



EARTH ENVIRONMENTAL
& GEOTECHNICAL

Geo-Environmental

Site Investigation

Report

Louisa Street

Openshaw

June 2022



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

Tel : 01619756088

Email
headoffice@earthenvironmental.co.uk

www.earthenvironmental.co.uk

**GEOENVIRONMENTAL
SITE INVESTIGATION
REPORT**

LOUISA STREET

OPENSHAW

Report Ref: A4755/22/SI

JUNE 2022

Prepared on Behalf of:

Westchurch Homes

By:

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

DISTRIBUTION:

1 electronic copy Westchurch Homes

GEOENVIRONMENTAL SITE INVESTIGATION REPORT

LOUISA STREET, OPENSHAW

Report Reference: A4755/22/SI

Version B.0

Date: 26th June 2022

Prepared for: Westchurch Homes

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

Definition of Version Code:

- D. Applied during initial drafting of the report before it has been reviewed.
- C. Applied after the report has been reviewed but before it has been approved by the Project Manager.
- B. Applied after the Project Manager has approved the report ready for issue to the client.
- A. Applied to reports after external/internal review.

The version number starts at "0" and is raised by "1" at each re-type.

Written by:



Amy Ellams
Senior GeoEnvironmental Consultant

Reviewed by:



Dr. Shauna McLoughlin
Principal Geo-Environmental Consultant

Approved by:



Adam Czarnecki
Managing Director

TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY	1
2.0	INTRODUCTION	2
2.1	BACKGROUND	2
2.2	PREVIOUS INVESTIGATIONS.....	2
2.3	TERMS OF REFERENCE.....	3
2.4	REPORT SCOPE	3
2.5	LIMITATIONS OF THE STUDY	3
3.0	SITE LOCATION & DESCRIPTION	4
3.1	PROPOSED DEVELOPMENT.....	8
4.0	SITE INVESTIGATION	9
4.1	EXPLORATORY FIELDWORK.....	9
4.2	LABORATORY TESTING	1
4.2.1	<i>Geotechnical Testing</i>	1
4.2.2	<i>Environmental Testing</i>	2
5.0	GROUND CONDITIONS ENCOUNTERED	3
5.1	SOIL PROFILE ENCOUNTERED.....	3
5.2	OBSERVABLE INDICATIONS OF CONTAMINATION.....	4
5.3	OBSTRUCTIONS AND VOIDS.....	4
5.4	GROUNDWATER	6
5.5	LAND GAS	6
6.0	ENGINEERING PROPERTIES OF SOILS ENCOUNTERED	7
6.1	GENERAL.....	7
6.2	MADE GROUND	7
6.3	SUPERFICIAL DEPOSITS.....	7
6.3.1	<i>Sand</i>	8
6.3.2	<i>Clay</i>	10
7.0	GEOTECHNICAL ASSESSMENT	13
7.1	PROPOSED DEVELOPMENT.....	13
7.2	GROUND CONDITIONS ENCOUNTERED	13
7.3	FOUNDATION CONSIDERATIONS	13
7.3.1	<i>Conventional Shallow Depth Strip/Pad Foundations</i>	13
7.3.2	<i>Ground Improvement</i>	15
7.3.3	<i>Piled Foundations</i>	16
7.4	PAVEMENT DESIGN.....	16
7.5	CHEMICAL ATTACK ON BURIED CONCRETE	17
7.6	SUITABILITY OF EXCAVATED MATERIALS	17
7.7	TEMPORARY WORKS	17
8.0	SOIL CONTAMINATION RISK ASSESSMENT	19
8.1	TIER I HUMAN HEALTH SOIL RISK ASSESSMENT – GROUNDWORKERS DURING DEVELOPMENT.....	19
8.2	TIER I HUMAN HEALTH SOIL RISK ASSESSMENT – FUTURE SITE USERS.....	19
8.3	SOIL WASTE ASSESSMENT.....	25
9.0	GROUNDWATER CONTAMINATION RISK ASSESSMENT	26
10.0	GROUND GAS AND RADON GAS CONTAMINATION RISK ASSESSMENT	28
10.1	RADON GAS	28
10.2	ANALYSES OF MONITORING RESULTS.....	28

11.0	CONCLUSIONS & RECOMMENDATIONS	31
11.1	SOIL CONTAMINATION.....	31
11.2	ASBESTOS.....	31
11.3	FOUNDATIONS.....	31
11.4	SOIL DISPOSAL	31
11.5	LAND GAS	31
11.6	PAVEMENT DESIGN.....	32
11.7	GROUNDWATER	32
11.8	RISK TO BURIED (WATER) SERVICES.....	32
11.9	SITE PERSONNEL.....	32
11.10	OTHER MATTERS.....	32

LIST OF FIGURES

Figure 1	Aerial Photograph Showing Site Location
Figure 2	General Site Photographs
Figure 3	Proposed Development Plan
Figure 4	Exploratory Hole Location Plan
Figure 5	Photographs of Basement Encountered
Figure 6	SPT v Depth Plot
Figure 7	Plasticity Chart
Figure 8	Chemical Exceedance Location Plan

TABLES

Table 1	Shear Strength Definitions
Table 2	Summary of Exploratory Holes Undertaken
Table 3	Summary of Laboratory Geotechnical Tests Undertaken
Table 4	Summary of Ground Conditions Encountered
Table 5	Summary of Laboratory Geotechnical Test Results
Table 6	Summary of Design Parameters (Sand)
Table 7	Summary of Design Parameters (Clay)
Table 8	Soil Desiccation Indicators in the Clay
Table 9	Summary of Allowable Bearing Pressures
Table 10	Summary of Anticipated Settlement (Granular)
Table 11	Summary of Anticipated Settlement (Cohesive)
Table 12	Comparison of Capping Thickness with and without Geotextile
Table 13	Summary of Guideline Values for Protection of Workers and the General Public During Development of Contaminated Land
Table 14	Soil Results Comparison with C4SL/S4UL Values
Table 15	Summary of Asbestos Encountered
Table 16	Waste Classification of Soils
Table 17	Groundwater Results Comparisons with EQS/Drinking Water Quality Values
Table 18	Characteristic Situations (Wilson et al 2006/2007 modified from Wilson and Card, 1999)
Table 19	Gas Protection Point Score Required

APPENDICES

Appendix 1	Exploratory Hole Logs
Appendix 2	Ground Gas Monitoring Results
Appendix 3	Geotechnical Testing Results
Appendix 4	Chemical Testing Results
Appendix 5	Water Chemical Testing Results
Appendix 6	Soil Waste Assessment
Appendix 7	Report Limitations

1.0 EXECUTIVE SUMMARY

Appointment	A Site Investigation has been commissioned by Westchurch Homes (the Client), to examine ground conditions for a proposed new residential development at a site off Louisa Street, Openshaw.
The Investigation	The investigation comprised five windowless sample boreholes, one cable percussive borehole and six trial pits with associated sampling and in situ testing, laboratory geotechnical and contamination testing.
The Site	The site is located in Openshaw, Manchester, approximately 4.67km from Manchester City Centre. The approximate National Grid Reference for the centre of the site is SJ 88592 97635 (X:388592, Y: 397635) The site is underlain by Devensian Till Deposits and the solid geology beneath the site is the Chester Pebble Beds Formation.
Site History	Historically the site was vacant land until it was occupied by an Iron Foundry from the early 1900's. The area was dominated by heavy industry including, iron and steel works, mills, stream hammer works, electric motor works and railway sheds and sidings. The majority of the buildings on site were demolished in 2017/2018.
Ground Conditions Encountered	The exploratory holes generally encountered Made Ground to a maximum depth of 2.90m. Underlying the Made Ground in all exploratory boreholes were superficial deposits of variable Clay and Sand to a maximum depth of 15.00m bgl. Groundwater was encountered during the fieldwork at depths between 3.50m and 4.00m bgl and encountered during subsequent monitoring visits. A basement was found at TP5 and additional basements may be present.
Geotechnical Assessment	Shallow strip/pad foundation placed in the superficial deposits at a minimum depth of approximately 1.50m bgl are considered appropriate for the houses included in the proposed development. However, other foundation options may need to be considered such as ground improvement or piles for the larger apartment blocks and in areas of deep made ground. Pavement Design – preliminary design value = 1% in Made Ground. Design Sulphate Class = DS-1 ACEC Site Classification = AC-1s
Contamination Assessment	Risk from contamination to groundworkers during development – Moderate to Low Risk from contamination to future site users – Moderate. Asbestos identified in two soil samples. Soil Waste Assessment: One sample classified as Hazardous. Nine samples classified as Non-Hazardous. No exceedances identified in groundwater samples.
Ground Gas Assessment	Ground gas mitigation measures are not required.
<i>This sheet is intended to provide a summary only of the report. It does not provide a definitive engineering analysis for the purposes of costing or construction and is subject to the limitation of the agreed brief.</i>	

2.0 INTRODUCTION

2.1 Background

A Site Investigation has been commissioned by Westchurch Homes (the Client), to examine ground conditions for a proposed new residential development at a site off Louisa Street, Openshaw, Manchester.

2.2 Previous Investigations

2.2.1 Earth Environmental & Geotechnical Ltd, Phase I GeoEnvironmental Desk Study (A4755/22/FDS), dated June 2022.

Historically the site was vacant land until it was occupied by an Iron Foundry from the early 1900's. The area was dominated by heavy industry including, iron and steel works, mills, stream hammer works, electric motor works and railway sheds and sidings. The majority of the buildings on site were demolished in 2017/2018.

Potential on-site sources of contamination include possible contaminants (heavy metals, mineral acids, arsenic, and PCBs) in the Made Ground related to the historical iron foundry and electricity substation on site, subsequent works, and storage of materials on the site. Potential ground gas associated with the Made Ground on site and nearby infilled pits. Asbestos may be present on the site.

The risk from soil contamination to residential end users was considered to be **MODERATE**. The risk to controlled waters was concluded to be **LOW**. The risk from ground gas to end users was considered to be **MODERATE**. The risk from asbestos containing materials to end users was considered to be **MODERATE to LOW**. The risk of groundwater flooding was **MODERATE**.

An intrusive investigation was recommended to establish geotechnical parameters for the design of foundations, floor slabs and pavement construction. As part of the geotechnical investigation, it was recommended that samples are recovered for contamination testing, as well as installing ground gas monitoring standpipes to assess ground gas risk.

2.2.2 Planning Application to Manchester City Council, F10502, dated March 1979.

A planning application was submitted to Manchester City Council (Reference: F10502) for the proposed storage of hygiene and pharmaceutical products at the former Louisa Street Foundry. However, the planning application was withdrawn.

2.2.3 Planning Application to Manchester City Council, 027619, dated September 1986.

A planning application was submitted to Manchester City Council (Reference: 027619) for the proposed positioning of an incinerator within the existing project workshop site. The application was deemed 'Not Proceeded With'.

No relevant applications or site investigations within the vicinity of the site made in the last five years were recorded on the Manchester City Council Planning Portal.

2.3 Terms of Reference

Earth Environmental and Geotechnical Ltd (EEG) have been commissioned by the Client, to undertake a Site Investigation of the site in accordance with proposal A4755/22 dated 6th February 2022. The objectives of this investigation are as follows:

- *Provide factual information on the work undertaken including sampling location plan, borehole logs, geotechnical and chemical testing.*
- *Tier 1 (semi-quantitative) risk assessment will be undertaken. This will compare the concentrations of soil, water and ground gas contaminants identified against current and appropriate published guidelines, in relation to identified receptors, e.g., existing/ future end users and site neighbours.*
- *Classification of potential surplus soils for offsite disposal.*
- *Assessment of ground conditions for foundation design.*

2.4 Report Scope

This report presents full factual records of the site work carried out, the ground conditions encountered in the exploratory holes, the in situ and laboratory test results. All information collected has been used to provide an interpretation of the ground conditions, with recommendations on geotechnical design and potential ground contamination risks for the proposed development.

2.5 Limitations of the Study

The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information, improved practices or changes in legislation may require a reinterpretation of the report in whole or in part. EEG reserve the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use by the client and is confidential to them.

Recommendations within this report are also based on exploratory records and examination of samples and, where applicable, laboratory tests. No liability can be accepted for conditions not revealed by the boreholes and trial pits particularly at intervening locations. Whilst every effort is made to ensure accuracy of data supplied, all opinions expressed as to the spatial distribution of strata between sampling locations is for guidance only and no responsibility is accepted as to its accuracy.

3.0 SITE LOCATION & DESCRIPTION

The site is located in Openshaw, Manchester, approximately 4.6km from Manchester City Centre. The approximate National Grid Reference for the centre of the site is SJ 88592 97635 (X:388592, Y: 397635), with the closest postcode being M11 1AD.

The site is a near rectangular shaped parcel of land with current access via two gates off Louisa Street to the east of the site. The maximum dimensions of the proposed site are 82m north to south and 120m east to west. The site occupies an area of approximately 0.93 hectares.

The surrounding area comprises predominantly of residential properties. Industrial land uses are located immediately north of the site and to the south and southeast of the site. An open green space is located immediately south of the site along the boundary.

The site location is shown in the aerial photograph presented as Figure 1, below.

Figure 1: Aerial Photograph Showing Site Location



General site photographs are presented in Figure 2 overleaf.

Figure 2: General Site Photographs

Photograph taken viewing west showing the northern part of the site



Photograph taken viewing north showing the eastern part of the site.



Photograph taken viewing west showing the southern part of the site



Photograph taken viewing northwest showing the northern part of the site



Photograph taken viewing north showing the western part of the site



Photograph taken of soils recovered in Exploratory Hole WS3



3.1 Proposed Development

It is understood that the client wishes to demolish the existing buildings on site and construct a combination of approximately 16 houses with private gardens and 3 apartment blocks, all with parking and soft landscaping.

Site access will be retained via Louisa Street to the east of the site, via a new access road.

The proposed development layout details are shown in Figure 3 below.

Figure 3: Proposed Development Plan



4.0 SITE INVESTIGATION

4.1 Exploratory Fieldwork

The fieldwork was carried out by EEG on the 25th April 2022 and comprised:

- Five window sample boreholes (designated WS1 – WS5 inclusive) were each sunk to a maximum depth of 5.00m below existing ground level. Window sampler boring is carried out with a small, track-mounted rig, which uses a chain-driven trip hammer to drive sampling tubes or penetrometers into the ground. These tools are coupled to the anvil of the hammer by solid drill rods. Sampling tubes comprise “windowless samplers”, which are plain sampler tubes in which a continuous disturbed sample is recovered within a semi-rigid plastic liner. In order to reduce friction within the borehole, sampling tubes of progressively smaller diameter are used as the borehole depth increases. Sampler diameters generally range from between approximately 90mm to 50mm. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Groundwater observations were noted where possible. These observations relate to the time of the investigation only, and do not necessarily reflect seasonal fluctuations. Exploratory hole logs are included in Appendix 1.
- 50mm diameter standpipes were installed in all the window sample boreholes to a maximum depth of 5.00m below ground level. Installation and backfill details are shown with the appropriate borehole log sheet. EEG carried out groundwater/ground gas monitoring in standpipes after the fieldwork period, the results of which are presented in Appendix 2.
- One 150mm diameter borehole (designated CP1) was sunk to a depth of between 15.00m below existing ground level, using a light cable percussion boring rig. With this type of rig boreholes are advanced by the percussive action of drill tools suspended on a winch-driven steel cable. The tools generally include a clay-cutter for penetrating fine-grained soils, and a shell for use in coarse-grained, or “granular”, soils. Representative disturbed samples were recovered as boring proceeded. In addition, “undisturbed” 100mm diameter samples (U100’s) were recovered, as appropriate, using standard thick-walled, open-drive samplers, with a steel cutting shoe, dynamically driven by a sliding hammer. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Chiselling techniques, using a chisel or shell, were employed where necessary, to advance the boreholes through obstructions or into hard strata. Details of groundwater conditions were noted and are indicated on the attached borehole logs. These observations relate only to the time of boring, and do not necessarily reflect possible seasonal fluctuations. They may have been affected by the installation of casing, or the addition of water to aid boring. Borehole logs are included in Appendix 1.
- Six trial pits (designated TP1 to TP6 inclusive) were excavated by use of a JCB 3CX to a maximum depth of 3.50m bgl. Trial pits were backfilled immediately on completion of sampling and testing. Trial pit logs are presented in Appendix 1.

Exploratory hole locations were selected prior to the site works by an EEG engineer based on the proposed development layout and avoiding known services. Each exploratory location was scanned using a Cable Avoidance Tool (CAT) in order to locate unrecorded underground services, and the exploratory locations were repositioned if necessary.

On completion, samples recovered from the site were taken to specialist laboratories for chemical and geotechnical testing.

Soil samples were recovered in 250g glass amber jars and 1kg plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the DETS laboratory.

If collection was not possible the same day, then samples were stored in the sample storage fridge at the EEG offices below 4°C.

Samples were tracked using appropriate Chain of Custody forms provided by DETS.

It should be noted that hexavalent chromium soil is analysed using the USEPA recommended method of alkaline leach. This method limits chromium (VI) reduction to chromium (III).

All site investigation work was supervised full time by a representative of EEG. The logging of soils and rocks has been carried out in accordance with BS5930^(2015+A1:2020) except where superseded by the soil and rock description methodology in BS EN14688-1⁽²⁰⁰²⁾, BS EN 14688-2⁽²⁰⁰⁴⁾ and BS EN 14689-1⁽²⁰⁰³⁾.

All sampling locations were surveyed by use of a hand-held Trimble GeoXH GPS instrument that is capable of surveying to an accuracy of less than 10mm depending on satellite coverage, proximity to trees and building structures.

The descriptive terminologies such as firm, etc formerly used within older versions of BS5930 to describe strength now solely relate to consistency. Shear strength is now defined related to results obtained in the field (using a hand vane for example) or in the laboratory (from triaxial tests), as detailed in Table 1 below.

Table 1: Shear Strength Definitions

Term based on measurement	Undrained Strength (c_u) definition in kN/m ² (from BS EN ISO 14688-2: 2004, 5.3, Table 5)
Extremely Low Strength	<10
Very Low Strength	10 to 20
Low Strength	20 to 40
Medium Strength	40 to 75
High Strength	75 to 150
Very High Strength	130 to 300
Extremely High Strength	300 to 600

An Exploratory Hole Location Plan is presented as Figure 4, overleaf.

Figure 4: Exploratory Hole Location Plan



A summary of exploratory holes undertaken during the investigation are presented in Table 2 overleaf.

Table 2: Summary of Exploratory Holes Undertaken

Hole	Type*	Depth (m)	Date Started	Date Finished	Easting (m)	Northing (m)	Backfill Details**
CP1	CP	15.00	25/04/2022	25/04/2022	388587	397633	A
WS1	WS	4.00	25/04/2022	25/04/2022	388551	397588	SP
WS2	WS	2.50	25/04/2022	25/04/2022	388529	397624	SP
WS3	WS	5.00	25/04/2022	25/04/2022	388631	397646	SP
WS4	WS	4.50	25/04/2022	25/04/2022	388641	397616	SP
WS5	WS	5.00	25/04/2022	25/04/2022	388602	397604	SP
TP1	TP	2.60	25/04/2022	25/04/2022	388601	397648	A
TP2	TP	2.80	25/04/2022	25/04/2022	388630	397628	A
TP3	TP	3.20	25/04/2022	25/04/2022	388562	397633	A
TP4	TP	3.50	25/04/2022	25/04/2022	388556	397613	A
TP5	TP	3.30	25/04/2022	25/04/2022	388584	397611	A
TP6	TP	0.40	25/04/2022	25/04/2022	388542	397618	A
*CP = Cable Percussive Borehole, WS = Window Sample Borehole, TP = Trial Pit							
**A = Arisings, SP = Standpipe							

4.2 Laboratory Testing

4.2.1 Geotechnical Testing

A programme of laboratory testing was carried out on samples taken from the various strata to assist in classification and determine the engineering properties of the materials underlying the site. The tests were scheduled by EEG and carried out by Murray Rix. The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of the specific tests used in each case are given in Table 3, below.

Table 3: Summary of Laboratory Geotechnical Tests Undertaken

TEST	STANDARD	No.
Moisture Content	BS1377:1990 Part 2, Clause 3.2	6
Liquid Limit, Plastic Limit, Plasticity Index	BS1377:1990 Part 2, Clause 4/5	5
Particle size distribution (wet)	BS1377:1990 Part 2, Clause 9.2	4
Sulphate content of 2:1 soil: water extract	BS1377:1990 Part 3, Clause 5	8
pH value	BS1377:1990 Part 3, Clause 9	8
Triaxial tests		
“Quick” undrained with multistage loading	BS1377:1990 Part 7, Clause 9	1

The results of the laboratory geotechnical tests are discussed in Section 6 and included in Appendix 3.

4.2.2 Environmental Testing

The environmental chemistry of the ground was investigated by specialist chemical analysis of selected samples, scheduled by EEG, and carried out by DETS, a UKAS and MCERTS accredited laboratory.

Chemical analyses were carried out on ten soil samples and were submitted for the following suite of determinants:

Asbestos Screen, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Soil Organic Matter, Extractable Petroleum Hydrocarbons (EPH), Speciated Total Petroleum Hydrocarbon (TPH) and Speciated Polyaromatic Hydrocarbons (PAH).

Waste Acceptance Criteria Testing (WAC) was also carried out on two soil samples.

Full results of the laboratory contamination tests are discussed in Section 8 and included in Appendix 4.

Chemical analyses were also carried out on two groundwater samples and were submitted for the following suite of determinants:

Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Phenol, Sulphate (SO₄), Sulphide, pH, Total Organic Carbon (TOC), Extractable Petroleum Hydrocarbons (EPH), Speciated Petroleum Hydrocarbon (TPH) and Speciated Polyaromatic Hydrocarbons (PAH).

Full results of the laboratory contamination tests are discussed in Section 9 and included in Appendix 5.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 Soil Profile Encountered

BGS digital mapping shows the site is underlain by superficial deposits of Devensian Till, comprising Diamicton. The solid geology beneath the site is recorded as the Chester Pebble Beds Formation, comprising sandstone (Early Triassic Age). The eastern part of the site is also recorded to be underlain by artificial deposits of infilled ground. The sequence of strata encountered beneath the site was as follows:

- **Made Ground** – Variable Made Ground was encountered in all of the exploratory holes to a maximum depth of 2.90m bgl, comprising:
 - Asphalt Hardstanding
 - Concrete (with rebar in TP6 only)
 - Sandy GRAVEL containing gravel of sandstone, ash, clinker, slag, metal and redbrick with cobbles of red brick, metal, and timber (CP1 and WS1)
 - Gravelly SAND containing gravel of sandstone, plastic, concrete, and red brick with cobbles of redbrick
 - Gravelly CLAY containing gravel of ash and clinker
 - Sandy gravelly CLAY containing gravel of red brick and sandstone
 - SAND
 - Clayey sandy GRAVEL containing gravel of sandstone and red brick with cobbles of red brick and timber
 - Sandy CLAY
 - Sandy gravelly COBBLES containing gravel of red brick and yellow brick with cobbles of red brick and yellow brick
- **Superficial Deposits** –

Sand was encountered in exploratory holes CP1, WS3, WS4, WS5, TP1 and TP2 to a maximum depth of 11.50m bgl, comprising:

 - Gravelly SAND containing gravel of sandstone
 - Silty gravelly SAND containing gravel of sandstone and carbonaceous fragments
 - Clayey gravelly SAND containing gravel of sandstone with cobbles of sandstone

Clay was encountered in exploratory holes CP1, WS1, WS5, TP3, TP4 and TP5 to a maximum depth of 15.00m bgl, comprising:

 - Sandy CLAY
 - CLAY

The depths of the various materials encountered in the exploratory holes are summarised in Table 4, overleaf.

