report
APPENDIX 10 – CIRIA Risk Assessment Methodology
APPENDIX 11 – Relevant Legislative Background
APPENDIX 12 – Limitations

Plans		
Plan Reference	*Revision*	*Title*
GRO-23050-P01	-	*Project Location Plan*
GRO-23050-P04	-	*Exploratory Hole Location Plan*
GRO-23050-P05	-	*Generalised Ground Model*
GRO-23050-P06	-	*Illustrative Revised CSM*

1.0 INTRODUCTION

1.1 Project Objectives

Groundtech Consulting Limited have been instructed by Brindle and Yam Solicitors to undertake a Geo-Environmental Appraisal for a site at 113-117 North Road in Manchester.

The Ground Investigation was carried out to assist with discharging planning conditions relating to potential contaminated land and/or groundwater, specifically Condition 18A, which required an investigation and risk assessment into contamination at the site. The Ground Investigation was also conducted to obtain geotechnical parameters.

A main investigation was undertaken in accordance with BS 5930:2020, BS 10175:2017, BS 8576:2013 and Eurocode 7 to revise the Conceptual Site Model (CSM) and quantify the level of risk identified in the Preliminary Risk Assessment (PRA). The Appraisal has been prepared in accordance with current UK Legislation and to discharge Land Quality pre-commencement planning conditions.

The following report has previously been prepared for the site by Groundtech Consulting and should be read in conjunction with this appraisal:

- *Preliminary Environmental Risk Assessment referenced GRO-23050-4311, dated 27th April 2023.*

The report has been undertaken to fulfil the requirements of a preliminary risk assessment in accordance with current LCRM risk assessment guidance.

1.2 Development

The proposed development is residential end use comprising the construction of two semi-detached dwellings of two to three storey construction with private garages, gardens and associated landscaping.

Proposed Development

1.3 Limitations

Other conditions may exist on the site that have not been taken into account in this assessment as they are outside the scope of works. Groundtech Consulting are not responsible for circumstances that are not outlined in the report.

The assessment has been prepared for the exclusive use of the client. No third parties may rely on or reproduce the contents of the report without the written permission of Groundtech Consulting Limited. If any unauthorised third party comes into possession of the report, they rely on it at their own risk and Groundtech Consulting Limited will not be obliged to provide a duty of care.

2.0 SITE SETTING

2.1 Location

The site is located circa 2.5 miles east of Manchester City Centre, as shown on the Project Location Plan *GRO-23050-P01* and is approximately centred on National Grid Reference 388011, 398691. All Plans are located within *Appendix 1*.

Project Location

Access to the site is gained off Barrington Street to the north.

2.2 Site Description

The site is roughly rectangular in shape and encompasses an area of approximately 0.03 hectares. The topography of the site is sloping gently upwards in a north to south direction. A small grass surfaced mound is present in the north-eastern corner.

Onsite Features

The site currently stands disused. Hard surfacing is present in the north-eastern portion of the site as part of a relic driveway from the previous development. The east of the site is surrounded by Heras fencing and is surfaced by topsoil which is overgrown with vegetation. The west of the site is surfaced by overgrown grass. The vegetation is denser in the east; a large bush is located in the north-east corner of the site, and another is present adjacent to the site to the east alongside the Heras fencing.

The area of the site surrounded by Heras fencing contains various piles of household waste and household items. Access was restricted to this area of the site as it formed part of the adjacent development where a house was already under construction.

Boundaries and Surrounding Land Uses

The site boundaries are formed by a mixture of fence lines and kerb lines to the north, west and south. The east is bounded by Heras fencing, segregating the site from a current housing development.

The site is surrounded by the following features/land uses:

- North - *Residential dwellings.*
- East - *Residential dwellings.*
- South - *Residential dwellings and Clayton Park.*
- West - *Tiddlywinks Nursery.*

Site photographs are presented in *Appendix 2*, and any relevant features are recorded on the Preliminary Development Constraints Plan *GRO-23050-P02*.

3.0 PREVIOUS REPORT SUMMARY

3.1 PRA Summary

A Preliminary Risk Assessment (*GRO-23050-4311*) dated 27th April 2023 was previously produced by Groundtech Consulting and the findings are summarised in the following sections.

3.2 Site History and Consultations

Site History
Earliest onsite records show that the site comprised the rear gardens of the adjacent residential dwellings since 1908. By 1970, 5 No. residential garages had been erected on site but have since been demolished.

Consultations
The following environmental information was identified:

- *The site is not within an area requiring radon protective measures.*
- *There are 49 No. authorised processes within 500m of the site with the nearest relating to a waste oil burner at 266m south-west.*
- *There have been 10 pollution incidents within 500m of the site, with the closest being 213m south-west relating to chemical products which had a minor air impact.*
- *There are five landfills within 500m of the site, the nearest being 298m south-west relating to a historical waste paper works in 1978.*
- *There are no sewage discharge consents within 500m of the site.*
- *There is an obsolete petrol station 305m east of the site.*
- *There are electrical substations 220m northwest, 237m south and 247m north.*
- *There is a digital printing glass works 154m south.*
- *There are two hazardous substance storages 386m south relating to Evonik Chemical Works.*

3.3 Geology and Hydrogeology

Geological maps did not indicate the presence of any Made Ground beneath the site however, it was anticipated to be present due to the site's past usage.

Superficial deposits underlying the site are recorded to be Glacial Till, which characteristically comprise a mixture of clay, silt, sand, and gravel and is classified as a Secondary Undifferentiated Aquifer.

The site is indicated to be underlain by bedrock of the Manchester Marls Formation, which typically comprises red marl (calcareous mudstone and siltstone) with thin interbeds of fossiliferous marine limestone and dolomite. This formation is classified as a Secondary B Aquifer.

The site is not indicated to lie within 500m of a Source Protection Zone and there are no potable water abstractions located within 2000m of the site. There are 26 groundwater abstractions within 2000m of the site, the nearest is a historic licence 293m south relating to general cooling at Air Products Chemicals Ltd.

Hydrology
The nearest surface water feature is a moat surrounding Clayton Hall, c.110m south of the site. No other surface water features are present within 250m of the site. Environment Agency information indicates that the site is outside a flood risk zone and is not at risk of flooding. There are six surface water abstraction licenses within 2000m of the site. The nearest is 340m south-west of the site at the Ashton Canal.

3.4 Coal Authority Consultation

The site lies in an area where the Law Society and Coal Authority recommends a mining consultation is undertaken due to past or current mining possible affecting the site.

- *The property is in a surface area that could be affected by underground mining in 2 No. seams of coal at 660m to 710m depth, last worked in 1961.*
- *The site is not within the zone of influence of any present underground coal workings.*
- *The property is not in an area likely to be affected at the surface by any planned underground workings.*
- *No notice of the risk of land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.*
- *There are no records of any mine entries on or within 20m of site boundary.*
- *The Authority is not aware of any damage arising due to geological faults or lines of weakness that have been affected by coal mining.*
- *The property is not in an area affected by past or present coal mining extracted by opencast methods. The property is also not in an area affected by a proposed opencast coal mine.*
- *The Coal Authority has not received a damage notice or claim for the subject property or within 50m since 31 October 1994.*
- *There is no record of mine gas emission requiring action by the Coal Authority within the boundary of the property.*
- *The property is not in an area which notice of entitlement to withdraw support has been published.*

3.5 Preliminary Conceptual Site Model

The following risks were identified by Groundtech Consulting:

Receptor	Risk	Discussion
Site End Users from Contaminated Soils	*Moderate to Low*	*The site is currently undeveloped land but previously formed rear gardens and was later occupied by five units which were likely residential garages, now demolished. Made Ground is likely to be present beneath the site and may be a source of heavy metals, PAHs and asbestos. A number of potential offsite sources of contamination have been identified which include a brick works and electricity substations. Significant mobile contamination is unlikely to be present. Made Ground is likely to be present beneath the site, and therefore a possible pollution linkage is considered to exist.*

Site End Users from Inhalation of Vapours	*Low*	*No significant sources of volatiles have been identified onsite and a plausible pollution linkage is not considered to exist.*
Potable Water Supply Pipe	*Low*	*Limited Made Ground is anticipated to be present beneath the site due to its historical development, and therefore it is likely that new water supply pipes will be laid in natural ground. Therefore, a plausible pollution linkage is not considered to exist.*
Site End Users from Inhalation of Gas	*Moderate to Low*	*Deep Made Ground is unlikely to be present beneath the site. A large historic brick works was present circa 90m away and an infilled pond 50m north and graveyard 110m south have also been located. These may be a source of ground gases, however the Glacial Till deposits will have limited migration of any ground gases onto site. The site is not within an area requiring Radon precautions within foundations.*
Controlled Waters	*Low*	*Significant mobile contamination not anticipated.*

An Illustrative Preliminary CSM can be found on Groundtech Plan *GRO-23050-P03*.

3.6 Ground Engineering

Shallow strip/trench fill foundations will likely be a feasible solution for the proposed residential development, founding within the superficial Glacial Till deposits. As part of the enabling works, the site will require levelling and any excess soils removed offsite. Any areas of hard surfacing and any former foundations will need to be grubbed up and any topsoil materials should be stripped.

3.7 Additional Considerations

The site is not affected by a legacy of shallow coal mine workings.

It is unlikely that a SuDS drainage system will be a viable option for the site as the Glacial Till deposits are likely to be cohesive exhibiting poor drainage characteristics.

4.0 SCOPE OF INVESTIGATION AND RATIONALE

4.1 Project Objectives

The aim of the fieldwork was to:

Determine the stratification beneath the site.
Maintain watching brief for visual and olfactory evidence of contamination.
Obtain samples using methodology in current guidance for contamination analysis.
Identify realistic pollution linkages to groundwater.
Install monitoring standpipes for ground gas monitoring.
Assess the identified pollution linkages in the CSM.

4.2 Scope of Works

The following scope of works was completed on 7th September 2023:

- *4 No. windowless sample boreholes (WS01 to WS04) were advanced to a maximum depth of 4.00m bgl using a Dando Premier rig.*

The exploratory hole locations are presented on Groundtech Plan *GRO-23050-P04* and the exploratory hole logs are in *Appendix 3.*

The exploratory holes were positioned to establish the stratification beneath the site, and target areas of concern as summarised in the table below:

Location	Target Rationale
WS01 – WS04	*Proposed residential properties*

The exploratory holes were logged by a suitably experienced geo-environmental engineer in general accordance with the following current guidance:

- *BS 5930 'Code of Practice for Site Investigations' 2020*
- *BS EN 14688-1:2002 'Geotechnical Investigation and Testing – Identification and classification of soil'.*

4.3 Soil Sampling

During the intrusive investigation, representative samples were taken at regular intervals, changes of strata and where evidence of contamination existed. Laboratory analysis was scheduled on the samples obtained.

The samples obtained are summarised in the table below:

Soil Sample	Number
Environmental Sample	*11*
Disturbed Sample	*18*

The samples have been obtained in accordance with current environmental and geotechnical guidance. The sampling plan has been designed to obtain samples from all required strata using the correct methodology.

Disturbed samples of soil for geo-environmental testing were placed in the correct sampling containers as required by the laboratory in accordance with their MCERTS and UKAS Accreditation. Transportation was arranged in a timely manner and the samples were at the correct temperature.

The sample locations and depths are recorded on the exploratory logs.

4.4 Geo-Environmental Testing

To inform the Generic Quantitative Risk Assessment, the following geo-environmental testing was scheduled to assess the risk from contamination on the site. The testing is based on the potential sources identified in the PRA and observations during the Ground Investigation.

Contaminant of Concern	Matrix	Number
Arsenic, Cadmium, Chromium (total and hex), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons, organic matter, sulphate and pH	*Soil*	*5*
Asbestos Screening	*Soil*	*5*
Total Petroleum Hydrocarbons (TPH CWG)	*Soil*	*2*

The Geo-Environmental Laboratory Testing Results are presented in *Appendix 4.*

4.5 Geotechnical Testing

Representative disturbed samples were obtained for all soil types encountered. Selected samples were scheduled for testing at an approved laboratory in accordance with BS 1377 'Method of Test for Soils for Civil Engineering Purposes' 1990. The following tests were scheduled:

British Standard	Test Method	Number
Part 2	*Water Content*	*4*
Part 2	*Plasticity Index Analysis*	*4*
BRE SD1	*pH and Water-Soluble Sulphate*	*4*

The Geotechnical Laboratory Testing Results are presented in *Appendix 5.*

4.6 Gas and Groundwater Monitoring

Gas monitoring installations were constructed in three of the boreholes. The standpipes consisted of polyvinyl chloride (PVC) pipe - a bentonite seal was placed around the plain pipe and a clean gravel pack was placed around the slotted pipe. A summary of the installation construction is presented in the table below:

Location	Depth (m bgl)	Response Zone (m bgl)	Targeted Strata	Reason
WS01	*4.00*	*2.00 – 4.00*	*Natural Clay and Sand*	*Ground Gas*
WS03	*4.00*	*2.00 – 4.00*	*Natural Clay and Sand*	*Ground Gas*

WS04	*4.00*	*2.00 – 4.00*	*Natural Clay and Sand*	*Ground Gas*

Permanent gas and flow rate monitoring was carried out using a GFM 436 infrared gas monitor with integral electronic flow analyser. The measurements taken are listed below:

- *Oxygen (O_2), carbon dioxide (CO_2) and methane (CH_4) as the percentage volume in air (%v/v).*
- *Hydrogen sulphide (H_2S) and carbon monoxide (CO) as the percentage volume in air (%v/v).*
- *Lower Explosive Limit (%LEL) of methane.*
- *Atmospheric and borehole pressure, including pressure trend.*
- *Flow measurements (l/hr).*
- *Weather and ground surface conditions.*

Both peak and steady state conditions were monitored to understand the behaviour of the permanent ground gas, the steady state conditions were recorded by allowing the gas monitor to run for a minimum of 3 minutes.

Permanent gas and groundwater monitoring results are presented in *Appendix 6.*

5.0 GROUND MODEL

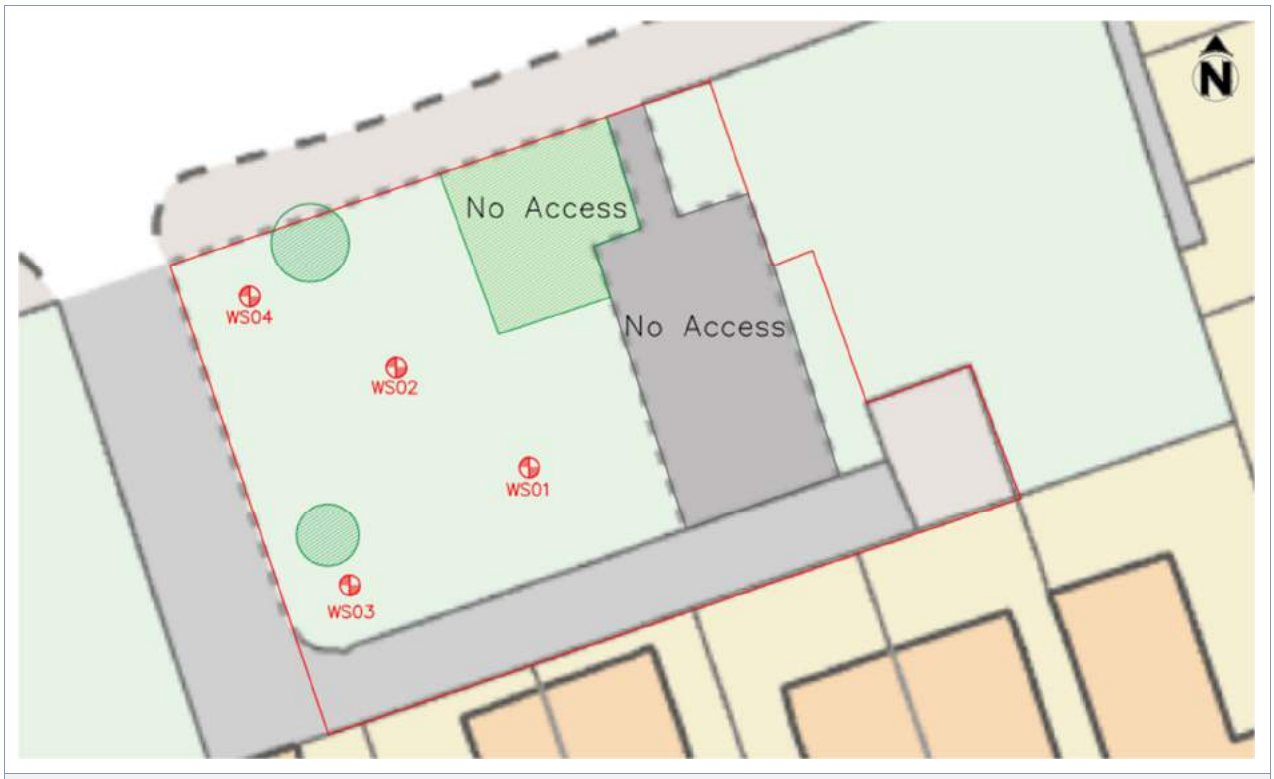
5.1 Made Ground

Surfacing
Surfacing populations were encountered within all exploratory holes at the site, comprising dark brown slightly clayey sandy gravelly topsoil with rootlets and minor constituents of brick, from ground level to a maximum depth of 0.30m bgl.

Made Ground was encountered beneath the site to a maximum depth of 0.70m bgl and generally comprised one main population:

- *Dark brown grey gravelly sand with minor constituents of brick, tarmac, and concrete was encountered within WS01 to WS03 from depths of between 0.15m and 0.30m bgl to depths of between 0.60m and 0.70m bgl.*

Cement and rare clinker were encountered locally in WS01 between 0.15m and 0.70m bgl within the granular Made Ground deposits.



Exploratory Hole Locations

5.2 Natural Ground

The natural strata generally confirmed the published records and comprised two main stratifications:

- *Firm to very stiff brown mottled grey, sometimes slightly gravelly, slightly sandy clay was encountered in all exploratory holes from depths between 0.25m and 0.70m bgl to depths between 3.40m and 4.00m bgl.*

- *Medium dense to dense light brown fine to coarse sand was encountered in all exploratory holes from depths between 3.00m and 3.40m bgl to depths between 3.30m and 4.00m bgl.*

5.3 Bedrock

Bedrock was not encountered during the investigation.

5.4 Groundwater

Groundwater strikes were encountered in WS01 and WS04 at 3.00m bgl within the natural strata.

Location	Depth of Groundwater Strike (m bgl)	Strata
WS01	*3.00*	*Natural Cohesive*
WS04	*3.00*	*Natural Granular*

5.5 Watching Brief

A watching brief was undertaken for visual and olfactory evidence of contamination.

No olfactory evidence of contamination was noted, however visual evidence of contamination was recorded in the form of rare clinker and tarmac fragments within the Made Ground locally to WS01 between depths of 0.15m to 0.70m bgl.

5.6 Borehole Progress

Standard Penetration Tests (SPTs) generally achieved refusal (greater than 50 blows) within the boreholes at a depth of 4.00m bgl, with the exception of WS01 which was terminated due to collapsing sand.

5.7 Borehole Stability

Evidence of collapse was encountered within WS01 at a depth of 4.00m within the natural medium dense Sand. No collapse occurred within any of the other boreholes.

