



Geo-Environmental Assessment

Clitheroe Road, Whalley

Presented to Trafford Housing Trust

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Delta-Simons Project No. 18-0886.03







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Report Details

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About us

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Executive Summary

<p>Brief</p>	<p>Delta-Simons Environmental Consultants Limited (“Delta-Simons”) was instructed by Trafford Housing Trust (the “Client”) to undertake a Site investigation and prepare a Geo-Environmental Assessment for land at Clitheroe Road, Whalley (the “Site”).</p> <p>The aim of the investigation is to complete a Geo-Environmental Assessment of the Site which is proposed for development for a residential end use, comprising up to 188 units. The investigation will obtain information regarding ground conditions, from which risks to end-users, the environment and structures can be assessed, with mitigation measures outlined, if necessary.</p> <p>The investigation will provide geotechnical information in order to comment on the preliminary design of foundations and infrastructure. The report will provide recommendations for further work based on the findings of the investigation, if required.</p>
<p>Site Setting</p>	<p>The Site currently comprises an irregularly shaped, roughly vegetated plot of agricultural land, formerly used for sheep grazing. The below ground Haweswater Aqueduct cuts through the central part of the Site and a tree lined track runs parallel to provide access to the aqueduct, a United Utilities maintenance building and the adjacent fields.</p> <p>The Site use appears to be predominantly agricultural from the earliest reviewed historical map dated 1848 until the present day. A reservoir is shown on this map in the centre of the Site; this was presumed to have been infilled and by 1970 there is no evidence on the mapping reviewed of the infilled reservoir.</p>
<p>Ground Conditions</p>	<p>The ground conditions comprises topsoil (to a maximum depth of 0.6 m bgl) underlain by Devensian Till. The Devensian Till typically comprises cohesive sandy and gravelly clay / silt underlain by granular clayey sand / gravel.</p> <p>The Site investigation and subsequent monitoring data suggest there is a continuous groundwater table below the Site and it should be noted that the investigation and monitoring took place during a prolonged period of dry weather and therefore the groundwater table has the potential to rise once the weather conditions deteriorate. It is also understood that artesian groundwater conditions were encountered during the excavation of attenuation ponds in the central part of the Site, suggesting that the cohesive clay / silt is acting as an aquitard to the underlying granular clayey sand / gravel.</p>
<p>Land Contamination Summary</p>	<p><u>Human Health</u></p> <p>No contaminants exceeded the relevant Generic Assessment Criteria in any of the samples analysed and no asbestos fibres were detected within the tested soil samples. No specific remedial measures are required to facilitate the proposed development. It is considered that the topsoil may be suitable to be reused with the gardens, subject to further testing.</p> <p><u>Controlled Waters</u></p> <p>On the basis that the Site has remained largely undeveloped, and in the absence of sources of contamination within soils it is considered that the risk to Controlled Waters is negligible and therefore, no further action is required.</p> <p><u>Built Environment</u></p> <p>A preliminary review of the results indicates that a relevant pollutant linkage is unlikely to exist associated with organic contaminants and therefore polyethylene and/or polyvinyl chloride water supply pipes may be suitable for use on the development.</p>

	<p><u>Ground Gas</u></p> <p>The ground gas regime at the site has been classified as CS2 in accordance with BS8485 and Green in accordance with the NHBC guidance and therefore, no gas protection measures are required.</p> <p>The Site is within an ‘Intermediate probability’ radon area (3 to 5 % of homes are estimated to be at or above the Action Level). Based on the higher risk level of 3 – 5 % BRE 211 (2007) it is recommended that a Site-specific radon risk report is produced and the provision of basic radon protection measures within buildings is allowed for.</p>
<p>Geotechnical Summary</p>	<p>The presence of both cohesive and granular Devensian Till at the Site and the changes to the Site elevations proposed, makes it difficult to predict the nature of the founding material at this stage.</p> <p>Shallow spread foundations may be possible in some parts of the Site; however, this may be precluded by trench instability, shallow groundwater or variable soft / loose soils. When the proposed elevations and development layout has been finalised, the feasibility of spread foundations should be considered on a plot by plot basis in an attempt to zone the Site.</p> <p>Raft foundations are recommended in areas of fill; however, these could be considered for all plots within the development.</p>
<p>Recommendations</p>	<p>Based on the findings of this report, the following recommendations for supplementary works are made;</p> <ul style="list-style-type: none"> ▲ Develop the foundation strategy once the Site layout and proposed elevations have been finalised; ▲ Additional soil sampling and laboratory testing from within the area of the construction compound once the attenuation pond construction has been completed and the compound accessible; ▲ Further chemical testing of topsoil across the Site to evaluate suitability for re-use prior to inclusion within private gardens and soft landscaped areas. Develop a soil management strategy to ensure all suitable topsoil is reused where possible (on-Site or off-Site depending on demand); ▲ Waste classification has not been undertaken as part of the scope of works, should it be proposed to dispose of materials from the Site then specific additional investigations may be needed to classify the materials in accordance with current regulatory requirements; ▲ It is recommended that advice is sought from a drainage specialist regarding dewatering the Site; and ▲ It is recommended that verification testing comprising in-situ CBR tests are undertaken at finished formation level to confirm that the minimum CBR value assumed in road pavement design has been achieved.

This is intended as a summary only. Further detail and the limitations of the assessment are provided within the main body of the Report.

Table of Contents

1.0 INTRODUCTION.....	1
1.1 Appointment.....	1
1.2 Context & Purpose	1
1.3 Scope of Works	1
1.4 Existing Information	1
1.5 Limitations.....	2
2.0 SITE DETAILS	3
2.1 Site Setting	3
2.2 Preliminary Conceptual Site Model	4
3.0 SITE INVESTIGATION.....	6
3.1 Intrusive Investigation.....	6
3.1.1 Health & Safety Considerations.....	6
3.2 Scope of Ground Investigation and Rationale.....	6
3.2.1 Scope.....	6
3.2.2 Rationale.....	6
3.3 Ground Investigation Factual Data	6
3.4 In-Situ Testing and Sampling	6
3.5 Geotechnical Laboratory Testing.....	7
3.6 Environmental Sampling, In-Situ Testing and Laboratory Analysis	7
3.7 Monitoring Programme	7
4.0 GROUND SUMMARY	8
4.1 Introduction	8
4.2 Ground Model.....	8
4.3 Visual and Olfactory Evidence of Contamination - Soils	8
4.4 Groundwater.....	8
4.4.1 Strikes During Investigations	8
4.4.2 Levels During Monitoring Programme	9
4.5 Visual and Olfactory Evidence of Contamination - Groundwater.....	10
4.6 Material Properties	10
4.7 Geochemical Testing.....	11
4.8 Ground Gas Data.....	11
5.0 GEOTECHNICAL ASSESSMENT.....	12
5.1 Summary of Development Proposals	12
5.2 Earthworks.....	12
5.2.1 Cut	12
5.2.2 Fill	12
5.3 Foundations	12
5.3.1 Spread Foundations	12
5.3.2 Volume Change Potential	13
5.4 Roads and Pavements	13
5.5 Excavations & Obstructions.....	13
5.6 Groundwater	13
5.7 Slopes & Retaining Features.....	14
5.8 Chemical Attack on Buried Concrete	14
5.9 Geotechnical Issues	14
6.0 GENERIC QUANTITATIVE RISK ASSESSMENT	15
6.1 Introduction	15
6.2 Human Health GQRA	15
6.2.1 Risks from Soil Sources.....	15
6.2.2 Risks from Non-Aqueous Phase Liquids (NAPL)	15
6.3 Controlled Waters/Water Environment.....	15
6.4 Built Environment.....	15
6.4.1 Potable Water Supply Pipes	15
6.4.2 Building Materials	16
6.5 Waste Classification	16
7.0 BULK GROUND GAS RISK ASSESSMENT	17

7.1	Ground Gas Conceptual Site Model.....	17
7.1.1	Sources.....	17
7.1.2	Receptors.....	17
7.1.3	Pathways	17
7.2	Duration & Extent of Monitoring.....	17
7.3	Ground Gas Risk Assessment	17
7.3.1	Background.....	17
7.3.2	Gas Screening Value (GSV).....	18
7.4	Ground Gas Risk Mitigation.....	18
7.5	Radon	18
7.6	Organic Vapours.....	18
8.0	REVISED CONCEPTUAL SITE MODEL.....	19
9.0	CONCLUSIONS & RECOMMENDATIONS	20
9.1	Geotechnical Summary	20
9.2	Contamination Issues	20
9.2.1	Human Health.....	20
9.2.2	Controlled Waters	20
9.3	Recommendations for Supplementary Work.....	21

Figures

- Figure 1 Site Location Map
- Figure 2 Exploratory Hole Location and Proposed Development Plan
- Figure 3 SPT N₆₀ versus Depth Plot
- Figure 4a – 4c Inferred Geological Cross Sections

Appendices

- Appendix A Limitations
- Appendix B Borehole and Trial Pit Logs, SPT Calibration Certificate
- Appendix C Geotechnical Analysis Results
- Appendix D Soil Chemical Analysis Results
- Appendix E Groundwater Chemical Analysis Results
- Appendix F Gas and Groundwater Monitoring Data
- Appendix G Risk Definitions

1.0 Introduction

1.1 Appointment

Delta-Simons Environmental Consultants Limited (“Delta-Simons”) was instructed by Trafford Housing Trust (the “Client”) to undertake a Site investigation and prepare a Geo-Environmental Assessment for land at Clitheroe Road, Whalley (the “Site”).

1.2 Context & Purpose

The aim of the investigation is to complete a Geo-Environmental Assessment of the Site which is proposed for development. The investigation will obtain information regarding ground conditions, from which risks to end-users, the environment and structures can be assessed, with mitigation measures outlined, if necessary.

The investigation will provide geotechnical information in order to comment on the preliminary design of foundations and infrastructure. The report will provide recommendations for further work based on the findings of the investigation, if required.

It is understood that the Site is to be developed for a residential end use, comprising up to 188 units. The Site has outline planning permission (Ref. 3/2013/0137) dated October 2013 and reserved matters approval (Ref. 3/2015/0489) dated January 2016; however, it is understood that the findings of this investigation will be used to support a fresh full planning application by Trafford Housing Trust (THT) to Ribble Valley Borough Council (RVBC).

1.3 Scope of Works

The scope of the investigation and layout of this report has been designed with consideration of *CLR11* (Environment Agency, 2004a), *BS 10175: 2013 Investigation of Potentially Contaminated Sites – Code of Practice* (BSI, 2011), guidance on land contamination reports issued by the Environment Agency (EA) (2010a) and *BS 5930: 2015 Code of practice for ground investigations*.

The project was carried out to an agreed brief as set out in Delta-Simons’ proposal dated 26 July 2018 (Ref. 18-0886.03). The scope of works is detailed in Section 3.2.1.

Specific sections of this report may generally follow guidance set out in Eurocode 7 for a Ground Investigation Report (GIR), as defined in BS EN 1997-1:2004 and BS EN 1997-2:2007. Eurocode 7 includes specific guidance on the number and spacing of investigation positions, methods of investigation and sample quality to be achieved which may not have been met by this investigation. The report also includes information which may support a Geotechnical Design Report (GDR) as defined in BS EN 1997-1:2004; however, unless otherwise explicitly stated, the investigation has not been undertaken in accordance with Eurocode 7 and the preliminary geotechnical interpretation, assessments, risk register and recommendations presented within this report may not meet the full requirements of a GDR.

1.4 Existing Information

Delta-Simons have been provided with the following relevant reports;

- ▲ Preliminary Assessment of Ground Conditions, Land East of Clitheroe Road, Whalley for Commercial Estates Group, Report C4023 Rev 3, dated February 2013;
- ▲ Geoenvironmental Appraisal of land to the east of Clitheroe Road, Whalley for Commercial Estates Group, C4023A, dated January 2013; and
- ▲ Geotechnical Assessments of Ponds A and B – Various authors, 2014 – 2018.

In addition to the above Delta-Simons has produced a Preliminary Geo-Environmental Risk Assessment for the Site (Ref. 18-0886.01) dated 27th July 2018.

1.5 Limitations

The assessment is limited to the issues agreed within the proposal for the works. Notes on limitations associated with this assessment are provided in Appendix A. In addition, there are the following Site-specific limitations that apply to this assessment:

- ▲ An area in the west of the Site was inaccessible during the Site investigation due to the construction of attenuation ponds for drainage purposes and the associated compound and working area;
- ▲ Dynamic Cone Penetrometers (DCPs) were omitted from the scope due to earthworks being proposed on-Site. It is recommended that these are undertaken at a later date to determine indicative CBR values at finished formation level;
- ▲ Due to the presence of a concrete slab in the north-east it was not possible to obtain soil samples from below the slab; however, this location is within an area proposed as public open space;
- ▲ The potential location of an infilled reservoir was within the attenuation pond construction area and was therefore inaccessible; and
- ▲ The Haweswater Aqueduct owned by United Utilities passes through the central part of the Site and no intrusive Site investigation was permitted on or within a specified easement of the underground infrastructure. This resulted in exploratory holes DS109, TP114 to TP117 and TP121 being repositioned or cancelled.

2.0 Site Details

2.1 Site Setting

A summary of the current Site status, environmental setting and key historical features is presented below. This has been summarised from the existing reports listed in Section 1.4 which should be consulted for further detail.

Co-ordinates	Centred at approximate National Grid Reference 373760,436440.	Elevation	Variable
		Area	10.34 ha
Site Location	The Site is located to the west of (A671) on the eastern periphery of Whalley which is approximately 5 km south of Clitheroe. Please refer to Figure 1.		
Current Site Use	<p>The Site currently comprises an irregularly shaped, roughly vegetated plot of agricultural land, formerly used for sheep grazing.</p> <p>The buried Haweswater Aqueduct cuts through the central part of the Site and a tree lined track runs parallel to provide access to the aqueduct, a United Utilities maintenance building and the adjacent fields.</p> <p>A gated access track provides access to the northern field from the A671. An area of vacant hardstanding is present in the north-east of the Site, with the exception of some discarded silage/haylage bales. Immediately west and south of the Site are residential properties including a new Redrow development and houses along Woodlands Park and Sydney Avenue.</p> <p>The A671 and a small area of woodland forms the north-eastern Site boundary and immediately southeast of the Site is an undeveloped plot of roughly vegetated land. There is more roughly vegetated land to the north of the Site beyond which is Oakhill nursery and college.</p>		
Proposed Development	<p>The proposed development comprises up to 188 residential units considered to be standard two / three storey dwellings with private gardens and associated areas of public open space. Please refer to Figure 2 for a Proposed Development Plan.</p> <p>Identified human and built environment receptors (R) relevant to the proposed development comprise:</p> <ul style="list-style-type: none"> ▲ Construction workers (R1); ▲ Third parties during construction (adjacent Site users and adjacent residents) (R2); ▲ Future Site users and maintenance workers (R3); and ▲ The Built Environment (new buildings and infrastructure / utilities) (R4). 		
Environmental Setting	<p>British Geological Survey (BGS) data available online and from published BGS mapping (1:50,000 Sheet Number 68 Clitheroe) shows that the Site is underlain by superficial deposits comprising Devensian Till. The underlying bedrock comprises mudstones of the Bowland Shale Formation. Given the current Site conditions (agricultural land), topsoil is likely to be present overlying the Devensian Till.</p> <p>The Devensian Till is designated by the Environment Agency as Unproductive Strata and the bedrock is designated as a Secondary (undifferentiated) Aquifer.</p> <p>The following controlled water / environmental receptors have been identified:</p> <ul style="list-style-type: none"> ▲ The unnamed stream along Brooke's Lane (R5); ▲ The underlying aquifers (R6); and 		

	<p>▲ The River Calder, circa 200 m to the south (R7).</p>
<p>Key Historical Features</p>	<p>The Site use appears to be predominantly agricultural from the earliest reviewed historical map dated 1848 until the present day. A reservoir is shown on this map in the centre of the Site although it is not explicitly identified as such until later mapping. Although not shown on historical mapping, it is understood that the Haweswater Aqueduct was constructed between 1935 to 1955. The 1968 map suggests that the reservoir has been drained and a depression is evident in this location (potentially infilling occurring). The 1992 map shows an access track from Brooke’s Lane through the centre of the Site and a second track is shown in the northern field from an area of hardstanding in the north-east heading west. By 1970 there is no evidence of the infilled reservoir and there are no other significant changes shown on maps from this time to the present day.</p> <p>A former gasholder / gasworks approximately 75 m to the south of the Site is shown on historical maps from 1932 to sometime prior to 1989. The 1989 map shows the gasholder / gasworks has been redeveloped into residential housing.</p>
<p>Summary of Previous Reports</p>	<p>▲ Preliminary Assessment of Ground Conditions, Land East of Clitheroe Road, Whalley for Commercial Estates Group, Report C4023 Rev 3, dated February 2013.</p> <p>The report identified the requirement for basic radon protection measures and further site investigation works to assess ground conditions. The aqueduct and existing footpath were considered as potential development constraints.</p> <p>▲ Geoenvironmental Appraisal of land to the east of Clitheroe Road, Whalley for Commercial Estates Group, C4023A, dated January 2013.</p> <p>This detailed a site investigation on a plot of land adjacent to the current subject site. The investigation comprised 19 trial pits to a maximum depth of 4.2 m below ground level (bgl) and six window sample boreholes to a maximum depth of 6.45 m bgl. The ground conditions comprised topsoil underlain by Glacial Till (firm to stiff gravelly clay) to the east of an unnamed brook, where traditional strip/pad foundations were considered suitable. An upper layer of very soft silt was identified in one area of the site which was also noted to be waterlogged. To the west of the brook, topsoil was underlain by very soft to soft clay and piles were recommended.</p> <p>Marginally elevated concentrations of benzo(a)pyrene were detected within natural topsoil. This was considered likely attributable to fragments of coal within the sample. Further analysis of topsoil was considered necessary to inform its suitability for re-use.</p> <p>Basic radon protection measures were recommended; however, no sources of ground gas were identified.</p> <p>▲ Geotechnical Assessments of Ponds A and B – Various authors, 2014 – 2018.</p> <p>BWB Consulting, Sirius Geotechnical and GRM Development have been involved in a Site investigation and the design of surface water attenuation ponds. Artesian groundwater was encountered within granular strata at circa. 8 m depth. The risk of settlement of the aqueduct as a result of dewatering during construction of the ponds was also considered and predicted settlement values were within acceptable limits.</p>

2.2 Preliminary Conceptual Site Model

A summary of the preliminary Conceptual Site Model (CSM) contained in the Delta-Simons Preliminary Geo-Environmental Risk Assessment, dated 27th July 2018, is presented below.

Source(s)	Potential Contaminants of Concern (CoC)	Pathway(s)	Receptor(s)	Preliminary Risk Rating
S1 Possible Made Ground	Asbestos, heavy metals, TPH, PAHs	P1, P2, P4, P5	R1, R3, R4, R5, R6	Low Risk
S2 Construction Compound	TPH	P1, P2, P4, P5	R1, R3, R4, R5, R6	Low Risk
S3 Infilled Reservoir	Asbestos, heavy metals, TPH, PAHs, ground gases	P1, P2, P3, P4, P5	R1, R2, R3, R5, R6	Low to Moderate Risk
S4 Off-Site Gasworks	Spent oxides, cyanide, phenols, petroleum hydrocarbons, VOC, SVOC's	P2, P3, P4, P5	R1, R3, R4, R5, R6	Low Risk
<p>Pathways:</p> <ul style="list-style-type: none"> ▲ P1 - Direct contact, ingestion or inhalation of soil bound contaminants / dust during or following redevelopment. ▲ P2 - Inhalation of organic vapours associated with contamination. ▲ P3 - Migration of ground gas / vapours into on-site buildings causing asphyxiation or risk of explosion. ▲ P4 - Leaching of contamination into groundwater followed by migration of groundwater to the wider groundwater environment or discharge to surface waters. ▲ P5 - Direct contact between aggressive ground conditions and new infrastructure. <p>Receptors:</p> <ul style="list-style-type: none"> ▲ R1 - Construction workers; ▲ R2 - Third parties during construction (adjacent Site users and adjacent residents); ▲ R3 - Future Site users and maintenance workers; ▲ R4 – River Calder (200 m to the south); ▲ R5 - The underlying aquifers; and ▲ R6 - The Built Environment (new buildings and infrastructure / utilities) including Haweswater Aqueduct. 				

Risk ratings are based on the classifications given in Appendix G.

3.0 Site Investigation

3.1 Intrusive Investigation

Delta-Simons carried out an intrusive investigation between the 9th to 13th July 2018 to obtain information regarding ground conditions, from which risks to end-users, the environment and structures can be assessed, with mitigation measures outlined, if necessary and provide geotechnical information in order to comment on the preliminary design of foundations and infrastructure.

3.1.1 Health & Safety Considerations

Service plans for the Site were provided by the Client and a utilities clearance specialist attended the Site on 9th and 10th July 2018 to carry out service avoidance works. No intrusive works were undertaken within a 13 m easement of the Haweswater Aqueduct.

An initial assessment of the Site identified a Low risk in relation to Unexploded Ordnance (UXO) and so no specific precautionary measures were required for the works. Future Contractors should undertake their own assessment of UXO risk in relation to their specific proposed scope of works.

3.2 Scope of Ground Investigation and Rationale

3.2.1 Scope

The Site investigation comprised the following items:

- ▲ Supervision of all works by Delta-Simons Geo-Environmental engineers. All intrusive locations were logged to *BS 5930:2015 Code of practice for ground investigations*;
- ▲ Excavation of 38 trial pits (TP101-TP113, TP118-TP120, and TP122-TP143) using a JCB 3CX to a maximum depth of 4.5 m bgl; and
- ▲ Drilling of 11 no. dynamic sampler boreholes (DS101-DS108, and DS110-DS112) to a maximum depth of 5.0 m bgl.

3.2.2 Rationale

All locations were placed for general coverage across the Site.

3.3 Ground Investigation Factual Data

The investigation locations were surveyed in by the appointed surveying contractor to an accuracy of approximately +/- 0.1 m. An Exploratory Hole Location Plan is included as Figure 2.

Delta-Simons' engineer borehole and trial pit logs are presented as Appendix B together with the Standard Penetration Tests (SPT) Calibration Certificate, in accordance with *BS EN ISO 22476-3:2005 (incorporating corrigendum No. 1 2007), Geotechnical investigation and testing - Field testing - Part 3: Standard penetration test for SPT trip hammers*.

3.4 In-Situ Testing and Sampling

Standard Penetration Tests (SPTs) were undertaken in all boreholes at 1.0 m intervals to 5.0 m bgl where ground conditions allowed. The results of these tests are presented on the borehole logs included as Appendix B. Corrected SPT N_{60} values have been plotted against Depth and are shown in Figure 3.

Hand vane shear (HSV) tests were undertaken where possible in cohesive soils excavated out of the trial pits. The test results are shown on the trial pit logs presented in Appendix B.

Sampling comprised disturbed tub, jar and bulk bag samples as detailed on the logs.

3.5 Geotechnical Laboratory Testing

A selection of soil samples were submitted to the UKAS accredited laboratory for a range of geotechnical testing, the results of which are included in Appendix C. A summary of the geotechnical tests undertaken is provided below.

Analysis	No. Tested	Rationale
Moisture content	10	To assess the classification properties of the soils encountered in order to inform preliminary geotechnical advice.
Plastic and liquid limits	10	
Particle size distribution (wet / dry sieve)	8	
Particle size distribution (sedimentation)	5	

In addition to these tests soil samples were taken from two stockpiles of Devensian Till located within the attenuation pond (AP) construction compound. The samples were submitted to the laboratory for particle size distribution testing to determine if the soil classified as Acceptable Earthworks Materials in accordance with the Specification for Highways Works, and therefore could be re-used on-Site during the development.

3.6 Environmental Sampling, In-Situ Testing and Laboratory Analysis

Soils collected for laboratory analysis were placed in a variety of containers appropriate to the anticipated testing suite. Samples were stored in accordance with Delta-Simons' quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination. Records of the samples taken including their depth and location are shown on the exploratory hole logs in Appendix B.

Seven groundwater samples were collected (from DS101, DS102, DS103, DS107, DS110, DS111 and DS112) on 31st July 2018. The groundwater samples were collected using a dedicated disposable bailer and placed in chilled cool boxes on-Site before being transported to the laboratory upon completion of the sampling visit.

The rationale for chemical analysis is presented in the table below and the results of the chemical laboratory testing are included in Appendix D (soils) and Appendix E (groundwater).

Analytes	No. of Samples Tested		Rationale
	Soil	Groundwater	
Asbestos	7	-	Common potential contaminant - Analysed in samples of topsoil.
Metals (including As, B, Ba, Be Cd, Cu, Cr, Hg, Pb, Ni, Zn), speciated Polycyclic Aromatic Hydrocarbons (PAH)	13	3	Potential contaminants of concern, common to many Sites.
Total Petroleum Hydrocarbons, Criteria Working Group Method (TPHCWG), Benzene, Toluene, Ethylbenzene and Xylene (BTEX)	13	2	Potential contaminants of concern, common to many Sites.
pH, sulphate	10	7	To assess the potential for chemical attack on buried concrete.

3.7 Monitoring Programme

A total of six rounds of groundwater level and ground gas monitoring visits have been completed over a three-month period between 19th July 2018 and 11th September 2018 on installed borehole wells (DS101-DS108, and DS110-DS112). The depth to groundwater within the borehole wells was recorded using an electronic dip meter. The groundwater monitoring sheets are included as Appendix F.

To characterise the ground gas regime at the Site, an infrared gas meter was used to measure gas flow, concentrations of carbon dioxide (CO₂), methane (CH₄) and oxygen (O₂) in percentage by volume. Initial and steady state concentrations were recorded. The atmospheric pressure before and during monitoring, together with the weather conditions, was recorded. All gas monitoring results obtained to date together with the temporal conditions are contained within Appendix F.

4.0 Ground Summary

4.1 Introduction

The sections below summarise the ground and groundwater conditions encountered during the Site investigation.

4.2 Ground Model

A summary of the observed ground conditions at the Site is provided below.

Summary of Observed Ground Conditions				
Strata	Typical Strata Description	Depth Range of Strata Base (m)	Maximum Proven Thickness (m)	Comments
Topsoil	Brown clayey fine to coarse SAND. Brown slightly silty clayey fine to medium SAND with numerous rootlets and rare gravel. Brown sandy CLAY.	0.15 – 0.6	0.6	Topsoil was present at all exploratory hole locations from ground level to a maximum depth of 0.6 m bgl. The average thickness of topsoil across the Site is c.0.3 m.
Devensian Till	Orange brown slightly sandy CLAY / SILT. Brownish grey slightly sandy gravelly CLAY with occasional to several cobbles.	The base of the Devensian Till was not proven during this Site investigation.		Devensian Till was encountered in all exploratory holes below the topsoil. Typically encountered as cohesive clay / silt underlain by granular sand and gravel.
	Very loose slightly clayey gravelly fine to coarse SAND. Loose slightly clayey sandy GRAVEL.			

Inferred Geological Cross Sections are presented as Figures 4a, 4b and 4c to provide an appreciation of the ground conditions at the Site and the variations observed within the Devensian Till.

Section A – A' through the southern field illustrates the presence of cohesive Devensian Till comprising sandy and gravelly clay, underlain by granular Devensian Till (gravelly sand and sandy gravel).