Table 4: Summary of Ground Conditions Encountered

Hole	Depth to Stratum (m bgl)				GROUNDWATER (m bgl)
	MADE GROUND		SUPERFICIAL DEPOSITS		
	Granular	Cohesive	SAND	CLAY	
CP1	GL – 1.10	-	1.10 – 2.30 2.80 – 11.50	2.30 – 2.80 11.50 – 15.00+	-
WS1	GL – 1.60 2.00 – 2.90	1.60 – 2.00	-	2.90 – 4.00+	-
WS2	GL – 1.20 1.50 – 2.50+	1.20 – 1.50	-	-	-
WS3	GL – 1.20	1.20 – 1.50	1.50 – 5.00+	-	4.00
WS4	GL – 0.55	0.55 – 1.60	1.60 – 4.50+	-	3.50
WS5	GL – 1.40 1.80 – 2.20	1.40 – 1.80 2.20 – 2.50	3.00 – 5.00+	2.50 – 3.00	-
TP1	GL – 0.20	0.20 – 0.60	0.60 – 2.60	-	-
TP2	GL – 0.50	0.50 – 1.20	1.20 – 2.80	-	-
TP3	GL – 2.50	-	-	2.50 – 3.20	-
TP4	GL – 2.70	-	-	2.70 – 3.50	-
TP5	GL – 2.40	2.40 – 2.90	-	2.90 – 3.30	-
TP6	GL – 0.40+	-	-	-	-
Depths in red indicate termination within the Made Ground.					

5.2 Observable Indications of Contamination

Gravel/cobbles of red brick, concrete, plastic, and yellow brick were observed in the Made Ground encountered on site, but these materials are generally considered inert.

However, gravel of clinker, ash, slag, metal, and timber were also encountered in the Made Ground.

A strong hydrocarbon odour was observed in TP1.

No other visual or olfactory indications of contamination were observed.

5.3 Obstructions and Voids

A basement was encountered in TP6 at 0.40m and the trial pit was terminated early. Photographs taken of the basement are presented in Figure 5, overleaf.

No Man-Made obstructions were encountered in any of the exploratory hole locations.

Figure 5: Photographs of Basement Encountered





5.4 Groundwater

Groundwater was only encountered in WS3 at 4.00m bgl and WS4 at 3.50m bgl during the fieldwork.

Subsequent monitoring in the standpipes encountered groundwater at depths between 2.68m bgl and 3.60m bgl.

On the first monitoring visit, samples of water were recovered for chemical testing from WS1 and WS4.

An attempt was made to recover water samples from the remaining boreholes on site. However due to the lack of water in the standpipes, no samples could be obtained for testing after purging of the wells.

5.5 Land Gas

Results obtained during six monitoring visits on the 16th, 23rd and 30th May and the 6th, 13th and 20th June 2022, indicated Methane (CH₄) levels of 0.0% by volume, Carbon Dioxide (CO₂) levels ranging from 0.1% to 6.6% by volume, and Oxygen (O₂) levels ranging from 12.4% to 21.3% by volume. Gas flows of -0.2l/hr to 0.1l/hr were recorded, together with atmospheric pressures between 993mb and 1016 mb.

It should be noted that the concentrations and levels of mobile liquid and gaseous materials are likely to vary with time. The results obtained may therefore be representative of the conditions only at the time of sampling.

Full monitoring results are discussed in Section 10 and included as Appendix 2.

6.0 ENGINEERING PROPERTIES OF SOILS ENCOUNTERED

6.1 General

The following sections discuss the engineering properties of the strata encountered, based on results of in situ testing and laboratory testing obtained during this investigation.

The results of laboratory geotechnical testing are summarised in the following table.

Table 5: Summary of Laboratory Geotechnical Test Results

Location	Depth (m)	Strata*	CLASSIFICATION										STRENGTH	CHEMICAL	
			Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Modified Plasticity Index (%)	PSD Gravel (%)	PSD Sand (%)	PSD Silt/Clay (%)	Bulk Density Mg/m ³	Dry Density (Mg/m ³)		pH Value	Water Soluble Sulphate SO ₄ (mg/l)
CP1	15.00	CLAY	17	30	14	16	13	-	-	-	2.18	1.86	61/68/78	-	-
WS1	1.00	MG	-	-	-	-	-	-	-	-	-	-	-	7.6	250
WS1	3.70	CLAY	19	33	14	19	15	-	-	-	-	-	-	-	-
WS2	1.50	MG	-	-	-	-	-	-	-	-	-	-	-	7.3	180
WS3	1.50-2.20	SAND	-	-	-	-	-	4	82	14	-	-	-	7.4	200
WS4	3.50-4.00	SAND	-	-	-	-	-	1	73	26	-	-	-	-	-
WS5	2.20	MG	-	-	-	-	-	-	-	-	-	-	-	7.2	150
WS5	3.00-3.50	SAND	-	-	-	-	-	2	74	24	-	-	-	-	-
TP1	2.00-2.50	SAND	-	-	-	-	-	3	70	27	-	-	-	7.3	200
TP2	2.60-2.80	SAND	-	-	-	-	-	-	-	-	-	-	-	7.1	180
TP3	3.00	CLAY	22	35	15	20	17	-	-	-	-	-	-	7.2	180
TP4	3.20	CLAY	26	38	15	23	21	-	-	-	-	-	-	7.4	210
TP5	2.95	CLAY	36	36	14	22	21	-	-	-	-	-	-	7.4	210

6.2 Made Ground

Variable Made Ground was encountered in all of the exploratory hole locations between ground level and 2.90m below ground level.

SPT tests carried out in the Made Ground were corrected for drilling energy efficiency and overburden pressure and resulted in **N1(60) values** of between 4 and 53, as shown on the SPT v Depth Plot in Figure 6 (overleaf).

The **water-soluble sulphate** content of three Made Ground samples ranged between 150 mg/l and 250mg/l SO₄, with **pH values** of between 7.2 and 7.6.

Made Ground is not typically considered to be a suitable founding material, and as such, no geotechnical testing was carried out on the material.

6.3 Superficial Deposits

As discussed in Section 5, soils interpreted to represent the Devensian Till Deposits were encountered as variable SAND and CLAY in all of the exploratory hole locations.

6.3.1 Sand

Sand was encountered in exploratory hole locations CP1, WS3, WS4, WS5, TP1 and TP2 at depths between ground level and 11.50m below ground level.

The **water-soluble sulphate** content of three sand samples ranged between 180 mg/l and 200mg/l SO₄, with **pH values** of between 7.1 and 7.4.

SPT tests carried out in the sand were corrected for drilling energy efficiency and overburden pressure and resulted in **N1(60) values** of between 17 and 61, as shown on the SPT v Depth Plot in Figure 6 (overleaf).

Four **Particle Size Distribution** (PSD) tests were carried out on the sand samples. A breakdown of results can be observed in Table 5, above. The laboratory generally described the material as a brown silty SAND with rare gravel.

Recommended N values and derived design values for the granular soils are summarised in Table 6, below.

Table 6: Summary of Design Parameters (Sand)

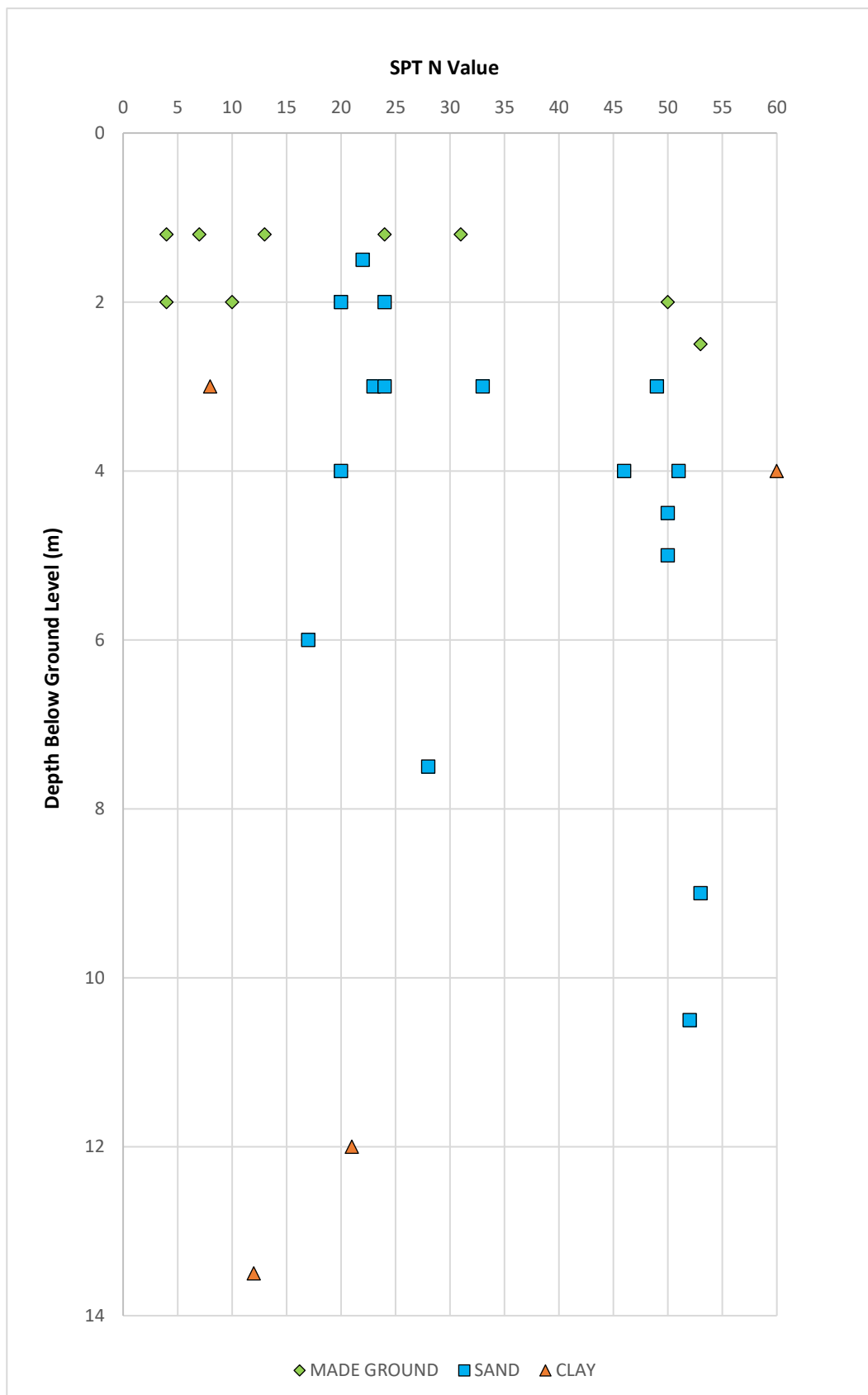
Depth	SPT N1(60) Value Range	Average N1(60) Value	Design N1(60) Value*	Equivalent Soil Density	Angle of Internal Friction (degrees°)**
1.50 – 2.00	20-24	22	21	Medium Dense	33.4
3.00	23-49	32	24	Medium Dense	34.3
4.00 – 4.50	20-63	46	46	Very Dense	40.1
5.00	50-61	56	53	Very Dense	41.6
6.00	17	17	17	Medium Dense	32.2
7.50	28	28	28	Dense	35.5
9.00	53	53	53	Very Dense	41.6
10.50	52	52	52	Very Dense	41.4
*Based on lower quartile N value					
**Based on the correlation by Peck, Hanson and Thornburn ⁽¹⁹⁷⁴⁾					

It is recommended that for assessing ultimate bearing capacities, where the lower values are critical, the lower quartile value of N values is used. For design purposes, a value of 21 seems reasonable based on the N1(60) values encountered between 1.50m to 2.00m depth.

Based on the correlation by Peck, Hanson and Thornburn⁽¹⁹⁷⁴⁾, this gives an **angle of shearing resistance** of $\phi=33.4$ at 1.50m to 2.00m bgl.

For assessing settlements average ground conditions will give a more realistic value of settlements, and the average of N values should be used.

Figure 6: SPT v Depth Plot



6.3.2 Clay

Clay was encountered in exploratory holes CP1, WS1, WS5, TP3, TP4 and TP5 between 2.30m and 15.00m below ground level.

SPT tests carried out in the clay were corrected for drilling energy efficiency and overburden pressure and resulted in **N1(60) values** of between 8 and 60, as shown on the SPT v Depth Plot in Figure 6 (overleaf). The results suggest the clay is firm to very stiff.

In-situ **hand penetrometer** (HP) tests have given results of shear strength in the range 24kN/m² to 132kN/m², suggesting the clay is low strength to high strength at the depths tested, in accordance with Table 1.

In-situ **hand shear-vane** (HSV) tests have given results of shear strength in the range 8kN/m² to 175kN/m², suggesting the clay is extremely low strength to very high strength at the depths tested, in accordance with Table 1.

The **undrained shear strength** in triaxial compression (U100) was carried out on two samples of the clay. Results of the test showed shear strength values in the range 61kN/m² to 78kN/m² at a depth of 15.0m bgl, suggesting the clay tested is medium to high strength.

Recommended N values and derived design values for the cohesive soils are summarised in Table 7, below.

Table 7: Summary of Design Parameters (Clay)

Depth	SPT N1(60) Value Range	Average N1(60) Value	Design N1(60) Value*	Equivalent Shear Strength** (kN/m ²)	Coefficient of Volume Compressibility** (mv)
3.00	8	8	8	41 (Medium Strength)	0.24
12.00	21	21	21	108 (High Strength)	0.09
13.50	12	12	12	62 (Medium Strength)	0.16
*Based on lower quartile N value and correlations by Peck Hanson and Thornburn ⁽¹⁹⁷⁴⁾					
**Based on correlation by Stroud & Butler ⁽¹⁹⁷⁵⁾					

It is recommended that for assessing ultimate bearing capacities, where the lower values are critical, the lower quartile value of N values is used. Based on the N Values in the above table, the equivalent shear strength values range between 41kN/m² and 108kN/m², suggesting the clay is medium strength to high strength at the depths tested, in accordance with Table 1.

Atterberg Limit tests were carried out on five samples of the clay. Results of the tests reported **liquid limit** values in the range 30% to 38% and **plastic limit** values in the range 14% to 15%, resulting in values of **plasticity index** in the range 16% to 23%. These results suggest the samples of clay tested are of **intermediate to low plasticity** as shown on the Plasticity Chart in Figure 7, overleaf.

For design purposes, a value of plasticity index = 22% is recommended, based on the upper quartile of the results.

The **coefficient of volume compressibility (mv)** has been estimated using the following correlation by Stroud and Butler ⁽¹⁹⁷⁵⁾: for a clay with a plasticity index of 22%, $mv = 1 / (0.515 \times N \text{ value})$.

This correlation gives values of the coefficient of volume compressibility of between 0.09m²/MN and 0.24m²/MN, as shown in Table 7, above. The results suggest the clay has **very low to medium compressibility**.

In accordance with NHBC Chapter 4.2 Building Near Trees ⁽²⁰⁰³⁾ soils can be classified in terms of volume change potential, using the relationship:

$$I_{p'} = I_p \times \frac{\% \text{ less than } 425\mu\text{m}}{100\%}$$

$I_{p'}$ = modified plasticity index,

I_p = plasticity index.

Based on the laboratory test results, the above relationship and Table 1 of NHBC Chapter 4.2, the samples of Clay are shown to have a **low to medium volume change potential**.

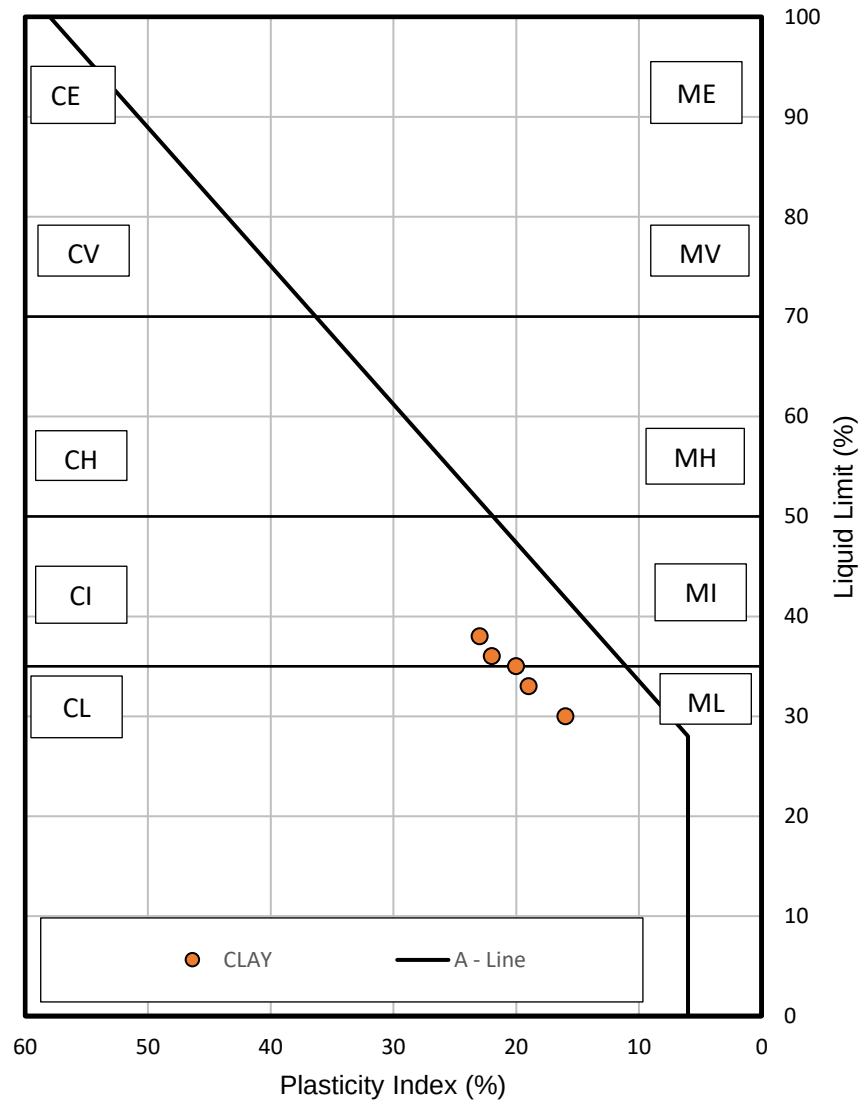
The **Natural Moisture Content (NMC)** and **Liquid Limit (LL)** of the soil can be used to give an indication of **soil desiccation**, i.e., where the NMC is less than 40% of the LL, the soil is inferred to be desiccated, as summarised in Table 8, below.

Table 8: Soil Desiccation Indicators in the Clay

Location	Depth (m)	Liquid Limit (%)	40% Liquid Limit (%)	Natural Moisture Content (%)	Desiccation
CP1	15.00	30	12	17	No
WS1	3.70	33	13	19	No
TP3	3.00	35	14	22	No
TP4	3.20	38	15	26	No
TP5	2.95	36	14	36	No

The results in the above table show that the samples tested show no evidence of desiccation.

Figure 7: Plasticity Chart



7.0 GEOTECHNICAL ASSESSMENT

7.1 Proposed Development

It is understood that the client wishes to demolish the existing buildings on site and construct a combination of approximately 16 houses with private gardens and 3 apartment blocks, all with parking and soft landscaping. Site access will be retained via Louisa Street to the east of the site, via a new access road.

Detailed information regarding structural loadings and proposed foundation type was not available, however, we anticipate the loadings of the houses to be similar to those of a typical two-storey house (up to 75kN/m²).

7.2 Ground Conditions Encountered

The exploratory holes generally encountered Made Ground to a maximum depth of 2.90m. Underlying the Made Ground in all exploratory boreholes were superficial deposits of variable Clay and Sand to a maximum depth of 15.00m bgl.

Groundwater was encountered in WS3 at 4.00m bgl and WS4 at 3.50m bgl during the fieldwork and encountered during subsequent monitoring visits.

7.3 Foundation Considerations

Based on the ground conditions encountered, conventional shallow strip/pad foundations are considered suitable for the houses included in the proposed development, bearing into the superficial deposits, providing the anticipated structural loadings are relatively low and subject to tolerance of structure to settlement. Should the allowable bearing pressure and settlement prove unfavourable, then alternative foundations options will need to be considered, such as ground improvement and piles.

The shallow strip/pad foundations are discussed below in 7.3.1.

Conventional shallow strip/pad foundations are not considered suitable for the apartment buildings included in the proposed development. Depending on the structural loadings, alternative foundations options may need to be considered, such as ground improvement and piles.

Further foundation options are discussed overleaf in 7.3.2 and 7.3.3.

7.3.1 Conventional Shallow Depth Strip/Pad Foundations

Strip/Pad foundations should be taken down below any Made Ground and placed in the superficial deposits beneath at a minimum depth of 1.50m. If any Made Ground, particularly loose or soft material, is encountered at foundation level this should be excavated and replaced with suitable granular fill or the foundation extended at least 150mm into suitable natural strata.

Foundations should be placed in materials of similar bearing and consolidation characteristics to avoid potential differential settlement occurring. Should foundations cross from cohesive to granular soils, nominal reinforcement should be incorporated to avoid the effects of differential settlement.

Table 9 below summarises anticipated allowable bearing pressures for strip/pad foundations placed in the superficial deposits. The bearing capacities are calculated based on Hansen's ⁽¹⁹⁷⁸⁾ method and assuming a factor of safety against bearing capacity failure of 3. For the purpose of the calculation, groundwater has been assumed to be at 6.00m bgl.

Due to the limited amount of clay encountered at foundation depth, the design value for clay at 3.00m bgl has been used for foundation calculations at 2.50m depth.

Table 9: Summary of Allowable Bearing Pressures

Foundation Strata	Design Value (Section 6)	Foundation Depth (m bgl)	Foundation Type	Foundation Size (m)	Allowable Bearing Pressure (kN/m ²)
SAND	$\phi = 33.4^\circ$	1.5	Strip	0.4	385
				0.9	408
			Pad	1.0 x 1.0	594
				2.0 x 2.0	605
	$\phi = 33.4^\circ$	2.0	Strip	0.4	508
				0.9	530
			Pad	1.0 x 1.0	795
				2.0 x 2.0	793
	$\phi = 33.4^\circ$	2.5	Strip	0.4	631
				0.9	652
			Pad	1.0 x 1.0	997
				2.0 x 2.0	979
CLAY	$c_u=41\text{kN/m}^2$	2.5	Strip	0.4	125
				0.9	120
			Pad	1.0 x 1.0	139
				2.0 x 2.0	129

Table 10 below summarises anticipated settlements of the above foundations in sand based on design values discussed in Section 6. The foundation loading assumed as equal to 75kN/m².

Table 10: Summary of Anticipated Settlement (Granular)

Foundation Depth (m bgl)	Foundation Strata	Foundation Type	Foundation Size (m)	Pad Foundation Loading (kN/m²)	Settlement* (mm)		
					Lower Limit	Upper Limit	Best Estimate
1.5	SAND	Strip	0.4	75	<5	<5	<5
			0.9	75	<5	5-10	<5
		Pad	1.0 x 1.0	75	<5	<5	<5
			2.0 x 2.0	75	<5	5-10	<5
2.0		Strip	0.4	75	<5	<5	<5
			0.9	75	<5	5-10	<5
		Pad	1.0 x 1.0	75	<5	<5	<5
			2.0 x 2.0	75	<5	5-10	<5
2.5		Strip	0.4	75	<5	<5	<5
			0.9	75	<5	5-10	<5
		Pad	1.0 x 1.0	75	<5	<5	<5
			2.0 x 2.0	75	<5	5-10	<5
*Immediate settlement							

*Immediate settlement

Table 11 below summarises anticipated settlements of the above foundations in clay based on design values discussed in Section 6. Settlement in cohesive soils typically comprises a small amount of immediate settlement as loads are applied and a larger proportion of consolidation

settlement, which will occur over a longer period of time. For the purposes of the calculations, the strata over the depth of influence of the foundation is assumed as the same type and the foundation loading assumed as equal to 75kN/m².