6.0 GROUND ENGINEERING

6.1 Geotechnical Testing Results

Comparison of water content and the value of 0.4 times the Liquid Limit, in accordance with BRE Digest 412 'Desiccation in Clay Soils', suggests significant desiccation has taken place when 0.4 times the Liquid Limit is greater than the actual measured water content. This is a rudimentary method but also a good guide.

Results of the PI analysis and the volume change potential of the clays are summarised in the table below:

Reference	Depth (m bgl)	Modified PI	Volume Change Potential	Desiccated Y/N
WS01	*2.00*	*24.00*	*Low*	*N*
WS02	*1.00*	*26.00*	*Low*	*Y*
WS03	*1.00*	*25.00*	*Low*	*N*
WS04	*2.00*	*21.16*	*Low*	*Y*

6.2 Assessment Background

Background

The ground engineering investigation has been undertaken to formulate an accurate ground model to undertake preliminary foundation design. The ground model has been constructed with a moderate level of confidence.

Earliest onsite records show that the site comprised the rear gardens of the adjacent residential dwellings in 1908. By 1970, five residential garages had been erected on site but have since been demolished. For the proposed development of two residential dwellings to be undertaken, any previous foundations will need to be grubbed up.

Ground Conditions

Surfacing at the site comprised dark brown slightly clayey sandy gravelly topsoil with rootlets and minor constituents of brick to a maximum depth of 0.30m bgl.

The majority of the site was underlain by dark brown grey gravelly sand with minor constituents of brick, tarmac, and concrete to a maximum depth of 0.70m bgl. Cement and rare clinker were encountered locally to WS01 at 0.15m to 0.70m bgl within the granular Made Ground deposits.

This was underlain by two natural stratum which predominantly comprised firm brown mottled grey sandy clay to a maximum drilled depth of 4.00m bgl. Medium dense to dense light brown fine to coarse sand was encountered in all exploratory holes from 3.00m bgl to a maximum drilled depth of 4.00m bgl in WS01.

Bedrock was not encountered during the ground investigation, although the SPTs achieved refusal in WS02 to WS04 at 4.00m bgl.

Groundwater strikes were encountered in WS01 and WS04 at 3.00m bgl within the natural strata.

The proposed development is residential end use comprising two dwellings with associated hard surfacing driveways, and soft landscaped private gardens.

Limitations

The main limitations for development are the grubbing up and removal of any relict foundations and the hard surfacing within the eastern portion of the site associated with the previous use as driveways and garages. The large bushes and areas of vegetation will also require removal before construction can commence. The bushes located centrally to the site have been inspected and concluded that Japanese Knotweed is not present at the site further inspections will be made during the enabling works at the site.

Further testing of any topsoil at the site will be required in order to determine if it is suitable for use within the rear gardens of the proposed residential properties once it has been stripped and stockpiled separately during the enabling works this will be completed in line with Council Guidance as specified in Manchester City Council Guidance - Verification Requirements for Cover Systems.

As the site is located on Barrington Street, which is a small residential road, access constraints may be an issue during the construction phase.

Additionally, due to the large bush in the north east of the site, a watching brief is recommended to confirm findings in this area of restricted access.

6.3 Geotechnical Parameters

The geotechnical test results have been evaluated to derive geotechnical parameters for the soils underlying the site. A '*Depth to SPT 'N' value*' graph is presented on *GRO-23050-P05* in *Appendix 1* to provide a generalised ground model for the site.

Characterisation of the geotechnical parameters above has been undertaken to select a characteristic value, which is a cautious estimate of the value affecting the occurrence of the limit state. The characteristic values for the Ultimate Limit State (ULS) conditions selected are presented in the table below:

Stratum	Parameter	Selected Characteristic Value
Medium Dense Sand	*Drained angle of friction (ϕ')*	*34°*
Dense Sand	*Drained angle of friction (ϕ')*	*37°*
Firm Clay	*Undrained Shear Strength (Cu)*	*100 kPa*
Stiff Clay	*Undrained Shear Strength (Cu)*	*125 kPa*

6.4 Preliminary Foundation Design

The most suitable foundations for the proposed dwellings are considered to be traditional strip/trench fill foundations constructed in the firm to very stiff Clay at a minimum depth of 1.00m bgl. Foundations should be deepened through all Made Ground which has been encountered across the site to a maximum depth of 0.90m bgl as part of this Ground Investigation.

A safe allowable bearing capacity of 120kN/m^2 is provided for ultimate limit state design for a 0.60m wide strip foundation constructed within the firm Clay at 1.00mbgl. A settlement criteria of 25mm will not be exceeded and Serviceability Limit State conditions will be satisfied, utilising the above pressures.

Additional investigation in the east of the site where access was restricted may be required before the construction phase to inform detailed foundation design.

Construction Requirements

The recommendations in this appraisal are preliminary, the detailed design should be developed in advance

and during the construction phase. If the ground conditions or groundwater regime encountered during the construction phase differ significantly to the conditions encountered during the Ground Investigation, work should cease and Groundtech Consulting contacted for further advice.

During the construction phase, supervision by a suitably qualified geotechnical engineer should be on a continuous basis, to check the design assumptions are correct and construction conforms to design in accordance with EC7. Supervision should include inspections, Control Ground Investigations and monitoring by a suitably qualified geotechnical engineer.

6.5 Building Near Trees

Foundation excavations will encounter shallow Clay deposits. A large bush has been identified in the south-west, which should be excavated as part of the enabling works and may generate potential heave dependant on the extent of its root system. No trees have been recorded within 35m of the site. Therefore, foundations may require adjusting in accordance with NHBC Chapter 4.2 'Building Near Trees' dependant on the extent of the bush encountered centrally to the site and should be examined upon removal.

6.6 Floor Slabs

If required ground bearing floor slabs may generally be adopted at the site provided that once finished levels have been established, less than 600mm of suitable, appropriately compacted granular material exists beneath the slab.

6.7 Construction

The boreholes indicate that instability of excavations is not anticipated provided they are not exposed to adverse weather conditions for any substantial period of time. Instability of the Made Ground is a possibility and should be considered in the groundworks method statements.

Tracked high specification plant is recommended to maintain the build programme. Breaking equipment may also be required locally to penetrate obstructions identified by the Ground Investigation, such as the concrete hardsurfacing in the east.

6.8 Concrete Classification

Made Ground
Water soluble sulphate testing was undertaken on five samples of the Made Ground. The range of soluble sulphate (SO_4) recorded is 86.2 mg/l to 244.1 mg/l and associated pH values ranged between 7.92 and 12.15 indicating mildly to strongly alkaline conditions.

For a dataset containing five to nine results, the mean of the highest two sulphate test results will be used and the average of the lowest two of the pH results. The characteristic water soluble sulphate concentration for the Made Ground is 222.05 mg/l and the pH value is 8.18.

Natural Strata
Water soluble sulphate testing was undertaken on four samples of the natural strata. The range of soluble sulphate (SO_4) recorded is 48.3mgl/l to 220.2mg/l and associated pH values ranged between 6.97 and 7.71 indicating neutral to mildly alkaline conditions.

For a dataset containing less than five results, the highest sulphate test result and the lowest pH test result will be used. The characteristic water-soluble sulphate concentration for the natural strata is 158.45mg/l and the pH value is 6.97.

The natural strata beneath the proposed development areas are predominantly cohesive, therefore the groundwater is considered to be static.

The results of laboratory pH and sulphate content indicate that ACEC Class AC-1s and sulphate class DS-1 conditions prevail in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005. The specific concrete mixes (the Design Concrete Class) to be used on site will be determined by the site-specific concrete requirements in terms of the durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM) detailed in Part D of BRE Special Digest 1 with further guidance in Pt E and F.

6.9 Highway Design

CBR values of greater than 5% are likely to be achieved in undisturbed natural soils for pavement design purposes, unless proven otherwise by in-situ testing at sub-base level by a specialist geotechnical engineer.

As a minimum the subgrade should be proof rolled prior to construction. Some reengineering of the subgrade may be required prior to highway construction to achieve the required design CBR value.

The soils are considered to be frost susceptible due to the fines content, and highway construction should be a minimum thickness of 450mm to mitigate against the risk.

6.10 Sustainable Urban Drainage System (SuDS)

Soil percolation testing was outside the scope of this investigation, however the use of SuDS drainage within the natural ground is not likely to be feasible at the site due to the presence of cohesive soils, which are capable of poor soil infiltration rates.

If drainage of the highway to soakaways is to be considered, it is suggested that this is discussed with the Local Authority at the earliest opportunity, to confirm the adequacy of proposed testing and to allow their inspection of any testing.

6.11 Slope Stability/Retaining

Due to the gentle topography of the site, no retaining structures will need to be incorporated.

7.0 LAND QUALITY

7.1 Geo-Environmental Testing Results - Soils

Samples of Made Ground have been tested for a range of relevant Contaminants of Concern. In accordance with LCRM, a Generic Quantitative Risk Assessment (GQRA) has been undertaken to determine the significance of the concentrations as derived through Geo-Environmental analysis.

The GQRA process comprises the comparison of the actual concentrations measured on site with Generic Assessment Criteria (GACs) for the protection of human health.

The GACs used for the assessment of soil concentrations have been derived using the CLEA model. The GACs used and their ranking of importance are listed below:

- *Soil Guideline Values (SGVs) which demonstrate minimal risk.*
- *LQM/CIEH S4ULs which use the same toxicological data as the SGVs but different exposure criteria.*
- *C4SLs which demonstrate low risk.*

In deriving the GACs for use on Brownfield sites, we have assumed a worst case scenario of 1% Soil Organic Matter.

The proposed end use of this site is residential development comprising two residential dwellings with soft landscaped gardens and associated driveways. We have therefore undertaken the GQRA on the basis that the proposed development site falls under the Residential (with Plant Uptake) land-use scenario as defined in SR3 (EA, 2009b).

The strata or potential sources of contamination targeted by the laboratory testing scheduled is summarised in the table below:

Strata	Number of Samples Tested	Locations
Granular Made Ground	*5*	*WS01 – WS04*
Natural Strata	*4*	*WS01 – WS04*

A summary of the Geo-Environmental Testing results is presented below and the GQRA screening values are presented in *Appendix 8:*

Metals				
Contaminant	Range (mg/kg)	Screening value (mg/kg)	Exceedances	Locations
Arsenic	*6.1 – 26.5*	*32*	*0*	-
Cadmium	*<0.1 – 0.4*	*10*	*0*	-
Chromium	*24.9 – 54.8*	*910*	*0*	-
Copper	*20 – 78*	*2400*	*0*	-
Lead	*22 – 152*	*200*	*0*	-
Mercury	*<0.1 – 0.2*	*1.2*	*0*	-
Nickel	*11.1 – 40.0*	*130*	*0*	-
Selenium	*<1 – 1*	*350*	*0*	-
Zinc	*42 - 277*	*3700*	*0*	-

Polycyclic Aromatic Hydrocarbons (PAHs)				
Contaminant	Range (mg/kg)	Screening value (mg/kg)	Exceedances	Locations
Naphthalene	0.06 – 0.27	2.3	0	-
Acenaphthylene	0.05 – 0.13	170	0	-
Acenaphthene	0.07 – 0.32	210	0	-
Fluorene	<0.04 – 0.23	170	0	-
Phenanthrene	0.52 – 2.71	95	0	-
Anthracene	0.14 – 0.59	2400	0	-
Fluoranthene	0.97 – 3.86	280	0	-
Pyrene	0.86 – 3.65	620	0	-
Benzo(a)anthracene	0.56 – 1.87	7.2	0	-
Chrysene	0.61 – 2.05	15	0	-
Benzo(b)fluoranthene	0.76 – 2.12	2.6	0	-
Benzo(k)fluoranthene	0.29 – 0.83	77	0	-
Benzo(a)pyrene	0.69 – 1.83	2.2	0	-
Indeno(123cd)pyrene	0.46 – 1.20	27	0	-
Dibenzo(ah)anthracene	0.11 – 0.27	0.24	2	WS01 at 0.10m WS02 at 0.50m
Benzo(ghi)perylene	0.49 – 1.11	320	0	-
TPH CWG - Aliphatics				
Contaminant	Range (mg/kg)	Screening value (mg/kg)	Exceedances	Locations
>C5-C6	<0.1	3200	0	-
>C6-C8	<0.1	7800	0	-
>C8-C10	<0.1	2000	0	-
>C10-C12	<0.2	9700	0	-
>C12-C16	<4	59000	0	-
>C16-C21	<7 - 17	1600000	0	-
>C21-C35	28 - 164	1600000	0	-
Total aliphatics C5-35	28 - 181	-	-	-
TPH CWG - Aromatics				
Contaminant	Range (mg/kg)	Screening value (mg/kg)	Exceedances	Locations
>C5-EC7	<0.1	<0.1	0	-
>EC7-EC8	<0.1	<0.1	0	-
>EC8-EC10	<0.1	<0.1	0	-
>EC10-EC12	<0.2	<0.2	0	-
>EC12-EC16	<4 – 9	<4 – 4	0	-
>EC16-EC21	28 – 271	23 – 73	0	-
>EC21-EC35	133 – 1448	124 – 364	0	-
Total aromatics C5-35	164 – 1728	147 – 441	-	-
Total aliphatics and aromatics(C5-35)	193 – 1902	175 – 622	-	-
MTBE	<0.005	<5	0	-
Benzene	<0.005	<5	0	-
Toluene	<0.005	<5	0	-
Ethylbenzene	<0.005	<5	0	-

m/p-Xylene	*<0.005*	*<5*	*0*	-
o-Xylene	*<0.005*	*<5*	*0*	-
Others				
Moisture Content	*7.3% – 29.0%*			
pH	*6.97 – 12.15*			
Organic Matter	*0.9% – 11.7%*			
Asbestos Screen				
Position	Depth (m bgl)	Result	Quantification	
WS01	*0.10*	*NAD*	-	
WS01	*0.50*	*NAD*	-	
WS02	*0.50*	*NAD*	-	
WS03	*0.50*	*NAD*	-	
WS04	*0.20*	*NAD*	-	

A high pH of 12.15 has been detected within WS02 at 0.50m bgl.

7.2 Generic Quantitative Risk Assessment - Soils

Made Ground was encountered beneath the site to a maximum depth of 0.70m bgl.

Visual evidence of contamination was recorded in the form of rare clinker gravel and tarmac fragments locally within the Made Ground to WS01 at 0.15m to 0.70m bgl. No olfactory or other visual evidence of contamination was encountered.

Metals
No elevated concentrations of metals have been encountered when compared to residential screening values within the samples tested.

Speciated Polycyclic Aromatic Hydrocarbons (PAHs)
Two elevated concentrations of PAHs were detected throughout the laboratory testing in relation to the residential end use. This comprised elevated concentrations of Dibenzo(ah)anthracene within WS01 and WS02 at 0.10m and 0.50m bgl respectively, with concentrations of 0.27 mg/kg and 0.25 mg/kg respectively, when compared with the screening value of 0.24 mg/kg. The source of these elevations is likely to be the former garages located on the site. These boreholes are located within the centre and east of the site surfaced by Made Ground topsoil.

Statistical analysis for the two elevated concentrations of dibenzo(ah)anthracene was undertaken using CL:AIRE Guidance on 'comparing soil contamination data with critical concentration'. The aim of the statistical analysis was to reject the Null Hypothesis – 'the true mean concentration is equal to or greater than the critical concentration' with a level of confidence greater than 95%.

Statistical analysis has been undertaken on the granular Made Ground population and is presented in *Appendix 8*. An Upper Confidence Limit of 0.26 mg/kg was calculated for dibenzo(ah)anthracene which is above the Critical Concentration of 0.24 mg/kg, therefore the Null Hypothesis was not rejected, with 90% confidence. Further action is required with respect to dibenzo(ah)anthracene.

Total Petroleum Hydrocarbons (TPH CWG)
No elevated concentrations of TPH CWG have been recorded within the 2 samples tested when compared to residential screening values.

Asbestos
No asbestos was detected within the samples screened.

7.3 Permanent Ground Gases

Made Ground was encountered beneath the site to a maximum depth of 0.70m bgl. No visual or olfactory evidence of contamination was noted during the Ground Investigation, with the exception of some brick, tarmac, concrete and rare clinker locally.

Six monitoring visits have been undertaken between 12th September and 17th November 2023.

No concentrations of methane (CH_4) were detected during the monitoring period. Carbon dioxide (CO_2) was detected with concentrations between 0.1% v/v to 5.8% v/v and associated depleted oxygen levels were recorded with concentrations between 12.3% to 20.6% v/v.

No positive gas flow rate was recorded during the monitoring period. Atmospheric pressure ranged between 976mb and 1011mb.

The monitoring visits were undertaken during a period of steady, rising, and falling barometric pressure.

Groundwater was not measured within the standpipes during the monitoring programme.

Characterisation of the Gas Screening Value (GSV)
In accordance with CIRIA Report C665, November 2007 it is felt that an adequate risk assessment can be undertaken based on the following limiting factors:

- *The proposed development has been considered as* ***high sensitivity*** *based on the site being developed with residential dwellings (Table 5.5 – Typical/Idealised frequency and period of monitoring, after Wilson et al, 2005).*
- *The risk associated with the generation potential of a source is considered as* ***low****, (assessment based on the environmental setting as well as observations noted during the fieldworks).*
- *No flow rates have been recorded over the monitoring period (Table 8.5 – Modified Wilson & Card classification). For this site, three of the monitoring visits were targeted to correlate with a falling atmospheric pressure trend. As a comparison, monitoring has also been undertaken during steady and rising atmospheric pressure trends.*

Based upon the results recorded to date, in accordance with BS8485, the risk to the site from ground gases has been assessed by converting the results to gas screening values (GSVs), calculated by multiplying the typical maximum gas concentrations with the recorded maximum positive flow rates. In addition, individual "hazardous gas flow rates" (Qhg) have been derived for each monitoring point. As no levels of methane have been recorded, only a GSV for carbon dioxide has been calculated.

GSV (l/hr) = max borehole flow rate (l/hr) x max gas concentration (%)

For this assessment, no methane has been encountered, and the maximum recorded concentration of carbon dioxide of 5.8% v/v has been used. No positive gas flow rates have been detected therefore, the limit of detection of the gas analyser of 0.1 l/hr has been used to calculate the GSV.

Carbon Dioxide GSV = 0.058 (5.8%) x 0.1 = 0.0058 l/hr
Methane GSV = 0.00 l/hr

Based on the site being developed with low-rise housing, building Type A according to BS 8485:2015. The Wilson and Card, 2006 method has been used to carry out the assessment. This is a risk-based approach that is designed to allow an identification of gas protection for a low-rise housing development by comparing the measured gas emission rates to generic Characteristic Situations. The assessment includes 'typical maximum concentrations' and are provided for initial screening purposes and risk-based gas screening values for consideration in situations where the typical maximum concentrations are exceeded.

In order to assess the ground gas regime beneath the site and the need to incorporate ground gas precautions, guidance was taken from CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'. Based on the site being developed for a residential end use, the Wilson and Card method has been used to carry out the assessment.

When considering the results in accordance with CIRIA C665 (Section A Development and Table 8.5 – Modified Wilson and Card Classification) it can be seen that the GSV values for carbon dioxide are below the assessment GSV of 0.07 l/hr and falls within Characteristic Situation 1 therefore, gas protection measures are not required.