Section B – B' and C – C' through the northern field suggests cohesive Devensian Till is present; however, granular Devensian Till is anticipated to be present at greater depths (due to the elevation difference of this field compared to the southern field) as evident in TP123. They also suggest the presence of a continuous groundwater table below the Site.

4.3 Visual and Olfactory Evidence of Contamination - Soils

No visual or olfactory evidence of potential gross contamination was observed during the Site investigation.

4.4 Groundwater

4.4.1 Strikes During Investigations

Groundwater strikes recorded during drilling or excavating ranged between 1.0 m bgl and 4.0 m bgl within the Devensian Till. The groundwater strikes are summarised below.

Exploratory Hole	Water strike during drilling (m bgl)	Water strike during drilling (m AOD)	Stratum
DS101	3.0	51.84	Devensian Till
DS102	1.5	56.45	
DS103	3.9	50.98	
DS104	1.2	55.42	
DS105	4.0	50.84	
DS107	1.4	66.37	
DS108	2.6	65.49	
DS110	1.0	68.68	
DS111	2.4	71.19	
DS112	2.4	67.28	
TP101	3.0	50.70	
TP104	2.6	52.19	
TP107	4.0	51.52	
TP110	1.9	55.83	
TP112	1.2	54.94	
TP113	1.5	56.59	
TP119	1.5	65.39	
TP120	2.0	63.17	
TP122	3.0	63.36	
TP123	3.3	66.40	
TP125	1.8	62.66	
TP126	2.6	69.75	
TP127	1.2	65.49	
TP128	3.1	68.71	
TP129	1.3	68.27	
TP131	2.0	66.08	
TP132	1.2	71.08	
TP134	2.0	67.65	
TP136	2.6	77.66	
TP142	2.5	-	

4.4.2 Levels During Monitoring Programme

Groundwater levels have been monitored on five occasions between 19th July 2018 and 11th September 2018. The monitoring results are provided in Appendix F and summarised in the table below.

Exploratory Hole	Response Zone				Water level during Monitoring				Stratum
					Max to Min Range				
	m bgl	m bgl	m AOD	m AOD	m bgl		m AOD		
DS101	1.00	4.00	53.84	50.84	3.41	4.04	50.80	51.43	Devensian Till
DS102	1.00	4.50	56.95	53.45	2.98	3.64	54.31	54.97	Devensian Till
DS103	1.00	4.00	53.88	50.88	3.73	3.75	51.13	51.15	Devensian Till
DS105	1.00	4.00	53.85	50.85	2.46	2.57	52.28	52.39	Devensian Till
DS106	1.00	4.50	64.81	61.31	4.19	4.41	61.40	61.62	Devensian Till
DS107	1.00	4.50	66.77	63.27	3.00	3.21	64.56	64.77	Devensian Till
DS110	1.00	4.50	68.68	65.18	2.23	3.75	65.93	67.45	Devensian Till
DS111	1.00	4.60	72.59	68.99	3.36	3.89	69.70	70.23	Devensian Till
DS112	1.00	4.90	68.68	64.78	3.01	4.19	65.49	66.67	Devensian Till

The groundwater strikes during the Site investigation combined with the monitoring data above suggest there is a continuous (and fluctuating due to weather conditions) groundwater table below the Site, at an elevation of approximately 70 m AOD in the far north-east and 51 m AOD in the far south-west (approximately 2.0 – 4.0 m below existing ground level).

Locally the groundwater flows appears to be to the south-west towards the adjacent un-named brook, regionally groundwater flow is likely to be to the south, towards the River Calder located approximately 280 m to the south of the Site.

It should be noted that the Site investigation and subsequent groundwater monitoring took place during a prolonged period of dry weather and therefore the groundwater table has the potential to rise once the weather conditions deteriorate and become wetter. It is also understood that artesian groundwater conditions were encountered during the excavation of attenuation ponds in the central part of the Site, suggesting that the cohesive Devensian Till is acting as an aquitard to the underlying granular (more permeable) Devensian Till.

4.5 Visual and Olfactory Evidence of Contamination - Groundwater

No visual or olfactory evidence of potential gross contamination was observed during the Site investigation.

4.6 Material Properties

The table below summarises the factual material properties based upon the results of in-situ and laboratory test data and where appropriate provides derived geotechnical parameters.

Parameter	Devensian Till
Moisture Content - w	9 % - 33 %
Liquid Limit - w _L	26 % - 69 %
Plastic Limit - w _P	14 % - 30 %
Plasticity Index - I _P	12 % - 39 %
Modified Plasticity Index - I' _P	6 % - 37 %
Particle Density	2.64 Mg/m ³ – 2.69 Mg/m ³
Maximum Dry Density	1.78 Mg/m ³ – 1.82 Mg/m ³
Optimum Moisture Content	13 %

Corrected SPT N₆₀ values have been plotted against depth and are included as Figure 3.

4.7 Geochemical Testing

Geochemical analysis was undertaken on 10 soil samples and 7 groundwater samples in accordance with BRE Special Digest 1:2005 (3rd Edition), Concrete in aggressive ground. The results are summarised in the table below.

Tests	No. of Tests	Minimum	Maximum
Soil - pH	10	7.3	8.4
Water Soluble Sulphate (SO ₄) (2:1 Leachate Equivalent)	10	0.0075 g/l	0.18 g/l
Water – pH	7	6.3	7.2
Water – Sulphate as SO ₄	7	7.6 mg/l	33.5 mg/l

4.8 Ground Gas Data

Gas monitoring has been undertaken on six occasions in installed boreholes DS101-DS103, DS105-DS107 and DS110-DS112). The results are presented in Appendix F and are summarised in the table below.

Barometric pressures ranged from 1001 mBar and 1015 mBar during the six visits.

Exploratory Hole	Steady Gas Concentration (%v/v)						Steady Flow Rate (l/hr)		Response Zone (m bgl)		Stratum	Flooded?
	Methane		Carbon Dioxide		Oxygen							
	Min	Max	Min	Max	Min	Max	Min	Max	From	To		
DS101	<0.1	0.0	0.2	2.0	18.7	20.4	<0.1	<0.1	1.0	4.0	Devensian Till	No
DS102	<0.1	0.0	1.8	4.2	18.2	19.4	<0.1	<0.1	1.0	4.5	Devensian Till	No
DS103	<0.1	0.0	0.1	2.5	18.6	20.4	<0.1	<0.1	1.0	4.0	Devensian Till	No
DS105	<0.1	0.0	1.3	2.5	16.8	19.8	<0.1	<0.1	1.0	4.0	Devensian Till	No
DS106	<0.1	0.0	0.1	3.0	16.7	20.6	<0.1	<0.1	1.0	4.5	Devensian Till	No
DS107	<0.1	0.0	1.3	2.4	18.2	19.4	<0.1	<0.1	1.0	4.5	Devensian Till	No
DS110	<0.1	0.0	1.8	2.9	17.1	19.7	<0.1	<0.1	1.0	4.5	Devensian Till	No
DS111	<0.1	0.0	0.2	2.0	18.8	20.4	<0.1	<0.1	1.0	4.6	Devensian Till	No
DS112	<0.1	0.0	0.5	3.7	18.7	20.4	<0.1	<0.1	1.0	4.9	Devensian Till	No

5.0 Geotechnical Assessment

5.1 Summary of Development Proposals

The proposed development comprises 188 residential dwellings with private gardens, driveways and access roads. A Proposed Development Plan is included as Figure 2.

Earthworks are proposed at the Site and proposed levels have yet to be finalised. The geotechnical assessment provided below is based upon existing ground levels and this section should be revisited once the proposed levels are finalised.

5.2 Earthworks

Materials used as fill will need to be placed to a suitable engineering specification and the degree of compaction required will be dependent on end usage and serviceability criteria. For example, a lesser degree of compaction may be suitable for paved areas than for building platforms supporting foundations and ground bearing slabs.

It is understood that between 1 m and 3 m of fill may be required in some parts of the Site. Shallow earthworks are likely to encounter both cohesive and granular Devensian Till; however generally the cohesive material is underlain by the granular material and therefore it may be possible to separate out the materials during excavation.

Gradings have been undertaken on 6 samples of cohesive Devensian Till and 2 samples of granular Devensian Till. The cohesive material tested appear to classify as a Class 2 material (General Cohesive Fill) and the granular material tested appears to classify as a Class 1 material (General Granular Fill) in accordance with the Specification for Highways Works, Table 6/1 Acceptable Earthworks Materials and Table 6/2 Grading Requirements for Acceptable Earthworks Materials.

In addition to these tests soil samples were taken from two stockpiles of Devensian Till located within the attenuation pond (AP) construction compound. The gradings results appear to classify the material as a Class 2C (General Cohesive Fill – Stony Cohesive Material) and Class 2D (General Cohesive Fill – Silty Cohesive Material).

A specification for re-use of these soils will need to be prepared by a suitably qualified geotechnical engineer to ensure that the materials are placed and compacted to an engineering specification and that the subsequent platform is suitable for development incorporating raft foundations.

5.2.1 Cut

Depending on the nature of the material at formation level, localised over-excavation may be required to ensure that the formation meets the minimum geotechnical parameters required for founding upon. If over-excavation is required, the base of the excavation shall be thoroughly proof rolled and the replaced material shall be recompacted to an engineering specification.

5.2.2 Fill

Following a topsoil strip, it is recommended that any Made Ground, organic material or soft spots are removed and the formation thoroughly proof rolled. The fill placed below plots should be to an end-product specification produced by the structural / civil engineers.

5.3 Foundations

5.3.1 Spread Foundations

Depending on the proposed elevations and location on-Site, granular and / or cohesive Devensian Till or engineered fill may be present at founding level.

It may be possible to use shallow spread foundations in some parts of the Site, founding upon firm clay or medium dense sand; however, this may be precluded by trench instability, shallow groundwater or variable soft / loose soils. The actual ground conditions at founding level are difficult to predict at this stage. When the

proposed elevations and development layout has been finalised, the feasibility of spread foundations should be considered on a plot by plot basis in an attempt to zone the Site.

Raft foundations are recommended in areas of fill; however, these could be considered for all plots within the development. Following a topsoil strip raft foundations are likely to be suitable and based on the findings of this Site investigation, a uniformly distributed load of 25 kPa is likely to be achievable (within acceptable settlement limits).

Made Ground or soft spots should be excavated and replaced with a well compacted granular fill and all foundation excavations should be inspected by a suitably qualified geotechnical engineer prior to casting to ensure the appropriate depth, founding medium and strength characteristics have been achieved.

5.3.2 Volume Change Potential

The volume change potential should be considered in any foundation schedule for structures and services located within the influence zone of trees or bushes (proposed, existing or to be removed) and appropriate precautions and/or founding depths should be designed accordingly. In cohesive soils, foundations will therefore need to be designed in accordance with NHBC Standard Chapter 4.2 '*Building Near Trees*' (2016).

The A-Line Plots presented in the geotechnical analysis results in Appendix C suggest that the cohesive material varies from low to high plasticity. The modified plasticity index (I_p) results suggest that the cohesive material has a 'medium' volume change potential. Plots within the vicinity of existing or proposed tree's / vegetation should be considered on a plot by plot basis to ensure the minimum founding depth (as stated in the above guidance) is achieved to mitigate against heave / subsidence caused by shrinking / swelling clay.

5.4 Roads and Pavements

It is recommended that a conservative California Bearing Ratio (CBR) value of 2 % should be adopted for preliminary road pavement design for external areas until verification testing comprising in-Situ CBR tests can be undertaken post earthworks, and at finished formation level.

5.5 Excavations & Obstructions

It is expected that conventional mechanical excavators will readily remove the Devensian Till likely to be encountered in shallow excavations, although a breaker may be required to remove the existing concrete hardstanding located in the far north-east of the Site.

All shallow foundation or services excavations at the Site should be considered unstable, therefore, temporary support of all excavations should be considered when excavating on-Site.

5.6 Groundwater

The groundwater strikes during the Site investigation combined with the monitoring data above suggest there is an established (and fluctuating due to climate conditions) groundwater table below the Site, at an elevation of approximately 70 m AOD in the far north-east and 51 m AOD in the far south-west (approximately 2.0 – 4.0 m below existing ground level).

It should be noted that the Site investigation and subsequent groundwater monitoring took place during a prolonged period of dry weather and therefore the groundwater table has the potential to rise once the weather conditions deteriorate and become wetter. It is also understood that artesian groundwater conditions were encountered during the excavation of the attenuation ponds in the central part of the Site, suggesting that the cohesive Devensian Till is acting as an aquitard to the underlying granular (more permeable) Devensian Till.

It is therefore recommended that advice is sought from a drainage specialist as a dewatering system (probably incorporating wellpoints or sumps) may need to be designed and implemented prior to earthworks starting on-Site to control groundwater.

5.7 Slopes & Retaining Features

It is understood that some retaining walls may be required within the development and it is recommended that these are designed by a specialist geotechnical engineer. If existing slopes are remaining or slopes are proposed the gradient should be considered by a geotechnical engineer to ensure that the slopes remain stable and are constructed to safe angles.

5.8 Chemical Attack on Buried Concrete

In accordance with the recommendations of BRE Special Digest 1, 'Concrete in Aggressive Ground' 2005, the soils and groundwater at the Site would be classified as Design Sulphate Class DS-1 and ACEC Class AC-1, when considering the most appropriate type of concrete to be used at the Site in order to resist chemical attack from elevated sulphate present in the soils (assuming mobile groundwater in non-pyritic soils).

5.9 Geotechnical Issues

The main identified geohazards associated with the construction phase are as follows:-

- ▲ It may be possible to use shallow spread foundations in some parts of the Site, founding upon firm clay or medium dense sand; however, this may be precluded by trench instability, shallow groundwater or variable soft / loose soils;
- ▲ The cohesive Devensian Till has a medium volume change potential. Plots within the vicinity of existing or proposed tree's / vegetation should be considered on a plot by plot basis to ensure the minimum founding depth as stated in the NHBC guidance (Chapter 4.2) is achieved; and
- ▲ The groundwater strikes during the Site investigation combined with the monitoring data above suggest there is an established groundwater table below the Site (at approximately 2.0 – 4.0 m bgl) with the potential to become shallower when the weather deteriorates and becomes wetter.

6.0 Generic Quantitative Risk Assessment

6.1 Introduction

The presence of hazardous substances in or on a Site is generally only of concern if an actual or potential unacceptable risk exists. Legislation and guidance on the assessment of contaminated sites, consistent with UK best practice, acknowledges the need for a tiered risk-based approach. A preliminary Conceptual Site Model is presented in Section 2.2. This section represents a Generic Quantitative Risk Assessment (GQRA) being a comparison of Site contaminant levels against Generic Assessment Criteria.

6.2 Human Health GQRA

The assessment of risks in relation to human health has been undertaken using Generic Assessment Criteria.

6.2.1 Risks from Soil Sources

Soils have been assessed against a GAC suitable for a Residential with Plant Uptake end use and assuming 1% organic matter. None of the determinand concentrations reported in soil exceeded the relevant GAC. Therefore, soils on-Site are considered unlikely to represent a risk to human health. This is considered consistent with, and suitably supports the assessment of previous soils data from Site.

6.2.2 Risks from Non-Aqueous Phase Liquids (NAPL)

Soil and groundwater exposure models used in generating GAC do not account for the potential for NAPL to represent a source of risk to human health, principally due to the production of vapours. Whilst it is possible to calculate theoretical soil saturation limits, in reality, due to co-solubility effects, these are not an appropriate indicator of the presence of NAPL. In order to assess the presence of NAPL, for petroleum hydrocarbons, an assessment criterion of 5,000 mg/kg has been applied based on professional experience.

The following has been identified in relation to NAPL at the Site:

- ▲ No observations of NAPL were made within the soils observed during drilling;
- ▲ No concentrations of Total Petroleum Hydrocarbons in excess of 5000 mg/kg were recorded; and
- ▲ No observations of NAPL were made during groundwater monitoring works.

On this basis, there is no evidence of NAPL being present at the Site.

6.3 Controlled Waters/Water Environment

The Preliminary Geo-Environmental Risk Assessment did not identify a significant risk to controlled waters from historical and current land uses and therefore, it is considered that the risk to controlled waters is negligible based on the following rationale;

- ▲ The Site has remained largely undeveloped greenfield with no significant historical contamination sources;
- ▲ The Site is not located within a designated Source Protection Zone (SPZ) and there are no potable abstractions within 1 km;
- ▲ The underlying cohesive Devensian Till will reduce the migration of mobile contaminants from off-site sources;
- ▲ No visual evidence of contamination was observed during the Site investigation; and
- ▲ No elevated contaminant concentrations were recorded in soil or groundwater samples analysed.

6.4 Built Environment

6.4.1 Potable Water Supply Pipes

The investigation requirements for the selection of potable water pipe material are set out in UKWIR Report 10/WM/03/21. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (UKWIR, 2010).

This report has very specific and onerous investigation requirements and as such the detailed investigation of each utility route was not within the scope of this investigation.

A preliminary review of the results indicates that a relevant linkage is unlikely to exist associated with organic contaminants and therefore pollutant polyethylene (PE) and/or polyvinyl chloride (PVC) water supply pipes may be suitable for use on the development.

It should be noted that at the time of this investigation the future routes of water supply pipes had not been established, hence the investigation and sampling strategy is not likely to be considered fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling/analytical strategy may be required at a later date once the route(s) of the supply pipe(s) are known. In addition, it is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment, which may not necessarily be the same as those recommended by UKWIR.

6.4.2 Building Materials

Risks to building materials associated with aggressive ground conditions is addressed in Section 5.0.

6.5 Waste Classification

This investigation was not undertaken to classify materials in terms of waste disposal. Where waste disposal then a specific and detailed investigation in accordance with Environment Agency Guidance WM3 would typically be required.

Should soils be required to be disposed of from Site, the results of the chemical analysis should be forwarded to the proposed receiving facility who will determine what criteria they will accept the waste from Site as. Further investigation in addition to specific waste acceptance criteria (WAC) analysis may be required.

Considering the nature of the materials encountered, more cost efficient and sustainable methods of removing the material should be considered prior to disposal at landfill (e.g. registering with the CL:AIRE Register of Materials) in an attempt to find a site with a requirement for import of materials.

7.0 Bulk Ground Gas Risk Assessment

7.1 Ground Gas Conceptual Site Model

7.1.1 Sources

The only potential source identified is an infilled reservoir in the central part of the Site. At the time of the Site investigation the anticipated location of the infilled reservoir was within the attenuation pond construction area and therefore inaccessible; however, no development plots are proposed within approximately 30 m of the anticipated location.

7.1.2 Receptors

The principal receptors under consideration are future residents. Other receptors include adjacent site occupiers and future maintenance / construction workers.

7.1.3 Pathways

The underlying geology is likely to be of variable permeability with respect to ground gases. The Devensian Till is both granular and cohesive in nature and therefore lateral and vertical migration may be possible.

The most significant pathways with respect to future residents relate to the potential for gases to enter future dwellings. At present, no gas protection measures are assumed. Consequently, ingress into dwellings may be possible through voids in the floor including service entry points and cracks.

Future maintenance / construction workers may come into contact with hazardous ground gases via entry into below ground confined spaces such as excavations or service entries / inspection points.

7.2 Duration & Extent of Monitoring

Tables 5.5a and 5.5b within CIRIA C665 detail current recommended monitoring duration and frequency for Sites in the UK. Based on the identification of potential sources in the preceding section, the gas generation potential is considered to be very low, whilst the sensitivity of the proposed development is high. On this basis, CIRIA C665 recommends 6 visits over a minimum period of 3 months.

Gas monitoring has been carried out at the Site on six occasions. During the six monitoring periods, gas concentrations have been recorded in 9 monitoring positions. The locations of the monitoring wells are highlighted on Figure 2 and representative a good coverage across the whole Site area.

Barometric pressures during the gas monitoring period ranged from 1001 mBar to 1015 mBar.

7.3 Ground Gas Risk Assessment

7.3.1 Background

Based on the proposed residential end use, the following documents have been consulted when assessing the gas regime at the site:

- ▲ NHBC/RSK Group PLC (2007), Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present, Report Edition No. 4.
- ▲ British Standards Institute (BSI, 2015): Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, BS:8485.

The presence of a source of hazardous gas within the ground does not necessarily indicate a risk will be present. Consideration of recorded gas flows together with source concentrations can allow an initial assessment to be made of the potential both for generation and subsequent migration of gas. A Characteristic Situation (CS) is derived from an assessment of the ground gas data and forms the basis of determining mitigation measures.

7.3.2 Gas Screening Value (GSV)

The Gas Screening Value (gas concentration as a fraction x maximum recorded flow) is used to provide an initial assessment of risks to future site users. The GSVs calculated for the monitoring wells are presented in the following table.

Location	Maximum Methane (%v/v)	Maximum Carbon Dioxide (%v/v)	Maximum Flow Rate (l/hr)	GSV / Characteristic Situation				Flooded well (Frequency)
				Methane		Carbon Dioxide		
				GSV	CS	GSV	CS	
DS101	0.0	2.0	0.6	0.000	CS1	0.012	CS1	No
DS102	0.0	4.2	0.3	0.000	CS1	0.013	CS1	No
DS103	0.0	2.5	0.3	0.000	CS1	0.008	CS1	No
DS105	0.0	2.5	3.2	0.000	CS1	0.080	CS2	No
DS106	0.0	3.0	<0.0	0.000	CS1	0.000	CS1	No
DS107	0.0	2.4	<0.0	0.000	CS1	0.000	CS1	No
DS110	0.0	2.9	<0.0	0.000	CS1	0.000	CS1	No
DS111	0.0	2.0	<0.0	0.000	CS1	0.000	CS1	No
DS112	0.0	3.7	<0.0	0.000	CS1	0.000	CS1	No

The gas monitoring rounds have typically recorded no methane and low carbon dioxide concentrations. A carbon dioxide concentration of 4.2 %v/v was recorded on one occasion in DS202; however, this was associated with a flow rate below the equipment's detection limit (0.1l/hr).

The preliminary data obtained by Delta-Simons indicates that the Site can be provisionally classified as CS2 (very low hazard potential) in accordance with BS 8485:2015 Table 2 and Green in accordance with NHBC Traffic Light classification for low rise housing.

7.4 Ground Gas Risk Mitigation

The ground gas regime at the site has been classified as CS2 in accordance with BS8485 and Green in accordance with the NHBC guidance and therefore, no gas protection measures are required.

The above assessment relates solely to future residential occupiers. Given the nature of the ground gas regime at the site, no further works are considered necessary to protect third-parties / surrounding occupiers. Entry to excavations / confined spaces should be restricted to personnel with relevant Confined Spaces training and with prior confirmation of atmospheric conditions.

7.5 Radon

The Site is within an 'Intermediate probability' radon area (3 to 5 % of homes are estimated to be at or above the Action Level)

Based on the higher risk level of 3 – 5 % BRE 211 (2007) it is recommended that a Site-specific radon risk report is produced and the provision of basic radon protection measures within buildings is allowed for.

7.6 Organic Vapours

There are no identified sources of volatile organic vapours on-Site. No mitigation is expected to be necessary.

8.0 Revised Conceptual Site Model

A revised CSM is presented in the table below. It considers all of the available data from the Delta-Simons intrusive Site investigation, suitable for a Site with a proposed residential end-use with consumption of home grown produce.

Source(s)	Pathway(s)	Receptor(s)	Confirmed Risk?	Mitigation / Comments
S1 Possible Made Ground	P1, P2, P3, P4, P5	R1, R2, R3, R4, R5, R6, R7	No	Made Ground was not encountered during the Site investigation. Although it was not possible to investigate the soils below the concrete slab in the north-east of the Site this area is not being developed into plots and is proposed as an area of Public Open Space. Upon removal of the concrete slab it may be prudent to obtain soil samples and analyse for common contaminants, to discount the presence of source of soil contamination in this location. It is considered unlikely that there is a significant risk to controlled waters based on the analysis undertaken.
S2 Construction Compound	P1, P2, P3, P4, P5	R1, R2, R3, R4, R5, R6, R7	Unlikely	Due to access restrictions soil samples could not be taken from within the construction compound. It is therefore recommended that once access is possible some shallow soil samples are recovered and tested for common contaminants, to discount the presence of contaminated soil in this location. However, if appropriate environmental controls are in place in accordance with current guidance and best practice, this area is considered unlikely to represent a significant source.
S3 Infilled Reservoir	P3, P4	R3, R4, R5, R6, R7	No	There has been no elevated gas concentrations recorded during the gas monitoring to date, suggesting that if the infilled reservoir exists and ground gas is being generated, it is not migrating significantly. In addition to this the central part of the Site is not proposed for development plots, due to the presence of the Haweswater Aqueduct and the soon to be completed attenuation ponds.
S4 Off-Site Gasworks	P4	R3, R4, R5, R6, R7	No	The soil and groundwater samples tested did not exceed the relevant GACs for a residential end use with consumption of home grown produce and therefore, it is considered that the Site is not being impacted from off-Site sources of contamination such as the gasworks.
<p>Pathways:</p> <ul style="list-style-type: none"> ▲ P1 - Direct contact, ingestion or inhalation of soil bound contaminants / dust during or following redevelopment; ▲ P2 - Inhalation of organic vapours associated with contamination; ▲ P3 - Migration of ground gas / vapours into on-site buildings causing asphyxiation or risk of explosion; ▲ P4 - Leaching of contamination into groundwater followed by migration of groundwater to the wider groundwater environment or discharge to surface waters; and ▲ P5 - Direct contact between aggressive ground conditions and new infrastructure. <p>Receptors:</p> <ul style="list-style-type: none"> ▲ R1 - Construction workers; ▲ R2 - Third parties during construction (adjacent Site users and adjacent residents); ▲ R3 - Future Site users and maintenance workers; ▲ R4 - The un-named brook adjacent to the Site; ▲ R5 - The River Calder (circa. 180 m south); ▲ R6 - The underlying aquifers; and ▲ R7 - The Built Environment (new buildings and infrastructure / utilities) including Haweswater Aqueduct. 				

9.0 Conclusions & Recommendations

9.1 Geotechnical Summary

The presence of both cohesive and granular Devensian Till at the Site and the changes to the Site elevations proposed, makes it difficult to predict the nature of the founding material at this stage.

Shallow spread foundations may be possible in some parts of the Site; however, this may be precluded by trench instability, shallow groundwater or variable soft / loose soils. When the proposed elevations and development layout has been finalised, the feasibility of spread foundations should be considered on a plot by plot basis in an attempt to zone the Site.

Raft foundations are recommended in areas of fill; however, these could be considered for all plots within the development.

It is understood that between 1 m and 3 m of fill may be required in parts of the Site. Site won material is likely to be either granular or cohesive Devensian Till and grading results suggest that it is an Acceptable Earthworks Material, in accordance with the Specification for Highways Works. The fill placed below plots should be placed to an end-product specification produced by the structural / civil engineers. Verification testing comprising in-Situ CBR tests can be undertaken post earthworks and at finished formation.

The groundwater strikes during the Site investigation combined with the monitoring data above suggest there is a continuous groundwater table below the Site. The Site investigation and subsequent monitoring took place during a prolonged period of dry weather and therefore the groundwater table has the potential to rise once the weather conditions deteriorate and it becomes wetter. Artesian groundwater conditions were encountered during the excavation of the attenuation ponds in the central part of the Site, suggesting that the cohesive Devensian Till is possibly acting as an aquitard to the underlying granular (more permeable) Devensian Till.