Table 11: Summary of Anticipated Settlement (Cohesive)

Foundation Depth (m bgl)	Foundation Strata	Foundation Type	Foundation Size (m)	Pad Foundation Loading (kN/m ²)	Settlement (mm)		
					At Centre	At Corner	Average
2.5	CLAY	Strip	0.4	75	-	-	<5
			0.9	75	-	-	<5
		Pad	1.0 x 1.0	75	5-10	<5	5-10
			2.0 x 2.0	75	5-10	<5	5-10

Floor slabs should be designed as suspended if Made Ground of 600mm thickness or greater is present. Made Ground is not considered an appropriate bearing stratum due to its variable nature. Floor slabs may be designed as ground bearing where Made Ground is excavated and replaced with suitable granular fill.

The presence of trees within site boundaries indicates that foundations could be within their influence zone. In order to avoid possible excessive settlement due to water removal by trees during dry periods or ground heave due to tree removal, the recommendations of the National House Building Council Practice Standard “Building Near Trees”, should be closely followed. In this context clays near surface should be considered as having a low to medium volume change potential.

All foundation excavations should be inspected by a suitable qualified engineer to prove that the founding strata is suitable and uniform along the length of the foundation, and capable of taking the anticipated structural loadings. If foundations cross from granular to cohesive soils, nominal reinforcement should be incorporated.

7.3.2 Ground Improvement

Ground treatment (e.g., vibro displacement) may be an option, subject to environmental and noise/vibration constraints.

For example, vibro stone columns are often used to solve a wide range of static, dynamic, and seismic foundation problems by using powerful depth vibrators to densify soils of form stone columns that compact or reinforce soils in situ. Vibro systems can be used to treat granular deposits, fills, made ground and soft clays/silts.

Soils treated by vibro could offer an allowable bearing pressure in the range 100kN/m² to 200kN/m², depending on column spacings and ground encountered.

Once the treatment has been carried out, spread foundations may be adopted across the site, and designed to the loadings given above. Providing that any imported fill material between the tops of the columns and the underside of the floor slab is placed in a controlled manner, floor slabs may be ground bearing. Positive assurances should be sought from an experienced specialist contractor that the proprietary system proposed can provide the required working loads in the ground conditions encountered, with a guarantee on maximum settlement for both footings and floor slabs.

7.3.3 Piled Foundations

In areas of deep made ground or unfavourable bearing capacities, foundation loading may be transferred via piles taken down to depth to a suitable founding stratum.

A variety of pile types may be used, including bored and continuous flight auger (CFA) piles. Driven piles may be suitable, subject to environmental and noise/vibration constraints.

Because of the various advantages and limitations of each pile type, and the cost implications, advice should be sought from specialist piling contractors to determine the most suitable and cost-effective type. They should also be able to give recommended pile diameters and depths and likely pile capacities, with guaranteed performance. It is recommended a pile test be carried out to confirm pile capacities. In assessing the pile capacities, contractors should make an allowance for the effects of negative skin friction, particularly in the made ground and soft clays.

There may be differential settlement between piled structures and the surrounding ground level. Provision should, therefore, be made to make up ground levels at threshold positions, loading bays, vehicle access doorways, etc. Alternatively, these materials should be removed and replaced in a controlled manner by suitable existing materials or imported engineered fill.

It is essential the advice of a specialist piling contractor is sought and that positive assurances are provided by the piling contractor that their proprietary system can provide the required working loads in the ground conditions encountered.

7.4 Pavement Design

The ground investigation identified the soil type at the subgrade level to typically be Made Ground.

A conservative design CBR value of 1% should be adopted in areas where Made Ground is encountered at subgrade level, where encountered.

Consideration should be given to the potential differing ground conditions near surface, which could cause pavements to be constructed on variable made ground. In this context a flexible pavement design may be required.

Consideration should also be given to the use of geotextiles to allow reduction of capping thickness. For examples biaxial geogrids such as Tensar SSLA20 and SSLA30 are often used to reduce capping thickness. The advice of a suitable contractor should be sought as to the most appropriate type of geotextile to use in the ground conditions encountered at this site. For guidance, the following table gives a comparison of granular layer thickness with and without the use of a geotextile, in accordance with the requirement of HA25/94 Part 2.

It should be noted the type of construction will depend on proposed finished pavement levels across the site and it is recommended the pavement design is reviewed once these levels are known. In this context, it is essential further in situ CBR testing is carried out once formation levels are known to confirm design CBR values.

Table 12: Comparison of Capping Thickness with and without Geotextile

CBR	Unreinforced			Reinforced with Tensar Geogrid				
	Sub-base	Capping	Total	Sub-base	Capping	No. of grids	Total	Thickness saving
0.5%	Design not suitable			200mm	400mm	2	600mm	-
1.0%	150mm	600mm	750mm	400mm	0	1	400mm	350mm
1.5%	150mm	600mm	750mm	310mm	0	1	310mm	440mm
2.0%	150mm	600mm	750mm	260mm	0	1	260mm	490mm
3.0%	150mm	350mm	500mm	210mm	0	1	210mm	290mm
4.0%	150mm	300mm	450mm	175mm	0	1	175mm	275mm
5.0%	150mm	250mm	400mm	160mm	0	1	160mm	240mm
These figures are suitable for light access roads and car parks, based on 1000 standard axes. For heavier loaded pavements, the advice of specialist contractor should be sought.								

All formation excavations should be examined by a suitably experienced engineer or inspector to check for soft or unsuitable material, which should be removed and replaced with compacted granular fill. Also, to ensure good compaction and remove unevenness, the formation should be compacted with equipment suitable for use in the ground conditions encountered. Careful inspection of this work will also help identify any soft spots at or just below formation level.

7.5 Chemical Attack on Buried Concrete

Chemical tests (see Appendices) show low levels of water-soluble sulphates and near neutral conditions. Based on these conditions, it is recommended that for concrete placed in natural strata the Design Sulphate Class for the site, as defined in BRE Special Digest 1⁽²⁰⁰⁵⁾, be taken as DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification be taken as AC-1s. The recommendations of BRE Special Digest 1 should be followed for concrete foundations and ground bearing floor slabs.

7.6 Suitability of Excavated Materials

Acceptability criteria and testing, and methods of compaction/placement will depend on the type of contract and specification used for the construction of the proposed development and it is recommended that earthworks specifications are reviewed by a suitably qualified engineer once these have been prepared by the relevant parties.

Granular Made Ground and natural sand could be suitable for re-use as structural fill, providing it is not contaminated and does not contain excessive amounts of clay and providing moisture contents are controlled during placement. The control of moisture contents will be important as the cohesive content of this stratum is likely to be sensitive to moisture content changes.

7.7 Temporary Works

Formations will be susceptible to damage both by weather and trafficking, and should be protected immediately on exposure, particularly in areas where construction plant will access the site.

Excavations in Made Ground are likely to be unstable and should be battered back to an angle of 1 in 2, or a system of close sheeting and shoring adopted to ensure stability, and in particular where personnel are required to enter excavations. All excavations should be adequately supported where personnel are required to enter.

Groundwater seepages could be encountered near surface within excavations, particularly during the wetter months of the year. Pumping of excavations from a suitable located sump is likely to be required to keep excavations dry.

All natural materials on site should be capable of being excavated using conventional excavating machinery.

8.0 SOIL CONTAMINATION RISK ASSESSMENT

8.1 Tier I Human Health Soil Risk Assessment – Groundworkers During Development

To assess the risk of soil contamination to construction and ground workers during development, guidelines from the HSE Document 'Protection of workers and the general public during development of contaminated land' ⁽¹⁹⁹¹⁾ are used. The document assesses soil contamination test results and classifies the site as being uncontaminated or contaminated with varying degrees of contamination from 'slight' to 'unusually heavy'. The guideline values and laboratory test results are summarised in the following table:

Table 13: Summary of Guideline Values for Protection of Workers and the General Public During Development of Contaminated Land

Contaminant	Typical Values* for:					Test Results	Class
	Uncontaminated Soils	Slight Contamination	Contaminated	Heavy Contamination	Unusually Heavy Contamination		
	Class A	Class B	Class C	Class D	Class E		
pH (acid)	6 - 7	5 - 6	4 - 5	2 - 4	<2	5	B
pH (alkaline)	7 - 8	8 - 9	9 - 10	10 - 12	12	7.5 – 9.2	A - C
Arsenic	0 - 30	30 - 50	50 - 100	100 - 500	500	6 - 32	A - B
Cadmium	0 - 1	1 - 3	3 - 10	10 - 50	50	< 0.2	A
Chromium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	8 – 51	A
Copper	0 - 100	100 - 200	200 - 500	500 - 2500	2500	15 – 457	A - C
Lead	0 - 500	500 - 1000	1000 - 2000	2000 – 1%	1.0%	21 – 160	A
Mercury	0 - 1	1 - 3	3 - 10	10 - 50	50	< 1	A
Nickel	0 - 20	20 - 50	50 - 200	200 - 1000	1000	5 – 42	A - B
Zinc	0 - 250	250 - 500	500 - 1000	1000 - 5000	5000	27 – 136	A
Boron	0 - 2	2 - 5	5 - 50	50 - 250	250	< 1	A
Selenium	0 - 1	1 - 3	3 - 10	10 - 50	50	< 3	A
Barium	0-500	500-1000	1000-2000	2000-1.0%	1.0%	43 – 478	A
Beryllium	0 - 5	5 - 10	10 - 20	20 - 50	50	< 0.5 – 3.8	A
Vanadium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	17 – 84	A
Sulphate	0 - 2000	2000 - 5000	5000 – 1%	1% - 5%	5.05%	525 – 5412	A - C
Sulphide	0 - 10	10 - 20	20 - 100	100 - 500	500	< 5	A
Cyanide (free)	0 - 1	1 - 5	5 - 50	50 - 100	100	< 2	A
Phenol	0 - 2	2 - 5	5 - 50	50 - 250	250	< 2	A

Based on the above results, the soils are ranging from contaminated to uncontaminated. A contaminated concentration of pH (alkaline), copper and sulphate were observed. A slightly contaminated concentration of pH (acid), arsenic and nickel were also observed. The remaining values are present in uncontaminated concentrations.

Therefore, there is a **MODERATE to LOW** potential risk from soil contamination to construction workers, ground workers and members of the public during construction. Appropriate measures, such as PPE, site health plans, and appropriate disposal of material arisings will further mitigate this risk.

8.2 Tier I Human Health Soil Risk Assessment – Future Site Users

The following section provides a Human Health Soil Assessment for future site users. Based on the proposed development type, the following section compares the results of contamination analyses to residential types of end development as specified by Defra/LQM/CIEH. As part of

the contamination assessment, the chemical results obtained by EEG have been screened against accepted compliance criteria, namely:

- Defra C4SL Health Criteria Values (March 2014), where available; and
- Tier 1 assessment values - based on LQM/CIEH Suitable 4 Use Levels ⁽²⁰¹⁵⁾ (S4ULs).

The soil chemical testing results are summarised in Table 14, below.

Table 14: Soil Results Comparison with C4SL/S4UL Values

Parameter	C4SL/S4UL Levels Residential with Plant Uptake (mg/kg)	WS1 0.30m	WS2 0.50m	WS3 1.00m	WS4 1.20m	WS5 0.65m	TP1 0.40m	TP2 0.25m	TP3 0.90m	TP4 0.70m	TP5 0.45m	No of Exceedances
		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	
Metals												
Arsenic	37	32	20	10	7	29	27	11	16	15	6	0
Boron	290	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0
Cadmium	22	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0
Chromium	910	51	26	15	18	16	17	27	13	18	8	0
Chromium VI	21	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0
Copper	2400	83	70	38	17	398	457	37	27	34	15	0
Lead	200	120	160	110	21	101	126	24	44	110	42	0
Mercury	1.2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0
Nickel	180	42	24	10	12	27	33	39	12	16	5	0
Selenium	250	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	0
Vanadium	410	84	31	36	23	63	54	30	37	41	17	0
Zinc	3700	134	136	48	45	46	71	45	27	32	28	0
Petroleum Hydrocarbons												
Benzene	0.087	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
Toluene	130	0.016	< 0.005	0.010	< 0.005	0.006	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0
Ethylbenzene	47	0.008	< 0.002	0.005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
o-xylenes	60	0.008	< 0.002	0.021	< 0.002	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
m-xylenes	59	0.013	< 0.002	0.021	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
p-xylenes	56	0.013	< 0.002	0.021	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0
Aliphatic EC >5-6	42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0
Aliphatic EC >6-8	100	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0
Aliphatic EC >8-10	27	< 2	< 2	< 2	< 2	< 2	11	< 2	< 2	< 2	< 2	0
Aliphatic EC >10-12	130	< 2	< 2	< 2	< 2	< 2	34	< 2	< 2	< 2	< 2	0
Aliphatic EC >12-16	1100	8	< 3	< 3	< 3	< 3	140	< 3	< 3	< 3	< 3	0
Aliphatic EC >16-21	65000	29	< 3	< 3	< 3	7	136	< 3	< 3	< 3	< 3	0
Aliphatic EC >21-35	65000	263	< 10	< 10	< 10	15	31	< 10	< 10	< 10	< 10	0
Aromatic EC >5-7	70	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0
Aromatic EC >7-8	130	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0
Aromatic EC >8-10	34	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	0
Aromatic EC >10-12	74	8	< 2	< 2	< 2	3	12	< 2	< 2	< 2	< 2	0
Aromatic EC >12-16	140	36	< 2	5	< 2	26	96	< 2	< 2	< 2	< 2	0
Aromatic EC >16-21	260	116	14	21	< 3	69	577	< 3	9	< 3	< 3	1
Aromatic EC >21-35	1100	331	< 10	14	< 10	97	580	< 10	< 10	< 10	< 10	0

Parameter	C4SL/S4UL Levels Residential (mg/kg)	WS1 0.30m	WS2 0.50m	WS3 1.00m	WS4 1.20m	WS5 0.65m	TP1 0.40m	TP2 0.25m	TP3 0.90m	TP4 0.70m	TP5 0.45m	No of Exceedances
		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	
Polycyclic Aromatic Hydrocarbons												
Naphthalene	2.3	3.48	< 0.1	0.36	< 0.1	1	1.72	< 0.1	0.4	< 0.1	< 0.1	1
Acenaphthylene	210	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.27	< 0.1	< 0.1	< 0.1	< 0.1	0
Acenaphthene	170	2.54	0.21	0.31	< 0.1	0.9	1.21	< 0.1	< 0.1	< 0.1	< 0.1	0
Fluorene	170	1.9	0.15	0.25	< 0.1	0.59	1	< 0.1	0.2	< 0.1	< 0.1	0
Phenanthrene	95	11.5	1.52	2.4	< 0.1	5.39	37.6	< 0.1	1.53	0.3	< 0.1	0
Anthracene	2400	4.36	0.37	0.49	< 0.1	1.45	7.22	< 0.1	0.5	< 0.1	< 0.1	0
Fluoranthene	280	10.6	1.91	3.12	< 0.1	6.99	86.7	< 0.1	1.37	0.43	< 0.1	0
Pyrene	620	9.62	1.86	3.26	< 0.1	6.18	91.9	< 0.1	1.3	0.44	< 0.1	0
Benzo(a)anthracene	7.2	3.91	0.66	1.46	< 0.1	3	51.6	< 0.1	0.98	0.22	< 0.1	1
Chrysene	15	3.91	0.79	1.64	< 0.1	3.38	46.9	< 0.1	1.06	0.3	< 0.1	1
Benzo(a)pyrene	5	3.58	0.52	1.36	< 0.1	3.01	44.2	< 0.1	1.3	0.25	< 0.1	1
Benzo(b)fluoranthene	2.6	4.03	0.61	1.53	< 0.1	3.52	52.2	< 0.1	1.08	0.25	< 0.1	3
Benzo(k)fluoranthene	77	1.48	0.26	0.61	< 0.1	1.37	8.45	< 0.1	0.53	0.12	< 0.1	0
Indeno(1,2,3-cd) pyrene	27	1.88	0.27	0.77	< 0.1	1.8	23.7	< 0.1	0.65	0.14	< 0.1	0
Dibenz (a, h) anthracene	0.24	0.39	< 0.1	0.23	< 0.1	0.38	4.38	< 0.1	0.18	< 0.1	< 0.1	3
Benzo(ghi)perylene	320	1.64	0.26	0.67	< 0.1	1.6	22.6	< 0.1	0.52	0.14	< 0.1	0
Phenols												
Phenol	280	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	0
Concentrations in red are above the assessment criteria based on Residential End Use with Plant Uptake.												

Based on the above tables, eleven contaminant concentrations were found in exceedance of the screening criteria relevant to a Residential End Use.

The samples with identified contaminant exceedances include WS1 at 0.30m, WS5 at 0.65m, and TP1 at 0.40m.

The locations of these exceedances can be observed in Figure 8 overleaf.

The contaminants found in exceedance of the screening criteria relevant to a Residential End Use with Plant Uptake include Petroleum Hydrocarbon Aromatic EC >16-21 and several Polycyclic Aromatic Hydrocarbons: Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenzo (a, h) anthracene.

Elevated Naphthalene, which is volatile, has also been identified at WS1 (0.30m).

Asbestos was identified in two of the samples tested, see Table 15 below.

Table 15: Summary of Asbestos Encountered

Location	Depth (m bgl)	Asbestos Type	Sample Matrix	Quantification
WS1	0.30	Chrysotile	Loose Fibres	<0.001%
WS2	0.50	Chrysotile	Loose Fibres	0.001%

Figure 8: Chemical Exceedance Location Plan



8.3 Soil Waste Assessment

An assessment of the disposal characteristics of the soil in accordance with Environment Agency guidance WM3.1, edition of June 2018, "Guidance on the classification and assessment of waste" has been carried out on soils recovered from the site, using HazWasteOnline.

The results are summarised in Table 16 below and presented in full in Appendix 6.

Table 16: Waste Classification of Soils

Location	Depth (m bgl)	WM3.1 Classification	Comments
WS1	0.30	Non-Hazardous	-
WS2	0.50	Non-Hazardous	-
WS3	1.00	Non-Hazardous	-
WS4	1.20	Non-Hazardous	-
WS5	0.65	Non-Hazardous	-
TP1	0.40	Hazardous	Elevated TPH
TP2	0.25	Non-Hazardous	-
TP3	0.90	Non-Hazardous	-
TP4	0.70	Non-Hazardous	-
TP5	0.45	Non-Hazardous	-

Table 16 above shows that the ten soil samples collected from the window sample boreholes were classified as **Non-Hazardous** in accordance with WM3.1.

Further Waste Acceptance Criteria (WAC) testing may prove that this material is acceptable as inert waste.

Table 16 also identifies the sample taken from TP1 at 0.40m was classified as **Hazardous** in accordance with WM3.1, due to elevated TPH, and soils recovered from this area need to be disposed of at the correct facility.

Asbestos can affect the waste classification of soil, if the concentration is greater than 0.1%, the soil will automatically be classified as Hazardous waste. As asbestos quantification of the sample taken from WS1 at 0.30m revealed a value of <0.001% and the sample from WS2 at 0.50m revealed a value of 0.001%, this does not affect the Waste Classification as stated above.

9.0 GROUNDWATER CONTAMINATION RISK ASSESSMENT

In the absence of specific UK guidelines regarding groundwater quality in the UK, chemical results obtained by EEG have been compared with the following statutory and non-statutory standards:

- Environmental Quality Standards (EQS); and
- UK Drinking Water standards ⁽²⁰⁰⁰⁾.

Many of the EQS values lie just above the method detection limit for parameters and as such, are extremely conservative. In the absence of EQS values, Drinking Water Standards have been used for comparison of results. Again, these standards are highly conservative, especially in this site context.

A direct comparison was made between the groundwater analyses results and the EQS and Drinking Water Standards, and the results are summarised in Table 17, overleaf.

From the below table there are no contaminant exceedances in the groundwater samples taken on 16th May 2022.

Given the environmental setting of the site, and no exceedances, the risk to groundwater from contamination is considered low.

Further detail on the water chemical testing results can be found in Appendix 5.

Table 17: Groundwater Results Comparisons with EQS/Drinking Water Quality Values

Determinand	EQS Value (1)	Drinking Water Quality (DWQ) Value (2)	WS1	WS4	No. of Exceedances
Arsenic	50	10	< 5	< 5	0
Cadmium	0.9	5	< 0.4	< 0.4	0
Chromium	50	-	< 5	< 5	0
Copper	10	2000	< 5	< 5	0
Lead	1.2 - 14	10	< 5	< 5	0
Mercury	0.07	1.0	< 0.05	< 0.05	0
Selenium	-	10	< 5	< 5	0
Nickel	50 - 200	20	7	< 5	0
Zinc	75	-	8	< 2	0
Cyanide	-	50	< 5	< 5	0
Phenol	7.7 - 46	-	< 10	< 10	0
Sulphate	400000	250000	112	24	0
pH	6 - 9	-	7.0	6.8	0
Naphthalene	10	-	0.03	0.02	0
Anthracene	0.1	-	< 0.01	< 0.01	0
Benzo(a)pyrene	0.27	0.01	< 0.01	< 0.01	0
Benzo(b)fluoranthene	0.017	0.10	< 0.01	< 0.01	0
Benzo(k)fluoranthene	0.017	-	< 0.01	< 0.01	0
Indeno(123cd) pyrene	-	0.10	< 0.01	< 0.01	0
Fluoranthene	0.12	-	0.03	0.02	0
Benzene	10 - 50	1	< 1	< 1	0
Toluene	50 - 380	-	< 5	< 5	0
Ethylbenzene	20 - 200	300 (WHO)	< 5	< 5	0
Xylenes	30	-	< 25	< 25	0
Total Petroleum Hydrocarbons Aro C6-C8	-	10	< 10	< 10	0
Total Petroleum Hydrocarbons Aro C8-C10	-	700	< 10	< 10	0
Total Petroleum Hydrocarbons Aro C10-C12	-	300	< 10	< 10	0
Total Petroleum Hydrocarbons Aro C12-C16	-	90	< 10	< 10	0
Total Petroleum Hydrocarbons Aro C16-C21	-	90	< 10	< 10	0
Total Petroleum Hydrocarbons Aro C21-C35	-	90	< 10	< 10	0
Total Petroleum Hydrocarbons Ali C6-C8	-	15000	< 10	< 10	0
Total Petroleum Hydrocarbons Ali C8-C10	-	15000	< 10	< 10	0
Total Petroleum Hydrocarbons Ali C10-C12	-	300	< 10	< 10	0
Total Petroleum Hydrocarbons Ali C12-C16	-	300	< 10	< 10	0

10.0 GROUND GAS AND RADON GAS CONTAMINATION RISK ASSESSMENT

10.1 Radon Gas

The site is not located within a Radon Affected Area as defined by the Health Protection Agency, and therefore radon protection measures are not necessary.

10.2 Analyses of Monitoring Results

The potential risk associated with gases being generated in the ground (whether from natural or man-made sources) depends on the concentrations of gas and its flow rate to the surface. These factors are assessed by monitoring of the gas installations in the boreholes. The variable nature of gas generation and the effect of barometric pressure on gas flow, means that the volume of gas potentially reaching the ground surface is normally inconsistent over time.

A total of six gas monitoring visits have been completed by Earth Environmental & Geotechnical Ltd. The monitoring visits were carried out between the 16th May and 20th June 2022. The results recorded methane (CH₄) levels of 0.0% (v/v) and carbon dioxide (CO₂) levels of 0.1% to 6.6% v/v. Oxygen concentrations of between 12.4% to 21.3% v/v were also recorded.

Regarding flow rates, for the purposes of the ground gas risk assessment BS8485 2015+A1 2019 states that *'steady state flow rates, rather than brief peak values on opening, should be used in screening risk assessment if these are representative of the conceptual site model'*.

Gas flow rates were recorded between -0.2l/hr to 0.1l/hr and a maximum flow rate of 0.1l/hr has been adopted for the below calculations. Atmospheric pressure was recorded to be between 993mb and 1016mb.

Full results of the monitoring are presented in Appendix 2.

Table 18 overleaf, adapted from CIRIA C665 "Assessing risks posed by hazardous ground gases to buildings", shows a summary of the current UK practice with respect to appropriate gas protection measures based upon a Gas Screening Value (GSV).

A GSV for the site has been obtained by multiplying the maximum concentration of gas by the steady flow rate of 0.1l/h adopted for assessment purposes.