Characteristic Situation 1

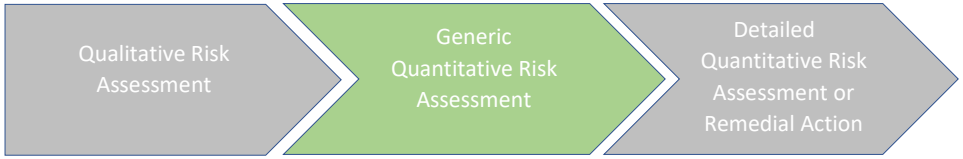
The proposed development is classified as a Building Type A in accordance with BS 8485:2015 and the site falls in CS1 in accordance with Table 2 of the above guidance and no gas protection measures are required.

Radon
The site is in an area not requiring Radon precautions.

7.4 Revised Pollution Linkage Assessment

A revised pollution linkage assessment has been undertaken based on the findings of the Ground Investigation and testing to identify any realistic pollution linkages in order to quantify the risks to human health and controlled waters. The risk classification has been estimated in accordance with the CIRIA C552 assessment criteria outlined in *Appendix 8*.

Human Health Pollution Linkage Assessment



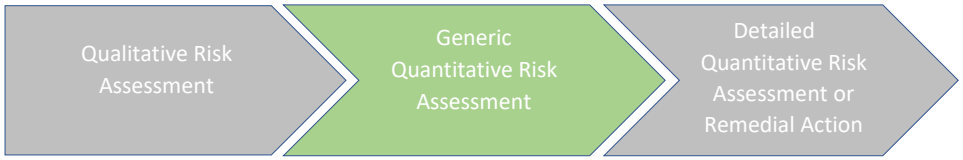
- The table below represents the second stage in the land quality risk assessment process - **the Generic Quantitative Risk Assessment**.
- In order for a development site to be deemed 'suitable for use' the level of risk needs to be reduced to an acceptable level - low to negligible risk. The purpose of each stage of risk assessment is to establish if there is a requirement for additional stages of assessment in order to have sufficient confidence to support a risk characterisation or remedial action.

Conceptual Site Model						*Generic Quantitative Risk Assessment*
PL	Potential Source	Pollution Linkage	Likelihood	Consequence/ Severity	Risk Rating	*Rationale and Action*
PL1	Contaminated Soils	Ingestion of soil and dust. Dermal contact with soil.	Likely	Medium	Low	*Pollution Linkage 1 refers to proposed site users coming into contact with contaminated soils on the site.* *Historically, the site has been occupied by residential garages. Made Ground has been encountered beneath the site to a maximum depth of 0.70m bgl and generally comprised sand and gravel.* *Based on the site having a residential end use, elevated concentrations of PAHs have been recorded in the granular Made Ground of WS01 and WS02 at 0.10m and 0.50m bgl respectively. No other elevated Contaminants of Concern were determined. A cover system comprising 600mm of clean cover (150mm topsoil and 450mm of subsoil) should be implemented in areas of soft landscaping. Cover System implementation and validation shall be undertaken in accordance with Manchester City Council Guidance - Verification Requirements for Cover Systems Version 3.4 dated February 2021.*

Conceptual Site Model						*Generic Quantitative Risk Assessment*
PL	Potential Source	Pollution Linkage	Likelihood	Consequence/ Severity	Risk Rating	*Rationale and Action*
						The proposed development is residential end use comprising of two residential dwellings with associated hardsurfacing and soft landscaped gardens. *Therefore, a pollution linkage is not considered to exist and the risk is Low.*
PL2	Contaminated Soils	Inhalation of vapour.	Unlikely	Medium to Severe	Low	*No volatile contamination has been encountered and no evidence of hydrocarbon contamination was encountered.* *No realistic pollution linkage exists.*
PL3	Contaminated Soils	Inhalation of soil dust by adjacent site users.	Unlikely	Medium	Low	*Pollution Linkage 3 relates to contamination on the subject site affecting adjacent site users. No mobile contamination is present at the site and no pollution linkage has been identified.*
PL4	Contaminated Soils	Attacking potable water supply pipe.	Unlikely to Low Likelihood	Medium	Low	*Pollution Linkage 4 refers to the possible contaminants permeating potable water pipes and consumption by the future site end users of the tainted water supply.* *Shallow Made Ground has been encountered, and will likely be stripped from site to facilitate development. The new potable supply will likely be laid in natural soils or clean imported material, and therefore will not be affected by contaminated soils and a viable pollution linkage has not been identified.*

	Conceptual Site Model					*Generic Quantitative Risk Assessment*
PL	Potential Source	Pollution Linkage	Likelihood	Consequence/ Severity	Risk Rating	*Rationale and Action*
PL5	Ground Gas	Migration and accumulation of ground gas in internal spaces.	Low Likelihood	Medium to Severe	Low	*Ground gas monitoring has been undertaken, and the site has been placed in CS1 and gas protection measures are not required.* *The site does not require any radon precautions.*

Controlled Waters Pollution Linkage Assessment



- The table below represents the second stage in the land quality risk assessment process – **Generic Quantitative Risk Assessment**.
- In order for a development site to be deemed 'suitable for use' the level of risk needs to be reduced to an acceptable level - low to negligible risk. The purpose of each stage of risk assessment is to establish if there is a requirement for additional stages of assessment in order to have sufficient confidence to support a risk characterisation or remedial action.

Conceptual Site Model						*Generic Quantitative Risk Assessment*
PL	Potential source	Pollution linkage	Likelihood	Severity	Level of risk	*Rationale*
PL6	Contaminated Soils	Impaction of groundwater from soil contamination (diffuse and point). Impaction of groundwater from groundwater plume.	Unlikely	Medium	Low	*Made Ground has been encountered to a maximum depth of 0.70m bgl and is underlain by Clay and Sand up to a maximum depth of 4.00m bgl. No elevated concentrations of Contaminants of Concern have been identified with the exception of two elevated concentrations of Dibenzo(ah)anthracene, which has been encountered within the Made Ground soils of WS01 and WS02. However, due to the cohesive nature of the underlying natural soils, vertical and lateral migration of contaminants will be restricted. Significant mobile contamination has also not been identified during the investigation.* *As a source of mobile contamination has not been identified, a realistic pollution linkage has not been identified.*
PL7	Contaminated Soils	Migration of soil and groundwater contamination impacting surface waters.	Unlikely	Medium	Low	*The nearest surface water feature is a moat surrounding Clayton Hall c.110m south.* *Due to a combination of no mobile source and the significant attenuation distance of the watercourse, no realistic pollution linkage exists.*

7.5 Remedial Strategy

Soils

Surfacing at the site comprised dark brown slightly clayey sandy gravelly topsoil with rootlets and minor constituents of brick to a maximum depth of 0.30m bgl. Hard surfacing in the form of a concrete slab was encountered locally in the east of the site. The majority of the site was underlain by dark brown grey gravelly sand with minor constituents of brick, tarmac, and concrete to a maximum depth of 0.70m bgl. Cement and rare clinker were encountered locally to WS01 at 0.15m to 0.70m bgl within the granular Made Ground deposits.

This was underlain by two natural stratum; firm brown mottled grey sandy clay with rare angular to rounded fine to medium gravel of sandstone was encountered to a maximum depth of 4.00m bgl. Medium dense to dense light brown fine to coarse sand was encountered in all exploratory holes to a maximum depth of 4.00m bgl. No bedrock was encountered throughout the ground investigation.

Two elevations of Dibenzo(ah)anthracene were encountered within the laboratory testing. Statistical analysis shows that these concentrations exceed the critical concentration and remediation is required with respect to contaminated soils. This will include stripping the Made Ground and stockpiling to determine suitability for reuse or required removal classifications.

As the Made Ground at the site is unlikely to be suitable for reuse, and due to the elevated concentrations of Dibenzo(ah)anthracene, the import of clean soil for the gardens is likely to be required. A 600mm cover system should be placed in soft landscaping areas, comprising a minimum of 150mm of topsoil and 450mm of subsoil. Imported or site won material to be utilised in the cover systems at the site shall be sampled to meet the requirements of the specified Council Guidance and validation of the cover system will be undertaken in general accordance with Manchester City Council Guidance - Verification Requirements for Cover Systems Version 3.4 dated February 2021. The sampling frequencies for imported or site won materials is shown in the figure below:

End-Use	Greenfield Soils	Remediated Soils	Brownfield Soils	Unknown Soil Source
Residential Gardens	1:200m^3	1:100m^3	1:50m^3	1:50m^3
Soft Landscaping	1:200m^3	1:150m^3	1:150m^3	1:150m^3
Other	1:200m^3	1:200m^3	1:200m^3	1:200m^3

Sampling of site won or imported material shall be carried out in-situ post importation to site in line with Council Guidance.

Ground Gas

Permanent gas monitoring results have placed the site is within Characteristic Situation 1 and no gas protection measures are required. The site is also not in an area requiring radon precautions.

Controlled Waters

No mobile contamination has been encountered and therefore the risk to controlled waters is *Low*.

Watching Brief and Regulatory Liaison

A watching brief should be in place during ground works and construction. If previously unidentified contamination is encountered, work should cease in that area and Groundtech Consulting contacted for advice.

Regulatory compliance should be obtained pre-commencement to avoid delays during the construction phase which will have cost implications.

7.6 Asbestos in Soils

No asbestos has been recorded within the samples screened.

7.7 Health and Safety - Construction and Ground Workers

During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. The risk to construction and ground workers is assessed in the table below:

PL Ref	Potential Source	Pollution Linkage	Likelihood	Severity	Level of Risk
PL8	*Made Ground*	*Ingestion, direct contact, inhalation of dusts.*	*Likely*	*Medium*	*Moderate to Low*

The potential risk from elevated concentrations of PAHs should be communicated to ground workers through a site induction and information made available on noticeboards.

General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following measures are suggested to provide a minimum level of protection:

- *All ground workers should be issued with the relevant protective clothing, footwear and gloves. These protective items should not be removed from the site and personnel should be instructed as to why and how they are to be used.*
- *Hand-washing and boot-washing facilities should be provided.*
- *Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.*
- *Good practices relating to personal hygiene should be adopted on the site.*
- *The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.*

7.8 Waste Classification by Assessment

We have reviewed the testing results and inputted them into the HazWasteOnline model which allows users to code and classify waste as defined in the EWC (European Waste Catalogue 2002) based on EC Regulation 1272/2008 on the Classification, labelling and packaging of substances and mixtures (CLP) and latest Environment Agency guidance (WM3 "Guidance on the classification and assessment of waste (1st edition 2015)-Technical Guidance").

This is a useful tool as waste producers have the legal responsibility to classify any waste they produce.

Nine samples were tested to assess whether they contained any contaminants in the hazardous range when screened against assessment criteria within WM3. The results are in the Waste Classification Report presented in *Appendix 9.*

Location	Depth (m bgl)	Material	Classification	Hazardous Properties
WS01	*0.10*	*Made Ground*	*Non-Hazardous*	-
WS01	*0.50*	*Made Ground*	*Non-Hazardous*	-
WS02	*0.50*	*Made Ground*	*Hazardous*	*HP8: Corrosive*
WS02	*0.80*	*Cohesive Natural*	*Non-Hazardous*	-
WS03	*0.50*	*Made Ground*	*Non-Hazardous*	-
WS03	*0.80*	*Cohesive Natural*	*Non-Hazardous*	-
WS04	*0.20*	*Made Ground*	*Non-Hazardous*	-
WS01	*1.00*	*Cohesive Natural*	*Non-Hazardous*	-
WS04	*1.00*	*Cohesive Natural*	*Non-Hazardous*	-

Based on the assessment tool, one sample within WS02 at 0.50m bgl (Made Ground) has been classified as *Hazardous* based on corrosive properties caused by a high pH. This material comprised dark brown, grey gravelly sand with minor constituents of brick, tarmac, and concrete.

Four samples within the natural soils were tested and have been classified as *Non-Hazardous*.

The Waste Classification Reports can be found in *Appendix 9.*

7.9 Waste Acceptance Criteria (WAC) Results

The Landfill Directive (Directive 1999/31/EC on the landfilling of waste) led to the establishment of a methodology for classifying wastes. Wastes can only be accepted at a landfill if they meet the relevant Waste Acceptance Criteria (WAC) for that type of landfill. There are three different WAC, these are for:

- *Inert waste*
- *Non-Hazardous waste*
- *Hazardous waste*

Wastes should first be classified based on their total concentrations as detailed in the previous section. WAC testing is then required if the end disposal route is a landfill.

Waste Acceptance Criteria (WAC) testing was outside the scope of this investigation and the guidance given below is general.

The possibility of automatic inert classification of the natural soils should be explored in accordance with Section 4.3 of the EA guidance document. The Council Decision includes a list of wastes in Section 2.1.1 of the document that are assumed to be inert and therefore acceptable at a landfill for inert waste without testing, this is the case if:

- *They are single stream waste of a single waste type (although different waste types from the list may be accepted together if they are from a single source)*
  and
- *There is no suspicion of material or substances such as metals, asbestos, plastics, chemicals, etc to an extent which increases the risk associated with the waste sufficiently to justify contamination and they do not contain other landfill classifications.*

If any organic contaminated material is encountered during the construction phase, it is possible that this may be classified as hazardous, and testing should be undertaken at that time.

Materials should be segregated and where necessary sufficient time is allowed to further classify the material properly, including discussion with landfill sites and waste transfer stations to find the best disposal route. It is recommended that where possible that the soils could be recycled at a suitable local waste treatment plant or transfer station rather than a landfill disposal route.

The reuse of soils on the site this should be done in accordance with the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE CoP). Any re-use scheme should be designed to minimise disposal costs.

After a cut and fill balance plan/volume calculation has been carried out, a U1 and T5 exemption could be registered. This will allow the use of the following soils without a waste permit or under Dow CoP MMP:

- *1,000 tonnes (c. 600m^3) of non-hazardous soil*
- *5,000 tonnes (c. 3,000m^3) of natural sand and gravels.*
- *50,000 tonnes (c. 25,000m^3) of bituminous material to be used in roadways.*
- *5,000 tonnes (c. 3,000m^3) of crushed concrete / stone.*

8.0 FINAL APPRAISAL

8.1 Land Quality

The site was generally featureless until 1970, when five garages were erected. They have since been demolished and the site is now covered by vegetation and a dwelling in the east.

Made Ground was encountered beneath the site to a maximum depth of 0.70m bgl and comprised entirely of granular material. Visual evidence of contamination was recorded in the form of clinker within the Made Ground locally to WS01 at 0.15m to 0.70m bgl. No olfactory or other visual evidence of contamination was encountered.

Two elevated concentrations of Dibenzo(ah)anthracene were detected within WS01 at 0.10m bgl and WS02 at 0.50m bgl, with concentrations of 0.27 mg/kg and 0.25 mg/kg respectively when compared against the screening value of 0.24 mg/kg. Statistical analysis has shown that these concentrations pose a threat to human health and the Made Ground should be stripped and stockpiled separately in order to undertake testing to confirm the waste disposal route. WS02 is located beneath the building footprint, however WS01 is located beneath the proposed soft landscaping areas and will therefore pose a risk to human health if not removed.

All other results were below the relevant screening values.

Following redevelopment, a large majority of the site will be covered by building footprint and associated driveways and pavement, however the soft landscape gardens will require a clean cover system comprising a 600mm cover system comprising a minimum of 150mm topsoil and 450mm subsoil. The risk to Human Health is considered to be *Low*.

Permanent ground gas monitoring results have placed the site in Characteristic Situation 1. Radon precautions are also not required within foundations. The risk from permanent ground gases is *Low*.

The majority of soils have been classified as *Non-Hazardous* for waste disposal purposes. The soils encountered in WS02 have been classified as *Hazardous* for waste disposal purposes and should be removed to a hazardous landfill if they are to be removed from site.

8.2 Ground Engineering

The most suitable foundations for the proposed dwellings are considered to be traditional strip/trench fill foundations constructed in the firm Clay at a minimum depth of 1.00m bgl. Foundations should be deepened through all Made Ground which has been encountered across the site to a maximum depth of 0.70m bgl as part of this Ground Investigation.

The use of SuDS drainage within the natural ground is not considered to be a feasible option as poor soil infiltration rates are likely within the natural cohesive strata. If required, this should be confirmed with in-situ testing in accordance with BRE Digest 365.

8.3 Required Supplementary Investigation

The following further work is considered necessary to progress the site to construction phase:

Watching brief required in areas of restricted access.
Detailed foundation design.
Confirmation of the recommendations made within this report with the regulators.

9.0 RELEVANT INDUSTRY REFERENCES

British Standards Institution. *Investigation of Potentially Contaminated sites - code of practice*. BS 10175:2017.

British Standards Institution '*Code of Practice for Site Investigations*' BS 5930:2020

British Standards Institution "*Geotechnical investigation and testing – Identification and classification of soil*" BS EN ISO 14688:2018

British Standards Institution "*Geotechnical investigation and testing – Identification and classification of rock*" BS EN ISO 14689:2002.

BRE Report BR211 '*Radon – Guidance on protective measures for new buildings'* 2023 Edition.

BRE Special Digest 1: "*Concrete in Aggressive Ground*" 3rd Ed 2005.

CIRIA 552 "Contaminated Land Risk Assessment – A guide to good practice" 2001.

CIRIA C665 "Assessing Risks Posed by Hazardous Ground Gases to Buildings" 2007.

Wilson & Card "*Proposed method classifying gassing sites*" Ground Engineering 1999.

Card & Steve Wilson in "*A pragmatic approach to ground gas risk assessment for the 21st Century*" - CIRIA/Environmental Protection UK Ground gas seminar 2011

BS 8576:2013 '*Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)'*

BS 8485:2015 '*Code of practise for the design of protective measures for methane and carbon dioxide ground gases for new buildings'*

The Hazardous Waste (England) Regulations 2005.

Environment Agency Hazardous Waste: "*Guidance on the classification and assessment of waste"* WM3 ver 1 May 2015.

The National Planning Policy Framework (NPPF) March 2012

DETR. Circular 02/2000 Contaminated Land.

Environment Agency, 2009 'Using Soil Guideline Values'.

Environment Agency, 2009 'Updated Technical Background to the CLEA model'.

Environment Agency, 2009 'Human health toxicological assessment of contaminants in soil'.

Department of the Environment, 1994, CLR Report No 1 'A framework for assessing the impact of contaminated land on groundwater and surface water'.

Department of the Environment, 1994, CLR Report No 2 'Guidance on Preliminary Site Inspection of Contaminated Land'.

Department of the Environment, 1994, CLR Report No 3 'Documentary research on Industrial Sites'.

Department of the Environment, 1994, CLR Report No 4 'Sampling Strategies for Contaminated Land'.

DEFRA and the Environment Agency, 2002-2004, CLR10 'Soil Guideline Value Reports for Individual Soil Contaminants'.

LCRM (Land Contamination Risk Management), April 2021.

Nathanail, C. P., McCaffrey, C., Gillett, A., Ogden, R. C. and Nathanail, J.F. 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.

CL:AIRE, 2014 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination'.

Water Framework Directive.

Environmental Quality Standards.

UK Drinking Water Standards: Water Supply (Water Quality) Regulations 1989 (SI 1989/1147) and Water Supply (Water Quality) Regulations

UKWIR Report 10/WM/03/21 2010 "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites".