It is therefore recommended that advice is sought from a drainage specialist as a dewatering system (probably incorporating wellpoints or sumps) may need to be designed and implemented prior to the earthworks starting on-Site.

9.2 Contamination Issues

The investigation has been carried out in order to provide information on the quality of the soil and groundwater beneath the Site in the context of land contamination and provide information on the ground gas regime beneath the Site for a residential end use. The assessment is being completed prior to the proposed development of the Site.

9.2.1 Human Health

The human health GQRA has demonstrated that none of the soil samples analysed for a range of contaminants have exceeded the relevant GACs for a residential end use with consumption of home grown produce and therefore, it is considered that no special remedial measures are required to facilitate the development of the Site.

It is considered that the topsoil material may be re-used for the gardens and soft landscaped areas on-Site, subject to further verification testing.

The preliminary data obtained by Delta-Simons indicates that the Site can be provisionally classified as CS2 (very low hazard potential) in accordance with BS 8485:2015 Table 2 and Green in accordance with NHBC Traffic Light classification for low rise housing. However, basic Radon protection measures will be required.

9.2.2 Controlled Waters

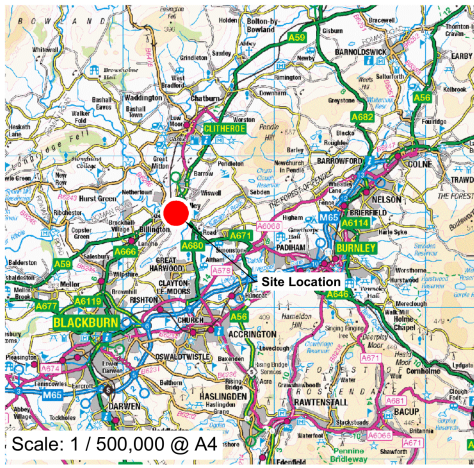
On the basis of the investigation completed it is considered that the risk to controlled waters is negligible and therefore, no further action is required.

9.3 Recommendations for Supplementary Work

Based on the findings of this report, the following recommendations for supplementary works are made;

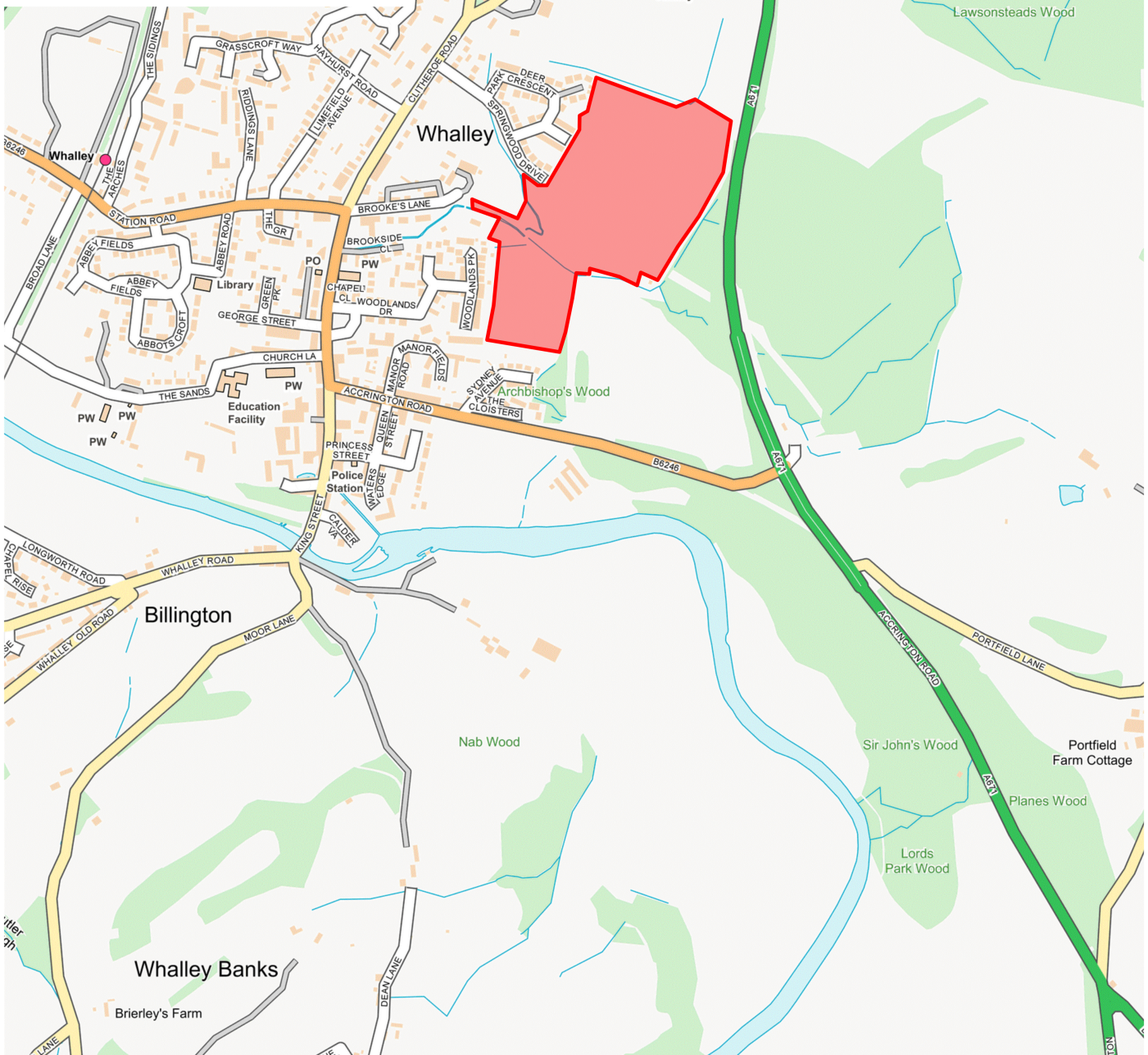
- ▲ Develop the foundation strategy once the Site layout and proposed elevations have been finalised;
- ▲ Additional soil sampling and laboratory testing from within the area of the construction compound once the attenuation pond construction has been completed and the compound accessible;
- ▲ Further chemical testing of topsoil across the Site to evaluate suitability for re-use prior to inclusion within private gardens and soft landscaped areas. Develop a soil management strategy to ensure all suitable topsoil is reused where possible (on-Site or off-Site depending on demand);
- ▲ Waste classification has not been undertaken as part of the scope of works, should it be proposed to dispose of materials from the Site then specific additional investigations may be needed to classify the materials in accordance with current regulatory requirements;
- ▲ It is recommended that advice is sought from a drainage specialist regarding dewatering the Site; and
- ▲ It is recommended that verification testing comprising in-situ CBR tests are undertaken at finished formation level to confirm that the minimum CBR value assumed in road pavement design has been achieved.

Figure 1 – Site Location Map



LEGEND

Site Boundary



Scale: 1 / 10,000 @ A4

Contains OS data © , Crown Copyright and Database Right (2018)

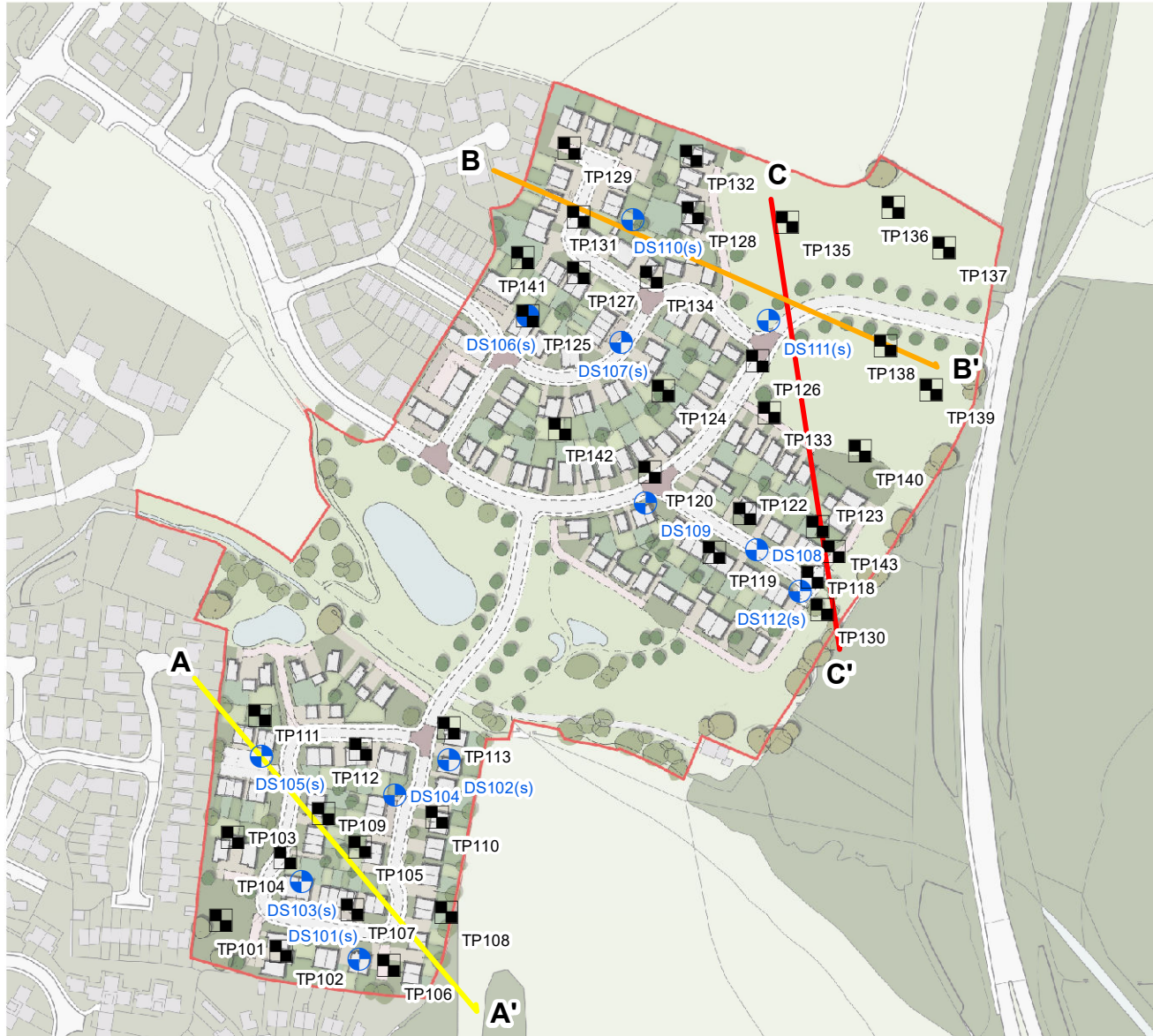


TITLE:
 Site Location Map
 Land off Clitheroe Road
 Whalley




DRAWN BY:	RB	SCALE:	To Scale@A4
CHECKED BY:	MB	REVISION:	1
DATE:	8th August 2018		

PROJECT NO:	18-0886.03
FIGURE NO:	1

Figure 2 – Exploratory Hole Location and Proposed Development Plan



LEGEND

-  TP10x Trial Pit
-  DS10x Dynamic Sampler
-  (s) Locations with Installs

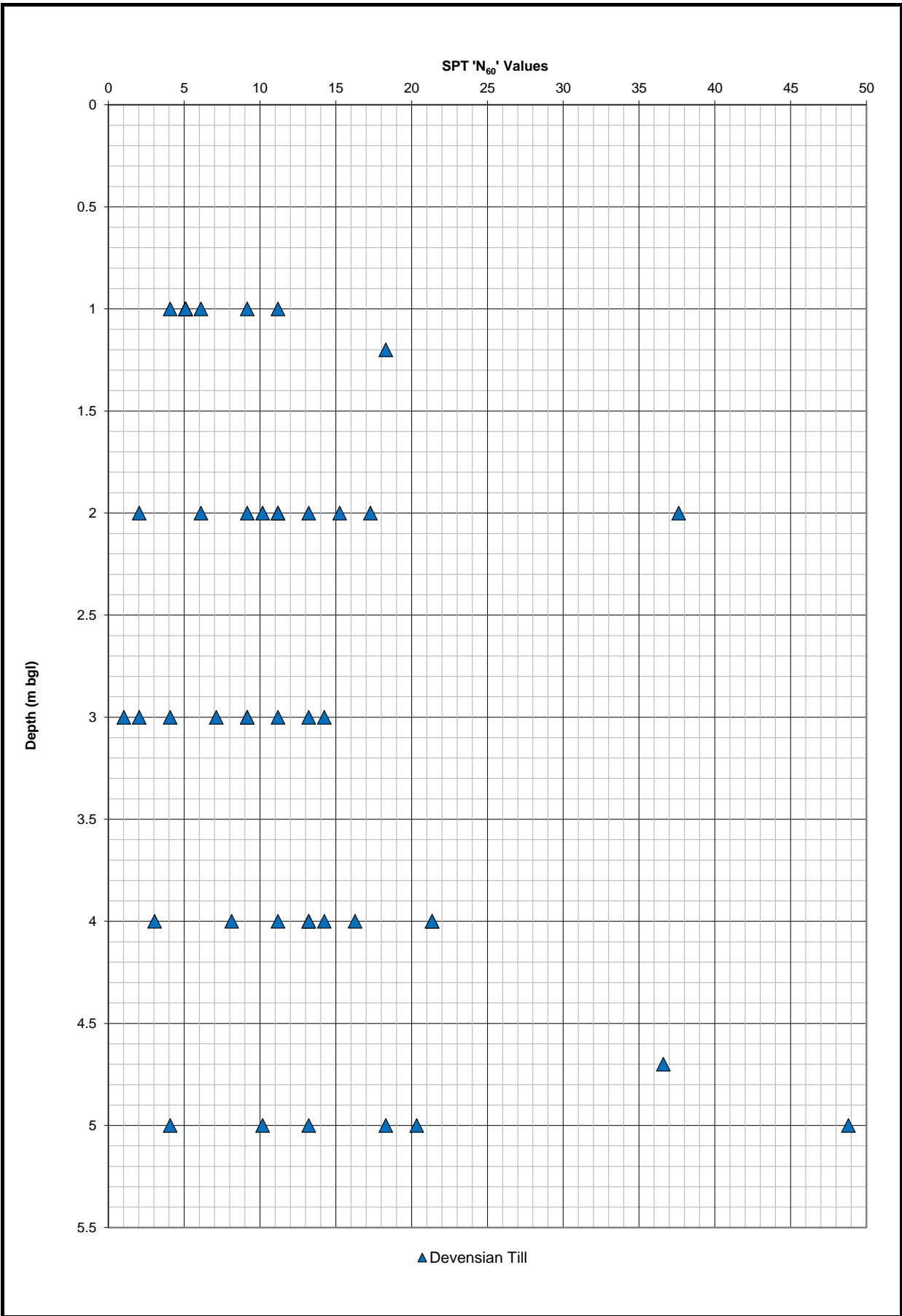
Site Plan Provided by Client



TITLE:
Exploratory Hole Location and Proposed Development Plan
 Land off Clitheroe Road
 Whalley

DRAWN BY: RB	SCALE: 1:3,500	PROJECT NO: 18-0886.03
CHECKED BY: MB	REVISION: 0	FIGURE NO:
DATE: 16th August 2018		2

Figure 3 – SPT N60 versus Depth Plot



TITLE:

Corrected SPT N₆₀ versus Depth Plot
Clitheroe Road, Whalley

DWN:

RJS

PROJECT NO.:

18-0886.03

DATE:

Aug-18

Figure:

3

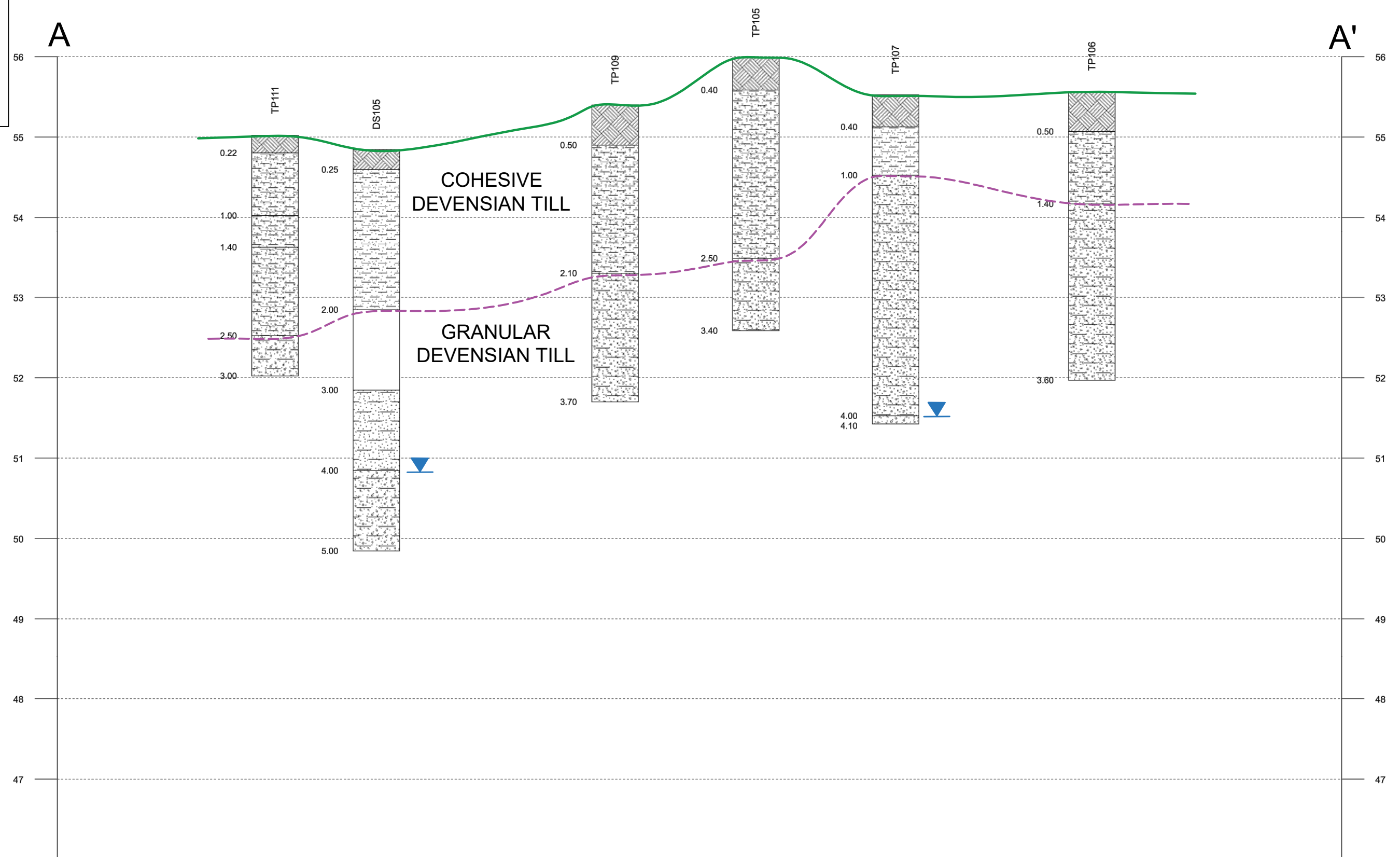
Figure 4a – 4c – Inferred Geological Cross Sections

LEGEND

- Existing Ground Level (mAOD)
- Indicative boundary between cohesive and granular material
- Groundwater Strike

Legend Key

- TOPSOIL
- Sandy gravelly CLAY
- Sandy CLAY
- Clayey gravelly SAND
- No Recovery
- Clayey sandy GRAVEL
- Clayey SAND
- Sandy GRAVEL



Chainage (m)	0.00	21.74	39.43	81.06	105.61	129.98	164.20	189.42
Offset (m)		2.09	8.72	1.25	7.33	13.50	14.14	
Elevation (mAOD)		55.02	54.85	55.40	55.98	55.53	55.57	



TITLE:
Section A-A'
Clitheroe Road, Whalley

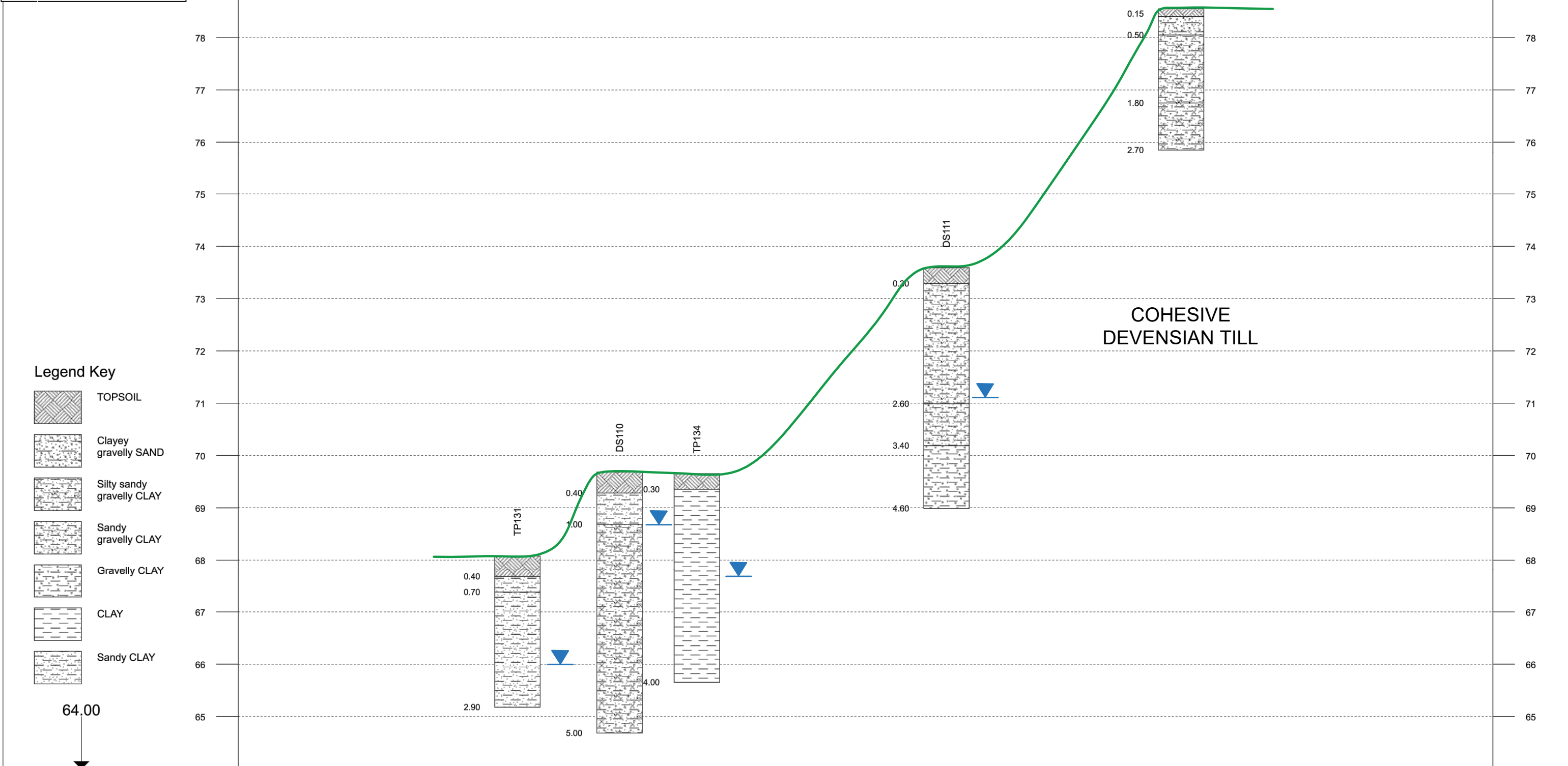
DRAWN BY: JR	ENGINEER:	VERTICAL SCALE: 1:50
CHECKED BY: RS	REVISION: -	HORIZONTAL SCALE: 1:700
DATE: 16 August 2018	CLIENT: Trafford Housing Trust	

PROJECT NO:
18-0886.03
FIGURE NO:
4a

LEGEND

Existing Ground Level (mAOD)

Groundwater Strike



Legend Key

- TOPSOIL
- Clayey gravelly SAND
- Silty sandy gravelly CLAY
- Sandy gravelly CLAY
- Gravelly CLAY
- CLAY
- Sandy CLAY

Chainage (m)	0.00	48.02	74.08	93.80	157.44	217.28	238.48
Offset (m)		0.52	9.05	14.70	12.56	1.78	
Elevation (mAOD)		68.08	69.68	69.65	73.59	78.55	



TITLE:
Section B-B'
Clitheroe Road, Whalley

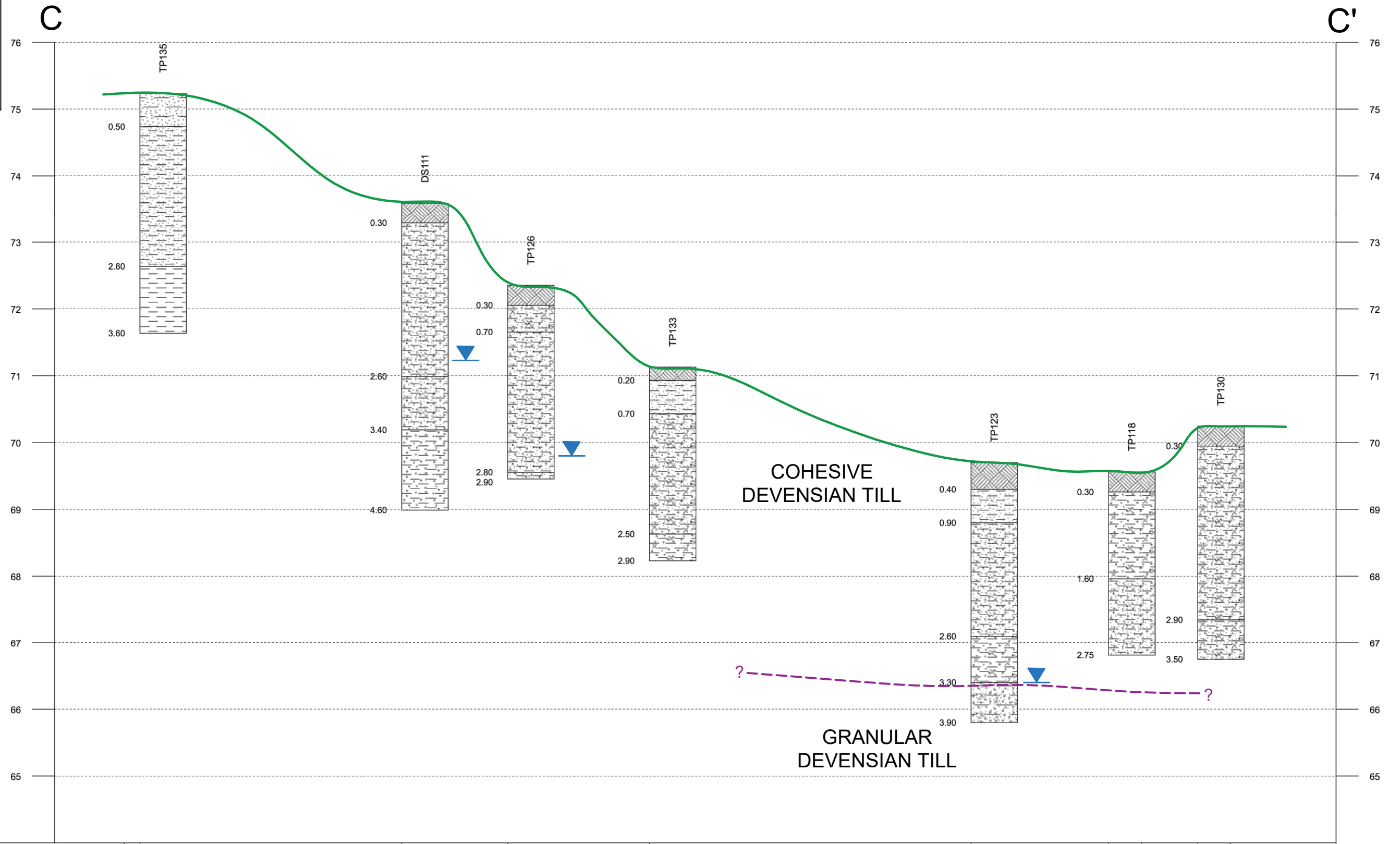
DRAWN BY: JR	ENGINEER:	VERTICAL SCALE: 1:75	PROJECT NO: 18-0886.03
CHECKED BY: RS	REVISION: -	HORIZONTAL SCALE: 1:1000	FIGURE NO: 4b
DATE: 16 August 2018	CLIENT: Trafford Housing Trust		

LEGEND

- Existing Ground Level (mAOD)
- Indicative boundary between cohesive and granular material
- Groundwater Strike

Legend Key

- Clayey SAND
- Sandy CLAY
- TOPSOIL
- Sandy gravelly CLAY
- CLAY
- Silty sandy gravelly CLAY
- Gravelly CLAY
- Silty gravelly CLAY
- Clayey silty sandy GRAVEL



Chainage (m)	0.00	2.93	51.98	71.83	98.38	158.59	184.37	190.59	201.05	207.14
Offset (m)		11.52	3.60	11.38	8.42	9.63	4.45	2.76	7.15	
Elevation (mAOD)	75.24		73.59	72.35	71.13	69.70	69.56	69.68	70.25	

TITLE:
Section C-C'
Clitheroe Road, Whalley

DRAWN BY: JR	ENGINEER:	VERTICAL SCALE: 1:60	PROJECT NO: 18-0886.03
CHECKED BY: RS	REVISION: -	HORIZONTAL SCALE: 1:750	FIGURE NO: 4c
DATE: 16 August 2018	CLIENT: Trafford Housing Trust		



Appendix A – Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.