- Carbon dioxide: steady flow rate = 0.1l/hr, max concentration = 6.6%
- Methane: steady flow rate = 0.1l/hr, max concentration = 0.0%.

Based on the above figures, the GSV is calculated as:

- **Carbon dioxide:** $GSV = 0.1 \times 5.1 / 100 = 0.0066 \text{ litres/hr}$
- **Methane:** $GSV = 0.1 \times 0.0 / 100 = 0.0000 \text{ litres/hr}$

Table 18: Characteristic Situations (Wilson et al 2006/2007 modified from Wilson and Card, 1999)

<i>Characteristic Situation (CS)</i>	<i>Risk Classification</i>	<i>Gas Screening Value CH₄ or CO₂ (l/hr)</i>	<i>Additional Factors</i>	<i>Typical source of generation</i>
1	Very Low	<0.07	Typically, < 1% methane Typically, < 5% carbon dioxide	Typical made ground
2	Low	<0.7	Borehole air flow rate to not exceed 70l/hr otherwise consider increase to Characteristic Situation 3	Typical made ground
3	Moderate	<3.5		Old landfill, inert waste, flooded mineworkings
4	Moderate to High	<15	Quantitative risk assessment	Mineworkings susceptible to flooding, completed landfill
5	High	<70		Mineworking unflooded inactive with shallow workings near surface
6	Very High	>70		Recent landfill site

The CIRIA guidance document notes that ‘...the GSV is a guideline value and not an absolute threshold’.

The above results suggest the site can be given a Characteristic Situation 1, i.e., ‘very low risk’, in accordance with Table 18, above.

Protection Measures

Based on the foregoing preliminary assessment, ground gas protection measures are not considered necessary at the site in accordance with BS8485:2015 + A1 2019.

Table 19: Gas Protection Point Score Required (BS8485:2015 + A1 2019)

Characteristic Situation	Minimum gas protection score (points)			
	High Sensitivity		Medium	Low
	Type A building (private housing)	Type B building (multiple occupancy private or commercial)	Type C building (single occupancy commercial)	Type D building (large industrial)
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4.0	3.0	2.5
4	6.5	5.5	4.5	3.5

The proposed development is for a Type A and Type B buildings (private housing and multiple occupancy private or commercial), both a high sensitivity risk.

11.0 CONCLUSIONS & RECOMMENDATIONS

11.1 Soil Contamination

There is a **low to moderate** potential risk from soil contamination to construction workers and ground workers during development, and appropriate measures such as PPE, site health plans, appropriate disposal of material arisings will be required to mitigate this risk. The groundworks contractor must provide a soil management plan including methods of dealing with unanticipated soil contamination encountered during groundworks.

Based on the results of the chemical testing, eleven exceedances in contaminants were observed in the soil samples analysed, including Naphthalene in WS1 at 0.30m. Therefore, there is a **moderate** potential risk from soil contamination to residential end users.

The naphthalene hotspot should be further delineated.

To break potential pollutant linkages to future residential end users, it is recommended that landscaped areas should be capped with imported clean cover soils.

The exceedances in contamination found across the site should be further delineated and any impacted material removed offsite.

A Remediation Strategy is recommended to specify the design of the capping system and any following validation work.

11.2 Asbestos

Asbestos was identified in two of the samples tested with quantifications of 0.001% and <0.001%.

11.3 Foundations

Shallow strip/pad foundation placed in the superficial deposits at a minimum depth of approximately 1.50m bgl are considered appropriate for the houses included in the proposed development plan.

Within areas of deep made ground (WS1, WS2) foundation loadings will need to be transferred to deeper strata by use of piles or vibro-stone columns.

11.4 Soil Disposal

Soils should be disposed of at a suitable site, registered to take the levels of contamination encountered. The soils collected from nine borehole locations have been classified as Non-Hazardous for the purpose of off-site disposal in accordance with Environment Agency guidance WM3.1.

However, due to the elevated TPH observed in TP1 at 0.40m, this sample is classified as **Hazardous** waste.

11.5 Land Gas

Based on results of the gas monitoring, the risk of ground gas is negligible to very low and protection against the ingress of ground gas will not be required at the site.

11.6 Pavement Design

Based on the findings of the site investigation, the soil type at subgrade level was typically Made Ground. Based on the recommendations for design CBR values provided in Interim advice note 73/06, Revision 1 (2009), a conservative design CBR value of 1% should be adopted in areas where Made Ground is encountered at subgrade level, where encountered.

11.7 Groundwater

Groundwater was encountered in WS3 at 4.00m bgl and WS4 at 3.50m bgl during the fieldwork.

Ground water was also encountered during subsequent monitoring visits at depths between 2.68m bgl and 3.60m bgl.

Chemical testing was carried out on two groundwater samples and no exceedances in contaminants were observed.

11.8 Risk to Buried (Water) Services

It is considered that, due to the presence of hydrocarbon contamination in TP1, non-standard materials may be required for new water pipes. Further advice should be sought from the local water company.

Previous guidance on buried water pipes was contained in Water Regulations Advisory Scheme (WRAS) Guidance Note No. 9-04-03⁽²⁰⁰²⁾, however this has been superseded by the UK Water Industry Research Report 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' Ref 10/WM/03/21 (January 2011).

11.9 Site Personnel

As with all construction sites, personnel working on the site during the construction period should be encouraged to maintain a high standard of personal hygiene and on-site washing facilities should be available.

11.10 Other Matters

Due diligence is required during the construction period, and should any further evidence of contamination be found, appropriate investigation and / or action should be taken. The significance of any contamination not discovered by this investigation is outside the scope of this report.

APPENDIX 1

EXPLORATORY HOLE LOGS

Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Project Name: Louisa Street, Openshaw

Project No.
A4755

Co-ords: 388551.00 - 397588.00

Hole Type	WS
-----------	----

Location: Openshaw, Greater Manchester

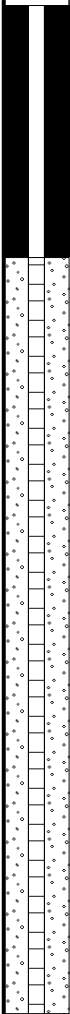
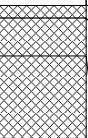
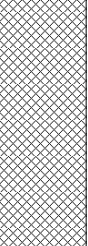
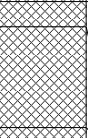
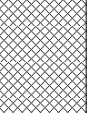
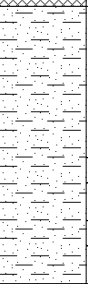
Level:

Scale
1:30

Client: Westchurch Homes

Dates: 25/04/2022 - 25/04/2022

Logged By
AE/BG

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05			Asphalt Hardstanding. (MADE GROUND).	
				0.20				Brown sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND).	
	0.30	ES						Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND).	
	1.00	D							
	1.20		N=16 (3,3/3,3,5,5)						
				1.50			Orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone. (MADE GROUND).		
				1.60				Black sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular ash and clinker. (MADE GROUND).	
	2.00		N=7 (2,2/2,1,2,2)	2.00				Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular sandstone, ash and clinker. (MADE GROUND).	
								<u>Water seepage at 2.50m.</u>	
				2.90			Soft to very stiff brown mottled grey sandy CLAY. Sand is fine to coarse.		
3.70	D				<u>HP at 3.50m = 132 kN/m2.</u>				
					<u>HP at 3.60m = 72 kN/m2.</u>				

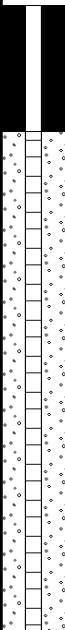
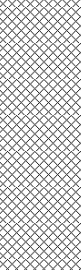
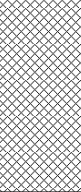
Remarks

Location scanned with CAT prior to excavation.

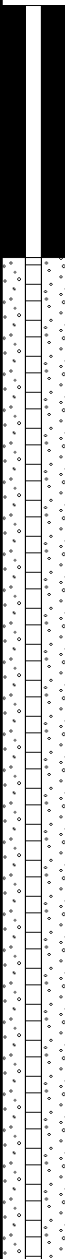
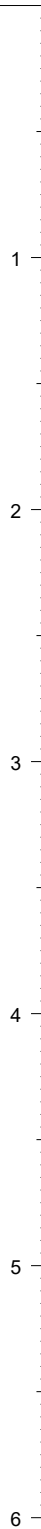
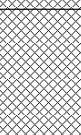
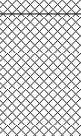
Hand dug pit excavated to 1.20m.

Monitoring installation: 1m plain pipe, 3m slotted pipe.

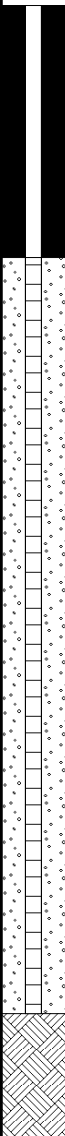
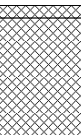
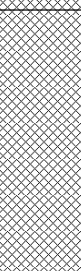
 EARTH ENVIRONMENTAL & GEOTECHNICAL Earth Environmental & Geotechnical Ltd Houldsworth Mill Business & Arts Centre Houldsworth Street Stockport SK5 6DA					Borehole Log			Borehole No. WS2 Sheet 1 of 1		
Project Name: Louisa Street, Openshaw					Project No. A4755		Co-ords: 388529.00 - 397624.00		Hole Type WS	
Location: Openshaw, Greater Manchester					Level:		Scale 1:30		Logged By AE/BG	
Client: Westchurch Homes					Dates: 25/04/2022 - 25/04/2022					

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10		 Grey Concrete. (MADE GROUND).		
		0.50	ES				 Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND).	1	
		1.20		N=24 (2,2/4,6,7,7)	1.20				
		1.50	D		1.50		 Black slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular redbrick. Strong hydrocarbon odour. (MADE GROUND).		
		2.00		N=44 (7,12/11,9,10,14)			 Yellowish brown SAND. Sand is fine to coarse. (MADE GROUND).	2	
		2.50		N=50 (16 for 9mm/15,16,16,3)	2.50		 Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND). End of borehole at 2.50 m	3	
								4	
								5	
								6	

Remarks Location scanned with CAT prior to excavation. Hand dug pit excavated to 1.20m. Monitoring installation; 0.5m plain pipe, 2m slotted pipe.								 EARTH ENVIRONMENTAL & GEOTECHNICAL	
---	--	--	--	--	--	--	--	---	--

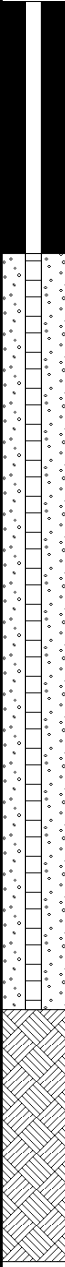
 Earth Environmental & Geotechnical Ltd Houldsworth Mill Business & Arts Centre Houldsworth Street Stockport SK5 6DA					Borehole Log			Borehole No. WS3 Sheet 1 of 1		
Project Name: Louisa Street, Openshaw					Project No. A4755		Co-ords: 388631.00 - 397646.00		Hole Type WS	
Location: Openshaw, Greater Manchester					Level:			Scale 1:30		
Client: Westchurch Homes					Dates: 25/04/2022 - 25/04/2022			Logged By AE/BG		
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
					0.15			Grey Concrete. (MADE GROUND).		
					0.70			Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND).		
	1.00	ES						Brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Low cobble content of redbrick, timber and metal pieces. (MADE GROUND).		
	1.20		N=11 (1,1/2,3,3,3)	1.20			Black slightly sandy CLAY. Sand is fine to medium. Strong hydrocarbon odour. (MADE GROUND).			
	1.50 - 2.20	B		1.50			Medium dense to dense orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone.			
	2.00		N=21 (4,4/5,5,5,6)							
		3.00		N=23 (5,4/5,6,6,6)				3		
	▼	4.00		N=18 (3,3/4,5,4,5)				4		
		5.00		N=50 (6,9/50 for 295mm)	5.00			5		
End of borehole at 5.00 m									6	
Remarks Location scanned with CAT prior to excavation. Hand dug pit excavated to 1.20m. Monitoring installation; 1m plain pipe, 4m slotted pipe.										

 EARTH ENVIRONMENTAL & GEOTECHNICAL Earth Environmental & Geotechnical Ltd Houldsworth Mill Business & Arts Centre Houldsworth Street Stockport SK5 6DA					Borehole Log			Borehole No. WS4 Sheet 1 of 1		
Project Name: Louisa Street, Openshaw					Project No. A4755		Co-ords: 388641.00 - 397616.00		Hole Type WS	
Location: Openshaw, Greater Manchester					Level:		Scale 1:30		Logged By AE/BG	
Client: Westchurch Homes					Dates: 25/04/2022 - 25/04/2022					

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05		 Asphalt Hardstanding. (MADE GROUND). Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND).	1	
					0.55		 Orange sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium subangular redbrick. (MADE GROUND).		
		1.20	ES	N=4 (1,1/1,1,1,1)					
		1.20							
		2.00		N=17 (3,4/3,4,5,5)	1.60		 Medium dense to dense orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone.	2	
		3.00		N=23 (4,5/5,6,6,6)				3	
	 3.50 - 4.00	B							
					4.00		N=44 (5,5/7,10,13,14)		4
					4.50		N=50 (9,12/15,15,17,3)	4.50	
End of borehole at 4.50 m								5	
								6	

Remarks Location scanned with CAT prior to excavation. Hand dug pit excavated to 1.20m. Monitoring installation; 1m plain pipe, 3m slotted pipe.		 EARTH ENVIRONMENTAL & GEOTECHNICAL
---	--	---

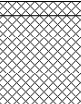
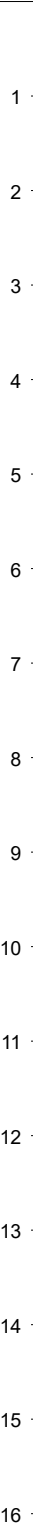
 Earth Environmental & Geotechnical Ltd Houldsworth Mill Business & Arts Centre Houldsworth Street Stockport SK5 6DA					Borehole Log			Borehole No. WS5 Sheet 1 of 1		
Project Name: Louisa Street, Openshaw					Project No. A4755		Co-ords: 388602.00 - 397604.00		Hole Type WS	
Location: Openshaw, Greater Manchester					Level:		Scale 1:30			
Client: Westchurch Homes					Dates: 25/04/2022 - 25/04/2022		Logged By AE/BG			

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.05			0.05		 Asphalt Hardstanding. (MADE GROUND). Grey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND). <i>Becomes black from 0.10m.</i>	1	
		0.65	ES						
		1.20		N=6 (1,2/1,2,2,1)					
					1.40		 Black slightly sandy CLAY. Sand is fine to medium. Strong hydrocarbon odour. (MADE GROUND).	2	
				1.80		 Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND).			
		2.00		N=4 (1,0/1,1,1,1)					
		2.20	D		2.20	 Black slightly sandy CLAY. Sand is fine to medium. Strong hydrocarbon odour. (MADE GROUND).			
					2.50		 Firm brown slightly sandy CLAY. Sand is fine to coarse. <i>HP at 2.80m = 60 kN/m2.</i>	3	
		3.00		N=33 (3,3/5,7,9,12)	3.00		 Dense orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone.		
		3.00 - 3.50	B						
				4.00		 N=41 (7,8/8,10,12,11)	4		
				5.00		 N=50 (8,10/12,12,15,11)			
						End of borehole at 5.00 m			5
									6

Remarks
Location scanned with CAT prior to excavation.
Hand dug pit excavated to 1.20m.
Monitoring installation; 1m plain pipe, 3m slotted pipe.



 Earth Environmental & Geotechnical Ltd Houldsworth Mill Business & Arts Centre Houldsworth Street Stockport SK5 6DA					Borehole Log			Borehole No. CP1 Sheet 1 of 1		
Project Name: Louisa Street, Openshaw					Project No. A4755		Co-ords: 388587.00 - 397633.00		Hole Type CP	
Location: Openshaw, Greater Manchester					Level:			Scale 1:80		
Client: Westchurch Homes					Dates: 25/04/2022 - 25/04/2022			Logged By AE		

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.15			Asphalt Hardstanding. (MADE GROUND).	
					1.10			Brown sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick and timber. (MADE GROUND).	
		1.50		N=15 (1,1/2,3,3,7)				Medium dense orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone.	
					2.30				
					2.80			Firm to stiff brown slightly mottled grey sandy CLAY. Sand is fine to coarse.	
		3.00		N=42 (4,6/8,10,12,12)				Medium dense to dense brown slightly silty slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded sandstone and carbonaceous fragments.	
		4.50		N=41 (4,7/7,9,11,14)					
		6.00		N=14 (1,2/2,2,3,7)					
		7.50		N=24 (3,5/5,6,6,7)					
		9.00		N=47 (7,9/9,11,13,14)					
		10.50		N=49 (5,9/10,13,13,13)					
					11.50				
			12.00			Firm to stiff brown very mottled grey sandy CLAY. Sand is fine to coarse.			
			13.50						
			15.00 - 15.45	U					
			15.00				End of borehole at 15.00 m		

Remarks
Location scanned with CAT prior to excavation.
Hand dug pit excavated to 1.20m.
No monitoring installation; backfilled with arisings.
Water added to aid drilling.





EARTH ENVIRONMENTAL & GEOTECHNICAL
Houldsworth Mill Business & Arts Centre, Houldsworth Street,
Stockport, SK5 6DA
Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

TRIAL PIT LOG

Project Name: Louisa Street, Openshaw

Date: 27/04/22

Project No.: A4755

Client: Westchurch Homes

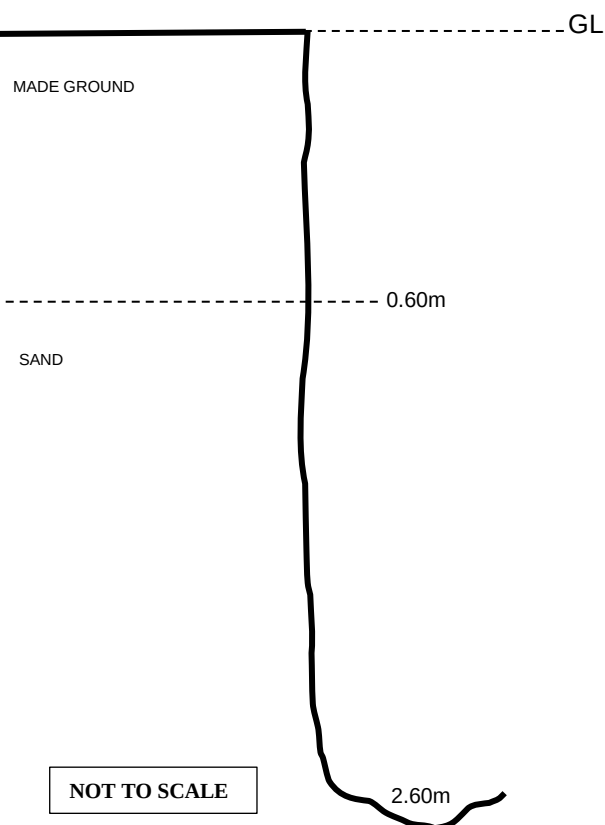
Hole Number: TP1

Logged By: BG

Total Depth: 2.60m

Remarks: -

Schematic Profile:



Legend	Depth (m)	Description
	0.00-0.07	Asphalt Hardstanding. (MADE GROUND).
	0.07-0.20	Orange and grey concrete. (MADE GROUND).
	0.20-0.60	Black slightly sandy CLAY. Sand is fine to medium. Strong hydrocarbon odour. (MADE GROUND). ES at 0.40m.
	0.60-1.70	Orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone.
	1.70-2.60	Yellowish brown slightly clayey slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone. Small frequent pockets of clay. Low cobble content of sandstone. B at 2.00-2.50m.

Trial pit terminated at 2.60m.

Trial pit stable.

No groundwater ingress.

ES=Environmental Sample, B=Bulk Sample

Pictures:



Trial Pit 1: Overview of excavation



Trial Pit 1: Overview of excavated soils



EARTH ENVIRONMENTAL
& GEOTECHNICAL

EARTH ENVIRONMENTAL & GEOTECHNICAL
Houldsworth Mill Business & Arts Centre, Houldsworth Street,
Stockport, SK5 6DA
Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

TRIAL PIT LOG

Project Name: Louisa Street, Openshaw

Date: 27/04/22

Project No.: A4755

Client: Westchurch Homes

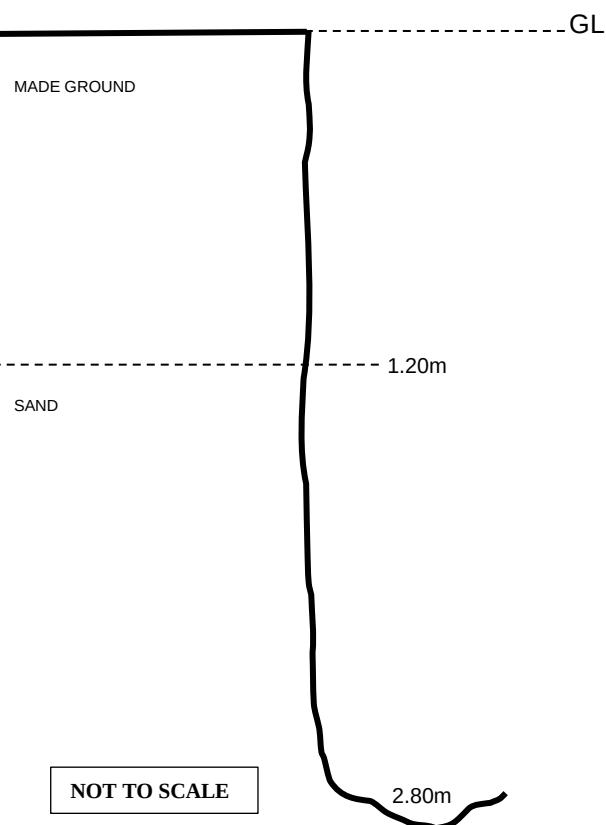
Hole Number: TP2

Logged By: BG

Total Depth: 2.80m

Remarks: -

Schematic Profile:



Legend	Depth (m)	Description
	0.00-0.05	Asphalt Hardstanding. (MADE GROUND).
	0.05-0.50	Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND). ES at 0.25m.
	0.50-1.20	Red and yellow sandy gravelly COBBLES. Sand is fine to coarse. Gravel is fine to coarse subangular redbrick and yellow brick. Cobbles are whole redbrick and yellow brick. (MADE GROUND).
	1.20-2.80	Orangish brown slightly clayey slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone. B at 2.60-2.80m.

Trial pit terminated at 2.80m.

Trial pit unstable in Made Ground only.
No groundwater ingress.

ES=Environmental Sample, B=Bulk Sample

Pictures:



Trial Pit 2: Overview of excavation



Trial Pit 2: Overview of excavated soils



EARTH ENVIRONMENTAL & GEOTECHNICAL
Houldsworth Mill Business & Arts Centre, Houldsworth Street,
Stockport, SK5 6DA
Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

TRIAL PIT LOG

Project Name: Louisa Street, Openshaw

Date: 27/04/22

Project No.: A4755

Client: Westchurch Homes

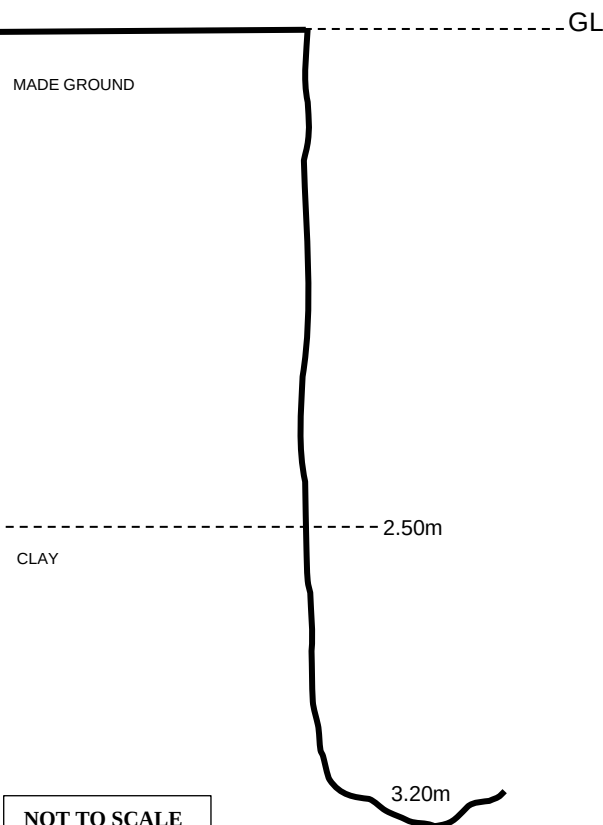
Hole Number: TP3

Logged By: BG

Total Depth: 3.20m

Remarks: -

Schematic Profile:



Legend	Depth (m)	Description
	0.00-0.05	Asphalt Hardstanding. (MADE GROUND).
	0.05-2.50	Black slightly clayey slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. Small frequent pockets of clay. (MADE GROUND). ES at 0.90m.
	2.50-2.65	Grey sandy CLAY. Sand is fine to coarse. SVs = 71 – 93kN/m ³ .
	2.65-3.20	Orange slightly sandy CLAY. Sand is fine to coarse. SVs = 71 – 93kN/m ³ . D at 3.00m.