Health & Safety Executive, 1991. 'Protection of Workers & the General Public during the Development of Contaminated Land'.

Environment Agency & NHBC, 2000. R&D Publication 66. Guidance for the Safe Development of Housing on Land Affected by Contamination.

Environment Agency "Guidance on the classification and assessment of waste (1st edition 2015) Technical Guidance WM3"

NHBC Standards 2023.

CL:AIRE "*The Definition of Waste: Development Industry Code of Practice*" Version 2 March 2011.

CIRIA "*Asbestos in soil and made ground: a guide to understanding and managing risks*" C733 2014

Control of Asbestos Regulations (CAR) 2012

Harris, M R, Herbert, S. M, Smith, M A 'Remedial Treatment for Contaminated Land' (twelve volumes), special publications 101-112, CIRIA 1996.

Department of the Environment. 1995. Industry Profiles - 48 separate publications available from The Stationery Office, London

BRE Report 465 "Cover Systems for Land Regeneration" 2004.

Manchester City Council Guidance - Verification Requirements for Cover Systems Version 3.4 dated February 2021

Privett, K D, Matthews, S C, & Hodges, R, A, 'Barriers, liners and cover systems for containment and control of land contamination' 1996. CIRIA Special Publication 124.

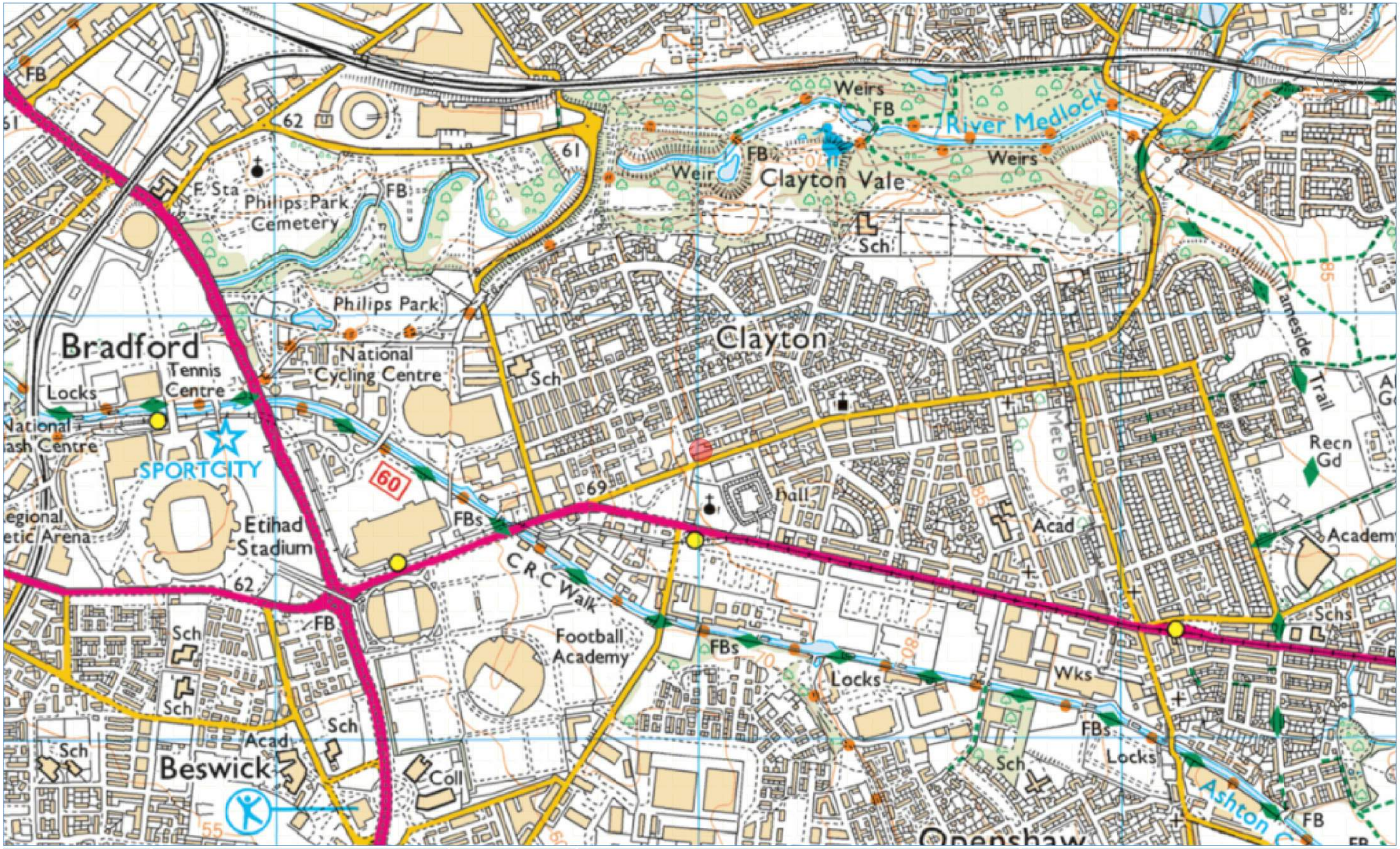
BRE Digest 365 "Soakaway Design" 2016.

Environment Agency. R&D Publication 20. Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources. 1999.

Environment Agency Technical Guidance Note 01. Hydrogeological Risk Assessment for Landfills.

Specification for Highways Works – Series 600 Earthworks November 2016.

APPENDIX 1 – Plans



GROUNDTECH
CONSULTING

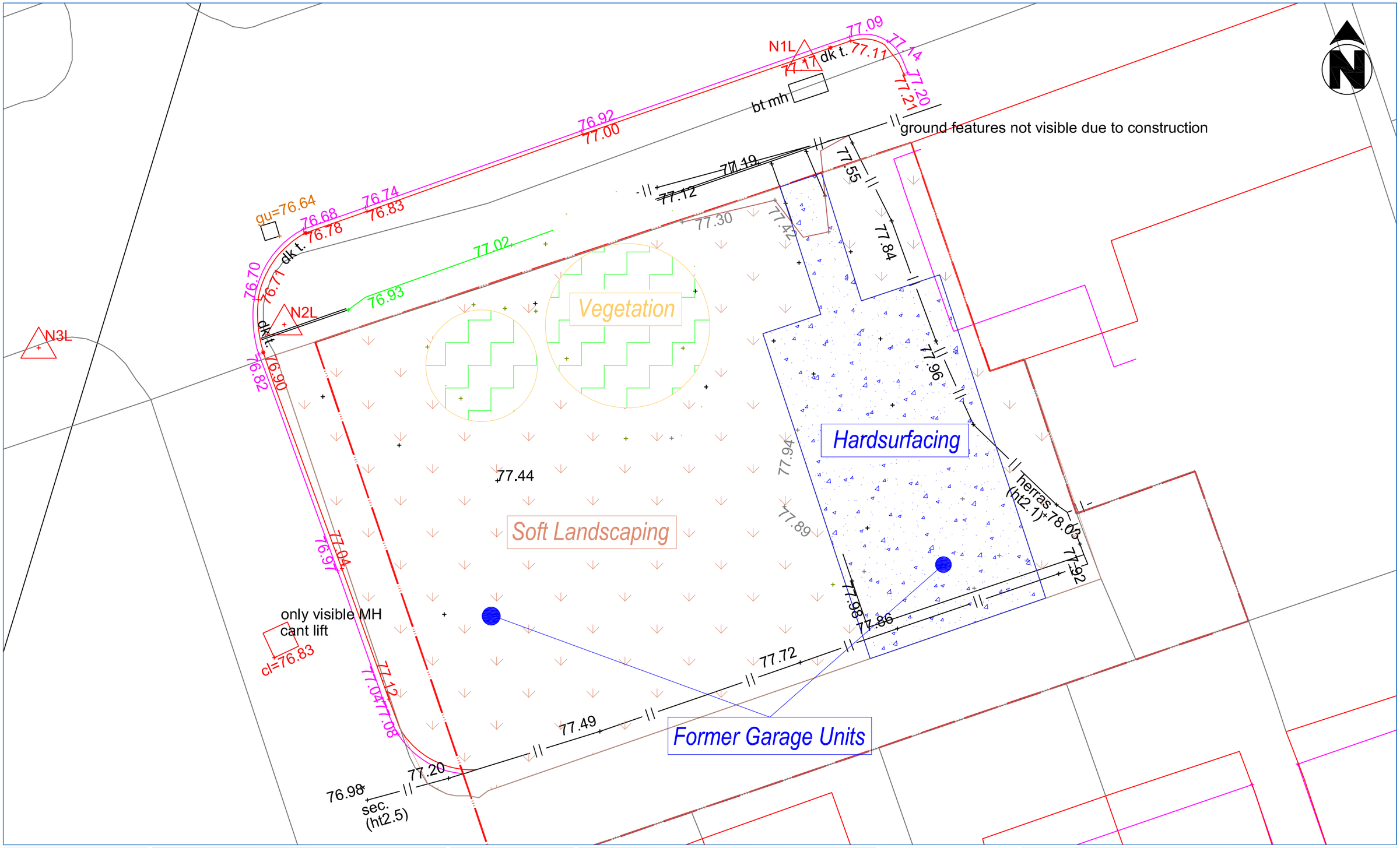
CLIENT	DATE
BRINDLE & YAW SOLICITORS	MARCH 2023
PROJECT TITLE	SCALE
113 TO 117 NORTH ROAD, MANCHESTER	NTS
PLAN TITLE	PLAN NUMBER
PROJECT LOCATION PLAN	GRO-23050-P01

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

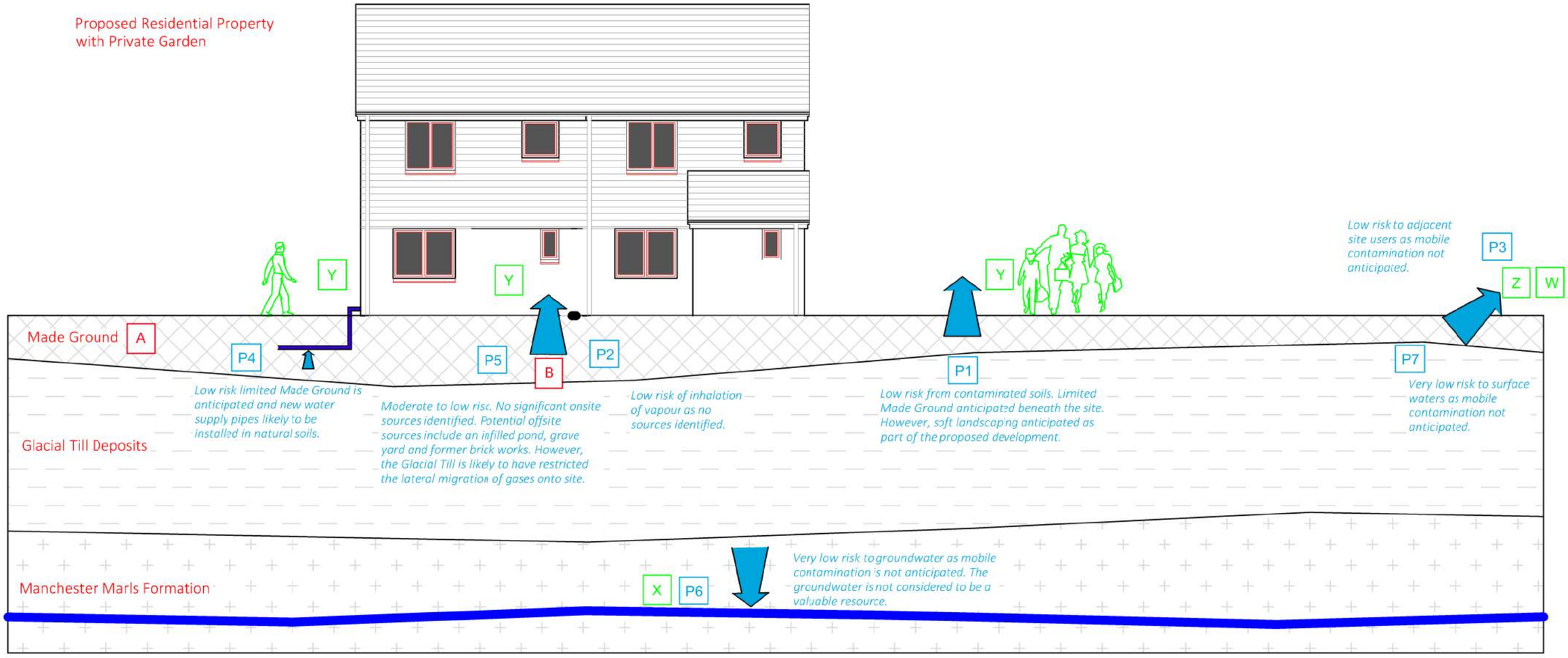
Notes

SITE LOCATION



GROUNDTECH CONSULTING	CLIENT BRINDLE & YAM SOLICITORS	DATE MARCH 2023				Status	Notes
	PROJECT TITLE 113 TO 117 NORTH ROAD, MANCHESTER	SCALE NTS				Preliminary	
						Draft	
						Issued	
	PLAN TITLE PRELIMINARY DEVELOPMENT CONSTRAINTS PLAN	PLAN NUMBER GRO-23050-P02	Rev.	Details	Date	For Comment	
						Approved	

SOURCES	POLLUTION LINKAGES	RECEPTORS
A. Contaminated soils / Made Ground. B. Ground gas.	P1. Ingestion of soil and dust. P2. Inhalation of vapour. P3. Inhalation of soil dust by adjacent site users. P4. Attacking of potable water supply pipe. P5. Migration and accumulation of ground gas in internal places. P6. Impaction of groundwater from soil contamination. P7. Migration of soil and groundwater contamination impacting surface waters.	W. Surface Waters. X. Groundwater within the underlying Secondary Aquifers. Y. Site end users. Z. Adjacent site users.



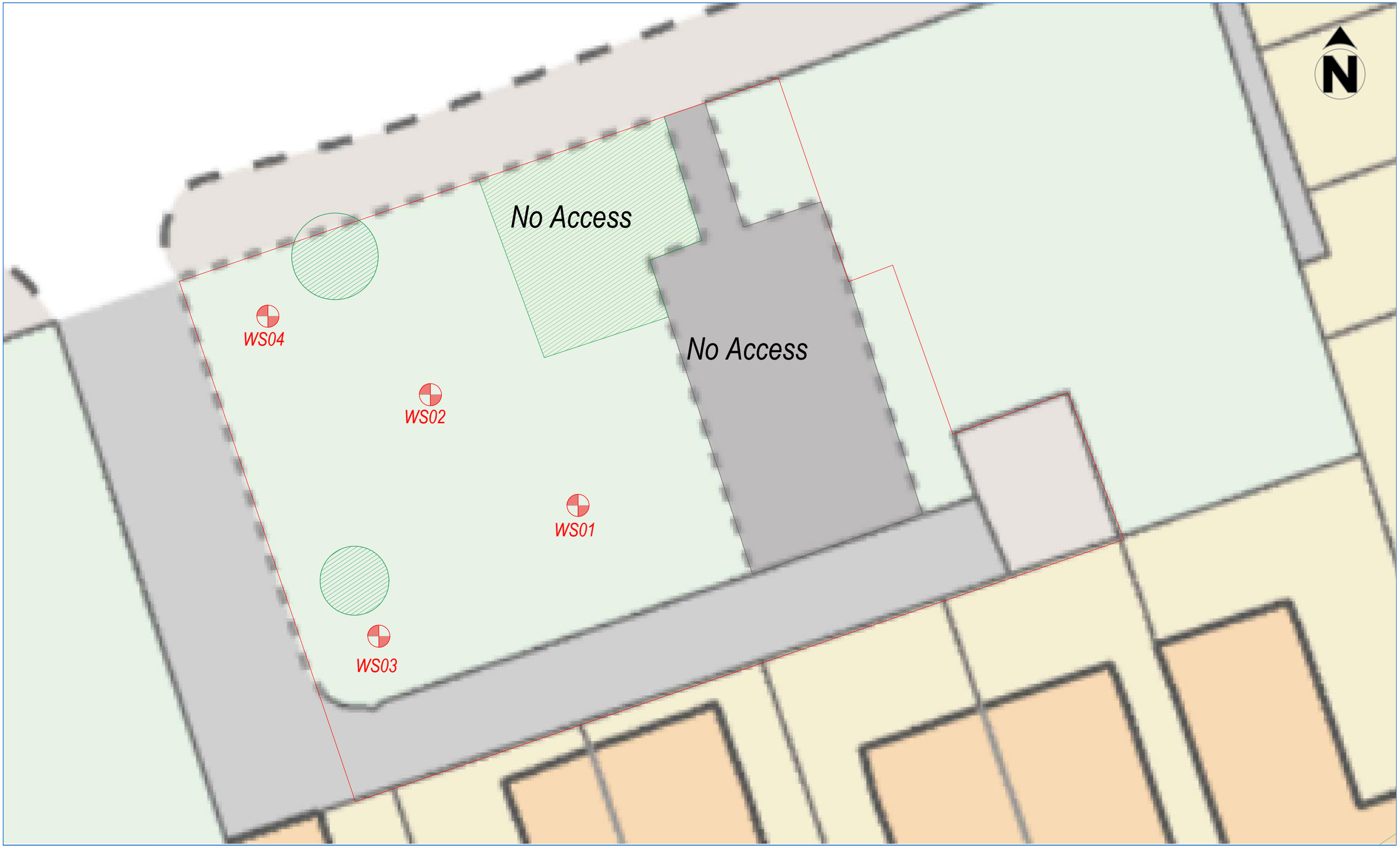
GROUNDTECH CONSULTING

CLIENT	DATE
BRINDLE & YAM SOLICITORS	MARCH 2023
PROJECT TITLE	SCALE
113 TO 117 NORTH ROAD, MANCHESTER	NTS
PLAN TITLE	PLAN NUMBER
ILLUSTRATIVE PRELIMINARY CSM	GRO-23050-P03