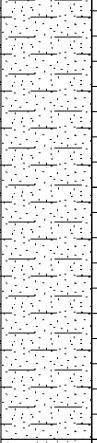
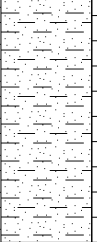
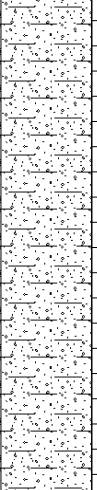
This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

Appendix B – Borehole and Trial Pit Logs, SPT Calibration Certificate

Dynamic Sampler Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey SAND with frequent rootlets. Sand is fine to medium.		0.25	(0.25)	54.59			0.00 - 0.25	ES 1	1			
Loose light brown becoming black at 2m bgl slightly clayey fine to coarse SAND with occasional gravel. Gravel is subrounded fine of natural lithologies. [DEVENSIAN TILL]		2.00	(1.75)	52.84			1.80 - 2.00	ES 2	2	1.00	SPT(S) N=9 (2,2/2,2,2,3)	
Soft to firm orangish brown slightly sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		3.00	(1.00)	51.84						2.00	SPT(S) N=11 (2,3/2,3,3,3)	
Very loose brown slightly clayey gravelly fine to coarse SAND with occasional cobbles. Gravel is subangular to subrounded fine to coarse of natural lithologies. Cobbles are rounded of sandstone. At 5.0 m bgl: Becomes medium dense. [DEVENSIAN TILL]		5.00	(2.00)	49.84						3.00	SPT(S) N=1 (0,0/0,1,0,0)	
										4.00	SPT(S) N=3 (0,1/0,1,1,1)	
Borehole complete at 5.00 m bgl.										5.00	SPT(S) N=20 (2,3/5,4,6,5)	

3.00 ▼

- Remarks:
1. Engineer verified logged in general accordance with BS 5930:2015.
 2. Dynamic sampled between 1.0 m and 5.0 m bgl.
 3. Hole terminated in superficial sand deposits.
 4. Groundwater was encountered at 3.0 m bgl.
 5. No visual or olfactory evidence of contamination was encountered.
 6. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
11/07/2018		3.00 m				

Coordinates: **E373663.44 N436217.64**

Elevation (mAOD): **54.84**

Drilled By: **Earth Engineering**

Plant Used: **Archway Dart**

Logged: **RR**

Checked: **MB**


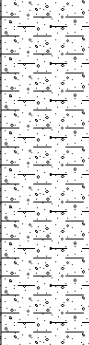

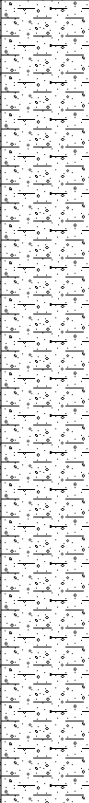
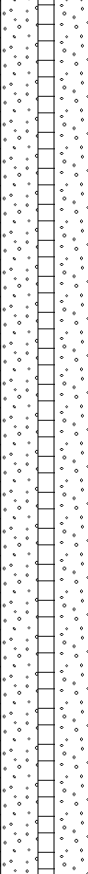



Approved: **RJS**

Scale: **1:30**

Dynamic Sampler Log


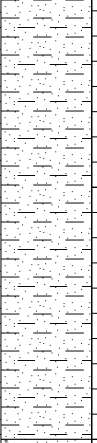
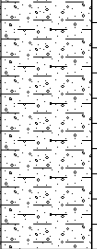
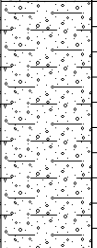
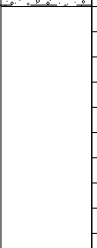
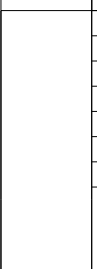
Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to coarse SAND with frequent rootlets.		0.40	(0.40)	57.55			0.00 - 0.40	ES	1			
Soft to firm orangish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		1.80	(1.40)	56.15		1.50	1.50 - 1.60	ES	2	1.00	SPT(S) N=5 (1,1/1,1,2,1)	
Very soft brownish grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mudstone. Poor recovery between 2 - 3m bgl. At 4.0 m bgl: Becomes firm. [DEVENSIAN TILL]		5.00	(3.20)	52.95						2.00	SPT(S) N=2 (1,0/1,0,0,1)	
										3.00	SPT(S) N=2 (0,1/0,1,0,1)	
										4.00	SPT(S) N=11 (2,3/2,3,3,3)	
Borehole complete at 5.00 m bgl.										5.00	SPT(S) N=13 (2,1/2,3,4,4)	

Remarks:
 1. Engineer verified logged in general accordance with BS 5930:2015.
 2. Dynamic sampled between 1.0 m and 5.0 m bgl.
 3. SPT taken from 5.0 m to 5.45 m bgl.
 4. Groundwater was encountered at 1.5 m bgl.
 5. No visual or olfactory evidence of contamination was encountered.
 6. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
11/07/2018		1.50 m				

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to medium SAND with frequent rootlets.		0.25	(0.25)	54.63			0.00 - 0.25	ES 1				
Soft to firm brown slightly sandy CLAY. Sand is fine to medium. [DEVENSIA TILL]		2.00	(1.75)	52.88			1.50 - 1.60	ES 2	1.00	SPT(S) N=5 (1,0/1,1,2,1)		
Firm brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of natural lithologies. [DEVENSIA TILL]		3.00	(1.00)	51.88			2.90 - 3.00	ES 3	2.00	SPT(S) N=9 (2,2/3,2,2,2)		
Loose brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone. [DEVENSIA TILL]		4.00	(1.00)	50.88					3.00	SPT(S) N=4 (0,3/1,1,1,1)		
No recovery.		5.00	(1.00)	49.88					4.00	SPT(S) N=13 (0,0/0,2,5,6)		
Borehole complete at 5.00 m bgl.									5.00	SPT(S) N=10 (3,1/2,2,3,3)		

3.90



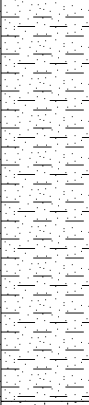





Remarks:
 1. Engineer verified logged in general accordance with BS 5930:2015.
 2. Dynamic sampled between 1.0 m and 5.0 m bgl.
 3. SPT taken from 5.0 m to 5.45 m bgl.
 4. Groundwater was encountered at 3.9 m bgl.
 5. No visual or olfactory evidence of contamination was encountered.
 5. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
11/07/2018		3.90 m				

Dynamic Sampler Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to coarse SAND with frequent rootlets.		0.40	(0.40)	56.22			0.00 - 0.40	ES 1				
Soft to firm orangish brown sandy CLAY with occasional gravel. Sand is fine to coarse. Gravel of natural lithologies. [DEVENSIAN TILL]		2.00	(1.60)	54.62		1.20 ▼				1.00	SPT(S) N=5 (2,1/1,1,2,1)	
Loose brown clayey fine to medium SAND. Between 3 - 3.2m bgl band of firm grey slightly silty CLAY. [DEVENSIAN TILL]		5.00	(3.00)	51.62			2.30 - 2.40	ES 2		2.00	SPT(S) N=10 (2,2/2,2,3,3)	
										3.00	SPT(S) N=7 (0,2/1,2,2,2)	
										4.00	SPT(S) N=8 (0,2/2,1,2,3)	
Borehole complete at 5.00 m bgl.										5.00	SPT(S) N=4 (0,0/1,0,2,1)	

Remarks:
1. Engineer verified logged in general accordance with BS 5930:2015.
2. Dynamic sampled between 1.0 m and 5.0 m bgl.
3. SPT taken from 5.0 m to 5.45 m bgl.
4. Hole terminated in superficial clay deposits.
5. Groundwater was encountered at 1.2 m bgl.
6. No visual or olfactory evidence of contamination was encountered.
7. Backfilled with arisings.



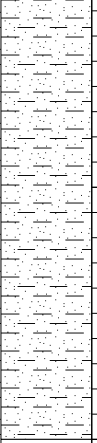
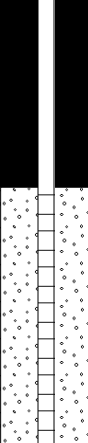
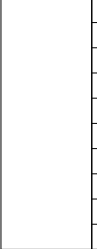
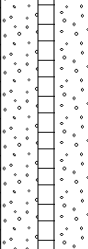
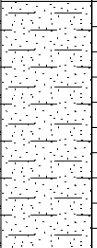
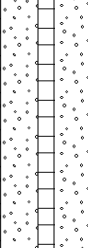
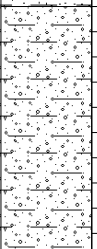

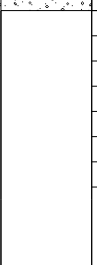

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
11/07/2018		1.20 m				

Coordinates: E373681.60 N436301.52	Elevation (mAOD): 56.62	Drilled By: Earth Engineering	Plant Used: Global Geotech	Logged: MB	Checked: RJS	Approved: RJS	Scale: 1:30
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Dynamic Sampler Log

Date: **11/07/2018**



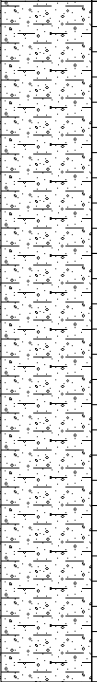
Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to medium SAND with frequent rootlets.		0.25	(0.25)	54.60			0.00 - 0.25	ES	1			
Soft to firm brown slightly sandy CLAY. Sand is fine to medium.		2.00	(1.75)	52.84								
No recovery.		3.00	(1.00)	51.84								
Brown slightly clayey fine to coarse SAND with occasional gravel. Gravel is subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		4.00	(1.00)	50.84								
Brown slightly clayey sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		5.00	(1.00)	49.84		4.00	4.00 - 5.00	ES	2			
Borehole complete at 5.00 m bgl.												

Remarks:
1. Engineer verified logged in general accordance with BS 5930:2015.
2. Dynamic sampled between 1.0 m and 5.0 m bgl.
3. Hole terminated in superficial gravel deposits.
4. Groundwater was encountered at 4.0 m bgl.
5. No visual or olfactory evidence of contamination was encountered.
6. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
11/07/2018		4.00 m				

Coordinates: E373613.60 N436321.29	Elevation (mAOD): 54.84	Drilled By: Earth Engineering	Plant Used: Global Geotech	Logged: RR	Checked: MB	Approved: RJS	Scale: 1:30
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Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey gravelly fine to coarse SAND. Gravel is subangular to subrounded fine to coarse of sandstone.		0.25	(0.25)	64.21			0.00 - 0.25	ES 1				
Soft to firm brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		2.00	(1.75)	62.46						1.00	SPT(S) N=5 (1,1/1,1,1,2)	
Stiff greyish brown slightly sandy gravelly CLAY with frequent cobbles. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of natural lithologies. Cobbles rounded of mudstone. At 3.0 m bgl: Becomes firm. At 4.7 m bgl: Becomes stiff. [DEVENSIAN TILL]		4.70	(2.70)	59.76			2.00 - 2.10	ES 2		2.00	SPT(S) N=17 (7,7/6,4,3,4)	
										3.00	SPT(S) N=11 (3,3/4,2,2,3)	
										4.00	SPT(S) N=14 (3,6/3,3,4,4)	
Borehole complete at 4.70 m bgl.										4.70	SPT(S) N=36 (7,6/7,8,10,11)	


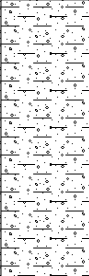
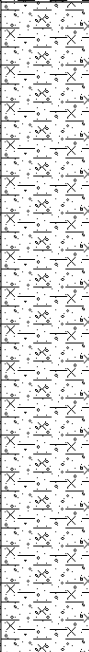
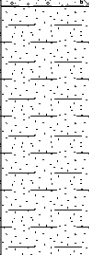
Remarks:
 1. Engineer verified logged in general accordance with BS 5930:2015.
 2. Dynamic sampled between 1.0 m and 4.7 m bgl.
 3. SPT taken from 4.7 to 5.15 m bgl.
 4. Hole terminated in superficial clay deposits.
 5. Groundwater was not encountered.
 6. No visual or olfactory evidence of contamination was encountered.
 7. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter

Dynamic Sampler Log

Date: **10/07/2018**



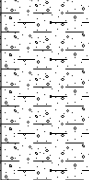

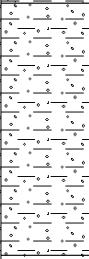

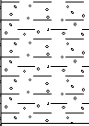

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to medium SAND with frequent rootlets.		0.30	(0.30)	67.47			0.00 - 0.30	ES	1			
Soft orangish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		1.40	(1.10)	66.37						1.00	SPT(S) N=4 (1,1/2,1,1,0)	
Firm brownish grey slightly silty sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		4.00	(2.60)	63.77		1.40	2.00 - 2.10	ES	2	2.00	SPT(S) N=13 (1,2/3,3,3,4)	
										3.00	SPT(S) N=14 (3,4/4,3,3,4)	
Medium dense to dense grey slightly clayey fine to coarse SAND. [DEVENSIAN TILL]		5.00	(1.00)	62.77						4.00	SPT(S) N=21 (3,3/3,4,6,8)	
Borehole complete at 5.00 m bgl.										5.00	SPT(S) N=48 (11,8/10,11,14,13)	

Remarks:
1. Engineer verified logged in general accordance with BS 5930:2015.
2. Dynamic sampled between 1.0 m and 5.0 m bgl.
3. SPT taken from 5.0 m to 5.45 m bgl.
4. Hole terminated in superficial sand deposits.
5. Groundwater was encountered at 1.4 m bgl.
6. No visual or olfactory evidence of contamination was encountered.
7. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
10/07/2018		1.40 m				

Coordinates: E373796.71 N436532.19	Elevation (mAOD): 67.77	Drilled By: Earth Engineering	Plant Used: Global Geotech	Logged: MB	Checked: RJS	Approved: RJS	Scale: 1:30
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Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey gravelly SAND. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of sandstone.		0.25	(0.25)	67.64			0.00 - 0.25	ES	1			
Soft to firm brownish grey slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		1.00	(0.75)	66.89						1.00	SPT(S) N=6 (2,0/1,1,1,3)	
Soft to firm brownish grey slightly gravelly CLAY with occasional cobbles. Gravel is subangular to subrounded fine to coarse of natural lithologies. Cobbles rounded of mudstone. [DEVENSIAN TILL]		2.00	(1.00)	65.89						2.00	SPT(S) N=37 (1,1/3,2,20,12)	
Stiff grey gravelly CLAY with frequent cobbles. Gravel is subangular to subrounded fine to coarse of natural lithologies. Cobbles rounded of mudstone and sandstone. [DEVENSIAN TILL]		2.50	(0.50)	65.39			2.20 - 2.50	ES	2			
Borehole complete at 2.50 m bgl.							2.40					

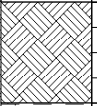
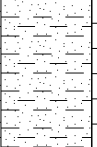
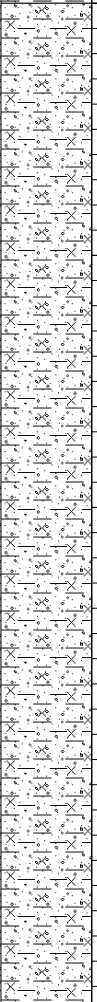
Remarks:
 1. Engineer verified logged in general accordance with BS 5930:2015.
 2. Dynamic sampled between 1.0 m and 2.5 m bgl.
 3. SPT taken from 2.0 m bgl.
 4. Hole terminated in superficial clay deposits.
 5. Groundwater was encountered at 2.4 m bgl.
 6. No visual or olfactory evidence of contamination was encountered.
 7. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
10/07/2018		2.40 m				

Dynamic Sampler Log

Date: **10/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to coarse SAND with frequent rootlets.		0.40	(0.40)	69.28			0.00 - 0.40	ES 1				
Firm dark brown slightly sandy CLAY. Sand is fine to coarse. [DEVENSIA TILL]		1.00	(0.60)	68.68		1.00						
Soft to firm dark brown slightly silty sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of natural lithologies. At 4.0 m bgl: Becomes stiff. Between 4.1 m bgl and 4.8 m bgl: Becomes soft. At 5.0 m bgl: Becomes very stiff. [DEVENSIA TILL]		5.00	(4.00)	64.68			2.50 - 2.60	ES 2				
Borehole complete at 5.00 m bgl.									5.00	SPT(S) 50 (4,10/50 for 40mm)		


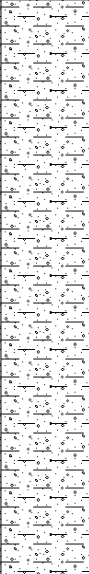
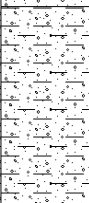
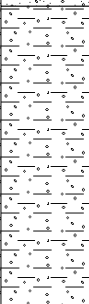
Remarks:
1. Engineer verified logged in general accordance with BS 5930:2015.
2. Dynamic sampled between 1.0 m and 5.0 m bgl.
3. SPT taken from 5.0m to 5.45m bgl.
4. Hole terminated in superficial clay deposits.
5. Groundwater was encountered at 1.0 m bgl.
6. No visual or olfactory evidence of contamination was encountered.
7. Backfilled with arisings.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
10/07/2018		1.00 m				

Dynamic Sampler Log

Date: **10/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to coarse SAND with frequent rootlets.		0.30	(0.30)	73.29			0.00 - 0.30	ES	1			
Firm greyish orangish brown slightly sandy gravelly CLAY with occasional laminations. Sand is fine to coarse. At 2.0 m bgl: Becomes soft. [DEVENSIAN TILL]		2.60	(2.30)	70.99			1.30 - 1.40	ES	2	1.00	SPT(S) N=11 (2,2/3,2,3,3)	
Firm brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to medium of sandstone. [DEVENSIAN TILL]		3.40	(0.80)	70.19			2.70 - 2.80	ES	3	2.00	SPT(S) N=6 (1,1/2,1,1,2)	
Firm to stiff grey slightly gravelly CLAY with thin (0. 1m) bands of coarse gravelly sand. Gravel is subrounded fine to coarse of natural lithologies. At 4.4 m bgl: becomes gravelly with frequent cobbles. Gravel and cobbles are subangular to subrounded fine to coarse of sandstone. [DEVENSIAN TILL]		4.60	(1.20)	68.99			3.50 - 3.60	ES	4	3.00	SPT(S) N=9 (0,1/2,2,2,3)	
Borehole complete at 4.60 m bgl.										4.00	SPT(S) N=21 (4,3/3,4,7,7)	
										4.60	SPT(S) 50 (25 for 10mm/50 for 70mm)	

Remarks:
1. Engineer verified logged in general accordance with BS 5930:2015.
2. Dynamic sampled between 1.0 m and 4.6 m bgl.
3. SPT taken from 4.6 m to 5.05 m bgl.
4. Hole terminated in superficial clay deposits.
5. Groundwater was encountered at 2.4 m bgl.
6. No visual or olfactory evidence of contamination was encountered.
7. Backfilled with arisings.


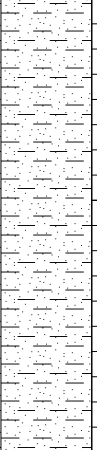

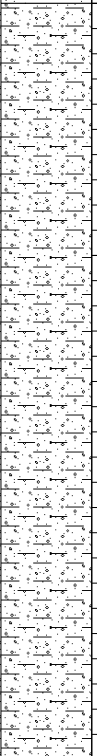
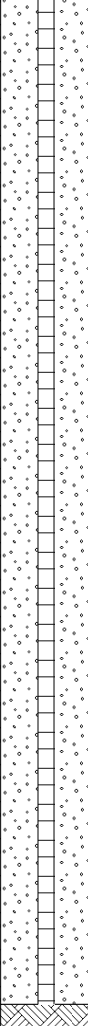
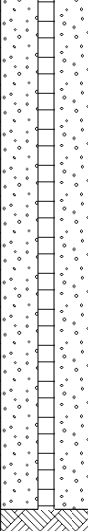
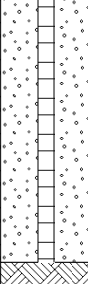

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
10/07/2018		2.40 m				

Coordinates: E373871.84 N436543.12	Elevation (mAOD): 73.59	Drilled By: Earth Engineering	Plant Used: Archway Dart	Logged: MB	Checked: RJS	Approved: RJS	Scale: 1:30
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Dynamic Sampler Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details			Test Details		Backfill
							Depth (m)	Type	Ref	Depth (m)	Results	
TOPSOIL: Brown slightly clayey fine to coarse SAND with frequent rootlets.		0.20	(0.20)	69.48			0.00 - 0.20	ES	1			
Firm to stiff orangish brown slightly sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]			(1.80)				0.20 - 0.40	ES	2	1.20	SPT(S) N=18 (4,5/4,5,5,4)	
Firm brownish grey slightly sandy gravelly CLAY with occasional mudstone cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		2.00		67.68		2.40 ▼				2.00	SPT(S) N=15 (2,2/3,2,4,6)	
			(3.00)							3.00	SPT(S) N=13 (2,3/3,3,3,4)	
										4.00	SPT(S) N=13 (2,2/3,3,3,4)	
Borehole complete at 5.00 m bgl.		5.00		64.68						5.00	SPT(S) N=18 (3,3/4,4,5,5)	

Remarks:
 1. Engineer verified logged in general accordance with BS 5930:2015.
 2. Dynamic sampled between 2.4 m and 5.0 m bgl.
 3. SPT taken from 5.0 m to 5.45 m bgl.
 4. Hole terminated in superficial clay deposits.
 5. Groundwater was encountered at 2.4 m bgl.
 6. No visual or olfactory evidence of contamination was encountered.
 7. Backfilled with arisings.