Trial pit terminated at 3.20m.

Trial pit stable.

No groundwater ingress.

ES=Environmental Sample, D=Disturbed Sample
SV=Hand Shear Vane

Pictures:



Trial Pit 3: Overview of excavation



Trial Pit 3: Overview of excavated soils



EARTH ENVIRONMENTAL
& GEOTECHNICAL

EARTH ENVIRONMENTAL & GEOTECHNICAL
Houldsworth Mill Business & Arts Centre, Houldsworth Street,
Stockport, SK5 6DA
Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

TRIAL PIT LOG

Project Name: Louisa Street, Openshaw

Date: 27/04/22

Project No.: A4755

Client: Westchurch Homes

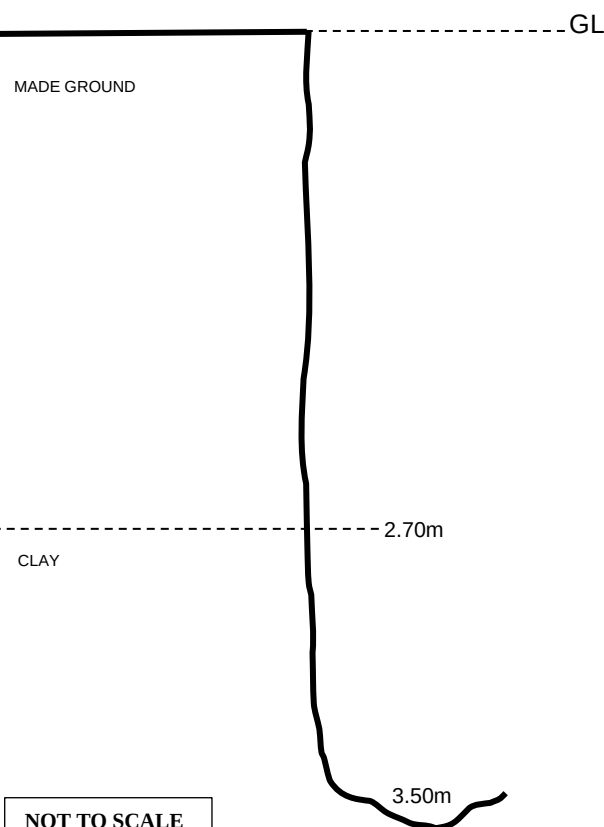
Hole Number: TP4

Logged By: BG

Total Depth: 3.50m

Remarks: -

Schematic Profile:



Legend	Depth (m)	Description
	0.00-0.05	Asphalt Hardstanding. (MADE GROUND).
	0.05-2.70	Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone, ash, clinker, slag and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND). ES at 0.70m.
	2.70-3.50	Grey CLAY. SVs = 30 – 33kN/m ³ . D at 3.20m.

Trial pit terminated at 3.50m.

Trial pit stable.

No groundwater ingress.

ES=Environmental Sample, D=Disturbed Sample
SV=Hand Shear Vane

Pictures:



Trial Pit 4: Overview of excavation



Trial Pit 4: Overview of excavated soils



EARTH ENVIRONMENTAL
& GEOTECHNICAL

EARTH ENVIRONMENTAL & GEOTECHNICAL
Houldsworth Mill Business & Arts Centre, Houldsworth Street,
Stockport, SK5 6DA
Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

TRIAL PIT LOG

Project Name: Louisa Street, Openshaw

Date: 27/04/22

Project No.: A4755

Client: Westchurch Homes

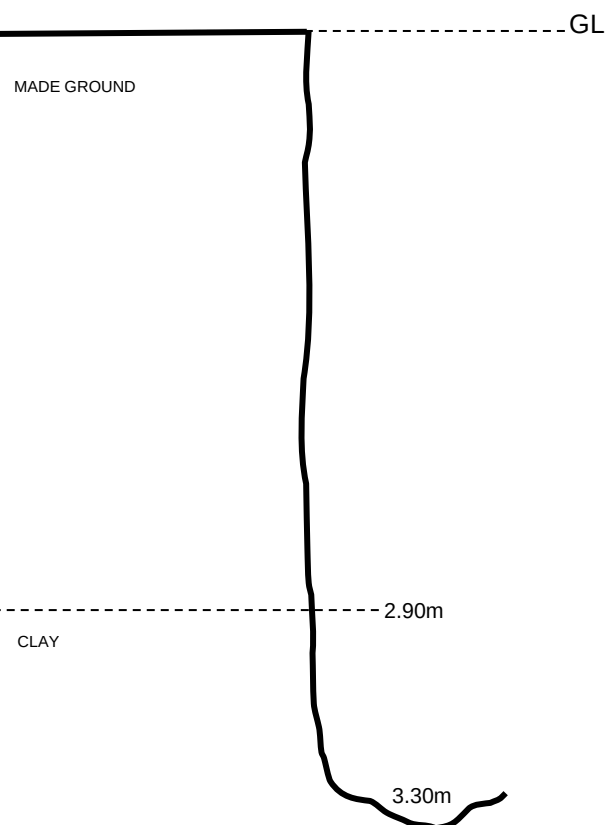
Hole Number: TP5

Logged By: BG

Total Depth: 3.30m

Remarks: -

Schematic Profile:



NOT TO SCALE

Legend	Depth (m)	Description
	0.00-0.10	Grey Concrete. (MADE GROUND).
	0.10-0.30	Black sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Medium cobble content of redbrick, timber and metal pieces. (MADE GROUND).
	0.30-1.20	Black slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and redbrick. Low cobble content of redbrick. (MADE GROUND). ES at 0.45m.
	1.20-2.40	Orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone. (MADE GROUND).
	2.40-2.90	Brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to medium sandstone and redbrick. (MADE GROUND).
	2.90-3.30	Brown slightly sandy CLAY. Sand is fine to coarse. SVs = 8 – 175kN/m ³ . D at 2.95m.

Trial pit terminated at 3.30m.

Trial pit stable.

No groundwater ingress.

ES=Environmental Sample, D=Disturbed Sample
SV=Hand Shear Vane

Pictures:



Trial Pit 5: Overview of excavation



Trial Pit 5: Overview of excavated soils



EARTH ENVIRONMENTAL & GEOTECHNICAL
Houldsworth Mill Business & Arts Centre, Houldsworth Street,
Stockport, SK5 6DA

Tel: 0161 975 6088
Email: info@earthenvironmental.co.uk
Web: www.earthenvironmental.co.uk

TRIAL PIT LOG

Project Name: Louisa Street, Openshaw

Date: 27/04/22

Project No.: A4755

Client: Westchurch Homes

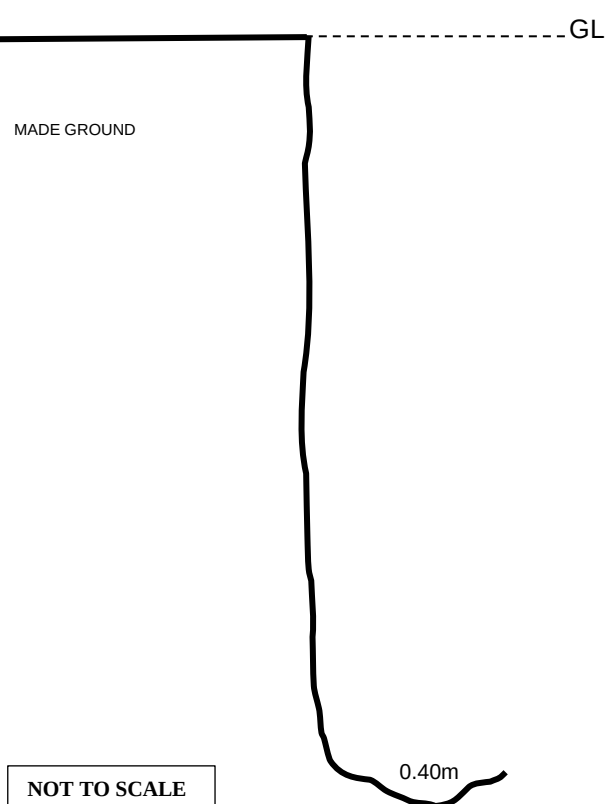
Hole Number: TP6

Logged By: BG/AE

Total Depth: 0.40m

Remarks: Terminated due to identification of a basement at base of trial pit.

Schematic Profile:



Legend	Depth (m)	Description
	0.00-0.10	Grey concrete with rebar. (MADE GROUND). Blue plastic membrane at 0.10m.
	0.10-0.40	Orangish brown gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse rounded sandstone. Concrete, redbrick and plastic. (MADE GROUND). Basement identified at base of pit. Trial Pit terminated.

Trial pit terminated at 0.40m.
Trial pit stable.
No groundwater ingress.

Pictures:



Trial Pit 6: Overview of excavation



Trial Pit 6: Overview of excavated soils

APPENDIX 2

GROUND GAS MONITORING RESULTS

GAS MONITORING RECORD SHEET

JOB DETAILS

Site: Louisa Street, Openshaw
Date: 16/05/2022
Time:

Job No: A4755
Engineer: MS
Client: Westchurch Homes

METEOROLOGICAL & SITE INFORMATION

State of ground: Dry ☐ Moist ☒ Wet ☐
Wind: Calm ☐ Light ☐ Moderate ☒ Strong ☐
Cloud cover: None ☐ Slight ☐ Cloudy ☐ Overcast ☒
Precipitation: None ☐ Slight ☐ Moderate ☒ Heavy ☐
Barometric pressure (mb): 1005 Local pressure system*: Air temperature (°C):

Well No.	Time (s)	Flow (l/hr)	CH ₄ (% vol. in air)	CO ₂ (% vol. in air)	O ₂ (% vol. in air)	PID (ppm)	Depth to GW (mbgl)	Total Depth (mbgl)	Comments
WS1	0	0.0	0.0	0.1	20.8		2.68	3.91	H2S:0 CO:1
	15	0.0	0.0	2.3	18.4				
	30	0.0	0.0	2.3	17.8				
	45	0.0	0.0	2.3	17.8				
	60	0.0	0.0	2.3	17.8				
	120	-0.1	0.0	2.6	17.5				
	180	0.0	0.0	2.9	17.1				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS2	0	0.0	0.0	0.2	20.8		Dry	2.28	H2S:0 CO:5
	15	0.0	0.0	0.8	18.5				
	30	0.0	0.0	0.7	18.4				
	45	0.0	0.0	0.7	18.4				
	60	0.0	0.0	0.7	18.5				
	120	0.0	0.0	0.6	19.4				
	180	0.0	0.0	0.6	19.1				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS3	0	0.0	0.0	0.6	20.5		3.57	3.67	H2S:0 CO:23
	15	0.0	0.0	3.3	16.6				
	30	0.0	0.0	3.3	16.5				
	45	0.0	0.0	3.3	16.5				
	60	0.0	0.0	3.3	16.5				
	120	0.0	0.0	3.3	16.5				
	180	0.0	0.0	3.3	16.4				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS4	0	0.0	0.0	0.6	20.4		3.02	3.32	H2S:0 CO:8
	15	0.0	0.0	5.0	17.0				
	30	0.0	0.0	5.0	16.1				
	45	0.0	0.0	5.1	16.0				
	60	0.0	0.0	5.1	16.0				
	120	0.0	0.0	5.1	15.9				
	180	0.0	0.0	5.2	15.9				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WSS	0	0.0	0.0	0.2	20.9		Dry	3.78	H2S:O CO:5
	15	0.1	0.0	5.8	14.1				
	30	0.0	0.0	5.6	13.6				
	45	0.0	0.0	5.6	13.5				
	60	0.0	0.0	5.6	13.5				
	120	0.0	0.0	5.6	13.4				
	180	0.0	0.0	5.7	13.4				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

Notes: TOC = top of casing

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

** With reference to the Met Office rolling weather archive*

	Flow (l/hr)	CH4	CO2	O2
MIN	-0.1	0.0	0.1	13.4
MAX	0.1	0.0	5.8	20.9
GSV		0	0.0058	

GAS MONITORING RECORD SHEET

JOB DETAILS

Site: Louisa Street, Openshaw	Job No: A4755
Date: 23/05/2022	Engineer: MS
Time:	Client: Westchurch Homes

METEOROLOGICAL & SITE INFORMATION

State of ground:	Dry ☒	Moist ☐	Wet ☐		
Wind:	Calm ☐	Light ☒	Moderate ☐	Strong ☐	
Cloud cover:	None ☐	Slight ☐	Cloudy ☒	Overcast ☐	
Precipitation:	None ☒	Slight ☐	Moderate ☐	Heavy ☐	
Barometric pressure (mb): 993		Local pressure system*: _____		Air temperature (°C): _____	

Well No.	Time (s)	Flow (l/hr)	CH ₄ (% vol. in air)	CO ₂ (% vol. in air)	O ₂ (% vol. in air)	PID (ppm)	Depth to GW (mbgl)	Total Depth (mbgl)	Comments
WS1	0	0.0	0.0	0.4	20.5		2.69	3.91	H2S:0 CO:1
	15	0.0	0.0	3.9	16.6				
	30	0.0	0.0	3.9	16.5				
	45	0.0	0.0	3.9	16.4				
	60	0.0	0.0	3.9	16.4				
	120	0.0	0.0	3.9	16.4				
	180	0.0	0.0	3.9	16.4				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS2	0	0.0	0.0	0.3	20.8		Dry	2.28	H2S:0 CO:1
	15	0.1	0.0	1.1	18.9				
	30	0.1	0.0	1.2	18.8				
	45	0.1	0.0	1.3	18.6				
	60	0.1	0.0	1.3	18.5				
	120	0.1	0.0	1.1	19.1				
	180	0.1	0.0	1.0	19.3				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS3	0	0.0	0.0	0.2	21.3		3.58	3.67	H2S:0 CO:1
	15	0.0	0.0	3.3	18.0				
	30	0.0	0.0	3.3	17.1				
	45	0.0	0.0	3.4	17.0				
	60	0.0	0.0	3.4	17.0				
	120	0.0	0.0	3.4	16.9				
	180	0.0	0.0	3.4	16.9				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS4	0	0.0	0.0	0.2	21.2		3.02	3.30	H2S:0 CO:1
	15	0.0	0.0	3.3	18.9				
	30	0.0	0.0	3.8	18.4				
	45	0.0	0.0	3.9	18.4				
	60	0.0	0.0	3.9	18.4				
	120	0.0	0.0	3.6	18.8				
	180	0.0	0.0	3.5	18.9				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WSS	0	0.0	0.0	0.1	20.9		Dry	3.76	H2S:O CO:2
	15	0.0	0.0	4.3	16.3				
	30	-0.1	0.0	4.8	14.9				
	45	0.0	0.0	5.5	13.9				
	60	-0.1	0.0	5.9	13.2				
	120	-0.1	0.0	6.4	12.5				
	180	-0.1	0.0	6.4	12.4				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

Notes: TOC = top of casing

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

** With reference to the Met Office rolling weather archive*

	Flow (l/hr)	CH4	CO2	O2
MIN	-0.1	0.0	0.1	12.4
MAX	0.1	0.0	6.4	21.3
GSV		0	0.0064	

GAS MONITORING RECORD SHEET

JOB DETAILS

Site: Louisa Street, Openshaw Date: 30/05/2022 Time:	Job No: A4755 Engineer: MS Client: Westchurch Homes
--	---

METEOROLOGICAL & SITE INFORMATION

State of ground:	Dry	Moist <input checked="" type="text"/>	Wet		
Wind:	Calm	Light <input checked="" type="text"/>	Moderate	Strong	
Cloud cover:	None	Slight	Cloudy <input checked="" type="text"/>	Overcast	
Precipitation:	None	Slight	Moderate <input checked="" type="text"/>	Heavy	
Barometric pressure (mb): 1002		Local pressure system*: _____		Air temperature (°C): _____	

Well No.	Time (s)	Flow (l/hr)	CH ₄ (% vol. in air)	CO ₂ (% vol. in air)	O ₂ (% vol. in air)	PID (ppm)	Depth to GW (mbgl)	Total Depth (mbgl)	Comments
WS1	0	0.0	0.0	0.3	20.9		2.69	3.89	H2S:0 CO:0
	15	0.0	0.0	3.9	18.4				
	30	0.0	0.0	4.1	16.6				
	45	0.0	0.0	4.1	16.5				
	60	0.0	0.0	4.1	16.5				
	120	0.0	0.0	4.1	16.4				
	180	0.0	0.0	4.1	16.4				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS2	0	0.0	0.0	0.4	20.8		Wet at base	2.26	H2S:0 CO:0
	15	0.0	0.0	1.6	19.2				
	30	0.0	0.0	1.6	18.9				
	45	0.0	0.0	1.6	18.8				
	60	0.0	0.0	1.7	18.7				
	120	0.0	0.0	1.5	19.0				
	180	0.0	0.0	1.2	19.4				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS3	0	0.0	0.0	0.2	20.9		3.58	3.68	H2S:0 CO:0
	15	0.0	0.0	3.5	19.2				
	30	0.0	0.0	3.6	17.0				
	45	0.0	0.0	3.6	16.8				
	60	0.1	0.0	3.6	16.8				
	120	0.1	0.0	3.6	16.7				
	180	0.1	0.0	3.7	16.7				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS4	0	0.0	0.0	0.4	20.6		3.03	3.25	H2S:0 CO:0
	15	0.0	0.0	5.5	17.3				
	30	0.0	0.0	5.6	15.4				
	45	0.0	0.0	5.6	15.1				
	60	0.0	0.0	5.6	15.1				
	120	0.0	0.0	5.7	15.0				
	180	0.0	0.0	5.7	15.0				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WSS	0	0.0	0.0	0.1	20.9		Dry	3.78	H2S:O CO:O
	15	-0.1	0.0	6.3	16.3				
	30	-0.1	0.0	6.4	14.1				
	45	-0.1	0.0	6.4	13.7				
	60	-0.1	0.0	6.4	13.7				
	120	-0.1	0.0	6.5	13.6				
	180	-0.2	0.0	6.5	13.5				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

Notes: TOC = top of casing

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

** With reference to the Met Office rolling weather archive*

	Flow (l/hr)	CH4	CO2	O2
MIN	-0.2	0.0	0.1	13.5
MAX	0.1	0.0	6.5	20.9
GSV		0	0.0065	

GAS MONITORING RECORD SHEET

JOB DETAILS

Site: Louisa Street, Openshaw	Job No: A4755
Date: 06/06/2022	Engineer: MS
Time:	Client: Westchurch Homes

METEOROLOGICAL & SITE INFORMATION

State of ground:	Dry ☒	Moist ☐	Wet ☐
Wind:	Calm ☒	Light ☐	Moderate ☐ Strong ☐
Cloud cover:	None ☐	Slight ☐	Cloudy ☐ Overcast ☒
Precipitation:	None ☒	Slight ☐	Moderate ☐ Heavy ☐
Barometric pressure (mb): 1000		Local pressure system*: _____	Air temperature (°C): _____

Well No.	Time (s)	Flow (l/hr)	CH ₄ (% vol. in air)	CO ₂ (% vol. in air)	O ₂ (% vol. in air)	PID (ppm)	Depth to GW (mbgl)	Total Depth (mbgl)	Comments
WS1	0	0.0	0.0	0.3	20.4		2.77	3.91	H2S:0 CO: 1
	15	0.0	0.0	2.4	18.3				
	30	0.0	0.0	2.3	18.6				
	45	0.0	0.0	2.3	18.6				
	60	0.0	0.0	2.5	18.5				
	120	-0.1	0.0	2.5	18.5				
	180	0.0	0.0	2.9	18.2				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS2	0	0.0	0.0	0.2	20.5		Dry	2.28	H2S:0 CO:1
	15	0.0	0.0	1.2	19.4				
	30	0.0	0.0	1.1	19.1				
	45	0.0	0.0	1.2	18.9				
	60	0.0	0.0	1.2	18.9				
	120	0.0	0.0	1.1	19.0				
	180	0.0	0.0	1.0	19.3				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS3	0	0.0	0.0	0.2	20.6		3.60	3.72	H2S:0 CO:1
	15	0.0	0.0	4.0	17.3				
	30	0.0	0.0	4.0	16.3				
	45	0.0	0.0	4.0	16.2				
	60	0.0	0.0	4.0	16.2				
	120	0.0	0.0	4.0	16.1				
	180	0.0	0.0	4.0	16.1				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS4	0	0.0	0.0	0.1	21.0		3.06	3.25	H2S:0 CO:0
	15	-0.1	0.0	5.0	17.2				
	30	-0.1	0.0	5.0	16.8				
	45	-0.1	0.0	5.1	16.6				
	60	-0.1	0.0	5.1	16.5				
	120	-0.1	0.0	5.5	16.1				
	180	-0.1	0.0	5.7	15.8				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WSS	0	0.0	0.0	0.3	20.5		Dry	3.82	H2S:O CO:1
	15	-0.1	0.0	5.9	15.7				
	30	-0.1	0.0	6.0	14.2				
	45	-0.1	0.0	6.0	13.8				
	60	-0.1	0.0	6.0	13.8				
	120	-0.1	0.0	6.1	13.6				
	180	-0.1	0.0	6.3	13.3				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

Notes: TOC = top of casing

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

** With reference to the Met Office rolling weather archive*

	Flow (l/hr)	CH4	CO2	O2
MIN	-0.1	0.0	0.1	13.3
MAX	0.0	0.0	6.3	21.0
GSV		0	0	

GAS MONITORING RECORD SHEET

JOB DETAILS

Site: Louisa Street, Openshaw	Job No: A4755
Date: 13/06/2022	Engineer: MS
Time:	Client: Westchurch Homes

METEOROLOGICAL & SITE INFORMATION

State of ground:	Dry ☒	Moist ☐	Wet ☐		
Wind:	Calm ☐	Light ☒	Moderate ☐	Strong	☐
Cloud cover:	None ☐	Slight ☐	Cloudy ☐	Overcast	☒
Precipitation:	None ☒	Slight ☐	Moderate ☐	Heavy	☐
Barometric pressure (mb): 1016		Local pressure system*: _____		Air temperature (°C): _____	