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes



GROUNDTECH CONSULTING

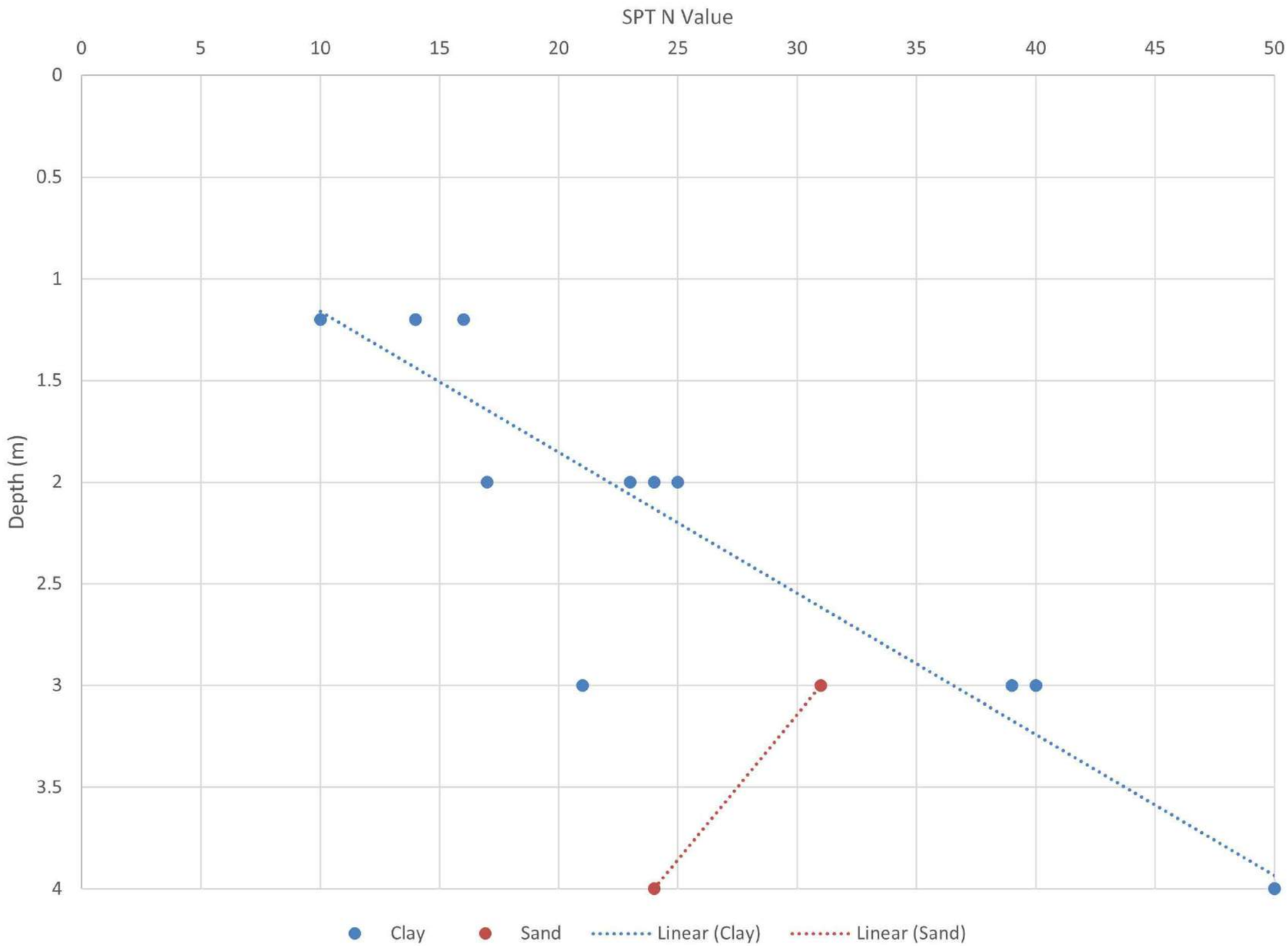
CLIENT	BRINDLE AND YAM SOLICITORS
PROJECT TITLE	113 - 117 NORTH ROAD, MANCHESTER
PLAN TITLE	EXPLORATORY HOLE LOCATION PLAN
DATE	OCTOBER 2023
SCALE	NTS
PLAN NUMBER	GRO-23050-P04

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes

- WINDOWLESS SAMPLE BOREHOLE LOCATION
- AREAS OF OVERGROWN VEGETATION
- FENCED OFF AREA



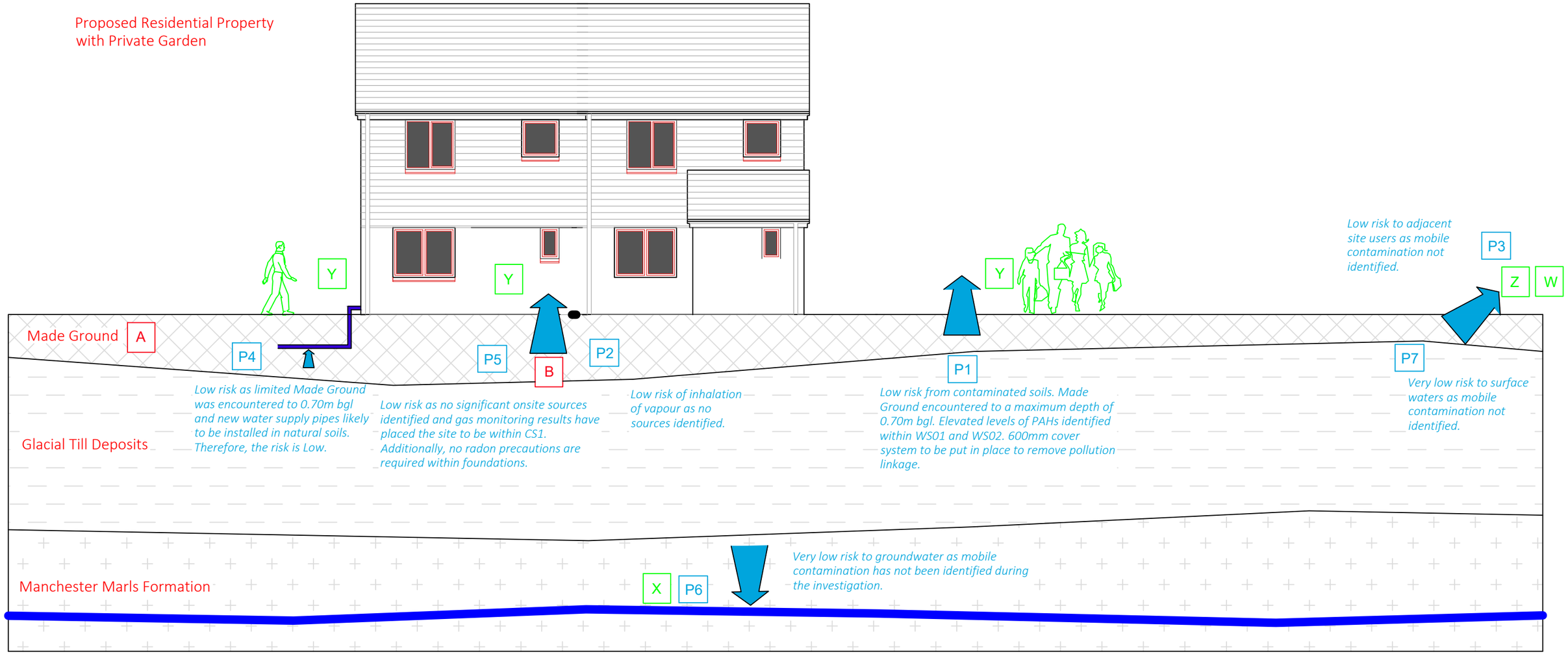
GROUNDTECH CONSULTING

CLIENT BRINDLE AND YAM SOLICITORS	DATE OCTOBER 2023				
PROJECT TITLE 113 - 117 NORTH ROAD, MANCHESTER	SCALE NTS				
PLAN TITLE GENERALISED GROUND MODEL	PLAN NUMBER GRO-23050-P05	Rev.	Details	Date	

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes

SOURCES	POLLUTION LINKAGES	RECEPTORS
A. Contaminated soils / Made Ground. B. Ground gas.	P1. Ingestion of soil and dust. P2. Inhalation of vapour. P3. Inhalation of soil dust by adjacent site users. P4. Attacking of potable water supply pipe. P5. Migration and accumulation of ground gas in internal places. P6. Impaction of groundwater from soil contamination. P7. Migration of soil and groundwater contamination impacting surface waters.	W. Surface Waters. X. Groundwater within the underlying Secondary Aquifers. Y. Site end users. Z. Adjacent site users.



GROUNDTECH CONSULTING

CLIENT	DATE
BRINDLE & YAM SOLICITORS	OCTOBER 2023
PROJECT TITLE	SCALE
113 - 117 NORTH ROAD, MANCHESTER	NTS
PLAN TITLE	PLAN NUMBER
REVISED PRELIMINARY CSM	GRO-23050-P06

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes

APPENDIX 2 – Site Photographs

Photograph 1 – South east area of the site.

Photograph 2 – North east area of the site.

Photograph 3 – South west area of the site.

Photograph 4 – Area to the immediate east of the site.

APPENDIX 3 – Exploratory Hole Logs

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS01**

Sheet 1 of 1

Project Name: 113 - 117 NORTH ROAD	Project No. GRO-23050	Co-ords: -	Hole Type WS
Location: MANCHESTER		Level:	Scale 1:25
Client: BRINDLE & YAM SOLICITORS		Dates: 07/09/2012 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.10	ES		0.15			MADE GROUND: Grass over dark brown slightly clayey sandy gravelly topsoil with occasional roots and rootlets. Gravel is angular to subrounded fine to medium of brick and rare clinker. Sand is fine to coarse.	
		0.50	ES		0.70			MADE GROUND: Dark brown grey gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, concrete, tarmac, cement and rare clinker.	
		0.80	ES					Stiff brown mottled grey sandy CLAY. Sand is fine to medium. (GLACIAL TILL).	
		1.00	D						1
		1.20		N=10 (1,1/2,2,3,3)				*Becoming stiff at 1.20m bgl.*	
		2.00 2.00	D	N=17 (1,2/3,4,4,6)				*Becoming very stiff at 2.00m bgl.*	2
	▼	3.00 3.00	D	N=21 (4,4/4,5,6,6)					3
					3.40			Medium dense light brown fine to coarse SAND. (GLACIAL TILL).	
		4.00 4.00	D	N=24 (9,7/6,6,5,7)	4.00			End of borehole at 4.00 m	4
									5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand excavated pit to 1.20m bgl. 3. Groundwater seepage encountered at 3.00m bgl. 4. Borehole terminated at 4.00m bgl due to collapse. 5. 35mm monitoring standpipe installed to 4.00m bgl (2.00m plain, 2.00m slotted).

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS02**

Sheet 1 of 1

Project Name: 113 - 117 NORTH ROAD	Project No. GRO-23050	Co-ords: -	Hole Type WS
Location: MANCHESTER		Level:	Scale 1:25
Client: BRINDLE & YAM SOLICITORS		Dates: 07/09/2023 -	Logged By HM

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.20	ES		0.20			MADE GROUND: Grass over dark brown slightly clayey sandy gravelly topsoil with occasional roots and rootlets. Gravel is subangular to subrounded fine to medium of brick. Sand is fine to coarse.	
		0.50	ES		0.63			MADE GROUND: Dark brown grey gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, concrete, and tarmac.	
		0.80	ES					Firm brown mottled grey sandy CLAY. Sand is fine to medium. (GLACIAL TILL).	
		1.00	D						1
		1.20		N=16 (2,3/4,4,4,4)				*Becoming stiff at 1.20m bgl.*	
		2.00 2.00	D	N=24 (4,3/5,6,6,7)				*Becoming very stiff at 2.00m bgl.*	2
		3.00 3.00	D	N=40 (5,7/12,12,10,6)					3
		3.30	D					*Band of fine to coarse sand from 3.20m to 3.35m bgl.*	
		4.00 4.00	D	N=50 (4,5/50 for 20mm)	4.00			End of borehole at 4.00 m	4
									5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand excavated pit to 1.20m bgl. 3. No groundwater encountered. 4. Borehole terminated at 4.00m bgl due to refusal. 5. Borehole backfilled with arisings.

GROUNDTECH CONSULTING

Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project Name: 113 - 117 NORTH ROAD	Project No. GRO-23050	Co-ords: -	Hole Type WS
Location: MANCHESTER		Level:	Scale 1:25
Client: BRINDLE & YAM SOLICITORS		Dates: 07/09/2023 -	Logged By HM

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.20	ES		0.30			MADE GROUND: Grass over dark brown slightly clayey sandy gravelly topsoil with occasional roots and rootlets. Gravel is subangular to subrounded fine to medium of brick. Sand is fine to coarse.	
		0.50	ES		0.60			MADE GROUND: Dark brown grey gravelly fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, concrete, and tarmac.	
		0.80	ES					Firm brown mottled grey sandy CLAY. Sand is fine to medium. (GLACIAL TILL).	
		1.00	D						1
		1.20		N=14 (3,3/3,3,4,4)				*Becoming stiff at 1.20m bgl.*	
		2.00 2.00	D	N=25 (3,4/5,6,7,7)				*Becoming very stiff at 2.0m bgl.*	2
		3.00 3.00	D	N=39 (8,10/10,10,10,9)	3.20			Dense light brown fine to coarse SAND. (GLACIAL TILL).	3
		3.50	D		3.60			Very stiff brown mottled grey sandy CLAY. Sand is fine to medium. (GLACIAL TILL).	
		4.00 4.00	D	N=50 (4,4/50 for 30mm)	4.00			End of borehole at 4.00 m	4
									5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand excavated pit to 1.20m bgl. 3. No groundwater encountered. 4. Borehole terminated at 4.00m bgl due to refusal. 5. 35mm monitoring standpipe installed to 4.00m bgl (2.00m plain, 2.00m slotted).

Borehole Log

GROUNDTECH CONSULTING

Borehole No. **WS04**

Sheet 1 of 1

Project Name: 113 - 117 NORTH ROAD	Project No. GRO-23050	Co-ords: -	Hole Type WS
Location: MANCHESTER		Level:	Scale 1:25
Client: BRINDLE & YAM SOLICITORS		Dates: 07/09/2023 -	Logged By JR

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.20	ES		0.25			MADE GROUND: Grass over dark brown slightly clayey sandy gravelly topsoil with occasional roots and rootlets. Gravel is angular to subrounded fine to medium of brick. Sand is fine to coarse.	
		0.50	ES					Firm brown mottled grey slightly gravelly slightly sandy CLAY. Gravel is angular to rounded of sandstone. Sand is fine to medium. (GLACIAL TILL).	
		1.00	D						1
		1.20		N=14 (3,2/3,3,4,4)					
		2.00 2.00	D	N=23 (3,4/5,5,6,7)					2
								Tree root (35mm) encountered from 2.65m to 3.00m bgl.	
	▼	3.00 3.00	D	N=31 (9,11/12,9,6,4)	3.00			Dense brown fine to coarse SAND. (GLACIAL TILL).	3
					3.30			Very stiff brown mottled grey sandy CLAY. Sand is fine to medium. (GLACIAL TILL).	
		4.00 4.00	D	N=50 (7,9/50 for 5mm)	4.00			End of borehole at 4.00 m	4
									5

Remarks

1. Location cleared of services using handheld Cable Avoidance Tool (CAT). 2. Hand excavated pit to 1.2m bgl. 3. Groundwater seepage encountered at 3.00m bgl. 4. Borehole terminated at 4.00m bgl due to refusal. 5. 35mm monitoring standpipe installed to 4.00m bgl (2.00m plain, 2.00m slotted).

APPENDIX 4 – Geo-Environmental Testing Results

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781
W: www.element.com

Groundtech Consulting Limited
PO Box 499
Manchester
United Kingdom
M28 8EE

Attention :	Jacob Roby
Date :	22nd September, 2023
Your reference :	GRO-23050
Our reference :	Test Report 23/15320 Batch 1
Location :	113-117 North Rd, Manchester
Date samples received :	16th September, 2023
Status :	Final Report
Issue :	1

Thirteen samples were received for analysis on 16th September, 2023 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 18.172 kg of CO2

Scope 1&2&3 emissions - 42.946 kg of CO2

Authorised By:

Bruce Leslie
Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 3rd Floor Davidson Building, 5 Southampton Street, London WC2E 7HA
Company Registration No: 11371415

Element Materials Technology

Client Name: Groundtech Consulting Limited
Reference: GRO-23050
Location: 113-117 North Rd, Manchester
Contact: Jacob Roby
EMT Job No: 23/15320

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	13-15	16-18	22-24	25-27	28-30	34	35		LOD/LOR	Units	Method No.
Sample ID	WS01	WS01	WS02	WS02	WS03	WS03	WS04	WS01	WS04				
Depth	0.100	0.500	0.500	0.800	0.500	0.800	0.200	1.000	1.000				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	T	T				
Sample Date	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023				
Arsenic #	18.6	6.1	7.3	-	6.4	-	26.5	-	-		<0.5	mg/kg	TM30/PM15
Cadmium #	0.2	0.4	0.2	-	<0.1	-	<0.1	-	-		<0.1	mg/kg	TM30/PM15
Chromium #	50.0	24.9	33.3	-	39.5	-	54.8	-	-		<0.5	mg/kg	TM30/PM15
Copper #	78	20	25	-	23	-	98	-	-		<1	mg/kg	TM30/PM15
Lead #	152	36	22	-	33	-	102	-	-		<5	mg/kg	TM30/PM15
Mercury #	0.2	<0.1	<0.1	-	<0.1	-	0.2	-	-		<0.1	mg/kg	TM30/PM15
Nickel #	40.0	11.1	13.8	-	17.2	-	21.8	-	-		<0.7	mg/kg	TM30/PM15
Selenium #	1	<1	<1	-	<1	-	<1	-	-		<1	mg/kg	TM30/PM15
Zinc #	277	66	42	-	64	-	104	-	-		<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.27	0.08	0.10	-	0.06	-	0.12	-	-		<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.13	0.05	0.05	-	0.05	-	0.07	-	-		<0.03	mg/kg	TM4/PM8
Acenaphthene #	0.32	0.10	0.18	-	0.07	-	0.22	-	-		<0.05	mg/kg	TM4/PM8
Fluorene #	0.23	0.08	0.14	-	<0.04	-	0.18	-	-		<0.04	mg/kg	TM4/PM8
Phenanthrene #	2.71	0.83	1.56	-	0.52	-	1.88	-	-		<0.03	mg/kg	TM4/PM8
Anthracene #	0.59	0.25	0.49	-	0.14	-	0.48	-	-		<0.04	mg/kg	TM4/PM8
Fluoranthene #	3.86	1.49	3.78	-	0.97	-	2.60	-	-		<0.03	mg/kg	TM4/PM8
Pyrene #	3.65	1.30	3.23	-	0.86	-	2.32	-	-		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	1.84	0.78	1.87	-	0.56	-	1.24	-	-		<0.06	mg/kg	TM4/PM8
Chrysene #	2.05	0.82	1.82	-	0.61	-	1.37	-	-		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	2.95	1.36	2.78	-	1.05	-	1.96	-	-		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	1.83	0.85	1.70	-	0.69	-	1.25	-	-		<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	1.20	0.60	1.07	-	0.46	-	0.76	-	-		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.27	0.11	0.25	-	0.11	-	0.20	-	-		<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	1.11	0.58	1.05	-	0.49	-	0.76	-	-		<0.04	mg/kg	TM4/PM8
PAH 16 Total	23.0	9.3	20.1	-	6.6	-	15.4	-	-		<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	2.12	0.98	2.00	-	0.76	-	1.41	-	-		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.83	0.38	0.78	-	0.29	-	0.55	-	-		<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	93	92	90	-	90	-	91	-	-		<0	%	TM4/PM8
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) #	-	<0.1 SV	<0.1	-	-	-	-	-	-		<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) #	-	<0.1 SV	<0.1	-	-	-	-	-	-		<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	-	<0.1 SV	<0.1	-	-	-	-	-	-		<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) #	-	<0.2	<0.2	-	-	-	-	-	-		<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) #	-	<4	<4	-	-	-	-	-	-		<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) #	-	<7	17	-	-	-	-	-	-		<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) #	-	28	164	-	-	-	-	-	-		<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-35 (EH+HS_CU_1D_AL)	-	28	181	-	-	-	-	-	-		<19	mg/kg	TM5/TM36/PM8/PM12/PM16

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Groundtech Consulting Limited
Reference: GRO-23050
Location: 113-117 North Rd, Manchester
Contact: Jacob Roby
EMT Job No: 23/15320