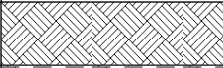
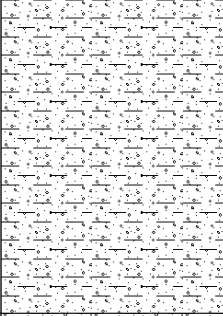
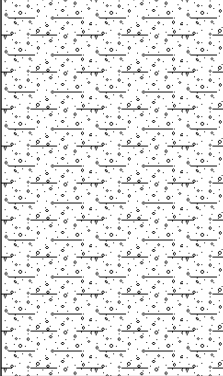
Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration	Depth Water	Depth Base	Diameter
11/07/2018		2.40 m				

Coordinates: E373887.97 N436405.45	Elevation (mAOD): 69.68	Drilled By: Earth Engineering	Plant Used: Archway Dart	Logged: MB	Checked: RJS	Approved: RJS	Scale: 1:30
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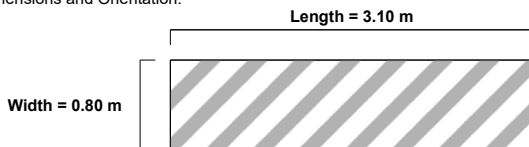
Trial Pit Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown slightly clayey fine to medium sand.		0.25	53.46					
Soft brown slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		1.50	52.20					
Dark brown slightly clayey sandy subrounded to subangular fine to coarse GRAVEL of mudstone and other natural lithologies. Frequent cobbles. [DEVENSIAN TILL]		3.00	50.70	3.00	3.00	B 1		
Trial pit complete at 3.00 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance with BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater encountered at 3.0 m during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.0 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373592.00 N436237.00

Elevation (mAOD):
53.70

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
RR

Checked:
MB

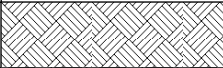
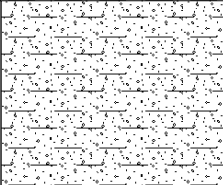
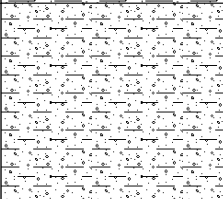
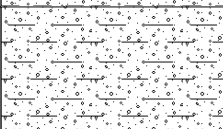
Approved:
RJS

Scale:
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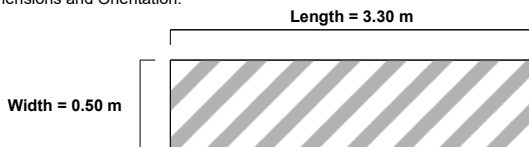
Trial Pit Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown slightly clayey fine to medium sand.		0.26	53.54		0.26 - 1.00	B 1		
Brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		1.00	52.80					
Brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse of natural lithologies. [DEVENSIAN TILL]		1.80	52.00					
Brown slightly clayey sandy subrounded fine to coarse GRAVEL of natural lithologies. Very frequent cobbles. [DEVENSIAN TILL]		2.30	51.50					
Trial pit complete at 2.30 m bgl.					2.30	B 2		

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance with BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 2.3 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373623.00 N436222.00

Elevation (mAOD):
53.80

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
RR

Checked:
MB

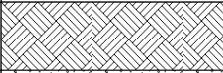
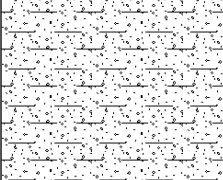
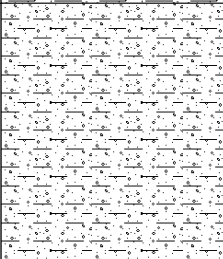
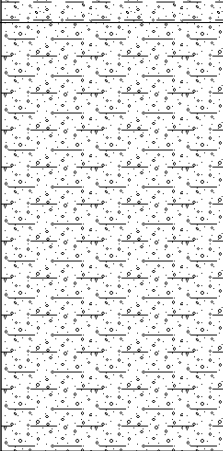
Approved:
RJS

Scale:
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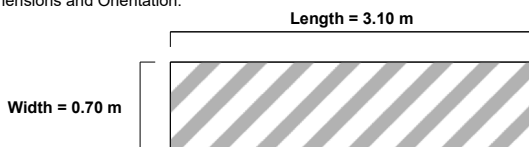
Trial Pit Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown slightly clayey slightly gravelly fine to medium sand. Gravel is subrounded fine to coarse of natural lithologies.		0.27	53.98					
Orangish brown slightly clayey gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of natural lithologies. Frequent cobbles. [DEVENSIAN TILL]		1.00	53.25					
Soft to firm dark brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is subrounded fine to coarse of mudstone and other natural lithologies. [DEVENSIAN TILL]		2.10	52.15			2.00 - 3.00	B 1	2.00 HV=101 kPa
Dark brown slightly clayey sandy subrounded to subangular fine to coarse GRAVEL of mudstone and other natural lithologies. Very frequent cobbles. [DEVENSIAN TILL]		3.80	50.45					
Trial pit complete at 3.80 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area cleared for services prior to excavations. 3. Groundwater was not encountered during excavation. 4. No visual or olfactory evidence of contamination was encountered. 5. Hole terminated at 3.8 m due to instability. 6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373599.16 N436279.98

Elevation (mAOD):
54.25

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
RR

Checked:
MB

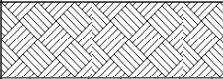
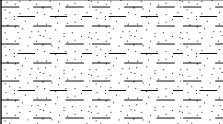
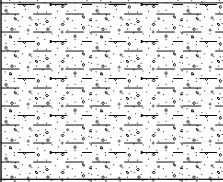
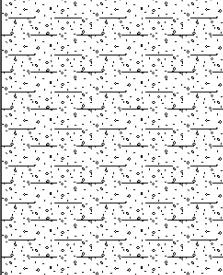
Approved:
RJS

Scale:
1:30

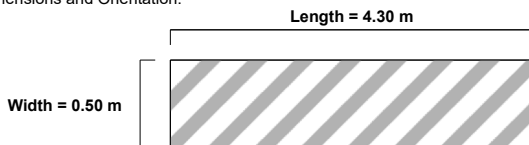
Trial Pit Log

Date: **12/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown sandy clay. Sand is fine to coarse.		0.30	54.49					
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		0.80	53.99					
Orangish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mudstone and other natural lithologies. [DEVENSIAN TILL]		1.50	53.29					
Orangish brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subrounded to subangular fine to coarse of natural lithologies. [DEVENSIAN TILL]		2.60	52.19	2.60		2.60 - 3.60	B 1	
Trial pit complete at 2.60 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 2.6 m during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 2.6 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373625.60 N436269.42

Elevation (mAOD):
54.79

Excavated By:
Clive Hurt Limited

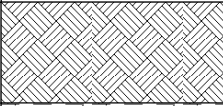
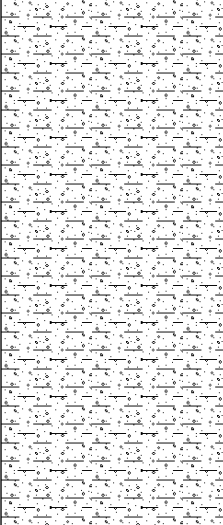
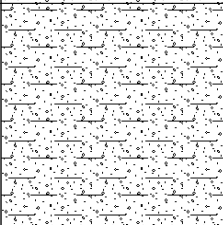
Plant Used:
JCB 3CX

Logged:
RR

Checked:
MB

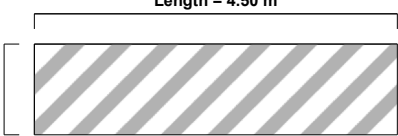
Approved:
RJS

Scale:
1:30

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey fine to coarse sand.		0.40	55.58					
Soft to firm orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mudstone, shale and other natural lithologies. [DEVENSIAN TILL]		2.50	53.48		1.00 - 2.50	B 1		
Orangish brown very clayey slightly gravelly fine to coarse SAND. Gravel is subrounded to subangular fine to coarse of mudstone, shale and other natural lithologies. [DEVENSIAN TILL]		3.40	52.58		3.00 - 3.40	B 2		
Trial pit complete at 3.40 m bgl.								

Dimensions and Orientation:

Length = 4.50 m



Width = 0.70 m

Orientation:

Inclination:

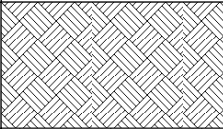
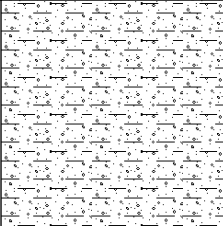
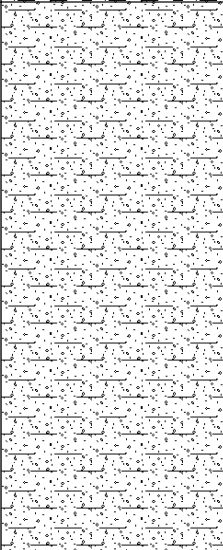
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.4 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

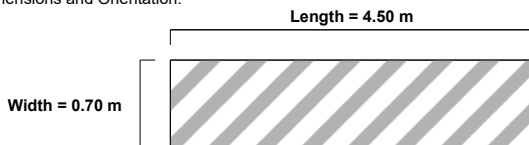
Trial Pit Log

Date: **12/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey fine to coarse sand.		0.50	55.07					
Firm orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mudstone and other natural lithologies. [DEVENSIAN TILL]		1.40	54.17					
Orangish brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subrounded fine coarse of mudstone and other natural lithologies. Occasional pockets of orange and black fine to medium sand. [DEVENSIAN TILL]					2.00 - 2.10	B 1		
Trial pit complete at 3.60 m bgl.		3.60	51.97					

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.6 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373678.54 N436214.60

Elevation (mAOD):
55.57

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
MB

Checked:
RR

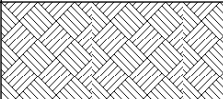
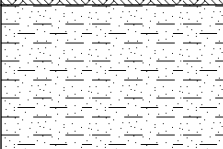
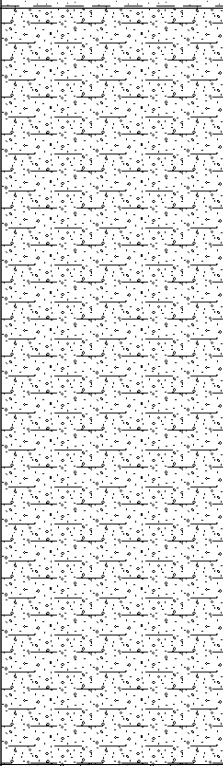

Approved:
RJS

Scale:
1:30

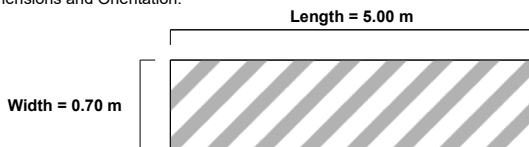
Trial Pit Log

Date: **12/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey fine to coarse sand.		0.40	55.12					
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		1.00	54.52					
Orangish brown clayey gravelly fine to coarse SAND. Gravel is subrounded to subangular fine to coarse of natural lithologies. [DEVENSIAN TILL]		4.00	51.52	4.00	1.00 - 4.00	B 1		
Brown sandy subrounded fine to coarse GRAVEL of natural lithologies. Sand is fine to coarse. [DEVENSIAN TILL] Trial pit complete at 4.10 m bgl.		4.10	51.42					

Dimensions and Orientation:



Orientation:

Inclination:

- Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015.
 2. Area cleared for services prior to excavations.
 3. Groundwater was encountered at 4.0 m during excavation.
 4. No visual or olfactory evidence of contamination was encountered.
 5. Hole terminated at 4.1 m due to instability.
 6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373660.03 N436243.40

Elevation (mAOD):
55.52

Excavated By:
Clive Hurt Limited

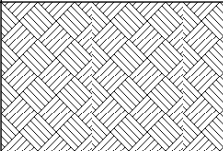
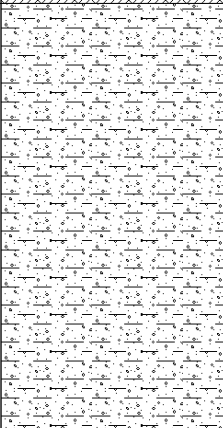
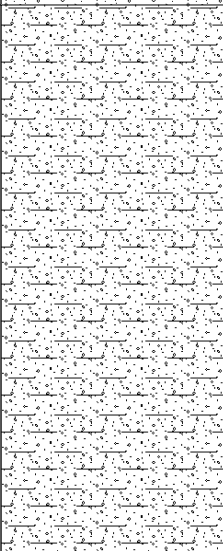
Plant Used:
JCB 3CX

Logged:
MB

Checked:
RR

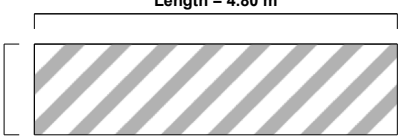
Approved:
RJS

Scale:
1:30

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey fine to coarse sand.		0.60	57.34					
Orangish brown clayey silty fine to coarse SAND. [DEVENSIAN TILL]		2.30	55.64			1.20 - 1.30	B 1	
						1.50 - 2.30	B 2	
Orangish brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mudstone and other natural lithologies. [DEVENSIAN TILL]		4.50	53.44			3.30 - 3.40	B 3	
Trial pit complete at 4.50 m bgl.								

Dimensions and Orientation:

Length = 4.80 m



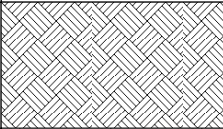
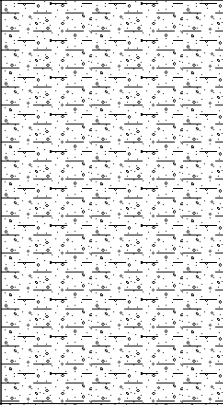
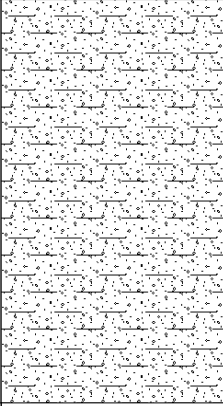
Width = 0.70 m

Orientation:

Inclination:

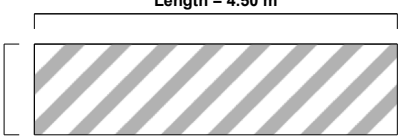
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 4.5 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey fine to coarse sand.		0.50	54.90		0.50 - 2.00	B 1		
Orangish brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mudstone, shale and other natural lithologies. [DEVENSIAN TILL]		2.10	53.30					
Brown clayey gravelly fine to coarse SAND. Gravel is subrounded to subangular fine to coarse of mudstone, shale and other natural lithologies. [DEVENSIAN TILL]		3.70	51.70		3.50 - 3.70	B 2		
Trial pit complete at 3.70 m bgl.								

Dimensions and Orientation:

Length = 4.50 m



Width = 0.70 m

Orientation:

Inclination:

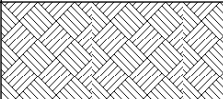
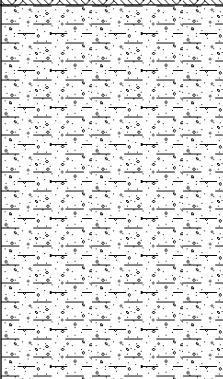
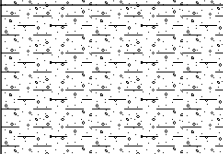
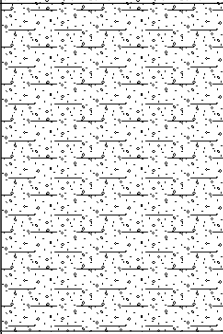
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.7 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

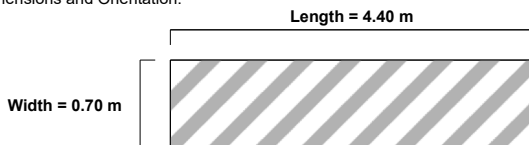
Trial Pit Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown clayey fine to coarse sand.		0.40	57.33					
Firm orange and grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mudstone and other natural lithologies. [DEVENSIA TILL]		1.90	55.83	1.90	1.00 - 1.90	B 1		
Soft orangish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mudstone, shale and other natural lithologies. [DEVENSIA TILL]		2.50	55.23		2.00 - 2.50	B 2		
Brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse of mudstone and other natural lithologies. [DEVENSIA TILL]		3.80	53.93		2.50 - 3.80	B 3		
Trial pit complete at 3.80 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.9 during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.8 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates: **E373703.11 N436290.52**

Elevation (mAOD): **57.73**

Excavated By: **Clive Hurt Limited**

Plant Used: **JCB 3CX**

Logged: **MB**

Checked: **RR**

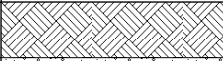
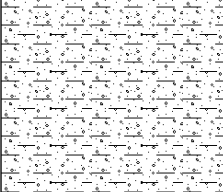
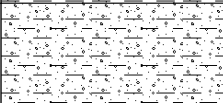
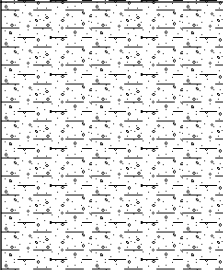
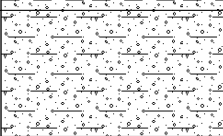
Approved: **RJS**

Scale: **1:30**

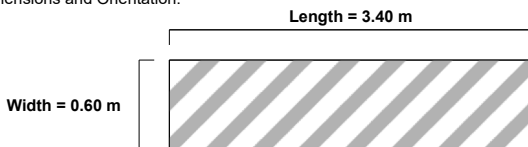
Trial Pit Log

Date: **11/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown slightly clayey fine to medium sand.		0.22	54.80		1.00 - 1.40	B 1		
Light brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of natural lithologies. Frequent cobbles. [DEVENSIAN TILL]		1.00	54.02					
Soft to firm brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded fine to coarse of mudstone and other natural lithologies. [DEVENSIAN TILL]		1.40	53.62					
Soft to firm dark brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of mudstone and other natural lithologies. [DEVENSIAN TILL]		2.50	52.52					
Dark brown slightly clayey sandy subrounded to subangular fine to coarse GRAVEL of mudstone and other natural lithologies. [DEVENSIAN TILL]		3.00	52.02					
Trial pit complete at 3.00 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.0 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373612.75 N436342.00

Elevation (mAOD):
55.02

Excavated By:
Clive Hurt Limited

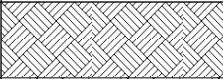

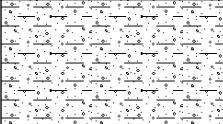
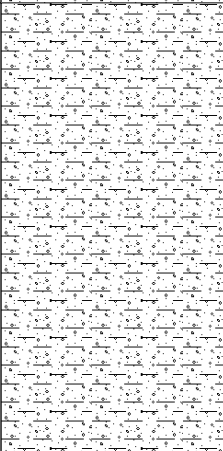
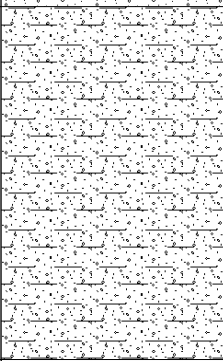
Plant Used:
JCB 3CX

Logged:
RR

Checked:
MB

Approved:
RJS


Scale:
1:30

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey fine to coarse SAND.		0.30	55.84		1.50 - 2.50	B 1		
Orangish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded mudstone, shale and sandstone. Occasional coal gravel. [DEVENSIAN TILL]		0.80	55.34					
Brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subrounded to subangular sandstone and mudstone. [DEVENSIAN TILL]		2.60	53.54					
Orangish brown slightly clayey gravelly fine to coarse SAND. Gravel is fine to coarse subangular to subrounded shale and mudstone. [DEVENSIAN TILL]		4.00	52.14					
Trial pit complete at 4.00 m bgl.								

Dimensions and Orientation:

Length = 4.50 m

Width = 0.70 m



Orientation:

Inclination:

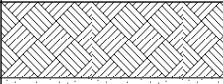
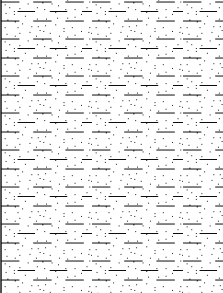
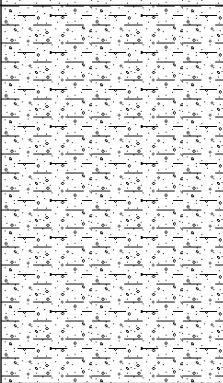
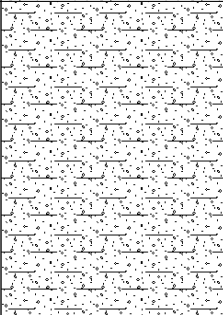
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.2 m bgl during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 4.0 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Trial Pit Log

Date: **12/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey fine to coarse SAND.		0.30	57.79	1.50	0.80 - 0.90	B 1		
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		1.50	56.59					
Greyish orangish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone, shale and mudstone. Frequent sandstone cobbles. [DEVENSIAN TILL]		3.00	55.09					
Orangish brown clayey slightly gravelly fine to coarse SAND. Gravel is fine to coarse subrounded to subangular of sandstone and mudstone. [DEVENSIAN TILL]		4.30	53.79					
Trial pit complete at 4.30 m bgl.								

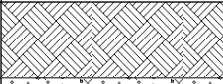
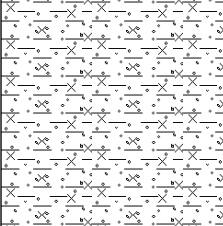
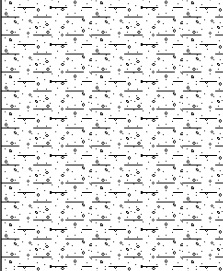


Orientation:

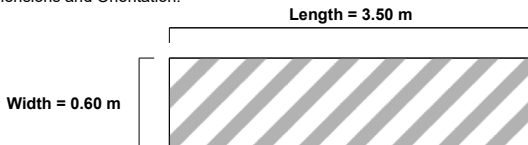
Inclination:

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.5 m during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 4.3 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.'

Trial Pit Log

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grey brown slightly silty clayey fine to medium SAND with numerous rootlets and rare gravel of subrounded quartzite.		0.30	69.26					
Stiff orange brown slightly gravelly silty CLAY with occasional orange fine to medium sand partings. Gravel is fine to medium subangular to subrounded quartzite and sandstone. Rare cobbles of sandstone. [DEVANSIAN TILL]					0.70	B 1		
<i>At 1.2 m: Becomes firm and dark grey.</i>							1.30	HV=62 kPa
		1.60	67.96				1.50	HV=60 kPa
Dark grey slightly sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse sandstone and siltstone. Occasional subrounded cobbles of sandstone. [DEVANSIAN TILL]								
		2.75	66.81					
Trial pit complete at 2.75 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 2.75 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373894.46 N436412.43

Elevation (mAOD):
69.56

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
RR

Checked:
MB


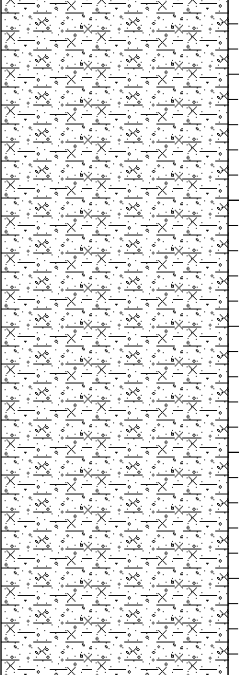
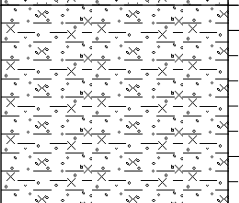
Approved:
RJS

Scale:
1:30

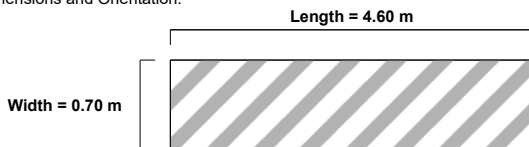
Trial Pit Log

Date: **12/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over sandy CLAY.		0.20	66.79					
Firm greyish brown slightly silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded mudstone and sandstone. [DEVENSIAN TILL]		2.90	64.09	1.60	2.00 - 2.90	B 1	2.50	HV=49 kPa
Soft to firm grey slightly silty gravelly CLAY. Gravel is fine to coarse subrounded mudstone and sandstone. Occasional rounded mudstone cobbles and boulders. [DEVENSIAN TILL]		3.70	63.29		3.00 - 3.70	B 2	3.50	HV=52 kPa
Trial pit complete at 3.70 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.6 m during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.7 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates: **E373844.21 N436424.98**

Elevation (mAOD): **66.99**

Excavated By: **Clive Hurt Limited**

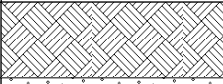
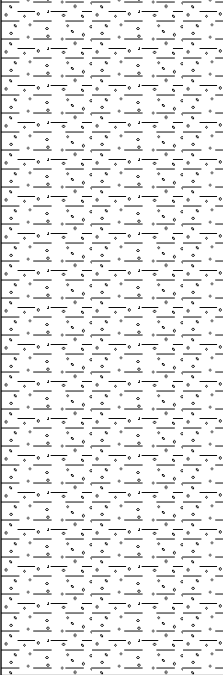
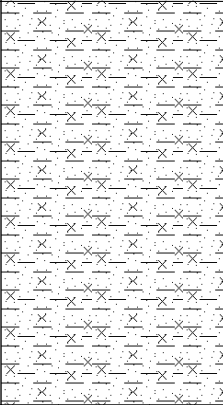
Plant Used: **JCB 3CX**

Logged: **MB**

Checked: **RR**

Approved: **RJS**

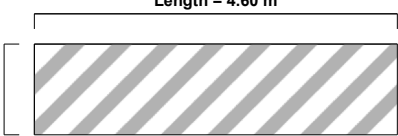
Scale: **1:30**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is fine to medium subangular to subrounded sandstone.		0.30	64.87					
Firm orangish brown slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. [DEVENSIAN TILL]				2.00			2.00	HV=50 kPa
		3.00	62.17					
Soft to firm grey slightly silty slightly sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]							4.50	HV=47 kPa
		4.60	60.57					
Trial pit complete at 4.60 m bgl.								

Dimensions and Orientation:

Length = 4.60 m

Width = 0.70 m



Orientation:

Inclination:

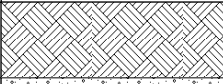
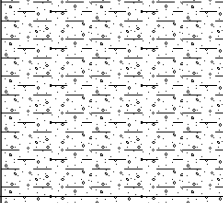
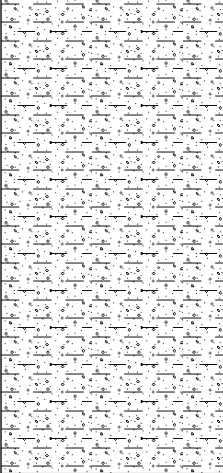
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 2.0 m bgl during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 4.6 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

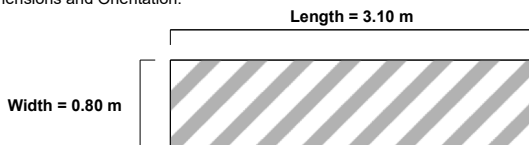
Trial Pit Log

Date: **12/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown sandy CLAY. Sand is fine to coarse.		0.30	66.06					
Brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. [DEVENSIAN TILL]		1.10	65.26					
Firm to stiff brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subrounded sandstone and mudstone. Frequent cobbles and boulders. [DEVENSIAN TILL]					1.80	B 1	1.80	HV=107 kPa
Trial pit complete at 3.00 m bgl.		3.00	63.36	3.00	3.00	B 2		

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater encountered at 3.0 m during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.0 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373859.57 N436445.11

Elevation (mAOD):
66.36

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
MB

Checked:
RR

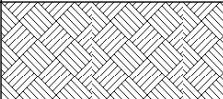
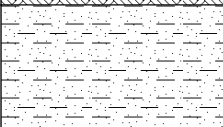
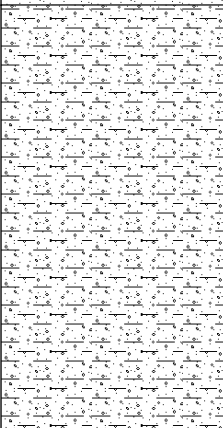
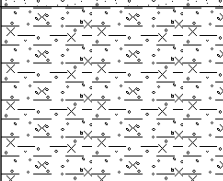
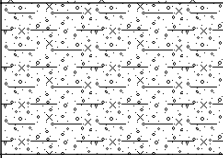
Approved:
RJS

Scale:
1:30

Trial Pit Log

Date: **12/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown sandy CLAY. Sand is fine to coarse.		0.40	69.30					
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		0.90	68.80					
Soft dark brown slightly silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded sandstone and mudstone. [DEVENSIAN TILL]		2.60	67.10		1.90	B 1		
Firm to stiff grey slightly silty gravelly CLAY. Gravel is fine to coarse subangular sandstone and mudstone. [DEVENSIAN TILL]		3.30	66.40	3.30	3.30 - 3.90	B 2	2.60	HV=96 kPa
Brown slightly silty slightly sandy clayey GRAVEL. Gravel is fine to coarse subrounded sandstone and mudstone. [DEVENSIAN TILL]		3.90	65.80					
Trial pit complete at 3.90 m bgl.								



Orientation:

Inclination:

- Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015.
 2. Area cleared for services prior to excavations.
 3. Groundwater was encountered at 3.3 m during excavation.
 4. No visual or olfactory evidence of contamination was encountered.
 5. Hole terminated at 3.9 m due to instability.
 6. Hole backfilled with arisings in reverse order of excavation.