Well No.	Time (s)	Flow (l/hr)	CH ₄ (% vol. in air)	CO ₂ (% vol. in air)	O ₂ (% vol. in air)	PID (ppm)	Depth to GW (mbgl)	Total Depth (mbgl)	Comments
WS1	0	0.0	0.0	0.3	20.2		2.75	3.89	H2S:0 CO:1
	15	0.0	0.0	4.1	17.0				
	30	0.0	0.0	4.1	16.6				
	45	0.0	0.0	4.1	16.6				
	60	0.0	0.0	4.1	16.6				
	120	0.0	0.0	4.1	16.6				
	180	0.0	0.0	4.1	16.6				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS2	0	0.0	0.0	0.3	20.3		Dry	2.29	H2S:0 CO:1
	15	0.0	0.0	1.5	18.8				
	30	0.0	0.0	1.6	18.7				
	45	0.0	0.0	1.7	18.6				
	60	0.0	0.0	1.7	18.6				
	120	0.0	0.0	1.5	18.8				
	180	0.0	0.0	1.2	19.3				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS3	0	0.0	0.0	0.2	20.6		3.60	3.72	H2S:0 CO:1
	15	0.0	0.0	2.8	17.2				
	30	0.0	0.0	2.8	17.2				
	45	-0.1	0.0	2.8	17.2				
	60	-0.1	0.0	2.8	17.1				
	120	0.0	0.0	2.8	17.1				
	180	-0.1	0.0	2.9	17.0				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS4	0	0.0	0.0	0.1	21.0		3.04	3.24	H2S:0 CO:1
	15	0.0	0.0	0.9	20.4				
	30	0.0	0.0	0.9	20.1				
	45	0.0	0.0	1.0	20.0				
	60	0.0	0.0	1.1	19.9				
	120	0.0	0.0	1.7	19.3				
	180	-0.1	0.0	2.2	18.8				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WSS	0	0.0	0.0	0.2	20.5		Dry	3.81	H2S:O CO:1
	15	0.0	0.0	5.2	17.4				
	30	0.0	0.0	5.7	14.2				
	45	0.0	0.0	5.9	13.9				
	60	0.0	0.0	6.1	13.7				
	120	0.0	0.0	6.5	13.1				
	180	0.0	0.0	6.6	12.9				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

Notes: TOC = top of casing

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

** With reference to the Met Office rolling weather archive*

	Flow (l/hr)	CH4	CO2	O2
MIN	-0.1	0.0	0.1	12.9
MAX	0.0	0.0	6.6	21.0
GSV		0	0	

I

GAS MONITORING RECORD SHEET

JOB DETAILS

Site: Louisa Street, Openshaw Date: 20/06/22 Time:	Job No: A4755 Engineer: AE Client: Westchurch Homes
--	---

METEOROLOGICAL & SITE INFORMATION

State of ground:	Dry ☒	Moist ☐	Wet ☐		
Wind:	Calm ☒	Light ☐	Moderate ☐	Strong ☐	
Cloud cover:	None ☒	Slight ☐	Cloudy ☐	Overcast ☐	
Precipitation:	None ☒	Slight ☐	Moderate ☐	Heavy ☐	
Barometric pressure (mb): 1012		Local pressure system*: _____		Air temperature (°C): _____	

Well No.	Time (s)	Flow (l/hr)	CH ₄ (% vol. in air)	CO ₂ (% vol. in air)	O ₂ (% vol. in air)	PID (ppm)	Depth to GW (mbgl)	Total Depth (mbgl)	Comments
WS1	0	0.0	0.0	5.0	14.0		2.78	3.91	H2S:1 CO:2
	15	0.0	0.0	0.9	17.7				
	30	0.0	0.0	0.9	18.6				
	45	0.0	0.0	1.0	18.6				
	60	0.0	0.0	1.0	18.5				
	120	0.0	0.0	1.8	17.6				
	180	0.0	0.0	2.2	17.2				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS2	0	0.0	0.0	2.5	17.2		Dry	2.27	H2S:0 CO:2
	15	0.0	0.0	1.6	18.2				
	30	0.0	0.0	1.5	18.4				
	45	0.0	0.0	1.6	18.2				
	60	0.0	0.0	1.7	18.0				
	120	0.0	0.0	1.7	18.2				
	180	0.0	0.0	1.2	18.9				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS3	0	0.0	0.0	1.3	19.2		3.59	3.68	H2S:0 CO:2
	15	0.0	0.0	3.7	17.0				
	30	0.0	0.0	3.8	16.3				
	45	0.0	0.0	3.8	16.3				
	60	0.0	0.0	3.8	16.2				
	120	0.0	0.0	3.8	16.2				
	180	0.0	0.0	3.8	16.2				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS4	0	0.0	0.0	0.1	20.6		3.05	3.23	H2S:0 CO:1
	15	0.0	0.0	2.9	17.6				Silty at Base
	30	0.0	0.0	3.1	17.0				
	45	0.0	0.0	3.3	16.8				
	60	0.0	0.0	3.5	16.6				
	120	0.0	0.0	4.2	15.9				
	180	0.0	0.0	4.8	15.3				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

WS5	0	0.0	0.0	4.2	15.4		Dry	3.74	H2S:1 CO:1
	15	0.0	0.0	1.8	17.7				
	30	0.0	0.0	1.9	17.6				
	45	0.0	0.0	2.0	17.5				
	60	0.0	0.0	2.1	17.4				
	120	0.0	0.0	3.1	16.3				
	180	0.0	0.0	5.2	14.2				
	240								
	300								
	360								
	420								
	480								
	540								
	600								

Notes: TOC = top of casing

The measurement of hydrogen sulphide and hydrocarbon free product is undertaken on a site specific basis, if deemed necessary.

** With reference to the Met Office rolling weather archive*

	Flow (l/hr)	CH4	CO2	O2
MIN	0.0	0.0	0.1	14.0
MAX	0.0	0.0	5.2	20.6
GSV		0	0	

APPENDIX 3

GEOTECHNICAL TESTING RESULTS

TEST REPORT

Client Earth Environmental & Geotechnical Ltd

Address Houldsworth Mill Business & Arts Centre
Houldsworth Mill
Reddish
Stockport
SK5 6DA

Contract A4755 -
Louisa Street, Openshaw

Job Number MRN 4288/47
Date of Issue 16 May 2022
Pages 1 of 19

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
- 5 The results included within the report are representative of the samples submitted for analysis.
- 6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870 FAX 0161 475 0871



TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

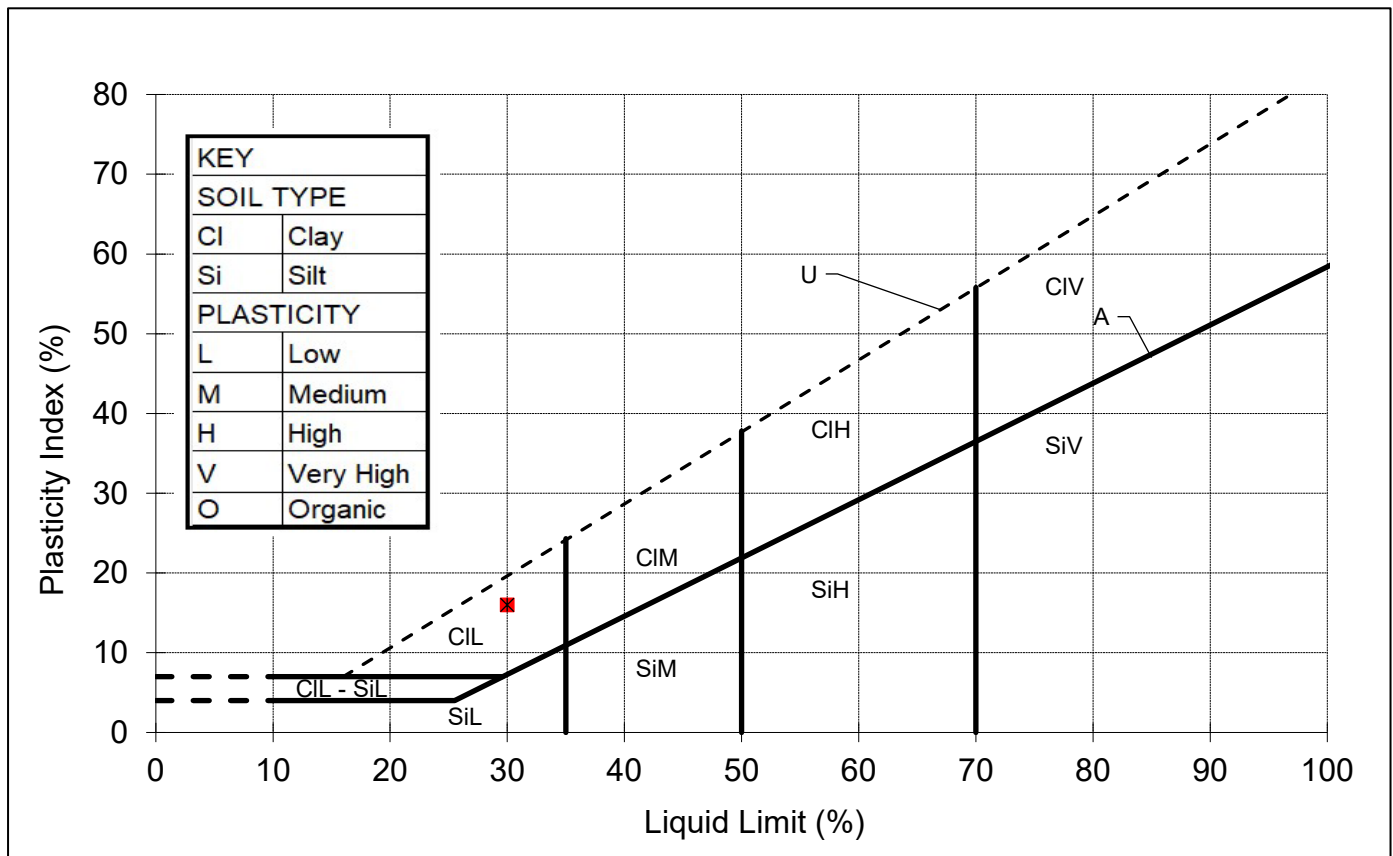
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	CP1 15	DATE SAMPLED	26-Apr-22
SAMPLE No.	111658	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Firm to stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
17	30	14	16	84



REMARKS

Sample tested after wet sieving

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

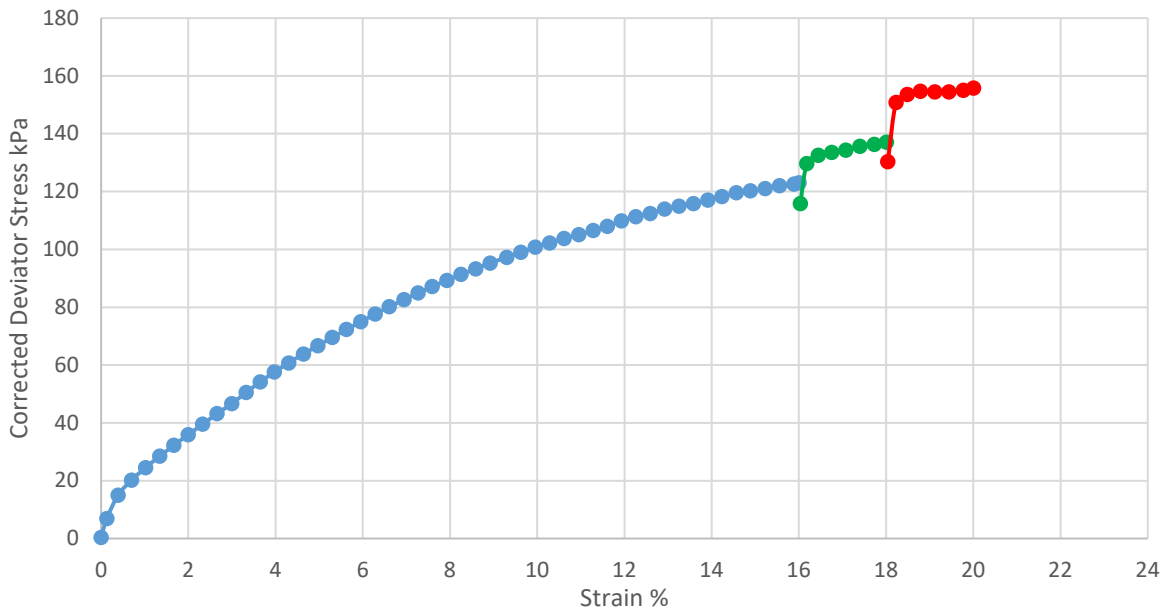
UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION
BS 1377 : PART 7: Clause 9 Multi Stage

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	CP1 15	DATE SAMPLED	26-Apr-22
LAB SAMPLE No.	111658	DATE RECEIVED	26-Apr-22
DATE TESTED	13-May-22	SAMPLED BY	Client
MATERIAL	Firm to stiff brown silty sandy CLAY with rare gravel		
ADVISED SOURCE	Site Investigation Sample		

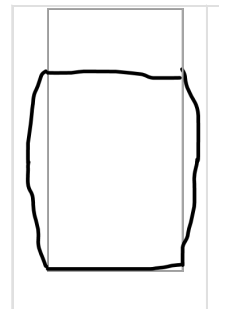
INITIAL CONDITIONS

Specimen Location		Sample Length (mm)	450	Specimen depth from top of Sample (mm)	150
		Sample Orientation	Vertical	Specimen Condition	Undisturbed
		Specimen Length (mm)	202	Specimen Moisture Content (%)	17
		Specimen Diameter (mm)	98	Specimen Bulk Density (Mg/m3)	2.18
		Membrane Thickness (mm)	0.40	Specimen Dry Density (Mg/m3)	1.86
		Membrane Correction	1.30	1.42	1.54

CORRECTED DEVIATOR STRESS vs AXIAL STRAIN

TEST TYPE
MULTI STAGE

SKETCH OF SPECIMEN AT FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength Cu (kPa)
150	16	2	122.5	61
300	18	2	136.3	68
600	20	2	155.0	78

Remarks/Abnormalities

Name O.P Davies BA (Hons)
(Laboratory Manager)

Signed



Date 16 May 2022

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS1 1	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111646	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.6	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.25	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870 FAX 0161 475 0871



TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

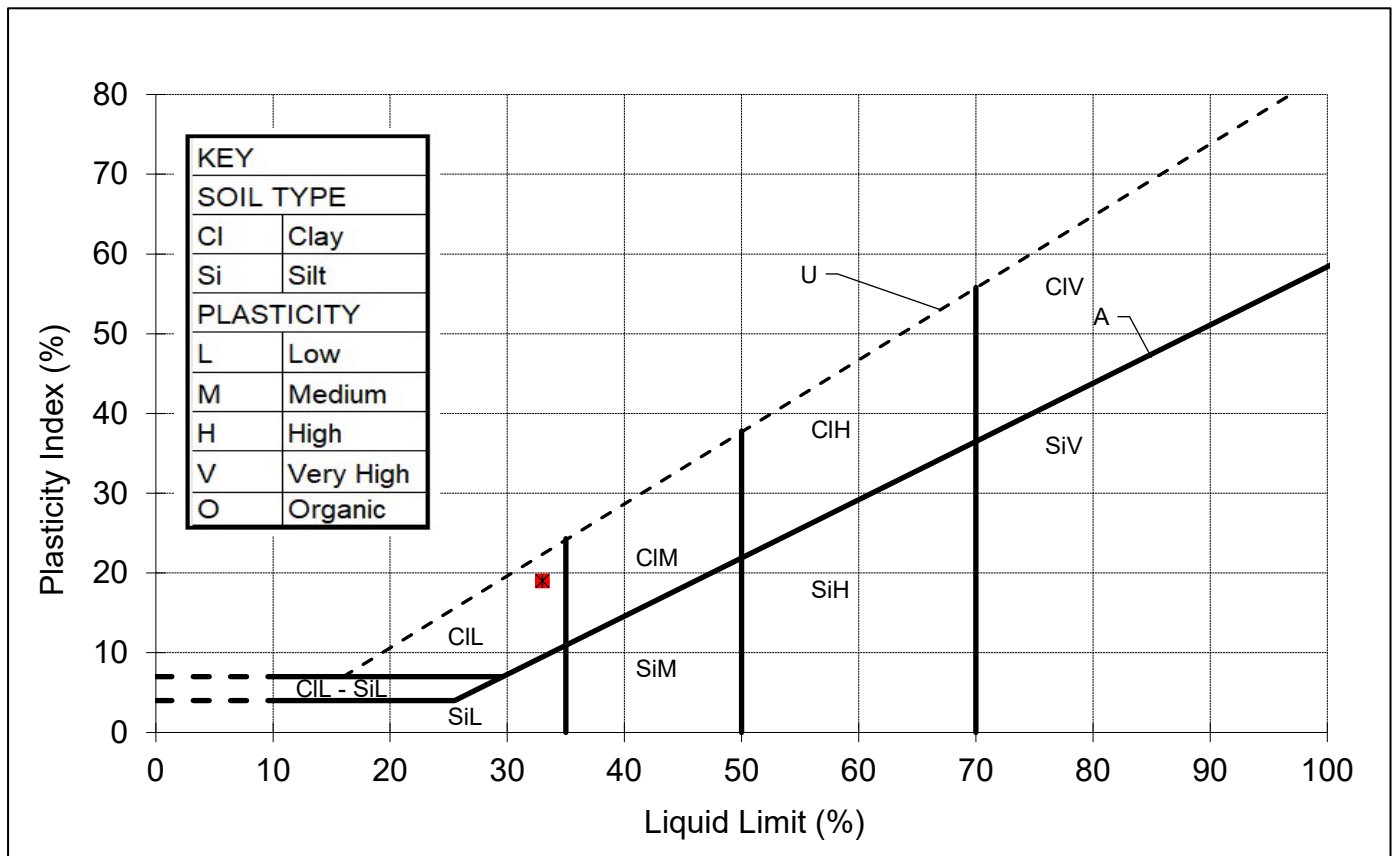
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS1 3.7	DATE SAMPLED	25-Apr-22
SAMPLE No.	111647	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Firm to stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
19	33	14	19	80



REMARKS

Sample tested after wet sieving

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS2 1.5	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111648	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.3	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.18	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

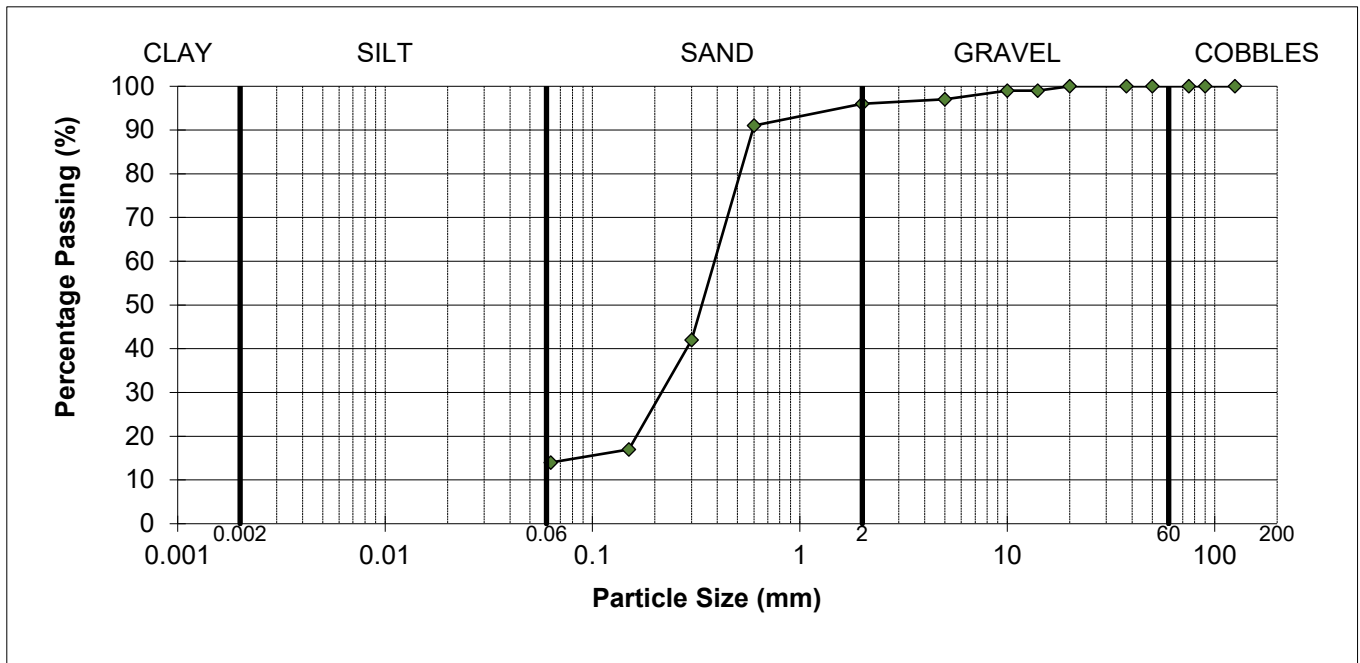
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS3 1.5-2.2	DATE SAMPLED	25-Apr-22
LAB SAMPLE No	111656	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	99	
90	100		5	97	
75	100		2	96	
50	100		0.6	91	
37.5	100		0.3	42	
20	100		0.15	17	
14	99		0.063	14	



REMARKS

SIGNED



NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS3 1.5-2.2	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111656	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.4	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.20	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

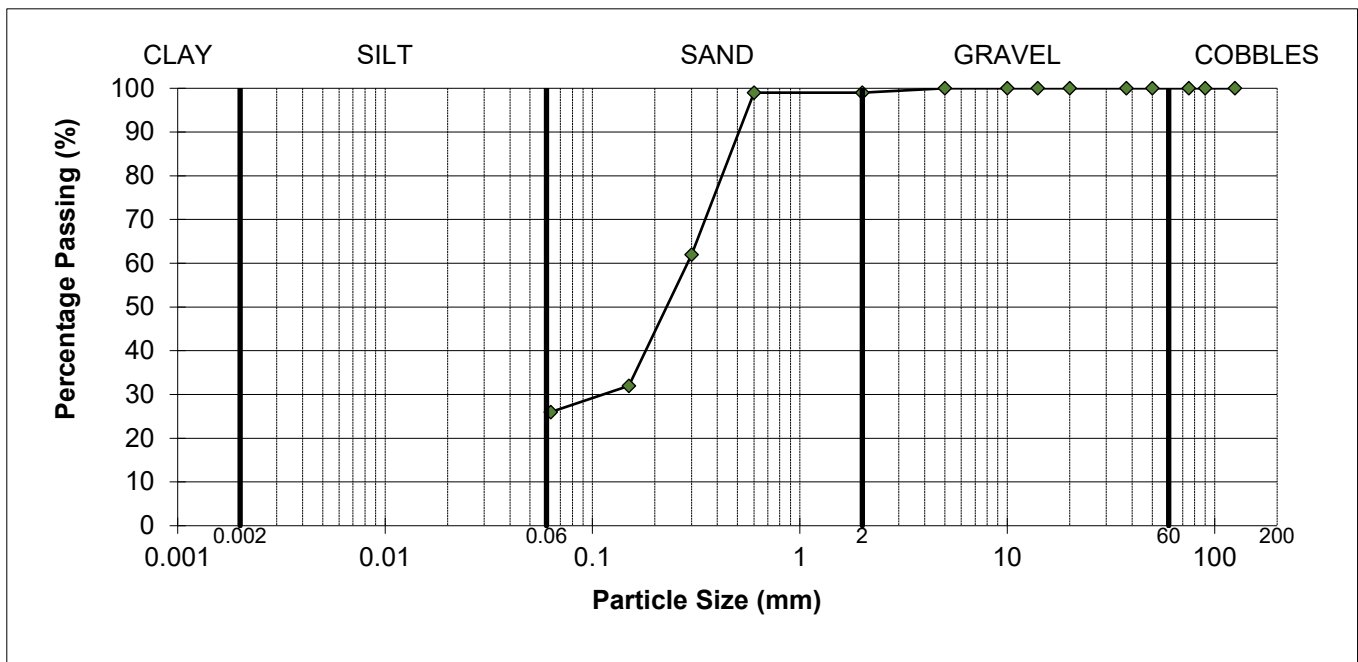
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS4 3.5-4	DATE SAMPLED	25-Apr-22
LAB SAMPLE No	111654	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	100	
75	100		2	99	
50	100		0.6	99	
37.5	100		0.3	62	
20	100		0.15	32	
14	100		0.063	26	



REMARKS

SIGNED



NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS5 2.2	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111649	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.2	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.15	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