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	4-6	13-15	16-18	22-24	25-27	28-30	34	35				
Sample ID	WS01	WS01	WS02	WS02	WS03	WS03	WS04	WS01	WS04				
Depth	0.100	0.500	0.500	0.800	0.500	0.800	0.200	1.000	1.000		Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	T	T				
Sample Date	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023	07/09/2023				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1		LOD/LOR	Units	Method No.
Date of Receipt	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023	16/09/2023				
TPH CWG													
Aromatics													
>C5-EC7 (HS_1D_AR)#	-	<0.1 SV	<0.1	-	-	-	-	-	-		<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	-	<0.1 SV	<0.1	-	-	-	-	-	-		<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	-	<0.1 SV	<0.1	-	-	-	-	-	-		<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	-	<0.2	<0.2	-	-	-	-	-	-		<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	-	<4	4	-	-	-	-	-	-		<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	-	23	73	-	-	-	-	-	-		<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	-	124	364	-	-	-	-	-	-		<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-35 (EH+HS_CU_1D_AR)#	-	147	441	-	-	-	-	-	-		<19	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-35) (EH+HS_CU_1D_Total)	-	175	622	-	-	-	-	-	-		<38	mg/kg	TM5/TM36/PM8/PM12/PM16
MTBE#	-	<5 SV	<5	-	-	-	-	-	-		<5	ug/kg	TM36/PM12
Benzene#	-	<5 SV	<5	-	-	-	-	-	-		<5	ug/kg	TM36/PM12
Toluene#	-	<5 SV	<5	-	-	-	-	-	-		<5	ug/kg	TM36/PM12
Ethylbenzene#	-	<5 SV	<5	-	-	-	-	-	-		<5	ug/kg	TM36/PM12
m/p-Xylene#	-	<5 SV	<5	-	-	-	-	-	-		<5	ug/kg	TM36/PM12
o-Xylene#	-	<5 SV	<5	-	-	-	-	-	-		<5	ug/kg	TM36/PM12
Natural Moisture Content	29.0	7.4	7.3	-	14.5	-	10.6	-	-		<0.1	%	PM4/PM0
Hexavalent Chromium#	<0.3	<0.3	<0.3	-	<0.3	-	<0.3	-	-		<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext)#	0.0947	0.2441	0.0862	0.2202	0.2000	0.0969	0.0990	0.0483	0.0562		<0.0015	g/l	TM38/PM20
Organic Matter	8.5	2.0	0.9	-	1.1	-	11.7	-	-		<0.2	%	TM21/PM24
pH#	7.92	8.46	12.15	7.71	8.71	6.97	8.44	7.63	7.49		<0.01	pH units	TM73/PM11

Client Name: Groundtech Consulting Limited

Reference: GRO-23050

Location: 113-117 North Rd, Manchester

Contact: Jacob Roby

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
23/15320	1	WS01	0.500	4-6	PAH's & Trace of lubricating oil
23/15320	1	WS02	0.500	13-15	PAH's, Trace of lubricating oil & Possible tarmac/bitumen

Client Name: Groundtech Consulting Limited
Reference: GRO-23050
Location: 113-117 North Rd, Manchester
Contact: Jacob Roby

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
23/15320	1	WS01	0.100	3	Emily Anderton	19/09/2023	**General Description (Bulk Analysis)**	Brown soil with stones and vegetation
					Emily Anderton	19/09/2023	**Asbestos Fibres**	NAD
					Emily Anderton	19/09/2023	**Asbestos ACM**	NAD
					Emily Anderton	19/09/2023	**Asbestos Type**	NAD
23/15320	1	WS01	0.500	6	Catherine Coles	19/09/2023	**General Description (Bulk Analysis)**	brown soil,roots
					Catherine Coles	19/09/2023	**Asbestos Fibres**	NAD
					Catherine Coles	19/09/2023	**Asbestos ACM**	NAD
					Catherine Coles	19/09/2023	**Asbestos Type**	NAD
23/15320	1	WS02	0.500	15	Charlotte Taylor	19/09/2023	**General Description (Bulk Analysis)**	brown soil/stones
					Charlotte Taylor	19/09/2023	**Asbestos Fibres**	NAD
					Charlotte Taylor	19/09/2023	**Asbestos ACM**	NAD
					Charlotte Taylor	19/09/2023	**Asbestos Type**	NAD
23/15320	1	WS03	0.500	24	Charlotte Taylor	19/09/2023	**General Description (Bulk Analysis)**	brown soil/stones
					Charlotte Taylor	19/09/2023	**Asbestos Fibres**	NAD
					Charlotte Taylor	19/09/2023	**Asbestos ACM**	NAD
					Charlotte Taylor	19/09/2023	**Asbestos Type**	NAD
23/15320	1	WS04	0.200	30	Catherine Coles	19/09/2023	**General Description (Bulk Analysis)**	brown soil,stone
					Catherine Coles	19/09/2023	**Asbestos Fibres**	NAD
					Catherine Coles	19/09/2023	**Asbestos ACM**	NAD
					Catherine Coles	19/09/2023	**Asbestos Type**	NAD

Element Materials Technology

Notification of Deviating Samples

Client Name: Groundtech Consulting Limited
Reference: GRO-23050
Location: 113-117 North Rd, Manchester
Contact: Jacob Roby

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/15320						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/15320

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/15320

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

EMT Job No: 23/15320

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

APPENDIX 5 – Geotechnical Testing Results

LABORATORY REPORT

Contract Number: PSL23/7843

Report Date: 03 October 2023

Client's Reference: GRO-23050

Client Name: Groundtech Consulting

First Floor
Lloyd House
Orford Court
Greenfold Way
WN7 3XJ

For the attention of: Jacob Roby

Project Name: 113-117 North Road, Manchester

Date Received: 14/9/2023
Date Commenced: 14/9/2023
Date Completed: 02/10/2023

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Director)	R Berriman (Quality Manager)	S Royle (Laboratory Manager)
L Knight (Assistant Laboratory Manager)	S Eyre (Senior Technician)	M Fennell (Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS01		D	2.00		Brown mottled grey sandy CLAY.
WS02		D	1.00		Brown mottled grey sandy CLAY.
WS03		D	1.00		Brown mottled grey sandy CLAY.
WS04		D	2.00		Brown slightly gravelly sandy CLAY.

UKAS TESTING 4043 PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY	113 - 117 North Road, Manchester	Contract No: PSL23/7843 Client Ref: ORD-23050-3682

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS01		D	2.00		20			46	22	24	100	Intermediate Plasticity CI
WS02		D	1.00		18			49	23	26	100	Intermediate Plasticity CI
WS03		D	1.00		19			47	22	25	100	Intermediate Plasticity CI
WS04		D	2.00		17			45	22	23	92	Intermediate Plasticity CI

SYMBOLS : NP : Non Plastic *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

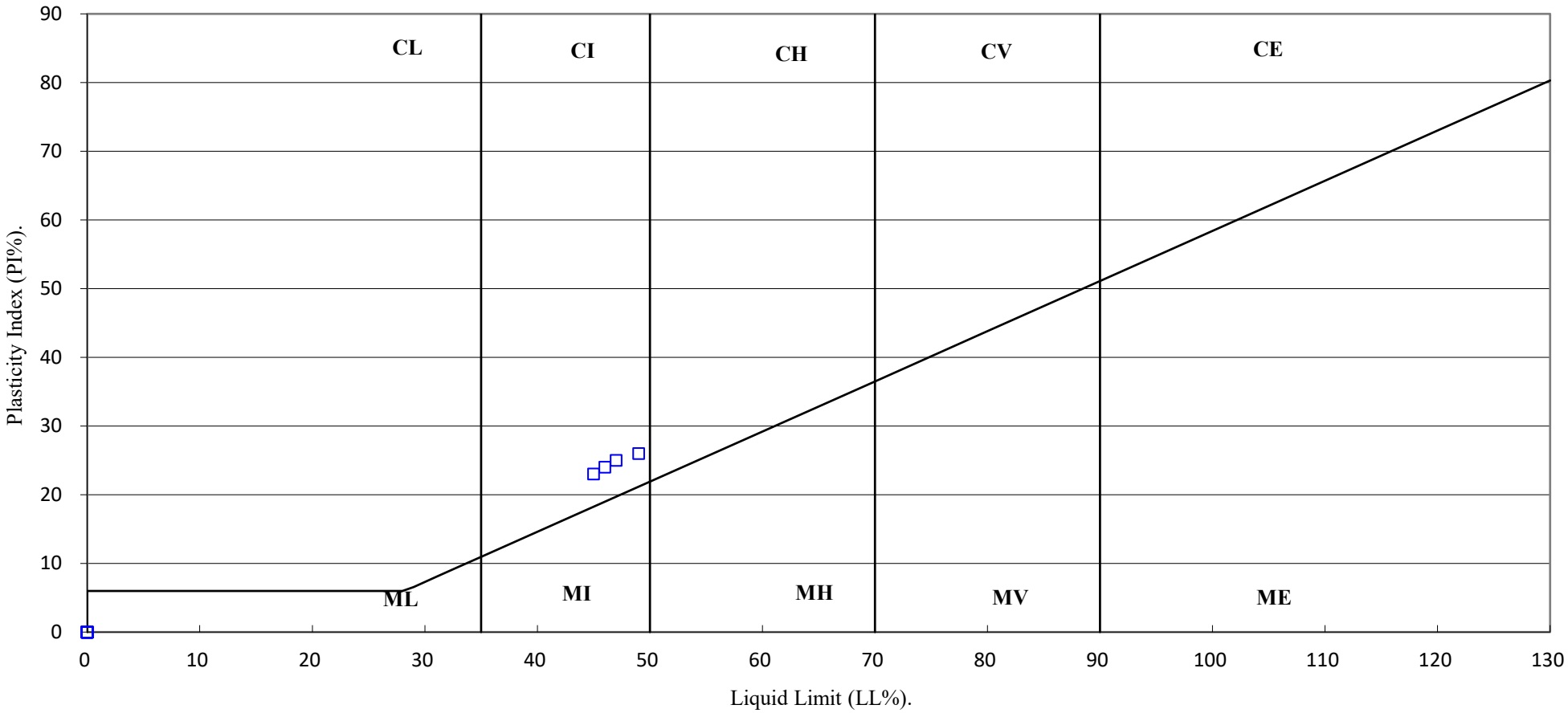
PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

113 - 117 North Road, Manchester

Contract No: PSL23/7843

Client Ref: ORD-23050-3682

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043 / PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY	113 - 117 North Road, Manchester	Contract No: PSL23/7843
		Client Ref: ORD-23050-3682

APPENDIX 6 – Interim Permanent Gas Monitoring Results

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*113-117 North Street*	***ENGINEER:***	*Ethan Hitchcow*
CLIENT:	*Brindale & Yams Solicitor's*	***DATE:***	*12/09/2023*
JOB NO:	*GRO-23050*		
Pressure Trend:	*Falling*	***Weather:*** *Overcast*	***Equipment:*** *GFM 436*

	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Ambient:						
Start	20.4	0.0	0.0	0.0	0.0	0.0
Finish	20.4	0.0	0.0	0.0	0.0	0.0

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q_{hg} CO_2 (l/hr)	Q_{hg} CH_4 (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	1.8	1.5	20.1	19.2	0.0	0.0	0.0	0.0	0.0018	0.0000	1002	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	2.0	0.9	19.9	19.1	0.0	0.0	0.0	0.0	0.0020	0.0000	1002	-	N	N/A	N/A	NGW
WS04	0.0	0.0	0.00	0.0	0.0	0.0	0.1	0.0	20.6	20.6	0.0	0.0	0.0	0.0	0.0001	0.0000	1002	-	N	N/A	N/A	NGW

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*113-117 North Street*	***ENGINEER:***	*Ethan Hitchcow*
CLIENT:	*Brindale & Yams Solicitor's*	***DATE:***	*20/09/2023*
JOB NO:	*GRO-23050*		

Pressure Trend:	*Steady*	***Weather:***	*Overcast*	***Equipment:***	*GFM 436*

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Start	20.4	0.0	0.0	0.0	0.0	0.0
Finish	20.4	0.0	0.0	0.0	0.0	0.0

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q_{hg} CO_2 (l/hr)	Q_{hg} CH_4 (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	4.7	4.7	14.0	13.8	0.0	0.0	0.0	0.0	0.0047	0.0000	976	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	0.6	0.3	20.3	19.7	0.0	0.0	0.0	0.0	0.0006	0.0000	977	-	N	N/A	N/A	NGW
WS04	0.0	0.0	0.00	0.0	0.0	0.0	4.8	4.7	15.7	15.5	0.0	0.0	0.0	0.0	0.0048	0.0000	977	-	N	N/A	N/A	NGW

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*113-117 North Street*	***ENGINEER:***	*William Sandiford Mitchell*
CLIENT:	*Brindale & Yams Solicitor's*	***DATE:***	*04/10/2023*
JOB NO:	*GRO-23050*		

Pressure Trend:	*Steady*	***Weather:***	*Overcast*	***Equipment:***	*GFM 436*

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Start	20.6	0.0	0.0	0.0	0.0	0.0
Finish	20.6	0.0	0.0	0.0	0.0	0.0

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q_{hg} CO_2 (l/hr)	Q_{hg} CH_4 (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.6	15.9	15.3	0.0	0.0	0.0	0.0	0.0038	0.0000	1009	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.2	19.2	19.4	0.0	0.0	0.0	0.0	0.0013	0.0000	1009	-	N	N/A	N/A	NGW
WS04	0.0	0.0	0.0	0.0	0.0	0.0	4.2	4.1	16.3	15.4	0.0	0.0	0.0	0.0	0.0042	0.0000	1009	-	N	N/A	N/A	NGW

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*113-117 North Street*	***ENGINEER:***	*William Sandiford Mitchell*
CLIENT:	*Brindale & Yams Solicitor's*	***DATE:***	
JOB NO:	*GRO-23050*		

Pressure Trend:	*Falling*	***Weather:***	*Overcast*	***Equipment:***	*GFM 436*

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Start	20.7	0.0	0.0	0.0	0.0	0.0
Finish	20.7	0.0	0.0	0.0	0.0	0.0

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q_{hg} CO_2 (l/hr)	Q_{hg} CH_4 (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	4.7	4.8	15.9	15.3	0.0	0.0	0.0	0.0	0.0047	0.0000	993	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	4.8	4.9	14.9	14.7	0.0	0.0	0.0	0.0	0.0048	0.0000	993	-	N	N/A	N/A	NGW
WS04	0.0	0.0	0.00	0.0	0.0	0.0	3.9	3.9	16.5	16.8	0.0	0.0	0.0	0.0	0.0039	0.0000	992	-	N	N/A	N/A	NGW

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*113-117 North Street*	***ENGINEER:***	*William Sandiford Mitchell*
CLIENT:	*Brindale & Yams Solicitor's*	***DATE:***	*30/10/2023*
JOB NO:	*GRO-23050*		

Pressure Trend:	*Falling*	***Weather:***	*Overcast*	***Equipment:***	*GFM 436*

	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Ambient:						
Start	20.8	0.0	0.0	0.0	0.0	0.0
Finish	20.8	0.0	0.0	0.0	0.0	0.0

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q_{hg} CO_2 (l/hr)	Q_{hg} CH_4 (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	4.7	4.5	13.8	14.2	0.0	0.0	0.0	0.0	0.0047	0.0000	987	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	4.2	4.0	15.3	14.7	0.0	0.0	0.0	0.0	0.0042	0.0000	987	-	N	N/A	N/A	NGW
WS04	0.0	0.0	0.00	0.0	0.0	0.0	5.3	5.2	12.6	12.3	0.0	0.0	0.0	0.0	0.0053	0.0000	987	-	N	N/A	N/A	NGW

Notes:

PERMANENT GROUND GAS MONITORING FORM

GROUNDTECH CONSULTING

SITE NAME:	*113-117 North Street*	***ENGINEER:***	*William Sandiford Mitchell*
CLIENT:	*Brindale & Yams Solicitor's*	***DATE:***	*17/11/2023*
JOB NO:	*GRO-23050*		

Pressure Trend:	*Rising*	***Weather:***	*CLEAR*	***Equipment:***	*GFM 436*

Ambient:	O_2 (%v/v)	CH_4 (%v/v)	CO_2 (%v/v)	LEL	H_2S (ppm)	CO (ppm)
Start	20.8	0.0	0.0	0.0	0.0	0.0
Finish	20.8	0.0	0.0	0.0	0.0	0.0

BH Ref.	Gas Flow Rate (l/hr)		Borehole Pressure (mb)	Methane (%v/v)			Carbon Dioxide (%v/v)		Oxygen (%v/v)		Hydrogen Sulphide (ppm)		Carbon Monoxide (ppm)		Q_{hg} CO_2 (l/hr)	Q_{hg} CH_4 (l/hr)	Atmos Press (mb)	PID (ppm)	Sheen (Y/N)	LNAPL (Y/N)	DNAPL (Y/N)	Depth to Water (m bgl)
	Peak	Steady		Peak	Steady	LEL	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady								
WS01	0.0	0.0	0.00	0.0	0.0	0.0	5.1	4.9	17.7	17.3	0.0	0.0	0.0	0.0	0.0051	0.0000	1011	-	N	N/A	N/A	NGW
WS03	0.0	0.0	0.00	0.0	0.0	0.0	3.5	2.2	18.3	18.2	0.0	0.0	0.0	0.0	0.0035	0.0000	1010	-	N	N/A	N/A	NGW
WS04	0.0	0.0	0.00	0.0	0.0	0.0	5.8	5.3	16.8	16.2	0.0	0.0	0.0	0.0	0.0058	0.0000	1010	-	N	N/A	N/A	NGW

Notes:

APPENDIX 7 – Generic Screening Values (Residential End Use)

Generic Assessment Criteria (GAC)