Coordinates: **E373896.76 N436438.62**

Elevation (mAOD): **69.70**

Excavated By: **Clive Hurt Limited**

Plant Used: **JCB 3CX**

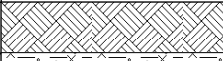
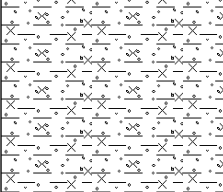
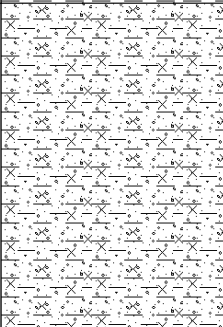
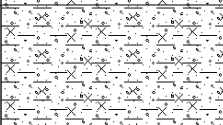

Logged: **MB**

Checked: **RR**

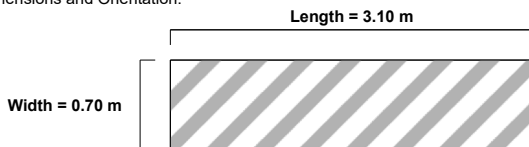
Approved: **RJS**

Scale: **1:30**

Trial Pit Log

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grey brown slightly gravelly silty sandy CLAY with numerous fine rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine quartzite and sandstone.		0.20	68.14					
Stiff orange brown and grey slightly gravelly slightly sandy silty CLAY. Sand is fine. Gravel is fine to medium subrounded to rounded shale. [DEVENSIAN TILL]		1.00	67.34					
Firm to stiff orange brown and grey clayey slightly sandy slightly gravelly SILT with occasional orange fine to medium sand partings. Sand is fine. Gravel is fine to medium subangular to subrounded sandstone and quartzite. Rare rounded quartzite cobbles. [DEVENSIAN TILL]		2.30	66.04		1.40	B 1		
Stiff to very stiff grey brown slightly gravelly slightly sandy very silty CLAY. Sand is fine. Gravel is fine to coarse subangular to subrounded sandstone. Rare orange fine to medium sand partings and bands of grey silt. [DEVENSIAN TILL]		2.80	65.54		2.35	B 2		
Wet orange and greyish brown clayey gravelly fine to coarse SAND. Gravel is subangular to rounded quartzite and sandstone. [DEVENSIAN TILL]		3.00	65.34		2.90	B 3		
Trial pit complete at 3.00 m bgl.								

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.0 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373818.47 N436507.47

Elevation (mAOD):
68.34

Excavated By:
Clive Hurt Limited

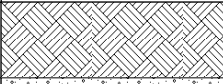
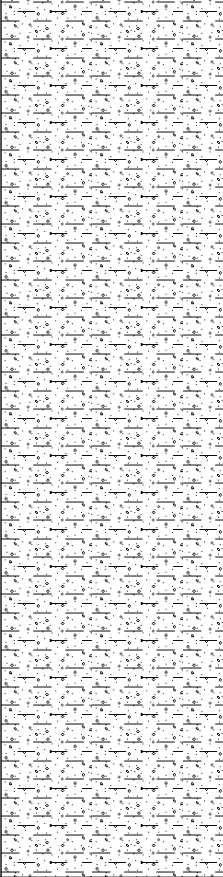
Plant Used:
JCB 3CX

Logged:
RR

Checked:
MB

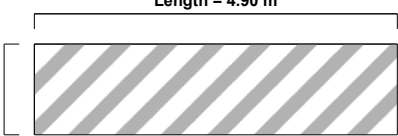
Approved:
RJS

Scale:
1:30

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown sandy CLAY. Sand is fine to coarse.		0.30	64.16					
Soft to firm orangish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of natural lithologies. [DEVENSIAN TILL]		3.80	60.66	1.80 ▼	3.00 - 3.80	B		
Trial pit complete at 3.80 m bgl.								

Dimensions and Orientation:

Length = 4.90 m



Width = 0.70 m

Orientation:

Inclination:

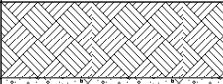
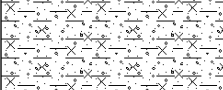
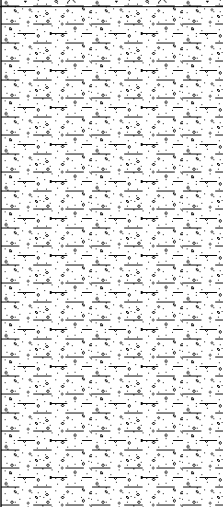
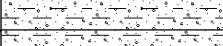

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.8 m bgl during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.8 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Trial Pit Log

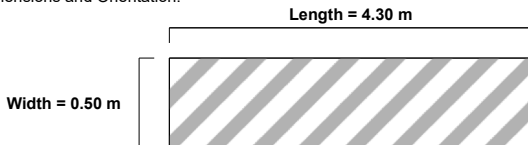
Date: **10/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grey brown slightly gravelly silty sandy CLAY with numerous fine rootlets. Sand is fine to medium. Gravel is subangular to subrounded fine quartzite and sandstone. [DEVENSIAN TILL]		0.30	72.05					
Firm to stiff orange brown slightly sandy slightly gravelly to gravelly silty CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse sandstone, siltstone and quartzite. [DEVENSIAN TILL]		0.70	71.65					
Stiff greyish brown and brown slightly sandy slightly gravelly silty CLAY with occasional orange brown fine to medium sand partings. Sand is fine. Gravel is angular to subrounded fine to coarse sandstone. [DEVENSIAN TILL]					1.30	B 1		
Between 2.7 m and 2.8 m: Band of wet grey brown clayey fine to coarse SAND.		2.80	69.55					
Stiff grey brown slightly sandy slightly gravelly silty CLAY with occasional orange brown fine to medium sand partings. Sand is fine. Gravel is angular to subrounded fine to coarse sandstone. [DEVENSIAN TILL]		2.90	69.45					
Trial pit complete at 2.90 m bgl.								

2.60

Dimensions and Orientation:



Orientation:

Inclination:

- Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015.
 2. Area cleared for services prior to excavations.
 3. Groundwater was encountered at 2.6 m during excavation.
 4. No visual or olfactory evidence of contamination was encountered.
 5. Hole terminated at 2.9 m due to instability of pit.
 6. Hole backfilled with arisings in reverse order of excavation.

Coordinates: **E373866.30 N436522.54**

Elevation (mAOD): **72.35**

Excavated By: **Clive Hurt Limited**

Plant Used: **JCB 3CX**

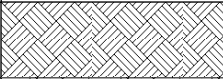
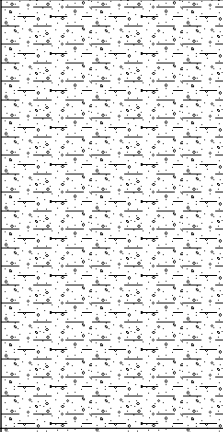
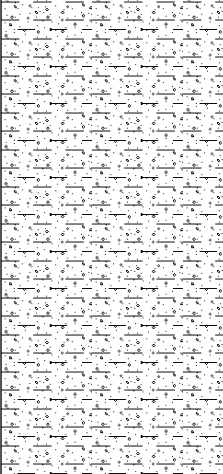
Logged: **RR**

Checked: **MB**

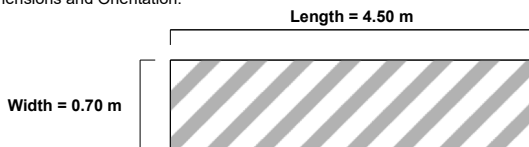
Approved: **RJS**

Scale: **1:30**

Trial Pit Log

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown sandy CLAY. Sand is fine to coarse.		0.30	66.39		0.30 - 0.60	B		
Firm orangish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of natural lithologies. [DEVENSIAN TILL]		2.00	64.69	1.20				
Soft to firm brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of natural lithologies. [DEVENSIAN TILL]		3.90	62.79					
Trial pit complete at 3.90 m bgl.					3.90	B		

Dimensions and Orientation:



Orientation:

Inclination:

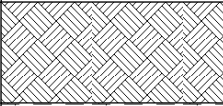

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.2 m bgl during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.9 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

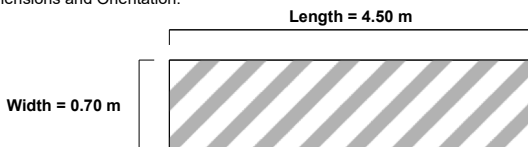
Trial Pit Log

Date: **09/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey SAND. Sand is fine to coarse. <i>At 0.2 m: Becomes orangish brown.</i>		0.40	71.40					
Firm to stiff brownish grey slightly silty slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded mudstone and sandstone. [DEVENSIAN TILL]					1.20 - 1.30	B 1	1.20	HV=128 kPa
							1.70	HV=75 kPa
					2.20 - 2.30	B 2	2.20	HV=96 kPa
				3.10				
Trial pit complete at 3.60 m bgl.		3.60	68.20					

Dimensions and Orientation:



Orientation:

Inclination:

- Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015.
 2. Area cleared for services prior to excavations.
 3. Groundwater was encountered at 3.1 m bgl during excavation.
 4. No visual or olfactory evidence of contamination was encountered.
 5. Hole terminated at 3.6 m due to instability.
 6. Hole backfilled with arisings in reverse order of excavation.

Coordinates: **E373833.35 N436598.33**

Elevation (mAOD): **71.81**

Excavated By: **Clive Hurt Limited**

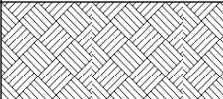
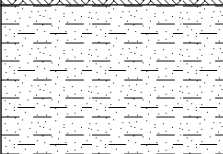
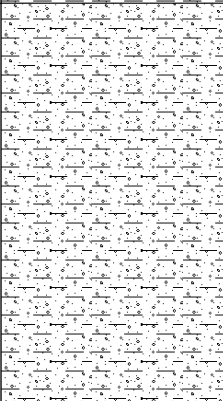
Plant Used: **JCB 3CX**

Logged: **MB**

Checked: **RR**

Approved: **RJS**

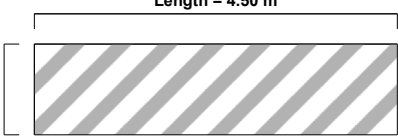
Scale: **1:30**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey SAND. Sand is fine to coarse. <i>At 0.3 m: Becomes orangish brown.</i>		0.40	69.17					
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		1.00	68.57					
Greyish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded mudstone and sandstone. Frequent cobbles throughout. [DEVENSIAN TILL] <i>Between 1.3 m and 1.4 m: Band of fine to medium brown SAND.</i>		2.60	66.97	1.30		1.00 - 2.60	B 1	
Trial pit complete at 2.60 m bgl.								

Dimensions and Orientation:

Length = 4.50 m

Width = 0.70 m


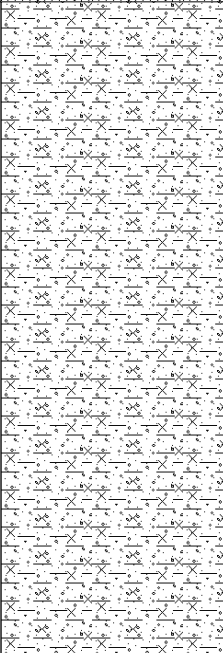
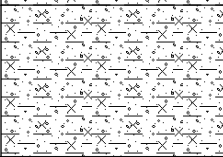


Orientation:

Inclination:

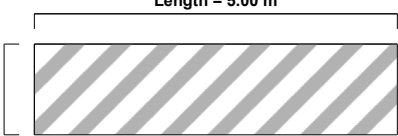
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.3 m during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 2.6 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey SAND. Sand is fine to coarse.		0.30	69.95					
Firm orange brown becoming dark grey silty sandy very gravelly CLAY with several subangular to rounded cobbles of sandstone and quartzite. Sand is fine to medium. Gravel is angular to subrounded fine to coarse siltstone, mudstone, sandstone and quartzite. [DEVENSIAN TILL]		2.90	67.35		2.00	B 1	2.50	HV=67 kPa
Wet very stiff dark grey silty very sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to rounded fine to coarse of natural lithologies. Occasional cobbles of subangular to rounded sandstone and quartzite. [DEVENSIAN TILL]		3.50	66.75		3.40	B 2		
Trial pit complete at 3.50 m bgl.								

Dimensions and Orientation:

Length = 5.00 m



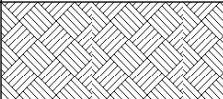

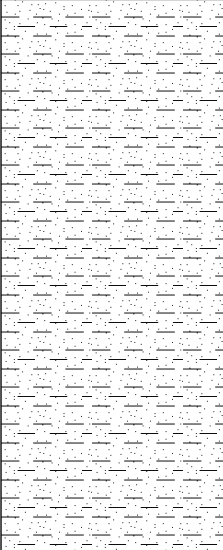
Width = 0.70 m

Orientation:

Inclination:

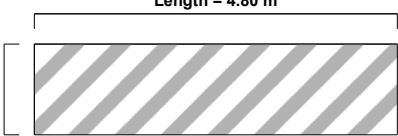
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.5 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey SAND. Sand is fine to coarse.		0.40	67.68					
Orange sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		0.70	67.38					
Firm brown slightly sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]							0.80	HV=48 kPa
At 2.0 m: Soft.				2.00	2.00 - 2.50	B 1	2.00	HV=17 kPa
Trial pit complete at 2.90 m bgl.		2.90	65.18					

Dimensions and Orientation:

Length = 4.80 m



Width = 0.70 m

Orientation:

Inclination:

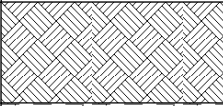
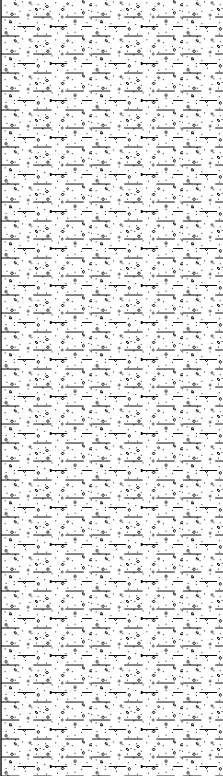
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 2.0 m during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 2.9 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Trial Pit Log

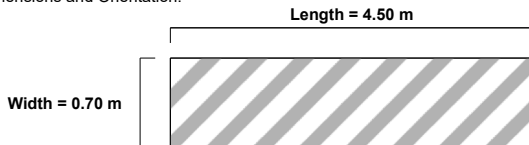
Date: **09/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey SAND. Sand is fine to coarse.		0.40	71.88					
Stiff brownish grey slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse subrounded sandstone and mudstone. [DEVENSIAN TILL]					0.60 - 0.70	B 1	0.60	HV=7140 kPa
							1.50	HV=102 kPa
Between 3.5 m and 3.6 m: Becomes wet and recovered as clayey sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded mudstone, shale and sandstone. [DEVENSIAN TILL]		3.60	68.68					

Trial pit complete at 3.60 m bgl.

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 1.2 m bgl during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.6 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Coordinates: **E373832.66 N436627.13**

Elevation (mAOD): **72.28**

Excavated By: **Clive Hurt Limited**

Plant Used: **JCB 3CX**


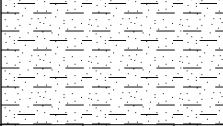
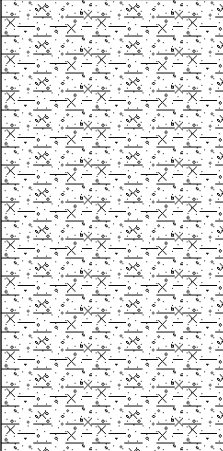
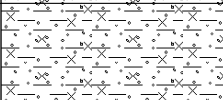
Logged: **MB**

Checked: **RR**

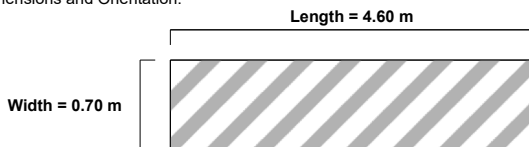
Approved: **RJS**

Scale: **1:30**

Trial Pit Log

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown sandy CLAY. Sand is fine to coarse.		0.20	70.93					
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		0.70	70.43					
Firm to stiff brown slightly silty sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of natural lithologies. [DEVENSIAN TILL]		2.50	68.63		1.90	B	1.90 1.90 1.90	HV=103 kPa HV=86 kPa HV=89 kPa
Firm grey slightly silty gravelly CLAY. Gravel is subrounded fine to coarse of natural lithologies. Frequent subrounded to rounded cobbles and boulders of mudstone. [DEVENSIAN TILL]		2.90	68.23		2.50 - 2.90	B		
Trial pit complete at 2.90 m bgl.								

Dimensions and Orientation:


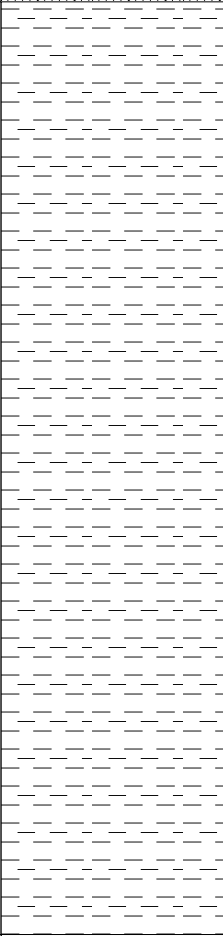


Orientation:


Inclination:

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered bgl during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 2.9 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey SAND. Sand is fine to coarse.		0.30	69.35					
Very stiff grey mottled light grey gravelly CLAY. Gravel is subrounded fine to coarse sandstone and mudstone. [DEVENSIAN TILL]					0.70 - 0.80	B 1		
At 2.0 m: Occasional lenses of fine to medium sand.				2.00				
Trial pit complete at 4.00 m bgl.		4.00	65.65					

Dimensions and Orientation:



Orientation: _____

Inclination: _____

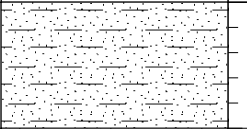
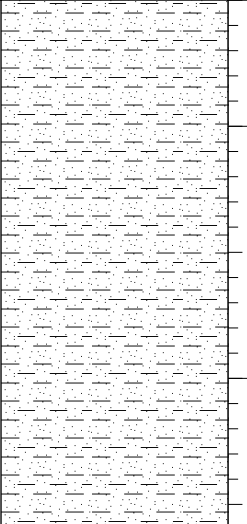
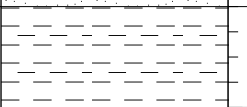
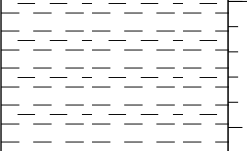
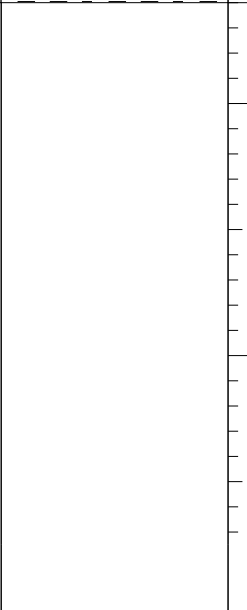
Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was encountered at 2.0 m bgl during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 4.0 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

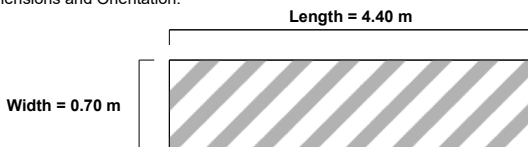
Trial Pit Log

Date: **09/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown clayey SAND. <i>At 0.3 m: Becomes orangish brown.</i>		0.50	74.74				0.50	HV=75 kPa
Firm brown slightly sandy CLAY. Sand is fine to medium. [DEVENSIA TILL]		2.60	72.64				2.60	HV=97 kPa
Stiff dark grey CLAY with occasional fine partings of sand. DEVENSIA TILL]							3.00 - 3.10	
<i>At 3.0 m: Firm.</i>						B 1	3.00	HV=72 kPa
Trial pit complete at 3.60 m bgl.		3.60	71.64				3.60	HV=60 kPa

Dimensions and Orientation:



Orientation:

Inclination:

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area cleared for services prior to excavations. 3. Groundwater was not encountered during excavation. 4. No visual or olfactory evidence of contamination was encountered. 5. Hole terminated at 3.6 m due to instability. 6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:
E373881.46 N436593.54

Elevation (mAOD):
75.24

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
MB

Checked:
RR

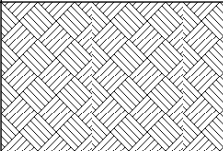
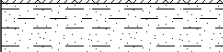
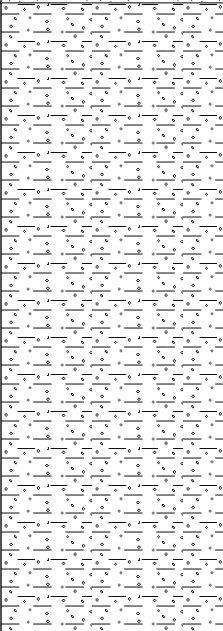
Approved:
RJS

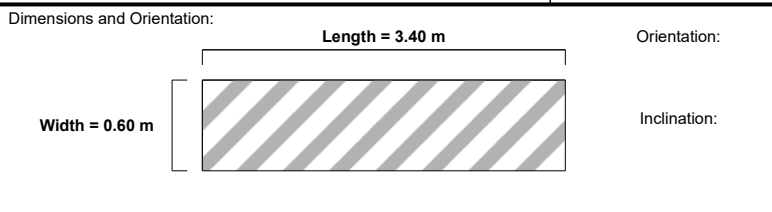
Scale:
1:30

Trial Pit Log

Date: **09/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown slightly clayey fine to medium SAND.		0.60	79.66					
Orange slightly sandy CLAY. Sand is fine to medium. [DEVENSIA TILL]		0.80	79.46					
Grey clayey very silty very sandy subangular to rounded fine to coarse GRAVEL of sandstone and mudstone with frequent thin bands of soft clay. [DEVENSIA TILL]					1.10 - 1.20	B 1	1.00	HV=30 kPa
				2.60	2.50 - 2.60	B 2	2.60	HV=25 kPa
Trial pit complete at 3.30 m bgl.		3.30	76.96					

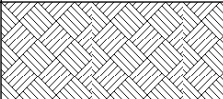
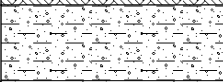
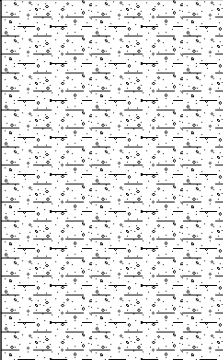
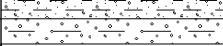


Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area cleared for services prior to excavations. 3. Groundwater was encountered at 2.6 m bgl during excavation. 4. No visual or olfactory evidence of contamination was encountered. 5. Hole terminated at 3.3 m due to instability of pit. 6. Hole backfilled with arisings in reverse order of excavation.

Trial Pit Log

Date: **09/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown slightly clayey SAND. <i>At 0.25 m: Becomes orangish brown.</i>		0.40	81.86		0.90 - 1.00	B 1	0.50	HV=131 kPa
Stiff orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded mudstone and sandstone. Occasional sandstone cobbles. [DEVENSIAN TILL]		0.70	81.56					
Soft dark brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded mudstone. [DEVENSIAN TILL]		2.20	80.06					
Dark grey and black clayey angular fine to coarse GRAVEL of mudstone. [DEVENSIAN TILL]		2.30	79.96					
Trial pit complete at 2.30 m bgl.								


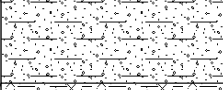
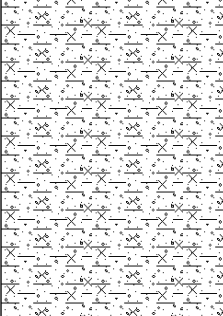
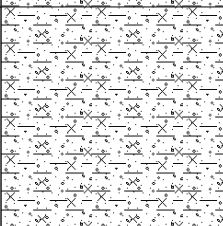


Orientation:

Inclination:

Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area cleared for services prior to excavations. 3. Groundwater was not encountered during excavation. 4. No visual or olfactory evidence of contamination was encountered. 5. Hole terminated at 2.3 m due to instability. 6. Hole backfilled with arisings in reverse order of excavation.

Trial Pit Log

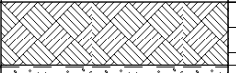
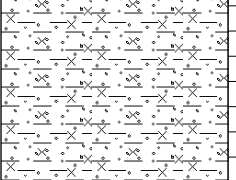
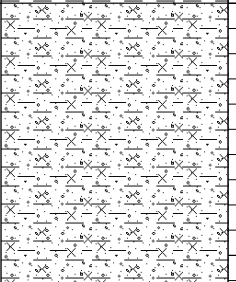
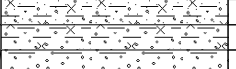
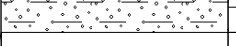
Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over grey brown slightly silty slightly gravelly CLAY with numerous rootlets. Gravel is subangular to subrounded fine to medium quartzite, sandstone and mudstone.		0.15	78.40					
Grey clayey gravelly SAND. Gravel is fine to medium subangular to subrounded of sandstone, quartzite and mudstone. [SUB-SOIL]		0.50	78.05					
Firm orange brown slightly sandy slightly silty gravelly CLAY. Sand is fine to medium. Gravel is angular to subrounded sandstone and mudstone. [DEVENSIAN TILL]		1.80	76.75		0.70 - 0.80	B 1	1.70	HV=91 kPa
Firm to stiff dark grey occasional orange brown slightly silty sandy gravelly friable CLAY. Gravel is angular to subrounded mudstone, quartzite and sandstone. [DEVENSIAN TILL]		2.70	75.85		2.30 - 2.40	B 2		
Trial pit complete at 2.70 m bgl.								



Orientation:

Inclination:

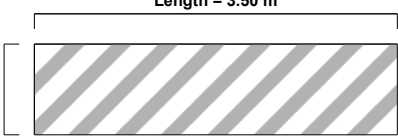
Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area cleared for services prior to excavations. 3. Groundwater was not encountered during excavation. 4. No visual or olfactory evidence of contamination was encountered. 5. Hole terminated at 2.7 m due to instability. 6 Hole backfilled with arisings in reverse order of excavation.

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over greyish brown slightly silty slightly gravelly CLAY with numerous rootlets. Gravel is subangular to subrounded fine to medium quartzite, sandstone and mudstone. [DEVENSIAN TILL]		0.25	79.50					
Soft to firm orange brown slightly silty gravelly friable CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse mudstone and sandstone. Occasional cobbles of subrounded to rounded sandstone. [DEVENSIAN TILL]		1.00	78.75		0.50 - 0.60	B 1	1.00	HV=43 kPa
Soft to firm orange brown, brown, orange and black slightly sandy silty gravelly friable CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse Mudstone and Sandstone, Numerous subangular to rounded cobbles of Mudstone and Sandstone.		2.20	77.55		1.50 - 1.60	B 2		
Stiff dark grey slightly silty gravelly CLAY with several cobbles and boulders of sandstone, siltstone and mudstone. Gravel is fine to medium subangular to subrounded quartzite. [DEVENSIAN TILL]		2.30	77.45					
Dark grey clay GRAVEL with several boulders of sandstone and siltstone. [DEVENSIAN TILL]		2.50	77.25					
Trial pit complete at 2.50 m bgl.								