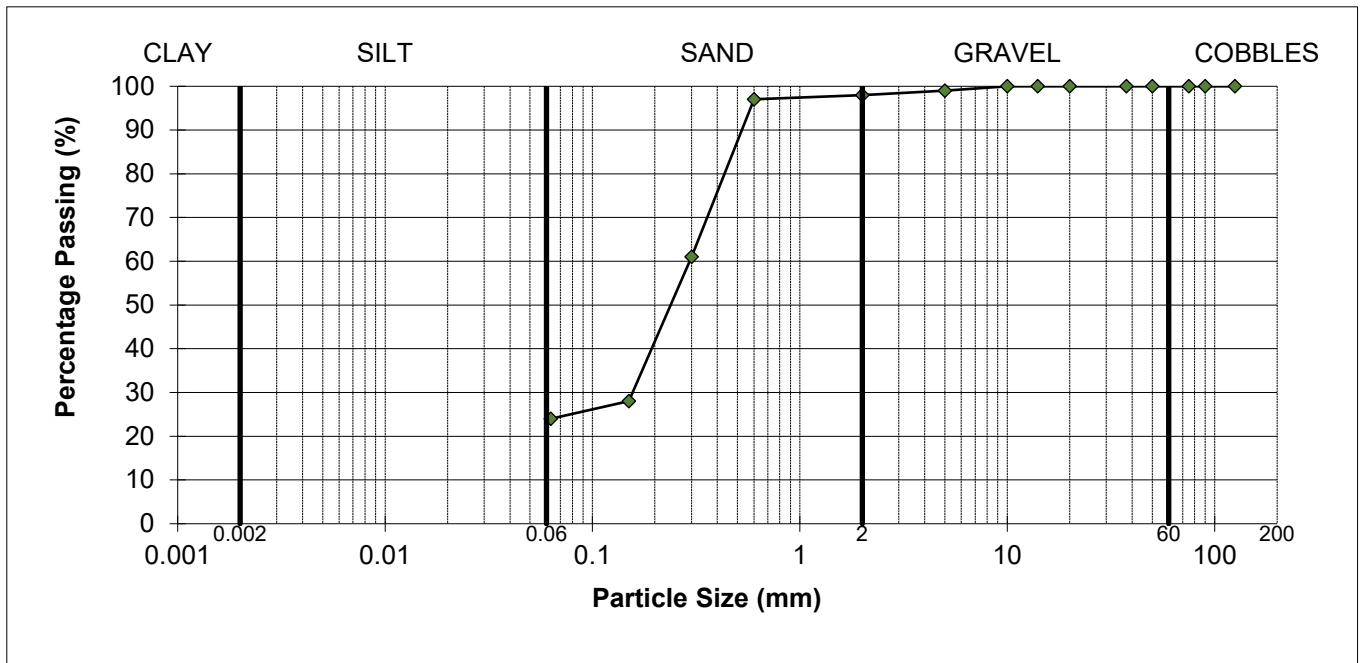
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	WS5 3-3.5	DATE SAMPLED	25-Apr-22
LAB SAMPLE No	111655	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	99	
75	100		2	98	
50	100		0.6	97	
37.5	100		0.3	61	
20	100		0.15	28	
14	100		0.063	24	



REMARKS

SIGNED



NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

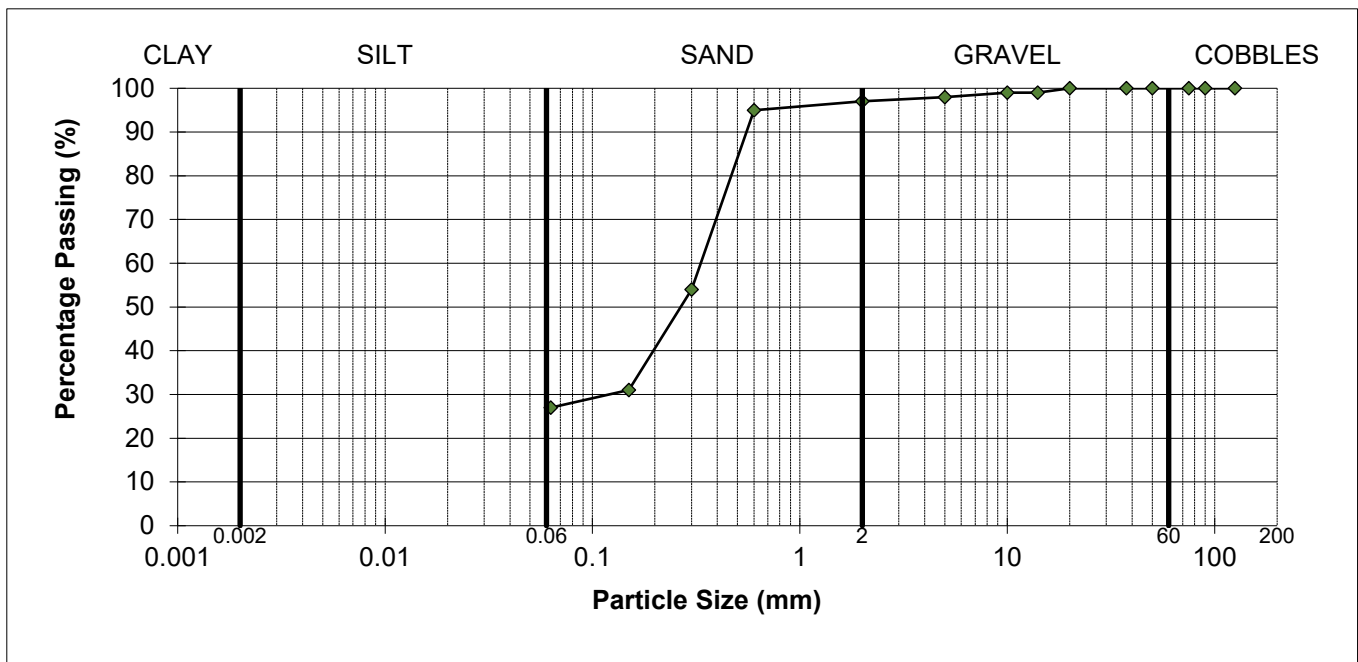
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP1 2-2.5	DATE SAMPLED	25-Apr-22
LAB SAMPLE No	111657	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	99	
90	100		5	98	
75	100		2	97	
50	100		0.6	95	
37.5	100		0.3	54	
20	100		0.15	31	
14	99		0.063	27	



REMARKS

SIGNED



NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP1 2-2.5	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111657	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.3	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.20	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP2 2.6-2.8	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111653	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.1	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.18	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870 FAX 0161 475 0871



TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

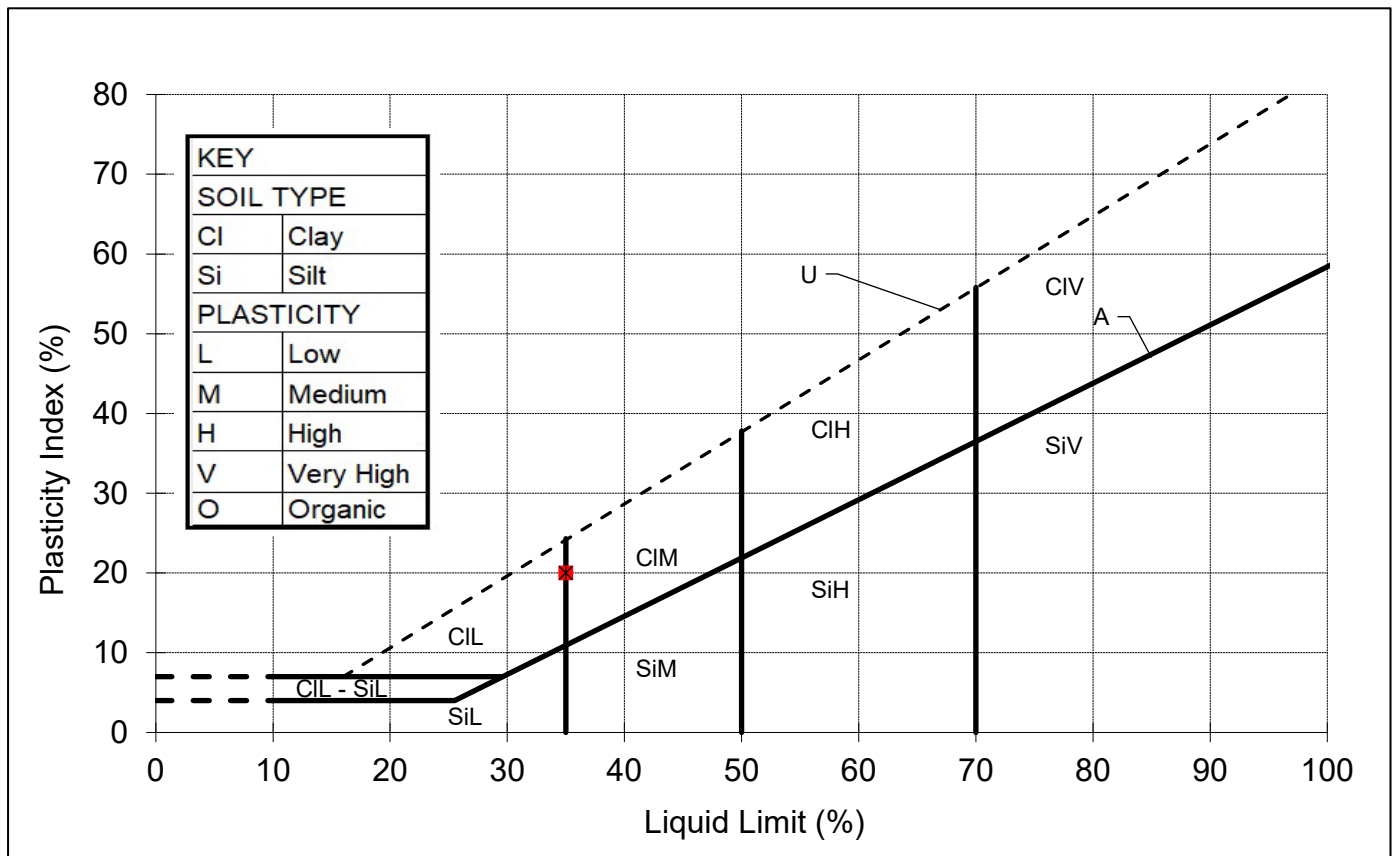
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP3 3	DATE SAMPLED	25-Apr-22
SAMPLE No.	111650	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Firm brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
22	35	15	20	86



REMARKS

Sample tested after wet sieving

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP3 3	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111650	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.2	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.18	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP4 3.2	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111651	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.4	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.21	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870 FAX 0161 475 0871



TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

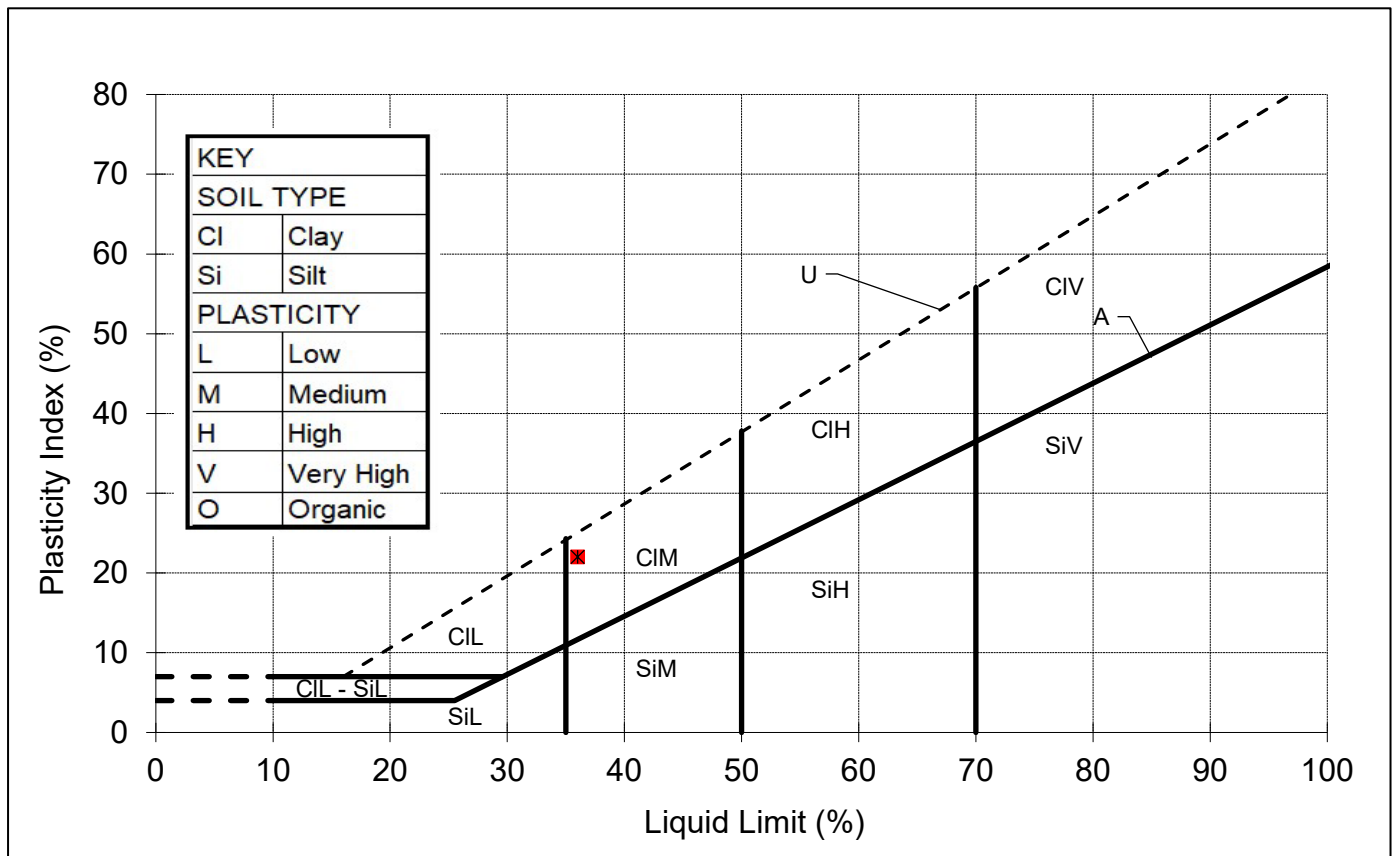
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP5 2.95	DATE SAMPLED	25-Apr-22
SAMPLE No.	111652	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Soft brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
36	36	14	22	94



REMARKS

Sample tested after wet sieving

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

16-May-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

pH and Sulphate as SO₄
BS 1377: PART 3: 1990

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47

SAMPLE LABEL	TP5 2.95	DATE SAMPLED	25 April 2022
LAB SAMPLE No	111652	DATE RECEIVED	26 April 2022
DATE TESTED	03 May 2022	SAMPLED BY	Client

ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried

PH Value	7.4	g/l
Sulphate as SO ₄ (2:1 Water Extract)	0.21	

REMARKS

SIGNED



NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 16 May 2022

TEST REPORT

Client Earth Environmental & Geotechnical Ltd

Address Houldsworth Mill Business & Arts Centre
Houldsworth Mill
Reddish
Stockport
SK5 6DA

Contract A4755 -
Louisa Street, Openshaw

Job Number MRN 4288/47A
Date of Issue 17 May 2022
Pages 1 of 2

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
- 5 The results included within the report are representative of the samples submitted for analysis.
- 6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870 FAX 0161 475 0871



TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

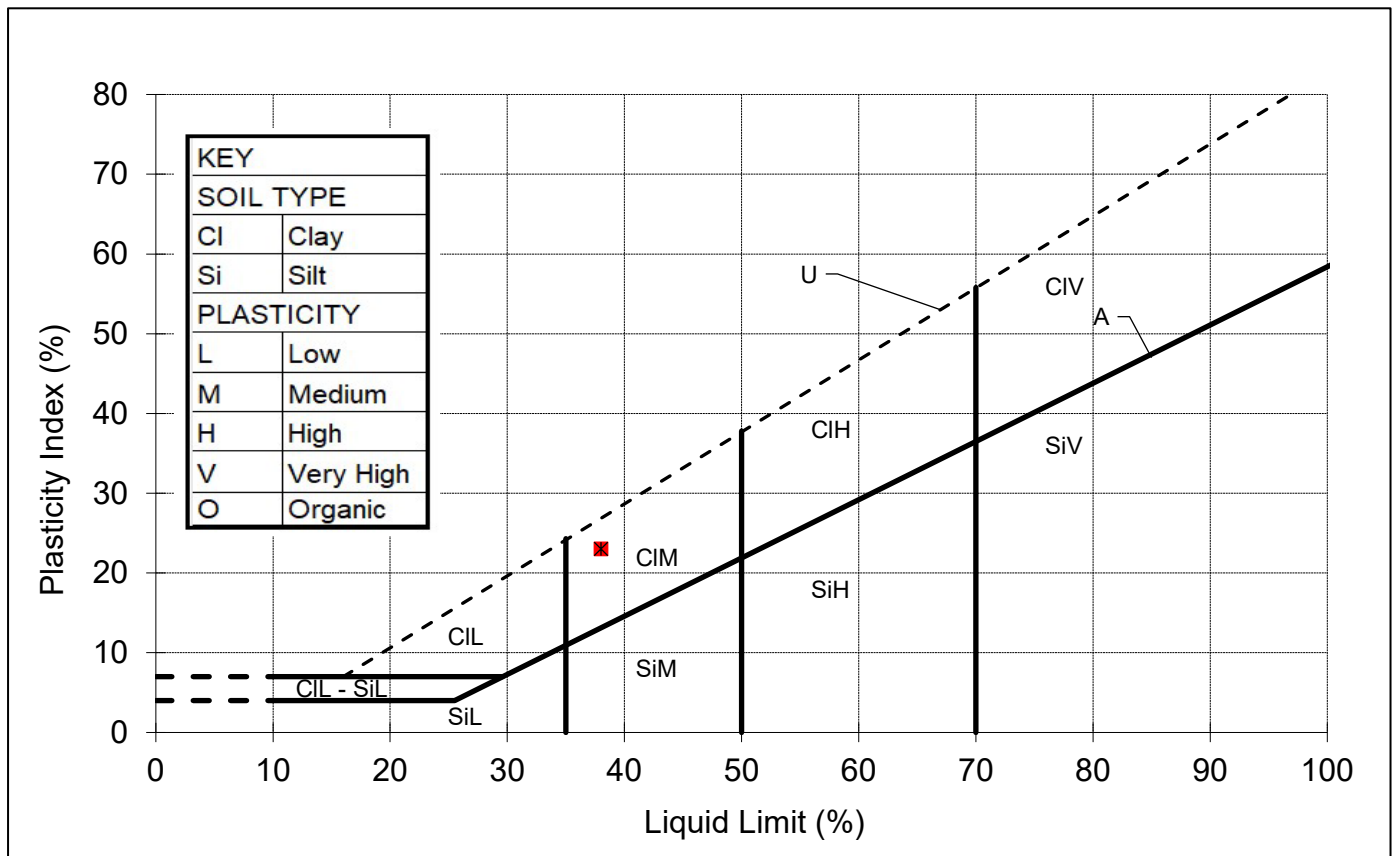
BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	Earth Environmental & Geotechnical Ltd
SITE	A4755 - Louisa Street, Openshaw
JOB NUMBER	MRN 4288/47A

SAMPLE LABEL	TP4 3.2	DATE SAMPLED	25-Apr-22
SAMPLE No.	111651	DATE RECEIVED	26-Apr-22
DATE TESTED	03-May-22	SAMPLED BY	Client

MATERIAL	Soft to firm brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
26	38	15	23	91



REMARKS

Sample tested after wet sieving

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

17-May-22

APPENDIX 4

CHEMICAL TESTING RESULTS



Amy Ellams
Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business Centre
Houldsworth Street
Reddish
Stockport
Cheshire
SK5 6DA

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 22-03783

Site Reference: Lousia Street, Openshaw

Project / Job Ref: A4755

Order No: A4755/AE/01

Sample Receipt Date: 27/04/2022

Sample Scheduled Date: 28/04/2022

Report Issue Number: 1

Reporting Date: 05/05/2022

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

For Topsoil and WAC analysis the expanded uncertainty measurement should be considered while evaluating results against compliance values.



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.30	0.50	1.00	1.20	0.65
Reporting Date: 05/05/2022	DETS Sample No	595909	595910	595911	595912	595913

Determinand	Unit	RL	Accreditation					
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Detected	Detected	Not Detected	Not Detected	Not Detected
Sample Matrix ^(S)	Material Type	N/a	NONE	Loose Fibres	Loose Fibres			
Asbestos Type ^(S)	PLM Result	N/a	ISO17025	Chrysotile	Chrysotile			
pH	pH Units	N/a	MCERTS	7.6	7.5	9.2	5.0	7.6
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Complex Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Free Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	5412	765	1197	525	1155
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.54	0.08	0.12	0.05	0.12
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	990	96	120	70	92
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.99	0.10	0.12	0.07	0.09
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	< 5
Organic Matter (SOM)	%	< 0.1	MCERTS	10	7.5	8.5	2.6	25.9
Arsenic (As)	mg/kg	< 2	MCERTS	32	20	10	7	29
Barium (Ba)	mg/kg	< 2.5	MCERTS	119	172	110	43	478
Beryllium (Be)	mg/kg	< 0.5	MCERTS	0.5	0.8	0.7	< 0.5	3.8
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	51	26	15	18	16
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	83	70	38	17	398
Lead (Pb)	mg/kg	< 3	MCERTS	120	160	110	21	101
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	42	24	10	12	27
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 1	MCERTS	84	31	36	23	63
Zinc (Zn)	mg/kg	< 3	MCERTS	134	136	48	45	46
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
EPH (C10 - C40)	mg/kg	< 6	MCERTS	811	29	63	< 6	212

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion

Subcontracted analysis (S)

(n) 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



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	TP1	TP2	TP3	TP4	TP5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.40	0.25	0.90	0.70	0.45
Reporting Date: 05/05/2022	DETS Sample No	595914	595915	595916	595917	595918

Determinand	Unit	RL	Accreditation	(n)				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix ^(S)	Material Type	N/a	NONE					
Asbestos Type ^(S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	7.7	7.6	7.5	7.5	7.7
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Complex Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Free Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	1386	2198	1469	1980	1052
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.14	0.22	0.15	0.20	0.11
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	154	213	255	328	31
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.15	0.21	0.26	0.33	0.03
Sulphide	mg/kg	< 5	NONE	< 5	< 5	< 5	< 5	< 5
Organic Matter (SOM)	%	< 0.1	MCERTS	32.7	3.2	11.6	11.1	5.5
Arsenic (As)	mg/kg	< 2	MCERTS	27	11	16	15	6
Barium (Ba)	mg/kg	< 2.5	MCERTS	284	85	129	90	58
Beryllium (Be)	mg/kg	< 0.5	MCERTS	3.1	0.6	0.5	0.5	< 0.5
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	17	27	13	18	8
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	457	37	27	34	15
Lead (Pb)	mg/kg	< 3	MCERTS	126	24	44	110	42
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	33	39	12	16	5
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 1	MCERTS	54	30	37	41	17
Zinc (Zn)	mg/kg	< 3	MCERTS	71	45	27	32	28
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
EPH (C10 - C40)	mg/kg	< 6	MCERTS	1870	14	29	21	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.30	0.50	1.00	1.20	0.65
Reporting Date: 05/05/2022	DETS Sample No	595909	595910	595911	595912	595913

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	3.48	< 0.1	0.36	< 0.1	1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	2.54	0.21	0.31	< 0.1	0.90
Fluorene	mg/kg	< 0.1	MCERTS	1.90	0.15	0.25	< 0.1	0.59
Phenanthrene	mg/kg	< 0.1	MCERTS	11.50	1.52	2.40	< 0.1	5.39
Anthracene	mg/kg	< 0.1	MCERTS	4.36	0.37	0.49	< 0.1	1.45
Fluoranthene	mg/kg	< 0.1	MCERTS	10.60	1.91	3.12	< 0.1	6.99
Pyrene	mg/kg	< 0.1	MCERTS	9.62	1.86	3.26	< 0.1	6.18
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	3.91	0.66	1.46	< 0.1	3
Chrysene	mg/kg	< 0.1	MCERTS	3.91	0.79	1.64	< 0.1	3.38
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	4.03	0.61	1.53	< 0.1	3.52
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	1.48	0.26	0.61	< 0.1	1.37
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	3.58	0.52	1.36	< 0.1	3.01
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	1.88	0.27	0.77	< 0.1	1.80
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	0.39	< 0.1	0.23	< 0.1	0.38
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	1.64	0.26	0.67	< 0.1	1.60
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	64.8	9.4	18.4	< 1.6	40.6