Proposed End Use	Unit	Residential with Plant Uptake			Commercial			Source
SOM	%	1	2.5	6	1	2.5	6	
Arsenic	*mg/kg*	*37*	*37*	*37*	*640*	*640*	*640*	*LQM S4ULs*
Beryllium	*mg/kg*	*1.7*	*1.7*	*1.7*	*12*	*12*	*12*	*LQM S4ULs*
Boron (water soluble)	*mg/kg*	*290*	*290*	*290*	*240000*	*240000*	*240000*	*LQM S4ULs*
Cadmium	*mg/kg*	*11*	*11*	*11*	*190*	*190*	*190*	*LQM S4ULs*
Chromium (Total)	*mg/kg*	*910*	*910*	*910*	*8600*	*8600*	*8600*	*LQM S4ULs*
Chromium (VI)	*mg/kg*	*6*	*6*	*6*	*33*	*33*	*33*	*LQM S4ULs*
Copper	*mg/kg*	*2400*	*2400*	*2400*	*68000*	*68000*	*68000*	*LQM S4ULs*
Lead	*mg/kg*	*200*	*200*	*200*	*2300*	*2300*	*2300*	*DEFRA C4SLs*
Organic Mercury	*mg/kg*	*1.2*	*1.2*	*1.2*	*26*	*26*	*26*	*LQM S4ULs*
Nickel	*mg/kg*	*130*	*130*	*130*	*980*	*980*	*980*	*LQM S4ULs*
Selenium	*mg/kg*	*250*	*250*	*250*	*12000*	*12000*	*12000*	*LQM S4ULs*
Vanadium	*mg/kg*	*410*	*410*	*410*	*9000*	*9000*	*9000*	*LQM S4ULs*
Zinc	*mg/kg*	*3700*	*3700*	*3700*	*730000*	*730000*	*730000*	*LQM S4ULs*
Aliphatic EC 5 - 6	*mg/kg*	*42*	*78*	*160*	*3200 (304) sol*	*5900 (558) sol*	*12000 (1150) sol*	*LQM S4ULs*
Aliphatic EC 6 - 8	*mg/kg*	*100*	*230*	*530*	*7800 (144) sol*	*17000 (322) sol*	*40000 (736) sol*	*LQM S4ULs*
Aliphatic EC 8 - 10	*mg/kg*	*27*	*65*	*150*	*2000 (78) sol*	*4800 (190) sol*	*11000 (451) vap*	*LQM S4ULs*
Aliphatic EC 10 - 12	*mg/kg*	*130 (48) vap*	*330 (118) vap*	*760 (283) vap*	*9700 (48) sol*	*23000 (118) vap*	*47000 (283) vap*	*LQM S4ULs*
Aliphatic EC 12 - 16	*mg/kg*	*1100 (24) sol*	*2400 (59) sol*	*4300 (142) sol*	*59000 (24) sol*	*82000 (59) sol*	*90000 (142) sol*	*LQM S4ULs*
Aliphatic EC 16 - 35	*mg/kg*	*65000 (8.48) f,sol*	*92000 (21) f,sol*	*110000 f*	*1600000 f*	*1700000 f*	*1800000 f*	*LQM S4ULs*
Aliphatic EC 35 - 44	*mg/kg*	*65000 (8.48) f,sol*	*92000 (21) f,sol*	*110000 f*	*1600000 f*	*1700000 f*	*1800000 f*	*LQM S4ULs*
Aromatic EC 5 - 7	*mg/kg*	*70*	*140*	*300*	*26000 (1220) sol*	*46000 (2260) sol*	*86000 (4710) sol*	*LQM S4ULs*
Aromatic EC 7 - 8	*mg/kg*	*130*	*290*	*660*	*56000 (869) vap*	*110000 (1920)*	*180000 (4360)*	*LQM S4ULs*
Aromatic EC 8 - 10	*mg/kg*	*34*	*83*	*190*	*3500 (613) vap*	*8100 (1500) vap*	*17000 (3580)*	*LQM S4ULs*
Aromatic EC 10 - 12	*mg/kg*	*74*	*180*	*380*	*16000 (364) sol*	*28000 (899) sol*	*34000 (2150) sol*	*LQM S4ULs*
Aromatic EC 12 -16	*mg/kg*	*140*	*330*	*660*	*36000 (169) sol*	*37000*	*38000*	*LQM S4ULs*
Aromatic EC 16 - 21	*mg/kg*	*260 f*	*540 f*	*930 f*	*28000 f*	*28000 f*	*28000 f*	*LQM S4ULs*
Aromatic EC 21 - 35	*mg/kg*	*1100 f*	*1500 f*	*1700 f*	*28000 f*	*28000 f*	*28000 f*	*LQM S4ULs*
Aromatic EC 35 - 44	*mg/kg*	*1100 f*	*1500 f*	*1700 f*	*28000 f*	*28000 f*	*28000 f*	*LQM S4ULs*
Benzene	*mg/kg*	*0.087*	*0.17*	*0.37*	*27*	*47*	*90*	*LQM S4ULs*
Toluene	*mg/kg*	*130*	*130*	*130*	*56000 (869)*	*110000 (1920)*	*180000 (4360)*	*LQM S4ULs*
Ethyl Benzene	*mg/kg*	*47*	*110*	*260*	*5700*	*13000*	*27000*	*LQM S4ULs*
Xylene - o	*mg/kg*	*60*	*140*	*330*	*6600*	*15000*	*33000*	*LQM S4ULs*
Xylene - m	*mg/kg*	*59*	*140*	*320*	*6200*	*14000*	*31000*	*LQM S4ULs*
Xylene - p	*mg/kg*	*56*	*130*	*310*	*5900*	*14000*	*30000*	*LQM S4ULs*
MTBE (methyl tert-butyl ether)	*mg/kg*	*49*	*84*	*160*	*7900*	*13000*	*24000*	*CL:AIRE 2010*
Acenaphthene	*mg/kg*	*210*	*510*	*1100*	*84000 (57) sol*	*97000 (141) sol*	*100000*	*LQM SAULs*
Acenaphthylene	*mg/kg*	*170*	*420*	*920*	*83000 (86.1) sol*	*97000 (212) sol*	*100000*	*LQM S4ULs*
Anthracene	*mg/kg*	*2400*	*5400*	*11000*	*520000*	*540000*	*540000*	*LQM S4ULs*
Benz(a)anthracene	*mg/kg*	*7.2*	*11*	*13*	*170*	*170*	*180*	*LQM S4ULs*
Benzo(a)pyrene	*mg/kg*	*2.2*	*2.7*	*3*	*35*	*35*	*36*	*LQM S4ULs*
Benzo(b)fluoranthene	*mg/kg*	*2.6*	*3.3*	*3.7*	*44*	*44*	*45*	*LQM S4ULs*
Benzo(ghi)perylene	*mg/kg*	*320*	*340*	*350*	*3900*	*4000*	*4000*	*LQM S4ULs*
Benzo(k)fluoranthene	*mg/kg*	*77*	*93*	*100*	*1200*	*1200*	*1200*	*LQM S4ULs*
Chrysene	*mg/kg*	*15*	*22*	*27*	*350*	*350*	*350*	*LQM S4ULs*
Dibenz(ah)anthracene	*mg/kg*	*0.24*	*0.28*	*0.3*	*3.5*	*3.6*	*3.6*	*LQM S4ULs*
Fluoranthene	*mg/kg*	*280*	*560*	*890*	*23000*	*23000*	*23000*	*LQM S4ULs*
Fluorene	*mg/kg*	*170*	*400*	*860*	*63000 (30.9) sol*	*68000*	*71000*	*LQM S4ULs*
Indeno(123-cd)pyrene	*mg/kg*	*27*	*36*	*41*	*500*	*510*	*510*	*LQM S4ULs*
Naphthalene	*mg/kg*	*15 f*	*36 f*	*85 f*	*1600 f*	*3700 f*	*8400 f*	*LQM S4ULs*
Phenanthrene	*mg/kg*	*95*	*220*	*440*	*22000*	*22000*	*23000*	*LQM S4ULs*
Pyrene	*mg/kg*	*620*	*1200*	*2000*	*54000*	*54000*	*54000*	*LQM S4ULs*

Generic Assessment Criteria (GAC)

Proposed End Use	Unit	Residential with Plant Uptake			Commercial			Source
SOM	%	1	2.5	6	1	2.5	6	
Phenol	*mg/kg*	*120*	*200*	*380*	*440*	*690*	*1300*	*LQM S4ULs*
Chlorophenols	*mg/kg*	*0.87* [g]	*2*	*4.5*	*3500*	*4000*	*4300*	*LQM S4ULs*
Pentachlorophenol	*mg/kg*	*0.22*	*0.52*	*1.2*	*400*	*400*	*400*	*LQM S4ULs*
Carbon disulphide	*mg/kg*	*0.14*	*0.29*	*0.62*	*11*	*22*	*47*	*LQM S4ULs*
Hexachlorobutadiene	*mg/kg*	*0.29*	*0.7*	*1.6*	*31*	*66*	*120*	*LQM S4ULs*
1,1,1,2 Tetrachloroethane	*mg/kg*	*1.6*	*3.4*	*7.5*	*270*	*550*	*1100*	*LQM S4ULs*
1,1,1 Trichloroethane	*mg/kg*	*8.8*	*18*	*39*	*660*	*1300*	*3000*	*LQM S4ULs*
Trichloroethene	*mg/kg*	*0.016*	*0.034*	*0.075*	*1.2*	*2.6*	*5.7*	*LQM S4ULs*
Tetrachoromethane (Carbon Tetrachloride)	*mg/kg*	*0.026*	*0.056*	*0.13*	*2.9*	*6.3*	*14*	*LQM S4ULs*
1,2-Dichloroethane	*mg/kg*	*0.0071*	*0.011*	*0.019*	*0.67*	*0.97*	*1.7*	*LQM S4ULs*
Chloroethene (Vinyl chloride)	*mg/kg*	*0.00064*	*0.00087*	*0.0014*	*0.059*	*0.077*	*0.12*	*LQM S4ULs*
Trichloromethane (Chloroform)	*mg/kg*	*0.91*	*1.7*	*3.4*	*99*	*170*	*350*	*LQM S4ULs*
Tetrachloroethene	*mg/kg*	*0.18*	*0.39*	*0.9*	*19*	*42*	*95*	*LQM S4ULs*
Hexachlorobenzene	*mg/kg*	*1.8 (0.2)* [vap]	*3.3 (0.5)* [vap]	*4.9*	*110 (0.2)* [vap]	*120*	*120*	*LQM S4ULs*
Pentachlorobenzene	*mg/kg*	*5.8*	*12*	*22*	*640 (43)* [sol]	*770 (107)* [sol]	*830*	*LQM S4ULs*
1,2,4,5-Tetrachlorobenzene	*mg/kg*	*0.33*	*0.77*	*1.6*	*42 (19.7)* [sol]	*72 (49.1)* [sol]	*96*	*LQM S4ULs*
1,2,3,5-Tetrachlorobenzene	*mg/kg*	*0.66*	*1.69*	*3.7*	*49 (39.4)* [vap]	*120 (98.1)* [vap]	*240 (235)* [vap]	*LQM S4ULs*
1,2,3,4-Tetrachlorobenzene	*mg/kg*	*15*	*36*	*78*	*1700 (122)* [vap]	*3080 (304)* [vap]	*4400 (728)* [vap]	*LQM S4ULs*
1,3,5-Trichlorobenzene	*mg/kg*	*0.33*	*0.81*	*1.9*	*23*	*55*	*130*	*LQM S4ULs*
1,2,4-Trichlorobenzene	*mg/kg*	*2.6*	*6.4*	*15*	*220*	*530*	*1300*	*LQM S4ULs*
1,2,3-Trichlorobenzene	*mg/kg*	*1.5*	*3.6*	*8.6*	*102*	*250*	*590*	*LQM S4ULs*
1,4-dichlorobenzene	*mg/kg*	*61* [f]	*150* [f]	*350* [f]	*4400* [f] *(224)* [vap]	*10000* [f] *(540)*	*25000* [f] *(1280)*	*LQM S4ULs*
1,3-dichlorobenzene	*mg/kg*	*0.4*	*1*	*2.3*	*30*	*73*	*170*	*LQM S4ULs*
1,2-Dichlorobenzene	*mg/kg*	*23*	*55*	*130*	*2000 (571)* [sol]	*4800 (1370)* [sol]	*11000 (3240)* [sol]	*LQM S4ULs*
Chlorobenzene	*mg/kg*	*0.46*	*1*	*2.4*	*56*	*130*	*290*	*LQM S4ULs*
Gamma-Hexachlorocyclohexane	*mg/kg*	*0.06*	*0.14*	*0.33*	*67*	*69*	*70*	*LQM S4ULs*
Beta-Hexachlorocyclohexane	*mg/kg*	*0.085*	*0.2*	*0.46*	*65*	*65*	*65*	*LQM S4ULs*
Alpha -Hexachlorocyclohexane	*mg/kg*	*0.23*	*0.55*	*1.2*	*170*	*180*	*180*	*LQM S4ULs*
Beta -Endosulfan	*mg/kg*	*7*	*17*	*39*	*6300 (0.00007)*	*7800 (0.0002)*	*8700*	*LQM S4ULs*
Alpha-Endosulfan	*mg/kg*	*7.4*	*18*	*41*	*5600 (0.003)* [vap]	*7400 (0.007)* [vap]	*8400 (0.016)* [vap]	*LQM S4ULs*
Dichlorvos	*mg/kg*	*0.032*	*0.066*	*0.14*	*140*	*140*	*140*	*LQM S4ULs*
Atrazine	*mg/kg*	*3.3*	*7.6*	*17.4*	*9300*	*9400*	*9400*	*LQM S4ULs*
Dieldrin	*mg/kg*	*0.97*	*2*	*3.5*	*170*	*170*	*170*	*LQM S4ULs*
Aldrin	*mg/kg*	*5.7*	*6.6*	*7.1*	*170*	*170*	*170*	*LQM S4ULs*
HMX	*mg/kg*	*5.7*	*13*	*26*	*110000*	*110000*	*110000*	*LQM S4ULs*
2,4,6-Trinitrotoulene	*mg/kg*	*1.6*	*3.7*	*8.1*	*1000*	*1000*	*1000*	*LQM S4ULs*
RDX	*mg/kg*	*120*	*250*	*540*	*210000*	*210000*	*210000*	*LQM S4ULs*

[sol] S4UL exceeds the solubility saturation limit (which is presented in brackets)

[vap] S4ULS presented exceeds the vapour saturation limit, which is presented in brackets

[f] For naphthalene, the S4UL is based on a comparison of inhalation exposure with the TDI_{inhal} for localised affects

[f] S4UL based on comparison of inhalation exposure with inhalation TDI for localised effects

[dir] S4ULs based on a threshold protecive direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustation only

APPENDIX 8 – Statistical Analysis

Test Results

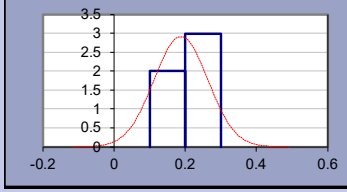
Client/client ref: Brindle & Yam S
Project ref: GRO-23050

Site ref: 113 - 117 North Road, Manchester
Data description: Made Ground

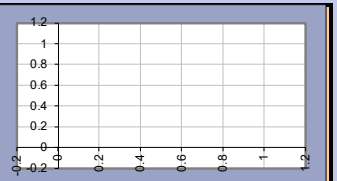
Date: 26-Oct-2023
User details: JR

Datase	Dibenzo(ah)anthracene (mg/kg)
Sample mean, $\bar{x}$, (mg/kg)	0.188
Sample standard deviation, s	0.0756
Sample size, n	5
Critical concentration, Cc (mg/kg)	0.24

Use Normal distribution to test



Outliers & non-detects	
Outliers present?	NO
Significance level	5%
Outliers removed?	0
Non-detects	0

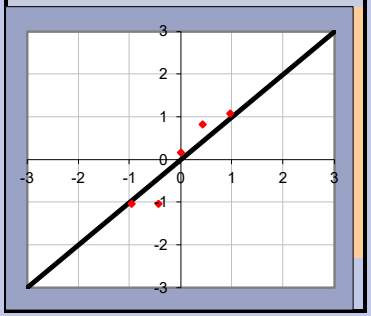


Normality test

Significance le 5%

Normal distribution

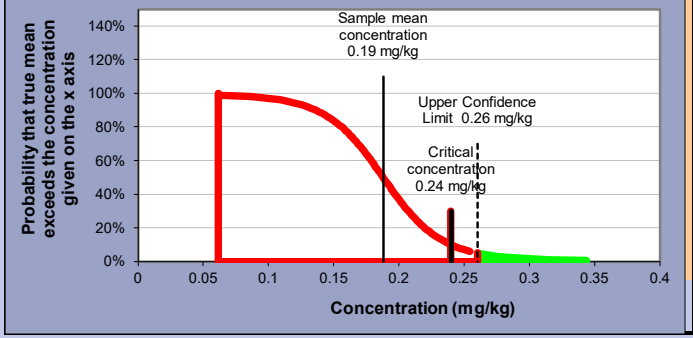
Use: Auto: One-sample



Test scenario:

Planning: is true mean lower than critical concentration (μ < Cc)?

Null hypothesis:	The true mean concentration is equal to or greater than the critical concentration: μ ≥ Cc
Alternative hypothesis:	The true mean concentration is less than the critical concentration: μ < Cc



Evidence against Null hypothesis:	**90%**
Base decision on:	evidence level
Evidence level required:	**95%**
Balance of probability?	N/A
Reject Null Hypothesis?	No

Not enough evidence

Back to data | Back to summary | Go to outlier test | Go to normality test

APPENDIX 9 – Waste Classification Report

HazWasteOnline™

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

GWPR9-JOMYH-3ZPTI

Job name

113-117 North Road

Description/Comments

Project

GRO-23050

Site

113-117 North Road

Classified by

Name:
Richard Wyatt
Date:
09 Oct 2023 14:05 GMT
Telephone:
07742660133

Company:
Groundtech Consulting Limited
First Floor, Lloyd House
Orford Court, Greenfold Way
Leigh
WN7 3XJ

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: -

Course	Date
Hazardous Waste Classification	50% complete

Purpose of classification

4 - Classification of Waste Products

Address of the waste

Post Code

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Description of the specific process, sub-process and/or activity that created the waste

Description of the waste

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS01-07/09/2023-0.100m		Non Hazardous		3
2	WS01-07/09/2023-0.500m		Non Hazardous		5
3	WS02-07/09/2023-0.500m		Hazardous	HP 8	7
4	WS02-07/09/2023-0.800m		Non Hazardous		9
5	WS03-07/09/2023-0.500m		Non Hazardous		10
6	WS03-07/09/2023-0.800m		Non Hazardous		12
7	WS04-07/09/2023-0.200m		Non Hazardous		13
8	WS01-07/09/2023-1.000m		Non Hazardous		15
9	WS04-07/09/2023-1.000m		Non Hazardous		16

Related documents

#	Name	Description
1	EMT-23-15320-Batch-1-202309221633.HWOL	Element .hwol file used to populate the Job

Report

Created by: Richard Wyatt

Created date: 09 Oct 2023 14:05 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	17
Appendix B: Rationale for selection of metal species	18
Appendix C: Version	18