Dimensions and Orientation:

Length = 3.50 m


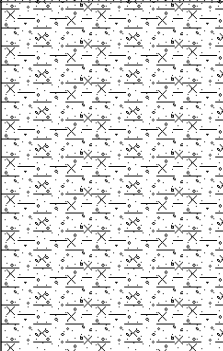
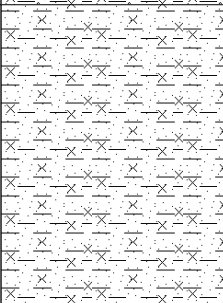

Width = 0.60 m



Orientation:

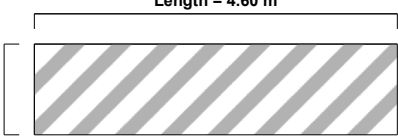
Inclination:

Remarks:
 1. Engineer verified logged in general accordance to BS 5930:2015. 2. Area cleared for services prior to excavations. 3. Groundwater was not encountered during excavation. 4. No visual or olfactory evidence of contamination was encountered. 5. Hole terminated at 2.5 m due to instability. 6. Hole backfilled with arisings in reverse order of excavation.

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over grey silty slightly gravelly clayey fine to medium SAND. Gravel is angular to rounded fine to medium quartzite and sandstone. Numerous rootlets throughout.		0.30	74.80					
Firm orange brown becoming brown with depth slightly sandy silty gravelly friable CLAY. Sand is fine to medium. Gravel is angular to subangular fine to coarse sandstone, quartzite and siltstone. [DEVENSIAN TILL]		1.70	73.40		0.90 - 1.00	B 1	1.30	HV=62 kPa
Soft to firm grey and dark brown friable sandy silty CLAY with several subangular to rounded fine to coarse cobbles of quartzite, sandstone and siltstone. [DEVENSIAN TILL]		2.90	72.20		1.80	B 2	1.80	HV=38 kPa
Very stiff dark grey silty sandy very gravelly CLAY. Gravel is angular to subangular fine to coarse grey sandstone. Sand is fine to medium. [DEVENSIAN TILL]		3.10	72.00					
Trial pit complete at 3.10 m bgl.								

Dimensions and Orientation:

Length = 4.60 m



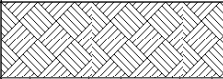
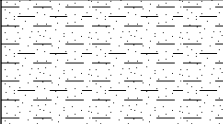
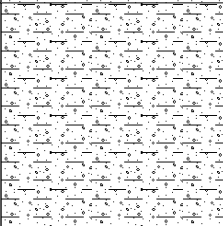
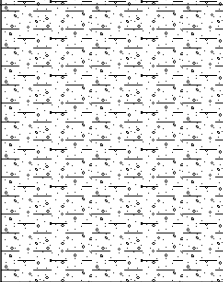
Width = 0.70 m

Orientation:

Inclination:

Remarks:

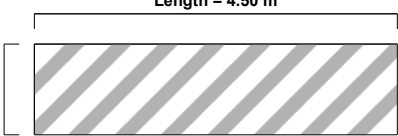
1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.1 m due to instability of pit.
6. Hole backfilled with arisings in reverse order of excavation."

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown sandy CLAY. Sand is fine to coarse.		0.30						
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		0.80						
Orangish brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of natural lithologies. Frequent subrounded to rounded cobbles of mudstone and sandstone. [DEVENSIAN TILL]		1.70						
Stiff grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subrounded to subangular fine to coarse of natural lithologies. Frequent rounded cobbles of mudstone. [DEVENSIAN TILL]		2.80			2.70 - 2.80	B		
Trial pit complete at 2.80 m bgl.								

Dimensions and Orientation:

Length = 4.50 m

Width = 0.70 m



Orientation:

Inclination:

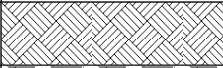
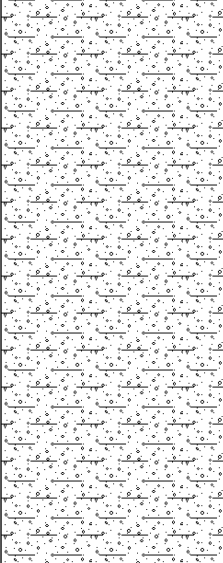

Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 2.8 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

Trial Pit Log

Date: **13/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Brown sandy CLAY. Sand is fine to coarse.		0.25						
Grey clayey sandy subrounded to rounded fine to coarse GRAVEL of natural lithologies with frequent bands of firm to stiff clay. Sand is fine to coarse. Frequent subrounded to rounded cobbles of mudstone and sandstone. [DEVENSIAN TILL]		2.50			1.70	B	1.70 1.70 1.70 1.70	HV=103 kPa HV=122 kPa HV=70 kPa HV=89 kPa HV=97 kPa
Stiff brownish grey CLAY with roots. Very dry breaking up into fragments at top and becomes maleable at 0.9m bgl. At 0.9m bgl becomes slightly sandy and slightly gravelly. Sand is fine to coarse. Gravel is surrounded fine to coarse of natural lithologies.		3.00		2.50	2.50 - 3.00	B		
Trial pit complete at 3.00 m bgl.								



Orientation:

Inclination:

- Remarks:
1. Engineer verified logged in general accordance to BS 5930:2015.
 2. Area cleared for services prior to excavations.
 3. Groundwater was encountered at 2.5 m during excavation.
 4. No visual or olfactory evidence of contamination was encountered.
 5. Hole terminated at 3.0 m due to instability.
 6. Hole backfilled with arisings in reverse order of excavation.

Coordinates:

Elevation (mAOD):

Excavated By:
Clive Hurt Limited

Plant Used:
JCB 3CX

Logged:
MB

Checked:
RR

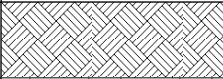
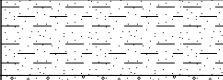
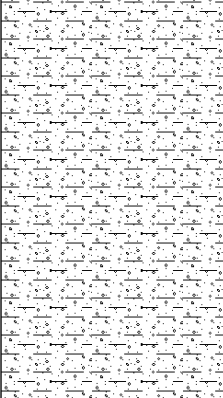
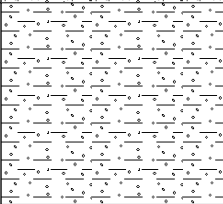
Approved:
RJS

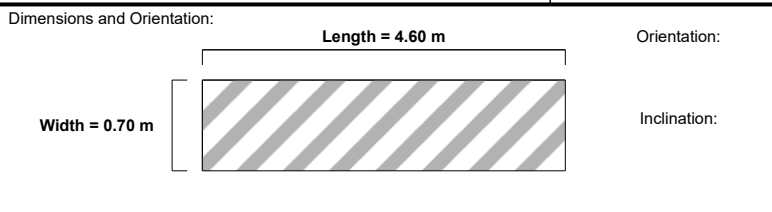
Scale:
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Trial Pit Log

Date: **13/07/2018**

Client: **Trafford Housing Trust**

Description of Strata	Legend	Strata Depth (m)	Reduced Level (mAOD)	Water Strike (m)	Sample Details		Test Details	
					Depth (m)	Type Ref	Depth (m)	Results
TOPSOIL: Grass over brown sandy CLAY. Sand is fine to coarse.		0.30						
Orangish brown sandy CLAY. Sand is fine to coarse. [DEVENSIAN TILL]		0.60						
Firm brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse subrounded to rounded sandstone and mudstone. [DEVENSIAN TILL]		2.20			2.20 - 3.00	B 1		
Soft to firm grey gravelly CLAY. Gravel is fine to coarse subrounded to rounded sandstone and mudstone. Frequent rounded to subrounded mudstone cobbles. [DEVENSIAN TILL]		3.00						
Trial pit complete at 3.00 m bgl.								



Remarks:

1. Engineer verified logged in general accordance to BS 5930:2015.
2. Area cleared for services prior to excavations.
3. Groundwater was not encountered during excavation.
4. No visual or olfactory evidence of contamination was encountered.
5. Hole terminated at 3.0 m due to instability.
6. Hole backfilled with arisings in reverse order of excavation.

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref: DART239
Test Date: 21/06/2018
Report Date: 21/06/2018
File Name: DART239.spt
Test Operator: BH

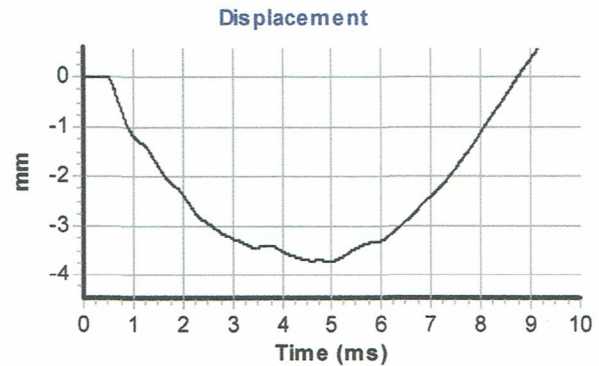
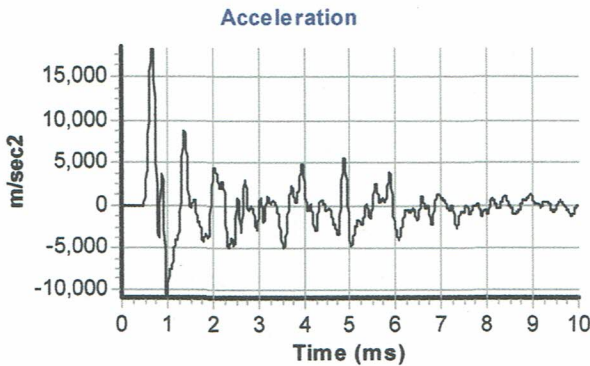
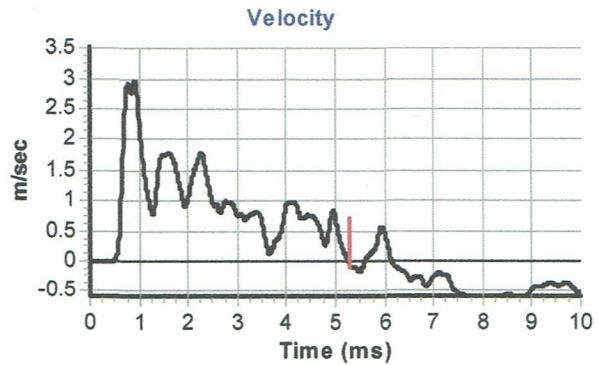
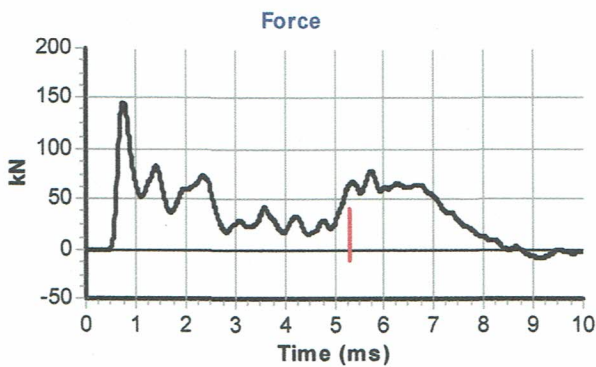
Instrumented Rod Data

Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.3
Assumed Modulus E_a (GPa): 200
Accelerometer No.1: 7080
Accelerometer No.2: 11609

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location



Calculations

Area of Rod A (mm^2): 944
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 290

Energy Ratio E_r (%): **61**

Signed: M.GARDNER
Title: FITTER

The recommended calibration interval is 12 months

Appendix C – Geotechnical Analysis Results



4041

TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



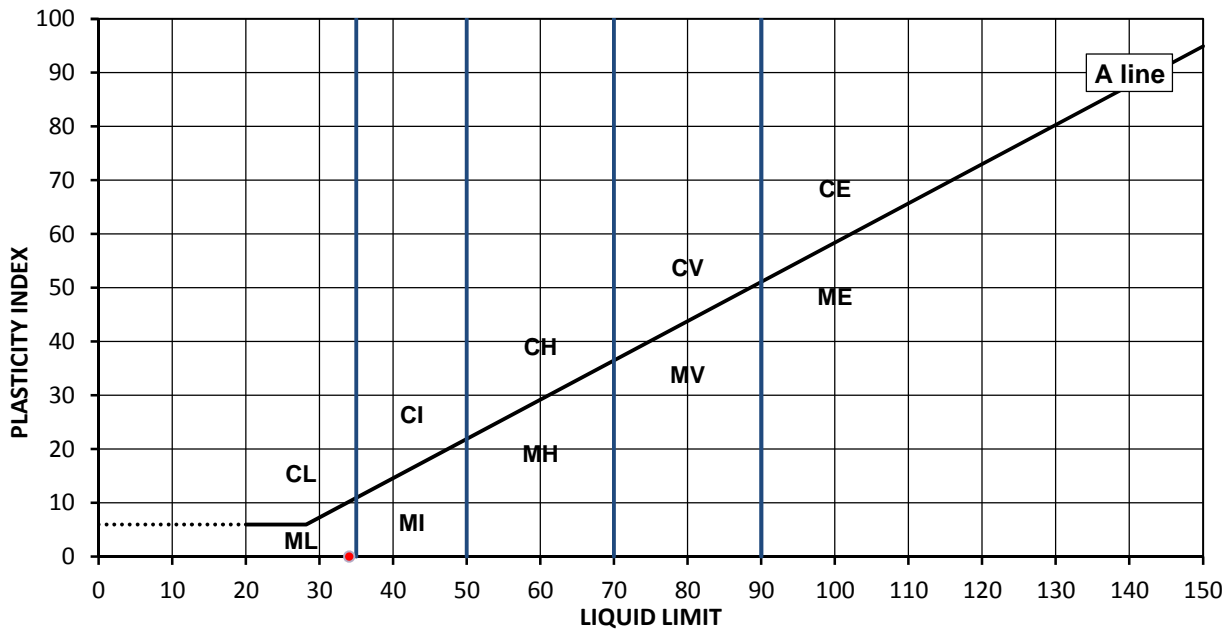
Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 11/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006188
Hole No.: TP102
Sample Reference: Not Given
Soil Description: Dark brown gravelly clayey SAND
Sample Preparation: Tested after washing to remove >425um
Depth Top [m]: 0.26
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
16	34	NP	NP	43



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks: NP – non plastic

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



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TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



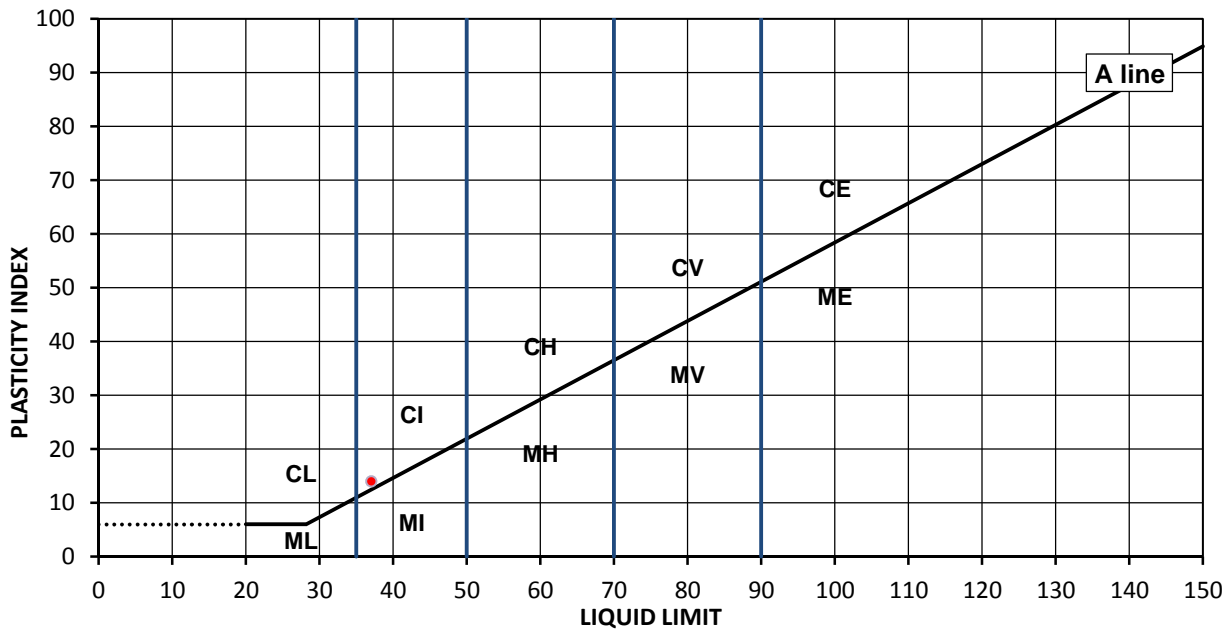
Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006192
Hole No.: TP108
Sample Reference: Not Given
Soil Description: Yellowish brown slightly gravelly slightly silty clayey SAND
Sample Preparation: Tested after >425um removed by hand
Depth Top [m]: 1.20
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
33	37	23	14	89



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



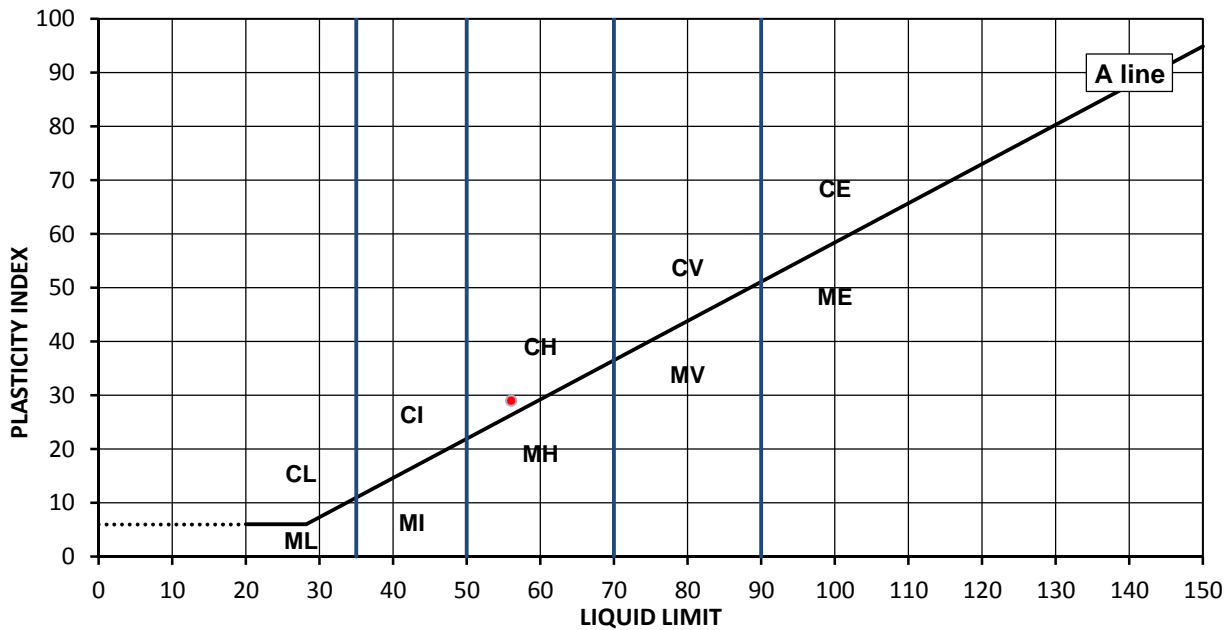
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Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 11/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006193
Hole No.: TP109
Sample Reference: Not Given
Soil Description: Yellowish brown slightly gravelly slightly sandy CLAY
Sample Preparation: Tested after washing to remove >425um
Depth Top [m]: 0.50
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
23	56	27	29	68



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

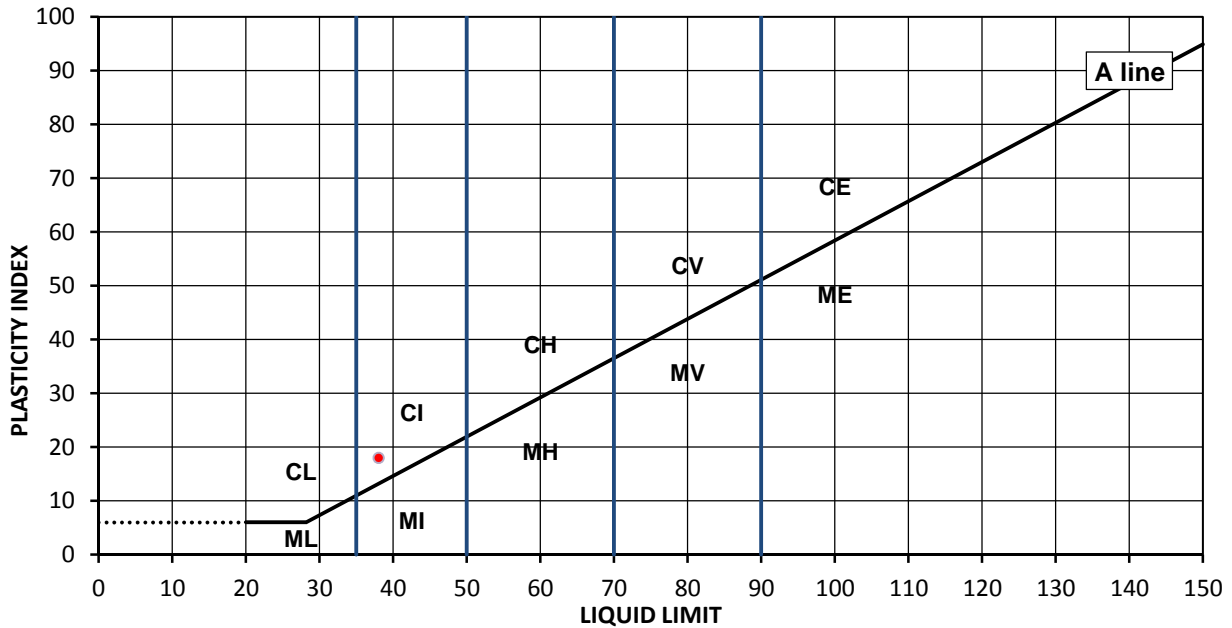
Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006194
Hole No.: TP113
Sample Reference: Not Given
Soil Description: Yellowish brown sandy CLAY
Sample Preparation: Tested in natural condition

Depth Top [m]: 0.80
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
18	38	20	18	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
Organic		O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

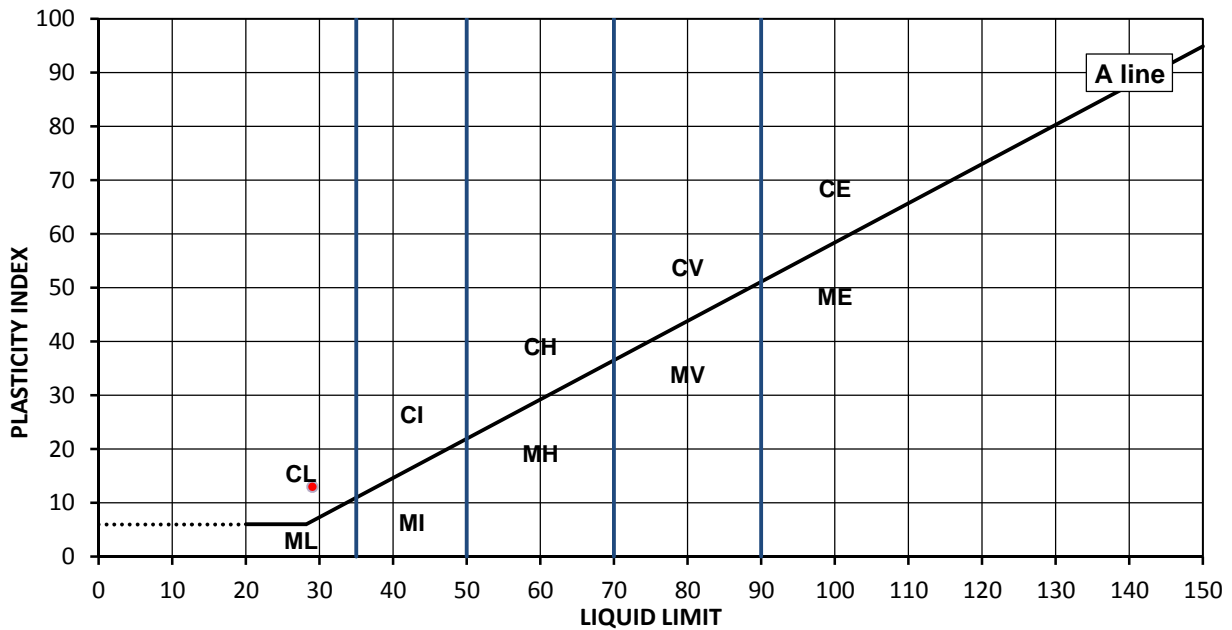
Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006196
Hole No.: TP122
Sample Reference: Not Given
Soil Description: Greyish brown gravelly very sandy CLAY
Sample Preparation: Tested after washing to remove >425um

Depth Top [m]: 3.00
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
9.2	29	16	13	58



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
Organic	O	append to classification for organic material (eg CHO)			

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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4041

TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

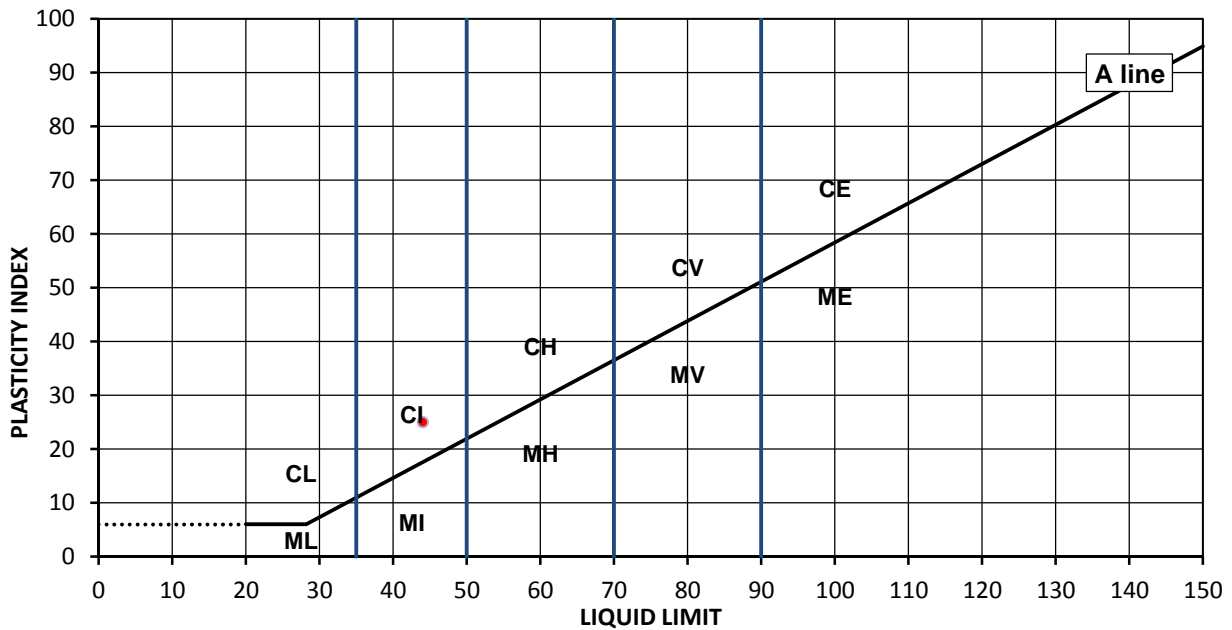
Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006197
Hole No.: TP123
Sample Reference: Not Given
Soil Description: Mottled brown gravelly very sandy SILT and CLAY
Sample Preparation: Tested after washing to remove >425um