(n) 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



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	TP1	TP2	TP3	TP4	TP5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.40	0.25	0.90	0.70	0.45
Reporting Date: 05/05/2022	DETS Sample No	595914	595915	595916	595917	595918

Determinand	Unit	RL	Accreditation	(n)				
Naphthalene	mg/kg	< 0.1	MCERTS	1.72	< 0.1	0.40	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	0.27	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	1.21	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	1	< 0.1	0.20	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	37.60	< 0.1	1.53	0.30	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	7.22	< 0.1	0.50	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	86.70	< 0.1	1.37	0.43	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	91.90	< 0.1	1.30	0.44	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	51.60	< 0.1	0.98	0.22	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	46.90	< 0.1	1.06	0.30	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	52.20	< 0.1	1.08	0.25	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	8.45	< 0.1	0.53	0.12	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	44.20	< 0.1	1.30	0.25	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	23.70	< 0.1	0.65	0.14	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	4.38	< 0.1	0.18	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	22.60	< 0.1	0.52	0.14	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	482	< 1.6	11.6	2.6	< 1.6



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.30	0.50	1.00	1.20	0.65
Reporting Date: 05/05/2022	DETS Sample No	595909	595910	595911	595912	595913

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	8	< 3	< 3	< 3	< 3
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	29	< 3	< 3	< 3	7
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	263	< 10	< 10	< 10	15
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	300	< 21	< 21	< 21	22
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	8	< 2	< 2	< 2	3
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	36	< 2	5	< 2	26
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	116	14	21	< 3	69
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	331	< 10	14	< 10	97
Aromatic (C5 - C35)	mg/kg	< 21	NONE	490	< 21	40	< 21	195
Total >C5 - C35	mg/kg	< 42	NONE	790	< 42	< 42	< 42	218

(n) 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



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - TPH CWG Banded

DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	TP1	TP2	TP3	TP4	TP5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.40	0.25	0.90	0.70	0.45
Reporting Date: 05/05/2022	DETS Sample No	595914	595915	595916	595917	595918

Determinand	Unit	RL	Accreditation	(n)				
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	11	< 2	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	34	< 2	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	140	< 3	< 3	< 3	< 3
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	136	< 3	< 3	< 3	< 3
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	31	< 10	< 10	< 10	< 10
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	352	< 21	< 21	< 21	< 21
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	12	< 2	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	96	< 2	< 2	< 2	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	577	< 3	9	< 3	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	580	< 10	< 10	< 10	< 10
Aromatic (C5 - C35)	mg/kg	< 21	NONE	1266	< 21	< 21	< 21	< 21
Total >C5 - C35	mg/kg	< 42	NONE	1618	< 42	< 42	< 42	< 42



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.30	0.50	1.00	1.20	0.65
Reporting Date: 05/05/2022	DETS Sample No	595909	595910	595911	595912	595913

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	16	< 5	10	< 5	6
Ethylbenzene	ug/kg	< 2	MCERTS	8	< 2	5	< 2	< 2
p & m-xylene	ug/kg	< 2	MCERTS	13	< 2	31	< 2	4
o-xylene	ug/kg	< 2	MCERTS	8	< 2	21	< 2	2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

(n) 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



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 22-03783	Date Sampled	25/04/22	25/04/22	25/04/22	25/04/22	25/04/22
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Lousia Street, Openshaw	TP / BH No	TP1	TP2	TP3	TP4	TP5
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: A4755/AE/01	Depth (m)	0.40	0.25	0.90	0.70	0.45
Reporting Date: 05/05/2022	DETS Sample No	595914	595915	595916	595917	595918

Determinand	Unit	RL	Accreditation	(n)				
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3																																				
DETS Report No: 22-03783		Date Sampled	25/04/22		Landfill Waste Acceptance Criteria Limits <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 33%;">Inert Waste Landfill</th> <th style="width: 33%;">Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill</th> <th style="width: 33%;">Hazardous Waste Landfill</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">3%</td> <td style="text-align: center;">5%</td> <td style="text-align: center;">6%</td> </tr> <tr> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> <td style="text-align: center;">10%</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">500</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">100</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">--</td> <td style="text-align: center;">>6</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">--</td> <td style="text-align: center;">To be evaluated</td> <td style="text-align: center;">To be evaluated</td> </tr> </tbody> </table>					Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	3%	5%	6%	--	--	10%	6	--	--	1	--	--	500	--	--	100	--	--	--	>6	--	--	To be evaluated	To be evaluated
Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill																																		
3%	5%	6%																																		
--	--	10%																																		
6	--	--																																		
1	--	--																																		
500	--	--																																		
100	--	--																																		
--	>6	--																																		
--	To be evaluated	To be evaluated																																		
Earth Environmental & Geotechnical Ltd		Time Sampled	None Supplied																																	
Site Reference: Lousia Street, Openshaw		TP / BH No	TP2																																	
Project / Job Ref: A4755		Additional Refs	None Supplied																																	
Order No: A4755/AE/01		Depth (m)	0.25																																	
Reporting Date: 05/05/2022		DETS Sample No	595915																																	
Determinand	Unit	MDL																																		
TOC ^{MU}	%	< 0.1	1.9																																	
Loss on Ignition	%	< 0.01	2.70																																	
BTEX ^{MU}	mg/kg	< 0.05	< 0.05																																	
Sum of PCBs	mg/kg	< 0.1	< 0.1																																	
Mineral Oil ^{MU}	mg/kg	< 10	< 10																																	
Total PAH ^{MU}	mg/kg	< 1.7	< 1.7																																	
pH ^{MU}	pH Units	N/a	7.6																																	
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	1																																	
Eluate Analysis			2:1 mg/l	8:1 mg/l	Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)																														
Arsenic ^U			< 0.01	< 0.01	< 0.2	0.5	2	25																												
Barium ^U			0.06	< 0.02	0.2	20	100	300																												
Cadmium ^U			< 0.0005	< 0.0005	< 0.02	0.04	1	5																												
Chromium ^U			< 0.005	< 0.005	< 0.20	0.5	10	70																												
Copper ^U			< 0.01	< 0.01	< 0.5	2	50	100																												
Mercury ^U			< 0.0005	< 0.0005	< 0.005	0.01	0.2	2																												
Molybdenum ^U			0.009	0.005	< 0.1	0.5	10	30																												
Nickel ^U			< 0.007	< 0.007	< 0.2	0.4	10	40																												
Lead ^U			< 0.005	< 0.005	< 0.2	0.5	10	50																												
Antimony ^U			< 0.005	< 0.005	< 0.05	0.06	0.7	5																												
Selenium ^U			< 0.005	< 0.005	< 0.05	0.1	0.5	7																												
Zinc ^U			0.016	< 0.005	< 0.2	4	50	200																												
Chloride ^U			2	1	< 12	800	15000	25000																												
Fluoride ^U			< 0.5	< 0.5	< 1	10	150	500																												
Sulphate ^U			403	25	651	1000	20000	50000																												
TDS			477	89	1304	4000	60000	100000																												
Phenol Index	< 0.01	< 0.01	< 0.5	1	-	-																														
DOC	10.6	6.8	72	500	800	1000																														
Leach Test Information																																				
Sample Mass (kg)			0.20																																	
Dry Matter (%)			88.2																																	
Moisture (%)			13.4																																	
Stage 1																																				
Volume Eluate L2 (litres)			0.33																																	
Filtered Eluate VE1 (litres)			0.19																																	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
 Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepancies with current legislation
 M Denotes MCERTS accredited test
 U Denotes ISO17025 accredited test

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3																																							
DETS Report No: 22-03783		Date Sampled	25/04/22		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: left; padding: 5px;">Landfill Waste Acceptance Criteria Limits</th> </tr> <tr> <th style="width: 33%; padding: 5px;">Inert Waste Landfill</th> <th style="width: 33%; padding: 5px;">Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill</th> <th style="width: 33%; padding: 5px;">Hazardous Waste Landfill</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; padding: 5px;">3%</td> <td style="text-align: center; padding: 5px;">5%</td> <td style="text-align: center; padding: 5px;">6%</td> </tr> <tr> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">10%</td> </tr> <tr> <td style="text-align: center; padding: 5px;">6</td> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">--</td> </tr> <tr> <td style="text-align: center; padding: 5px;">1</td> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">--</td> </tr> <tr> <td style="text-align: center; padding: 5px;">500</td> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">--</td> </tr> <tr> <td style="text-align: center; padding: 5px;">100</td> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">--</td> </tr> <tr> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">>6</td> <td style="text-align: center; padding: 5px;">--</td> </tr> <tr> <td style="text-align: center; padding: 5px;">--</td> <td style="text-align: center; padding: 5px;">To be evaluated</td> <td style="text-align: center; padding: 5px;">To be evaluated</td> </tr> </tbody> </table>					Landfill Waste Acceptance Criteria Limits			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	3%	5%	6%	--	--	10%	6	--	--	1	--	--	500	--	--	100	--	--	--	>6	--	--	To be evaluated	To be evaluated
Landfill Waste Acceptance Criteria Limits																																							
Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill																																					
3%	5%	6%																																					
--	--	10%																																					
6	--	--																																					
1	--	--																																					
500	--	--																																					
100	--	--																																					
--	>6	--																																					
--	To be evaluated	To be evaluated																																					
Earth Environmental & Geotechnical Ltd		Time Sampled	None Supplied																																				
Site Reference: Lousia Street, Openshaw		TP / BH No	TP5																																				
Project / Job Ref: A4755		Additional Refs	None Supplied																																				
Order No: A4755/AE/01		Depth (m)	0.45																																				
Reporting Date: 05/05/2022		DETS Sample No	595918																																				
Determinand	Unit	MDL																																					
TOC ^{MU}	%	< 0.1	3.2																																				
Loss on Ignition	%	< 0.01	4																																				
BTEX ^{MU}	mg/kg	< 0.05	< 0.05																																				
Sum of PCBs	mg/kg	< 0.1	< 0.1																																				
Mineral Oil ^{MU}	mg/kg	< 10	< 10																																				
Total PAH ^{MU}	mg/kg	< 1.7	< 1.7																																				
pH ^{MU}	pH Units	N/a	7.7																																				
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1																																				
Eluate Analysis			2:1 mg/l	8:1 mg/l		Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)																																
Arsenic ^U			< 0.01	0.02		< 0.2	0.5	2	25																														
Barium ^U			< 0.02	< 0.02		0.1	20	100	300																														
Cadmium ^U			< 0.0005	< 0.0005		< 0.02	0.04	1	5																														
Chromium ^U			< 0.005	< 0.005		< 0.20	0.5	10	70																														
Copper ^U			< 0.01	< 0.01		< 0.5	2	50	100																														
Mercury ^U			< 0.0005	< 0.0005		< 0.005	0.01	0.2	2																														
Molybdenum ^U			0.004	0.009		< 0.1	0.5	10	30																														
Nickel ^U			< 0.007	< 0.007		< 0.2	0.4	10	40																														
Lead ^U			< 0.005	< 0.005		< 0.2	0.5	10	50																														
Antimony ^U			< 0.005	< 0.005		< 0.05	0.06	0.7	5																														
Selenium ^U			< 0.005	< 0.005		< 0.05	0.1	0.5	7																														
Zinc ^U			0.014	< 0.005		< 0.2	4	50	200																														
Chloride ^U			2	4		34	800	15000	25000																														
Fluoride ^U			0.7	< 0.5		< 1	10	150	500																														
Sulphate ^U			11	24		221	1000	20000	50000																														
TDS	105	96		972	4000	60000	100000																																
Phenol Index	< 0.01	< 0.01		< 0.5	1	-	-																																
DOC	9	34.5			500	800	1000																																
Leach Test Information																																							
Sample Mass (kg)	0.19																																						
Dry Matter (%)	90.5																																						
Moisture (%)	10.6																																						
Stage 1																																							
Volume Eluate L2 (litres)	0.33																																						
Filtered Eluate VE1 (litres)	0.23																																						
Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepancies with current legislation M Denotes MCERTS accredited test U Denotes ISO17025 accredited test																																							



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions

DETS Report No: 22-03783	
Earth Environmental & Geotechnical Ltd	
Site Reference: Lousia Street, Openshaw	
Project / Job Ref: A4755	
Order No: A4755/AE/01	
Reporting Date: 05/05/2022	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
595909	WS1	None Supplied	0.30	6	Black gravelly sand with stones and concrete
595910	WS2	None Supplied	0.50	15.3	Brown sandy clay with stones and concrete
595911	WS3	None Supplied	1.00	11.6	Brown gravelly sand with stones and concrete
595912	WS4	None Supplied	1.20	13.7	Brown sandy clay
595913	WS5	None Supplied	0.65	12.3	Black gravelly sand with stones and concrete
595914	TP1	None Supplied	0.40	14	Black sandy gravel with stones and concrete
595915	TP2	None Supplied	0.25	11.9	Brown sandy clay with stones and brick
595916	TP3	None Supplied	0.90	13.2	Black sandy clay with stones
595917	TP4	None Supplied	0.70	9.7	Black sandy clay with stones
595918	TP5	None Supplied	0.45	9.5	Black sandy clay with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{U/S}

Unsuitable Sample ^{U/S}



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - Methodology & Miscellaneous Information	
DETS Report No: 22-03783	
Earth Environmental & Geotechnical Ltd	
Site Reference: Lousia Street, Openshaw	
Project / Job Ref: A4755	
Order No: A4755/AE/01	
Reporting Date: 05/05/2022	

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Water Analysis Certificate - Methodology & Miscellaneous Information	
DETS Report No: 22-03783	
Earth Environmental & Geotechnical Ltd	
Site Reference: Lousia Street, Openshaw	
Project / Job Ref: A4755	
Order No: A4755/AE/01	
Reporting Date: 05/05/2022	

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazine followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR dete	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered

Parameter	Matrix Type	Suite Reference	Expanded Uncertainty Measurement	Unit
TOC	Soil	BS EN 12457	12.1	%
Loss on Ignition	Soil	BS EN 12457	20.4	%
BTEX	Soil	BS EN 12457	14.0	%
Sum of PCBs	Soil	BS EN 12457	21.1	%
Mineral Oil	Soil	BS EN 12457	9.0	%
Total PAH	Soil	BS EN 12457	13.9	%
pH	Soil	BS EN 12457	0.248	Units
Acid Neutralisation Capacity	Soil	BS EN 12457	18.0	%
Arsenic	Leachate	BS EN 12457	15.9	%
Barium	Leachate	BS EN 12457	14.4	%
Cadmium	Leachate	BS EN 12457	12.6	%
Chromium	Leachate	BS EN 12457	13.4	%
Copper	Leachate	BS EN 12457	13.1	%
Mercury	Leachate	BS EN 12457	16.2	%
Molybdenum	Leachate	BS EN 12457	13.6	%
Nickel	Leachate	BS EN 12457	16.0	%
Lead	Leachate	BS EN 12457	12.4	%
Antimony	Leachate	BS EN 12457	14.6	%
Selenium	Leachate	BS EN 12457	16.5	%
Zinc	Leachate	BS EN 12457	14.5	%
Chloride	Leachate	BS EN 12457	17.0	%
Fluoride	Leachate	BS EN 12457	12.0	%
Sulphate	Leachate	BS EN 12457	25.1	%
TDS	Leachate	BS EN 12457	10.0	%
Phenol Index	Leachate	BS EN 12457	12.9	%
DOC	Leachate	BS EN 12457	10.0	%
Clay Content	Soil	BS 3882: 2015	15.0	%
Silt Content	Soil	BS 3882: 2015	14.0	%
Sand Content	Soil	BS 3882: 2015	13.0	%
Loss on Ignition	Soil	BS 3882: 2015	20.4	%
pH	Soil	BS 3882: 2015	0.248	Units
Carbonate	Soil	BS 3882: 2015	12.0	%
Total Nitrogen	Soil	BS 3882: 2015	12.0	%
Phosphorus (Extractable)	Soil	BS 3882: 2015	24.0	%
Potassium (Extractable)	Soil	BS 3882: 2015	20.0	%
Magnesium (Extractable)	Soil	BS 3882: 2015	26.0	%
Zinc	Soil	BS 3882: 2015	14.9	%
Copper	Soil	BS 3882: 2015	16.0	%
Nickel	Soil	BS 3882: 2015	17.7	%
Available Sodium	Soil	BS 3882: 2015	23.0	%
Available Calcium	Soil	BS 3882: 2015	23.0	%
Electrical Conductivity	Soil	BS 3882: 2015	10.0	%



Amy Ellams
Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business Centre
Houldsworth Street
Reddish
Stockport
Cheshire
SK5 6DA

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 22-04216

Site Reference: Lousia Street, Openshaw

Project / Job Ref: A4755

Order No: A4755/AE/01

Sample Receipt Date: 27/04/2022

Sample Scheduled Date: 12/05/2022

Report Issue Number: 1

Reporting Date: 19/05/2022

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate						
DETS Report No: 22-04216	Date Sampled	25/04/22	25/04/22			
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Lousia Street, Openshaw	TP / BH No	WS1	WS2			
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied			
Order No: A4755/AE/01	Depth (m)	0.30	0.50			
Reporting Date: 19/05/2022	DETS Sample No	597495	597496			

Determinand	Unit	RL	Accreditation			
Asbestos Quantification ^(S)	%	< 0.001	ISO17025	< 0.001	0.001	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 22-04216

Earth Environmental & Geotechnical Ltd

Site Reference: Lousia Street, Openshaw

Project / Job Ref: A4755

Order No: A4755/AE/01

Reporting Date: 19/05/2022

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

APPENDIX 5

WATER CHEMICAL TESTING RESULTS



Amy Ellams
Earth Environmental & Geotechnical Ltd
Houldsworth Mill Business Centre
Houldsworth Street
Reddish
Stockport
Cheshire
SK5 6DA

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 22-04436

Site Reference: Loisa Street, Openshaw

Project / Job Ref: A4755

Order No: A4755/AE/01

Sample Receipt Date: 18/05/2022

Sample Scheduled Date: 18/05/2022

Report Issue Number: 1

Reporting Date: 26/05/2022

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Water Analysis Certificate						
DETS Report No: 22-04436	Date Sampled	16/05/22	16/05/22			
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Loisa Street, Openshaw	TP / BH No	WS1	WS4			
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied			
Order No: A4755/AE/01	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/05/2022	DETS Sample No	598283	598284			

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	ISO17025	7.0	6.8		
Total Cyanide	ug/l	< 5	ISO17025	< 5	< 5		
Complex Cyanide	ug/l	< 5	NONE	< 5	< 5		
Free Cyanide	ug/l	< 5	ISO17025	< 5	< 5		
Sulphate as SO ₄	mg/l	< 1	ISO17025	112	24		
Sulphide	mg/l	< 0.1	NONE	< 0.1	< 0.1		
Total Organic Carbon (TOC)	mg/l	< 0.1	NONE	38.7	32.9		
Arsenic (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Barium (dissolved)	ug/l	< 5	ISO17025	68	27		
Beryllium (dissolved)	ug/l	< 3	ISO17025	< 3	< 3		
Boron (dissolved)	ug/l	< 5	ISO17025	142	69		
Cadmium (dissolved)	ug/l	< 0.4	ISO17025	< 0.4	< 0.4		
Chromium (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Chromium (hexavalent)	ug/l	< 20	NONE	< 20	< 20		
Copper (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Lead (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Mercury (dissolved)	ug/l	< 0.05	ISO17025	< 0.05	< 0.05		
Nickel (dissolved)	ug/l	< 5	ISO17025	7	< 5		
Selenium (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Vanadium (dissolved)	ug/l	< 5	ISO17025	< 5	< 5		
Zinc (dissolved)	ug/l	< 2	ISO17025	8	< 2		
Total Phenols (monohydric)	ug/l	< 10	ISO17025	< 10	< 10		

Subcontracted analysis ⁽⁵⁾
Insufficient sample ^{1/5}
Unsuitable Sample ^{U/S}



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - Speciated PAH						
DETS Report No: 22-04436	Date Sampled	16/05/22	16/05/22			
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Loisa Street, Openshaw	TP / BH No	WS1	WS4			
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied			
Order No: A4755/AE/01	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/05/2022	DETS Sample No	598283	598284			

Determinand	Unit	RL	Accreditation			
Naphthalene	ug/l	< 0.01	NONE	0.03	0.02	
Acenaphthylene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Acenaphthene	ug/l	< 0.01	NONE	0.03	< 0.01	
Fluorene	ug/l	< 0.01	NONE	0.02	< 0.01	
Phenanthrene	ug/l	< 0.01	NONE	0.04	0.02	
Anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Fluoranthene	ug/l	< 0.01	NONE	0.03	0.02	
Pyrene	ug/l	< 0.01	NONE	0.03	0.02	
Benzo(a)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Chrysene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Benzo(b)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Benzo(k)fluoranthene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Benzo(a)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Indeno(1,2,3-cd)pyrene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Dibenz(a,h)anthracene	ug/l	< 0.01	NONE	< 0.01	< 0.01	
Benzo(ghi)perylene	ug/l	0.008	NONE	< 0.008	< 0.008	
Total EPA-16 PAHs	ug/l	< 0.16	NONE	0.18	< 0.16	



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Water Analysis Certificate - TPH CWG Banded						
DETS Report No: 22-04436	Date Sampled	16/05/22	16/05/22			
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Loisa Street, Openshaw	TP / BH No	WS1	WS4			
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied			
Order No: A4755/AE/01	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/05/2022	DETS Sample No	598283	598284			

Determinand	Unit	RL	Accreditation			
Aliphatic >C5 - C6	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C6 - C8	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	
Aliphatic >C21 - C34	ug/l	< 10	NONE	55	< 10	
Aliphatic (C5 - C34)	ug/l	< 70	NONE	< 70	< 70	
Aromatic >C5 - C7	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C7 - C8	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C8 - C10	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C10 - C12	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C12 - C16	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C16 - C21	ug/l	< 10	NONE	< 10	< 10	
Aromatic >C21 - C35	ug/l	< 10	NONE	< 10	< 10	
Aromatic (C5 - C35)	ug/l	< 70	NONE	< 70	< 70	
Total >C5 - C35	ug/l	< 140	NONE	< 140	< 140	



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Water Analysis Certificate - BTEX / MTBE						
DETS Report No: 22-04436	Date Sampled	16/05/22	16/05/22			
Earth Environmental & Geotechnical Ltd	Time Sampled	None Supplied	None Supplied			
Site Reference: Loisa Street, Openshaw	TP / BH No	WS1	WS4			
Project / Job Ref: A4755	Additional Refs	None Supplied	None Supplied			
Order No: A4755/AE/01	Depth (m)	None Supplied	None Supplied			
Reporting Date: 26/05/2022	DETS Sample No	598283	598284			

Determinand	Unit	RL	Accreditation					
Benzene	ug/l	< 1	ISO17025	< 1	< 1			
Toluene	ug/l	< 5	ISO17025	< 5	< 5			
Ethylbenzene	ug/l	< 5	ISO17025	< 5	< 5			
p & m-xylene	ug/l	< 10	ISO17025	< 10	< 10			
o-xylene	ug/l	< 5	ISO17025	< 5	< 5			
MTBE	ug/l	< 10	ISO17025	< 10	< 10			



DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410



Water Analysis Certificate - Methodology & Miscellaneous Information	
DETS Report No: 22-04436	
Earth Environmental & Geotechnical Ltd	
Site Reference: Loisa Street, Openshaw	
Project / Job Ref: A4755	
Order No: A4755/AE/01	
Reporting Date: 26/05/2022	

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR dete	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GI-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	TPH CWG (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered

APPENDIX 6

SOIL WASTE ASSESSMENT

APPENDIX 7

REPORT LIMITATIONS

REPORT LIMITATIONS

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

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

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

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

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

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

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

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

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

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

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

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