Classification of sample: WS01-07/09/2023-0.100m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS01-07/09/2023-0.100m
Moisture content:
29%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 29% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		18.6	mg/kg	1.534	22.116	mg/kg	0.00221 %	✓	
2		cadmium { cadmium compounds, with the exception of cadmium sulphoselenide (xCdS.yCdSe), reaction mass of cadmium sulphide with zinc sulphide (xCdS.yZnS), reaction mass of cadmium sulphide with mercury sulphide (xCdS.yHgS), and those specified elsewhere in this Annex }	048-001-00-5			1	0.2	mg/kg		0.155	mg/kg	0.0000155 %	✓	
3		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		78	mg/kg	1.126	68.077	mg/kg	0.00681 %	✓	
4		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	152	mg/kg		117.829	mg/kg	0.0118 %	✓	
5		mercury { mercury }	080-001-00-0	231-106-7	7439-97-6		0.2	mg/kg		0.155	mg/kg	0.0000155 %	✓	
6		nickel { nickel diiodide }	028-029-00-4	236-666-6	13462-90-3		40	mg/kg	5.324	165.095	mg/kg	0.0165 %	✓	
7		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		1	mg/kg	2.554	1.98	mg/kg	0.000198 %	✓	
8		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		277	mg/kg	1.245	267.276	mg/kg	0.0267 %	✓	
9		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		**<LOD**
10		pH			PH		7.92	pH		7.92	pH	7.92 pH		
11		benzo[bk]fluoranthene		[1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9		2.95	mg/kg		2.287	mg/kg	0.000229 %	✓	
12		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		50	mg/kg	1.462	56.649	mg/kg	0.00566 %	✓	
											Total:	0.0702 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS01-07/09/2023-0.500m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS01-07/09/2023-0.500m
Moisture content:
7.4%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 7.4% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		6.1	mg/kg	1.534	8.712	mg/kg	0.000871 %	✓	
2		cadmium { cadmium compounds, with the exception of cadmium sulphoselenide (xCdS.yCdSe), reaction mass of cadmium sulphide with zinc sulphide (xCdS.yZnS), reaction mass of cadmium sulphide with mercury sulphide (xCdS.yHgS), and those specified elsewhere in this Annex }	048-001-00-5			1	0.4	mg/kg		0.372	mg/kg	0.0000372 %	✓	
3		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		20	mg/kg	1.126	20.966	mg/kg	0.0021 %	✓	
4		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	36	mg/kg		33.52	mg/kg	0.00335 %	✓	
5		mercury { mercury }	080-001-00-0	231-106-7	7439-97-6		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
6		nickel { nickel diiodide }	028-029-00-4	236-666-6	13462-90-3		11.1	mg/kg	5.324	55.028	mg/kg	0.0055 %	✓	
7		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
8		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		66	mg/kg	1.245	76.491	mg/kg	0.00765 %	✓	
9		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		**<LOD**
10		pH			PH		8.46	pH		8.46	pH	8.46 pH		
11		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**
12		benzene	601-020-00-8	200-753-7	71-43-2		<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**
13		toluene	601-021-00-3	203-625-9	108-88-3		<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**
14		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
15		xylene									
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.005 mg/kg		<0.005 mg/kg	<0.0000005 %		**<LOD**
16		TPH (C6 to C40) petroleum group				175 mg/kg		162.942 mg/kg	0.0163 %	✓	
				TPH							
17		benzo[bk]fluoranthene				1.36 mg/kg		1.266 mg/kg	0.000127 %	✓	
			[1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9							
18		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				24.9 mg/kg	1.462	33.885 mg/kg	0.00339 %	✓	
			215-160-9	1308-38-9							
								Total:	0.0396 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because No free phase contamination encountered

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0163%)

Classification of sample: WS02-07/09/2023-0.500m

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:
WS02-07/09/2023-0.500m
Moisture content:
7.3%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 8: Corrosive "waste which on application can cause skin corrosion"

pH; pH "Assumed to be irritant/corrosive because of pH value"

Because of determinand:

pH: (conc.: 12.15 pH)

Determinands

Moisture content: 7.3% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		7.3	mg/kg	1.534	10.436	mg/kg	0.00104 %	✓	
2		cadmium { cadmium compounds, with the exception of cadmium sulphoselenide (xCdS.yCdSe), reaction mass of cadmium sulphide with zinc sulphide (xCdS.yZnS), reaction mass of cadmium sulphide with mercury sulphide (xCdS.yHgS), and those specified elsewhere in this Annex }	048-001-00-5			1	0.2	mg/kg		0.186	mg/kg	0.0000186 %	✓	
3		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		25	mg/kg	1.126	26.232	mg/kg	0.00262 %	✓	
4		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	22	mg/kg		20.503	mg/kg	0.00205 %	✓	
5		mercury { mercury }	080-001-00-0	231-106-7	7439-97-6		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
6		nickel { nickel diiodide }	028-029-00-4	236-666-6	13462-90-3		13.8	mg/kg	5.324	68.477	mg/kg	0.00685 %	✓	
7		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
8		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		42	mg/kg	1.245	48.721	mg/kg	0.00487 %	✓	
9		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		**<LOD**
10		pH			PH		12.15	pH		12.15	pH	12.15 pH		
11		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**
12		benzene	601-020-00-8	200-753-7	71-43-2		<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
13		toluene				<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
14	•	ethylbenzene				<5	µg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
15		xylene				<0.005	mg/kg		<0.005	mg/kg	<0.0000005 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
16	•	TPH (C6 to C40) petroleum group				622	mg/kg		579.683	mg/kg	0.058 %	✓	
				TPH									
17	•	benzo[bk]fluoranthene				2.78	mg/kg		2.591	mg/kg	0.000259 %	✓	
			[1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9									
18		chromium in chromium(III) compounds { • chromium(III) oxide (worst case) }				33.3	mg/kg	1.462	45.359	mg/kg	0.00454 %	✓	
			215-160-9	1308-38-9									
										Total:	0.0805 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because No free phase contamination encountered

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.058%)

Classification of sample: WS02-07/09/2023-0.800m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:	
WS02-07/09/2023-0.800m	Chapter:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	**User entered data**	Conv. Factor	Compound conc.	**Classification value**	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1	•	pH				7.71 pH		7.71 pH	7.71 pH		
				PH							
								Total:	0%		

Key

	User supplied data
•	Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: WS03-07/09/2023-0.500m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS03-07/09/2023-0.500m
Moisture content:
14.5%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 14.5% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		6.4	mg/kg	1.534	8.574	mg/kg	0.000857 %	✓	
2		cadmium { cadmium compounds, with the exception of cadmium sulphoselenide (xCdS.yCdSe), reaction mass of cadmium sulphide with zinc sulphide (xCdS.yZnS), reaction mass of cadmium sulphide with mercury sulphide (xCdS.yHgS), and those specified elsewhere in this Annex }	048-001-00-5			1	<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
3		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		23	mg/kg	1.126	22.616	mg/kg	0.00226 %	✓	
4		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	33	mg/kg		28.821	mg/kg	0.00288 %	✓	
5		mercury { mercury }	080-001-00-0	231-106-7	7439-97-6		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
6		nickel { nickel diiodide }	028-029-00-4	236-666-6	13462-90-3		17.2	mg/kg	5.324	79.981	mg/kg	0.008 %	✓	
7		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
8		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		64	mg/kg	1.245	69.574	mg/kg	0.00696 %	✓	
9		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		**<LOD**
10		pH			PH		8.71	pH		8.71	pH	8.71 pH		
11		benzo[bk]fluoranthene		[1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9		1.05	mg/kg		0.917	mg/kg	0.0000917 %	✓	
12		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		39.5	mg/kg	1.462	50.42	mg/kg	0.00504 %	✓	
											Total:	0.0264 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS03-07/09/2023-0.800m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS03-07/09/2023-0.800m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1	•	pH				6.97 pH		6.97 pH	6.97 pH		
				PH							
								Total:	0%		

Key

	User supplied data
•	Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: WS04-07/09/2023-0.200m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS04-07/09/2023-0.200m
Moisture content:
10.6%
(dry weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 10.6% Dry Weight Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic pentoxide }	033-004-00-6	215-116-9	1303-28-2		26.5	mg/kg	1.534	36.752	mg/kg	0.00368 %	✓	
2		cadmium { cadmium compounds, with the exception of cadmium sulphoselenide (xCdS.yCdSe), reaction mass of cadmium sulphide with zinc sulphide (xCdS.yZnS), reaction mass of cadmium sulphide with mercury sulphide (xCdS.yHgS), and those specified elsewhere in this Annex }	048-001-00-5			1	<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		**<LOD**
3		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		98	mg/kg	1.126	99.762	mg/kg	0.00998 %	✓	
4		lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) }	082-001-00-6			1	102	mg/kg		92.224	mg/kg	0.00922 %	✓	
5		mercury { mercury }	080-001-00-0	231-106-7	7439-97-6		0.2	mg/kg		0.181	mg/kg	0.0000181 %	✓	
6		nickel { nickel diiodide }	028-029-00-4	236-666-6	13462-90-3		21.8	mg/kg	5.324	104.946	mg/kg	0.0105 %	✓	
7		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<1	mg/kg	2.554	<2.554	mg/kg	<0.000255 %		**<LOD**
8		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		104	mg/kg	1.245	117.044	mg/kg	0.0117 %	✓	
9		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<0.3	mg/kg	1.923	<0.577	mg/kg	<0.0000577 %		**<LOD**
10		pH			PH		8.44	pH		8.44	pH	8.44 pH		
11		benzo[bk]fluoranthene		[1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9		1.96	mg/kg		1.772	mg/kg	0.000177 %	✓	
12		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		54.8	mg/kg	1.462	72.417	mg/kg	0.00724 %	✓	
											Total:	0.0528 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS01-07/09/2023-1.000m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS01-07/09/2023-1.000m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1	•	pH				7.63 pH		7.63 pH	7.63 pH		
				PH							
								Total:	0%		

Key

	User supplied data
•	Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: WS04-07/09/2023-1.000m

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
WS04-07/09/2023-1.000m

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 0% Dry Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
1	•	pH				7.49 pH		7.49 pH	7.49 pH		
				PH							
								Total:	0%		

Key

	User supplied data
•	Determinand defined or amended by HazWasteOnline (see Appendix A)

Appendix A: Classifier defined and non GB MCL determinands

cadmium compounds, with the exception of cadmium sulphoselenide (xCdS.yCdSe), reaction mass of cadmium sulphide with zinc sulphide (xCdS.yZnS), reaction mass of cadmium sulphide with mercury sulphide (xCdS.yHgS), and those specified elsewhere in this Annex

EU CLP index number: 048-001-00-5
Description/Comments: Worst Case: IARC considers cadmium compounds Group 1; Carcinogenic to humans
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
)
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H312 , Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Carc. 1A; H350
Reason for additional Hazards Statement(s):
29 Sep 2015 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

lead compounds with the exception of those specified elsewhere in this Annex (worst case)

EU CLP index number: 082-001-00-6
Description/Comments: Worst Case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following CLP protocols, considers lead compounds from smelting industries, flue dust and similar to be Carcinogenic category 1A
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
)
Hazard Statements: Repr. 1A; H360Df , Acute Tox. 4; H332 , Acute Tox. 4; H302 , STOT RE 2; H373 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Repr. 2; H361f >= 2.5 % , STOT RE 2; H373 >= 0.5 % , Carc. 1A; H350
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 1A; H350 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html (worst case lead compounds). Review date 29/09/2015

zinc oxide (EC Number: 215-222-5, CAS Number: 1314-13-2)

EU CLP index number: 030-013-00-7
Description/Comments:
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
)
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

chromium(VI) oxide (EC Number: 215-607-8, CAS Number: 1333-82-0)

EU CLP index number: 024-001-00-0
Description/Comments:
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
)
Hazard Statements: Ox. Sol. 1; H271 , Carc. 1A; H350 , Muta. 1B; H340 , Repr. 2; H361f , Acute Tox. 2; H330 , Acute Tox. 3; H311 , Acute Tox. 3; H301 , STOT RE 1; H372 , Skin Corr. 1A; H314 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , STOT SE 3; H335 >= 1 %

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

benzo[bk]fluoranthene (EC Number: [1] 205-911-9 [2] 205-916-6, CAS Number: [1] 205-99-2 [2] 207-08-9)

Description/Comments: Combined data from harmonised entries in CLP for benzo[b] and benzo[k]fluoranthene; C&L Inventory Database
Data source: https://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 02 Mar 2017
Hazard Statements: Carc. 1B; H350 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

Appendix B: Rationale for selection of metal species

arsenic {arsenic pentoxide}

Worst case

cadmium {cadmium compounds, with the exception of cadmium sulphoselenide (xCdS.yCdSe), reaction mass of cadmium sulphide with zinc sulphide (xCdS.yZnS), reaction mass of cadmium sulphide with mercury sulphide (xCdS.yHgS), and those specified elsewhere in this Annex}

Cadmium results not speciated.

copper {dicopper oxide; copper (I) oxide}

Copper results not speciated.

lead {lead compounds with the exception of those specified elsewhere in this Annex (worst case)}

Lead results not speciated.

mercury {mercury}

Worst case

nickel {nickel diiodide}

Worst case

selenium {nickel selenate}

Worst case

zinc {zinc oxide}

Zinc results not speciated.

chromium in chromium(VI) compounds {chromium(VI) oxide}

Chromium(VI) compounds not speciated.

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Chromium (III) compounds not speciated.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.279.5771.10659 (06 Oct 2023)
HazWasteOnline Database: 2023.279.5771.10659 (06 Oct 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021

APPENDIX 10 – CIRIA Risk Assessment Methodology

Contaminated Land Risk Assessment

Contaminated Land Risk Assessment is a technique that identifies and considers the associated risk, determines whether the risks are significant and whether action needs to be taken. The four main stages of risk assessment are:

Hazard Identification ⇨ Hazard Assessment ⇨ Risk Estimation ⇨ Risk Evaluation

LCRM outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. The starting point of the risk assessment is to identify the context of the problem and the objectives of the process.

Formulating and developing a conceptual model for the site is an important requirement of risk assessment, this supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of preliminary risk assessment, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process.

Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk.

The risk assessment process needs to take into account the degree of confidence required in decisions. Identification of uncertainties is an essential step in risk assessment.

The likelihood of an event is classified on a four-point system using the following terms and definitions from CIRIA C552:

- High likelihood: There is a pollution linkage and an event 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;

- Likely: There is a pollution linkage and all the elements are present and in the right place, which means it is probable that an event will occur. Circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;

- Low likelihood: There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain even over a longer period such event would take place, and is less likely in the short term;

- Unlikely: There is a pollution linkage but circumstances are such that it is improbable the event would occur even in the long term.

The severity is also classified using a system based on CIRIA C552. The terms and definitions are:

- Severe: Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. A short-term risk to a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
  Examples – High concentrations of contaminant on surface of recreation area, major spillage of contaminants from site into controlled waters, explosion causing building to collapse;

- **Medium**: Chronic damage to human health ('significant harm' as defined in DETR 2000). Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
  Examples - Concentrations of contaminants exceed the generic assessment criteria, leaching of contaminants from a site to a Principal or Secondary Aquifer, death of species within a designated nature reserve;

- **Mild**: Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures, services or the environment;
  Examples – Pollution of non-classified groundwater or damage to buildings rendering it unsafe to occupy.

- **Minor**: harm, not necessarily significant harm, which may result in financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by use of personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.
  Examples – Presence of contaminants at such concentrations PPE is required during site work, loss of plants in landscaping scheme or discolouration of concrete.

Once the likelihood and severity have been determined, a risk category can be assigned using the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very Low	Very low

Definitions of the risk categories obtained from the above table are as follows together with an assessment of the further work that might be required:

- **Very high**: There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability. Urgent investigation and remediation are likely to be required;

- **High**: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the longer term;

- **Moderate**: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it would be more likely to be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term;

- **Low**: It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild;

- **Very Low**: There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

APPENDIX 11 – Relevant Legislative Background

Legislative Background

Environmental liabilities and risks have been evaluated in terms of a source -pathway - target relationship in accordance with the approach set out in:

- The 1995 Environment Act;
- The Contaminated Land (England) Regulations 2000;
- The DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land.

Contaminated land is defined within the legislative framework as land which is in such condition by reason of substances in, on or under the land that:

1) Significant harm is being caused or there is a significant possibility of such harm being caused;
2) Significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

- **Source** - substances that are potential contaminants or pollutants that may cause harm;
- **Pathway** - a potential route by which contaminants can move from the source to the receptor;
- **Receptor** - a receptor that may be harmed, for example the water environment, humans and water.

Where a source, pathway and target are all present a pollutant linkage exists and there is potential for harm to be caused. The presence of a source does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm. The nature and importance of both pathways and receptors are site specific and will vary according to the intended end use of the site, its characteristics and its surroundings.

The key principle which supports the SPR approach is 'suitable for use' criteria. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and, taking into account the proposed use of the site.

Relevant Guidance Documents

This report has been prepared in accordance with the list of guidance below however the list is not exhaustive:

- LCRM – Model Procedures;
- Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003);
- Brownfields – Managing the development of previously developed land – A client's guide, CIRIA 2002;
- DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002;
- DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990;
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002;

Relevant Legislative Documents

The following is a non-exhaustive list of legislative framework documents that has been considered in the production of this report:

- The Environment Act (1995);
- The Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (2012);
- The Environment Protection Act (1990);
- The Contaminated Land (England) Act (2000);
- Contaminated Land (England) Regulations (2012);
- The Water Resources Act (1991);
- The Pollution Prevention and Control (England and Wales) Regulations (2000);
- The Landfill Regulations (England and Wales) Regulations (2002);
- The Landfill (England and Wales) (Amendment) Regulations (2004);
- Health and Safety at Work Act;

APPENDIX 12 – Limitations

Limitations

This report (Report) forms part of the Services and if applicable Additional Services undertaken by Groundtech Consulting Ltd pursuant to a written contract (Agreement) which contains detailed provisions including express limitations of the liability of Groundtech Consulting Ltd.

This Report was prepared using reasonable skill and care as stated in the Agreement for the purpose including intended end use stated by the Client (Purpose) and the liability of Groundtech Consulting Ltd in respect of the form and content of this Report is no greater than its liability under the Agreement. All records, measurements notes, or any other data (Data) obtained by or for the benefit of the Consultant were obtained at a specific point in time and it may not be assumed by the Client or any person relying on this Report that the Data will remain unaffected by the passage of time, the seasons, weather conditions, changes in the water table or the carrying out and completion of works at the Site.

Unless otherwise agreed this Report has been prepared exclusively for the use and reliance of the Client and may not be relied upon, by any other party except as provided for in the Agreement. A third party who relies on this Report, does so at their own and sole risk and Groundtech Consulting Ltd has no liability to such parties.

Groundtech Consulting Ltd that this Report is to be used for the Purpose. The Purpose was instrumental in determining the scope and of the Services provided. If the Purpose should change, the Client may not be able to rely on the Report without the separate agreement of Groundtech Consulting Ltd.

Since the Report was written, later changes in legislation, statutory requirements and industry best practices have not been considered and this should be allowed for. Ground conditions can also change (see below) and should be investigated if there is any significant delay in acting on the findings of this Report. The period 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 in this Report should not be relied upon in the future without written confirmation from Groundtech Consulting Ltd that it is safe to do so.

The observations and conclusions outlined in this Report are based exclusively on the services that were provided as set out in the agreement between the client and Groundtech Consulting Ltd.

Groundtech Consulting Ltd is not liable for the existence of any condition, the discovery of which would require additional investigation outside the agreed scope of works or core competency. The Report is based upon Groundtech Consulting Ltd's observations of existing physical conditions at the Site gained from site reconnaissance together with 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 Groundtech Consulting Ltd have relied upon such information assuming it to be correct.

Groundtech Consulting Ltd accepts no responsibility for errors or inaccuracies in third party information presented in this Report. Groundtech Consulting Ltd was not authorised 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 or Additional Services. Groundtech Consulting Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, which may inform the scope of investigation undertaken by Groundtech Consulting Ltd and forms the contract with the client.

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 may also vary due to the ground's heterogeneous properties and because investigation exploratory locations 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, particularly between exploratory holes. The extent of the limited area depends on the soil and groundwater conditions, together with other constraints such as the position of any existing structures and underground utilities. If so stipulated in the Agreement, geo-environmental testing was carried out for a limited number of parameters based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

Any groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The groundwater level often has not had time to reach equilibrium and a monitoring period is required. Furthermore, groundwater levels are subject to seasonal variation or changes in local drainage conditions and groundwater levels may occur at other times of the year which are higher than were recorded during this investigation.

Any site drawings provided in this Report are preliminary and used to present the general relative locations of features on, and surrounding, the Site.