Depth Top [m]: 1.90
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
27	44	19	25	77



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



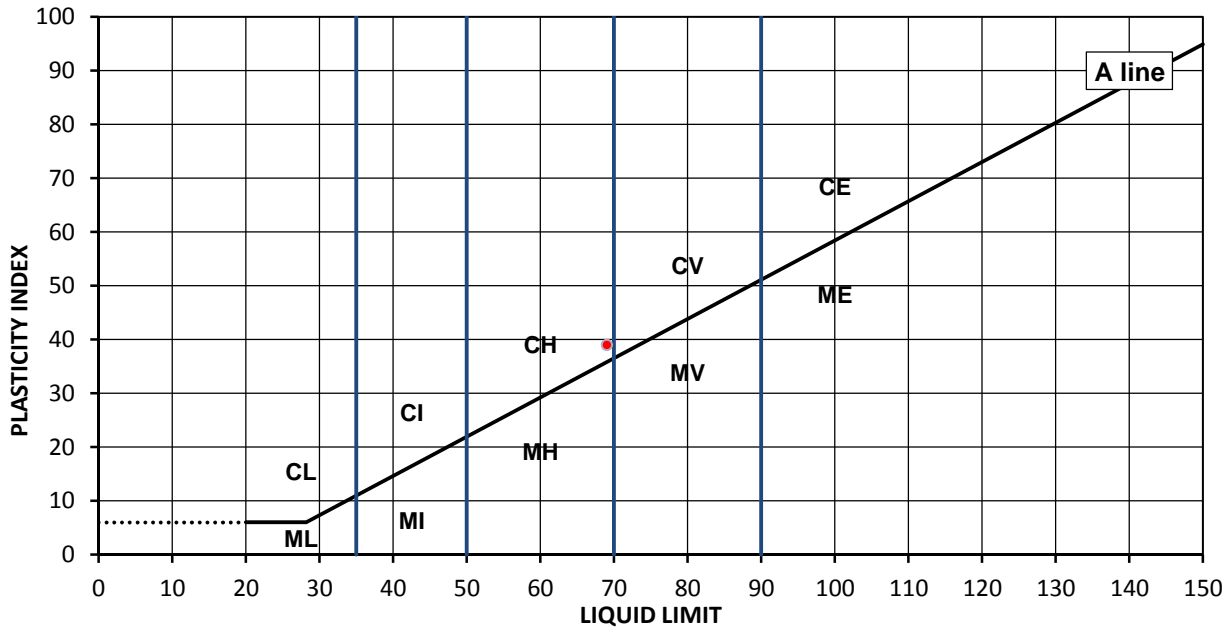
Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 10/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006198
Hole No.: TP124
Sample Reference: Not Given
Soil Description: Dark brown slightly gravelly slightly sandy very clayey SILT
Sample Preparation: Tested after >425um removed by hand
Depth Top [m]: 1.40
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
27	69	30	39	95



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



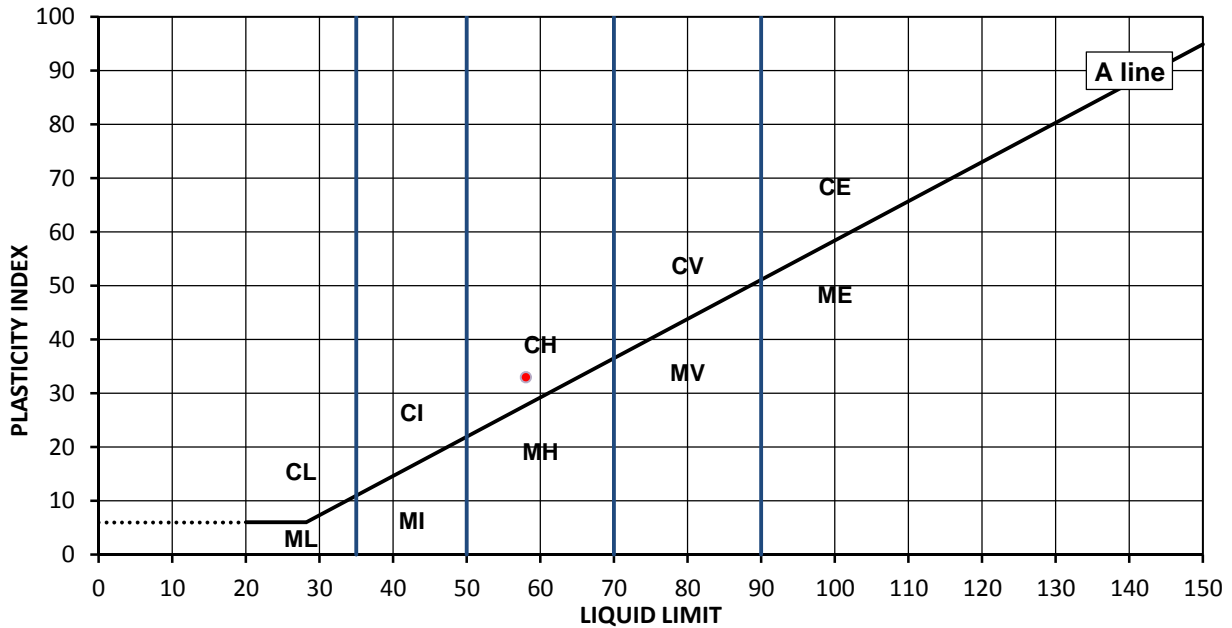
Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 09/04/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006199
Hole No.: TP128
Sample Reference: Not Given
Soil Description: Dark brown slightly gravelly slightly sandy very silty CLAY
Sample Preparation: Tested after >425um removed by hand
Depth Top [m]: 2.20
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
27	58	25	33	93



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

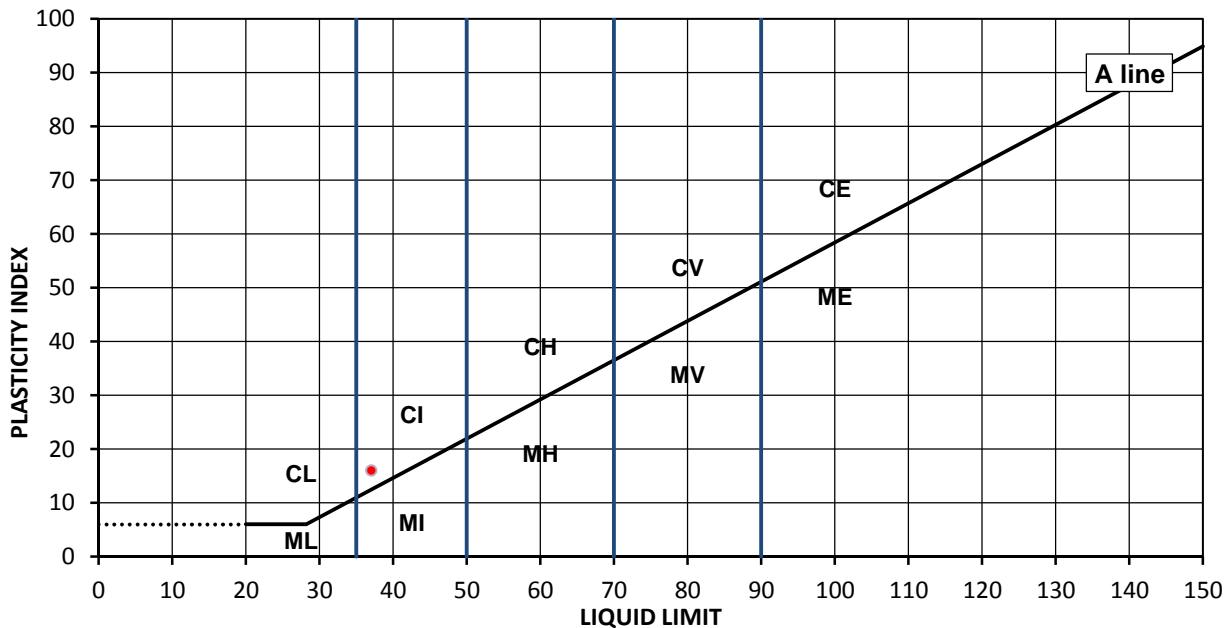
Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 09/04/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006200
Hole No.: TP130
Sample Reference: Not Given
Soil Description: Dark brown sandy CLAY
Sample Preparation: Tested in natural condition

Depth Top [m]: 2.00
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
14	37	21	16	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



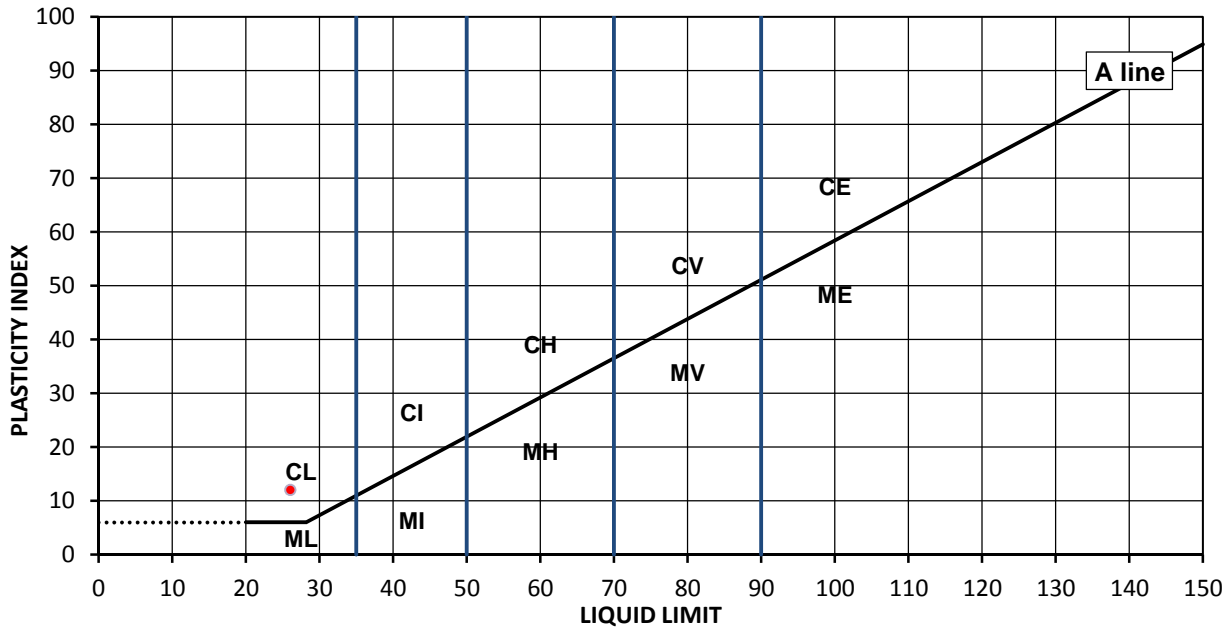
Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 09/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test Results

Laboratory Reference: 1006202
Hole No.: TP136
Sample Reference: Not Given
Soil Description: Greyish brown clayey very silty SAND and GRAVEL
Sample Preparation: Tested after >425um removed by hand
Depth Top [m]: 2.50
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
9.5	26	14	12	50



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	L	Low	Liquid Limit	below 35
M	Silt	I	Medium		35 to 50
		H	High		50 to 70
		V	Very high		70 to 90
		E	Extremely high		exceeding 90
	Organic	O	append to classification for organic material (eg CHO)		

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory
Manager
Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Summary of Classification Test Results

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 09/04 - 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test results

Laboratory Reference	Hole No.	Sample				Soil Description	M/C	Atterberg				Density		Total Porosity
		Reference	Top depth [m]	Base depth [m]	Type			% Passing 425um	LL	PL	PI	bulk	PD	
							%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3
1006188	TP102	Not Given	0.26	Not Given	B	Dark brown gravelly clayey SAND	16	43	34	NP	NP			
1006190	TP105	Not Given	3.00	Not Given	B	Dark brown slightly gravelly clayey SAND							2.64	
1006192	TP108	Not Given	1.20	Not Given	B	Yellowish brown slightly gravelly slightly silty clayey SAND	33	89	37	23	14			
1006193	TP109	Not Given	0.50	Not Given	B	Yellowish brown slightly gravelly slightly sandy CLAY	23	68	56	27	29		2.68	
1006194	TP113	Not Given	0.80	Not Given	B	Yellowish brown sandy CLAY	18	100	38	20	18			
1006196	TP122	Not Given	3.00	Not Given	B	Greyish brown gravelly very sandy CLAY	9.2	58	29	16	13		2.69	
1006197	TP123	Not Given	1.90	Not Given	B	Mottled brown gravelly very sandy SILT and CLAY	27	77	44	19	25			
1006198	TP124	Not Given	1.40	Not Given	B	Dark brown slightly gravelly slightly sandy very clayey SILT	27	95	69	30	39			
1006199	TP128	Not Given	2.20	Not Given	B	Dark brown slightly gravelly slightly sandy very silty CLAY	27	93	58	25	33			
1006200	TP130	Not Given	2.00	Not Given	B	Dark brown sandy CLAY	14	100	37	21	16			

Comments: NP - Non Plastic

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General Manager

for and on behalf of i2 Analytical Ltd

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The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland.*

TEST CERTIFICATE

Summary of Classification Test Results

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 09/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Test results

Laboratory Reference	Hole No.	Sample				Soil Description	M/C %	Atterberg				Density		Total Porosity Mg/m3
		Reference	Top depth [m]	Base depth [m]	Type			% Passing 425um %	LL %	PL %	PI %	bulk Mg/m3	PD Mg/m3	
1006201	TP132	Not Given	0.60	Not Given	B	Dark brown CLAY							2.68	
1006202	TP136	Not Given	2.50	Not Given	B	Greyish brown clayey very silty SAND and GRAVEL	9.5	50	26	14	12			

Comments:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General Manager

for and on behalf of i2 Analytical Ltd

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4041

TEST CERTIFICATE

Determination of Particle Size Distribution

Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006186

Sample Reference: Stockpile

Sample description: Dark brown very gravelly slightly sandy slightly clayey SILT

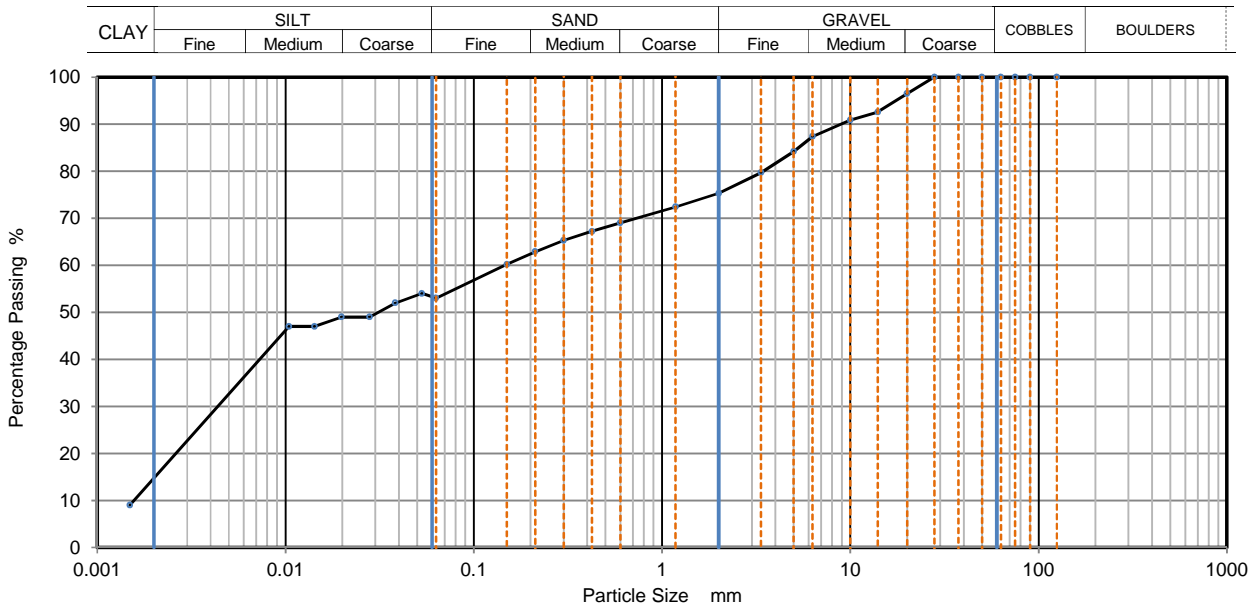
Sample Type: B

Location: AP01

Depth Top [m]: 0.00

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0530	54
90	100	0.0383	52
75	100	0.0280	49
63	100	0.0198	49
50	100	0.0143	47
37.5	100	0.0104	47
28	100	0.0075	47
20	97	0.0053	47
14	93	0.0038	47
10	91	0.0028	47
6.3	87	0.0019	47
5	84	0.0014	47
3.35	80	0.0010	47
2	75	0.0007	47
1.18	72	0.0005	47
0.6	69	0.0004	47
0.425	67	0.0003	47
0.3	65	0.0002	47
0.212	63	0.0001	47
0.15	60		
0.063	54		

Dry Mass of sample [g]: 1449

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	24.70
Sand	21.60
Silt	38.50
Clay	15.20

Grading Analysis		
D100	mm	28
D60	mm	0.145
D30	mm	0.00431
D10	mm	0.00153
Uniformity Coefficient		95
Curvature Coefficient		0.083

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Signed:

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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4041

TEST CERTIFICATE

Determination of Particle Size Distribution

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006187

Sample Reference: Stockpile

Sample description: Greyish brown slightly gravelly slightly sandy clayey SILT

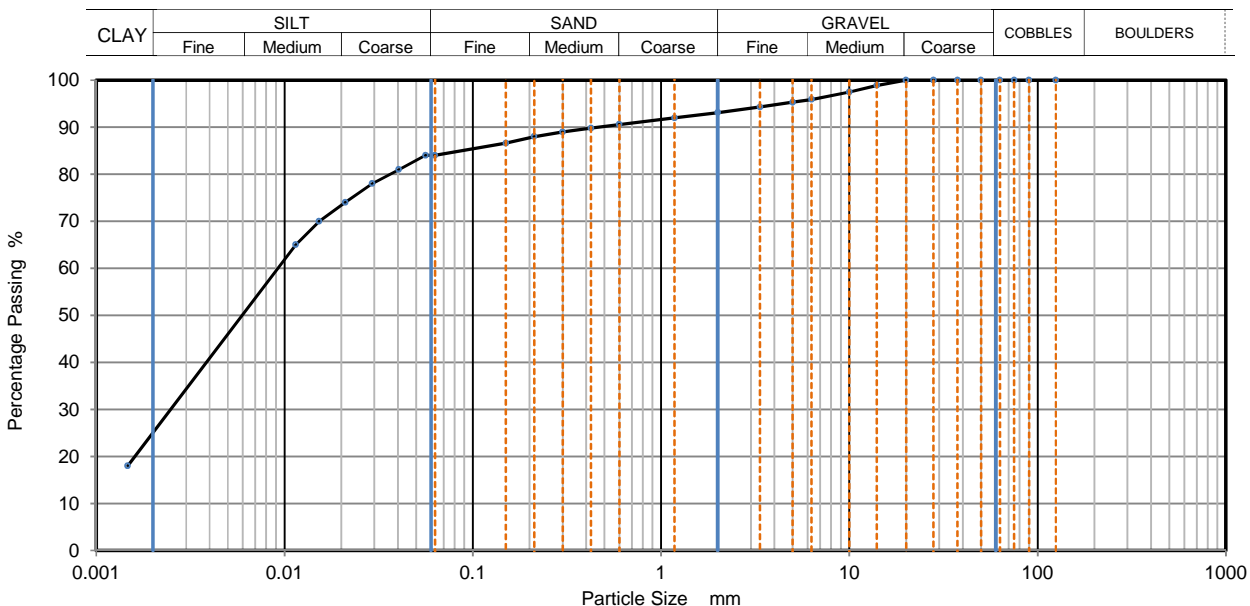
Sample Type: B

Location: AP02

Depth Top [m]: 0.00

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0560	84
90	100	0.0404	81
75	100	0.0292	78
63	100	0.0210	74
50	100	0.0153	70
37.5	100	0.0114	65
28	100	0.0015	18
20	100		
14	99		
10	98		
6.3	96		
5	95		
3.35	94		
2	93		
1.18	92		
0.6	91	Particle density (assumed)	
0.425	90	2.65	Mg/m3
0.3	89		
0.212	88		
0.15	87		
0.063	84		

Dry Mass of sample [g]: 1186

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	6.90
Sand	9.00
Silt	59.30
Clay	24.80

Grading Analysis		
D100	mm	20
D60	mm	0.00932
D30	mm	0.00251
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Particle Size Distribution

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006189

Sample Reference: Not Given

Sample description: Dark brown slightly sandy GRAVEL with cobbles

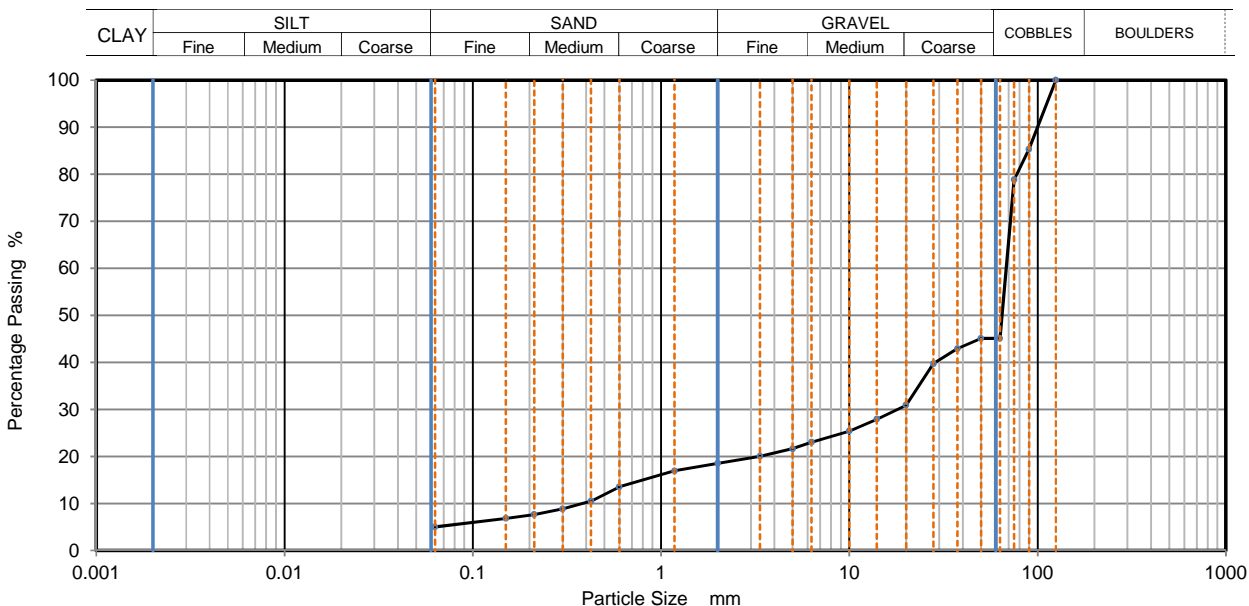
Sample Type: B

Location: TP104

Depth Top [m]: 2.60

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	85		
75	79		
63	45		
50	45		
37.5	43		
28	40		
20	31		
14	28		
10	25		
6.3	23		
5	22		
3.35	20		
2	19		
1.18	17		
0.6	14		
0.425	11		
0.3	9		
0.212	8		
0.15	7		
0.063	5		

Dry Mass of sample [g]: 13658

Sample Proportions	% dry mass
Very coarse	54.90
Gravel	26.50
Sand	13.60
Fines <0.063mm	5.00

Grading Analysis		
D100	mm	125
D60	mm	68.1
D30	mm	18
D10	mm	0.386
Uniformity Coefficient		180
Curvature Coefficient		12

Remarks

Preparation and testing in accordance with BS1377 unless noted below
The material submitted - fails to meet the minimum mass requirements as stated in BS1377 Part 2 Table 3

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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4041

TEST CERTIFICATE

Determination of Particle Size Distribution

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 11/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006190

Sample Reference: Not Given

Sample description: Dark brown slightly gravelly clayey SAND

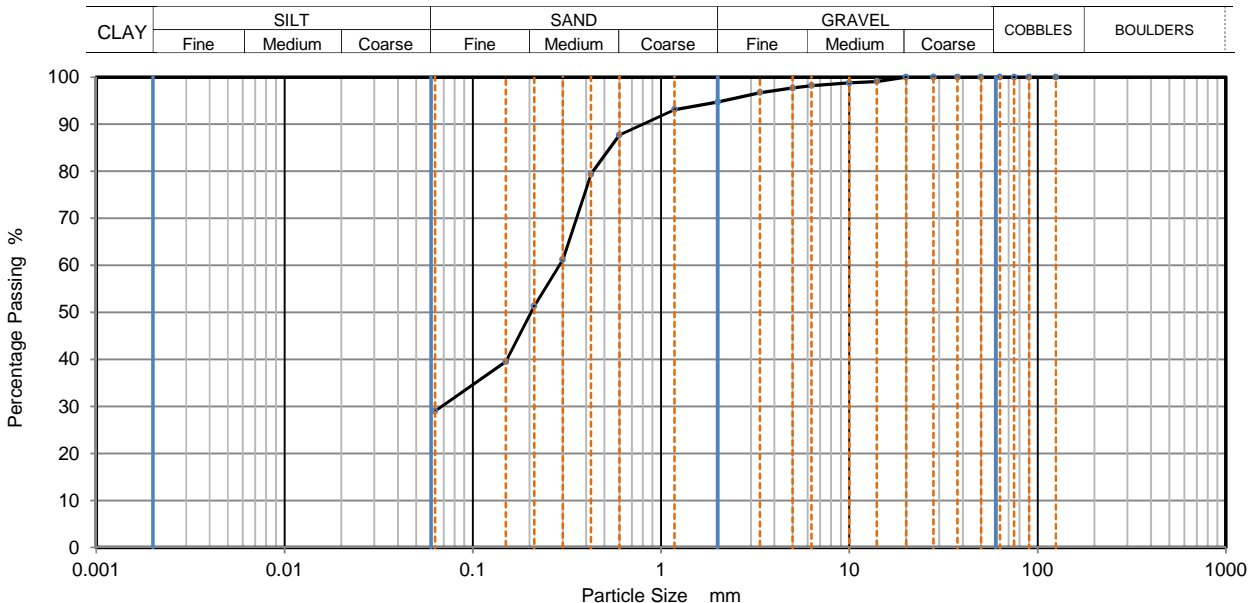
Sample Type: B

Location: TP105

Depth Top [m]: 3.00

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	99		
10	99		
6.3	98		
5	98		
3.35	97		
2	95		
1.18	93		
0.6	88		
0.425	79		
0.3	61		
0.212	51		
0.15	40		
0.063	29		

Dry Mass of sample [g]: 757

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	5.30
Sand	65.50
Fines <0.063mm	29.20

Grading Analysis		
D100	mm	20
D60	mm	0.288
D30	mm	0.0671
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Particle Size Distribution

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006191

Sample Reference: Not Given

Sample description: Light brown slightly gravelly slightly clayey SAND

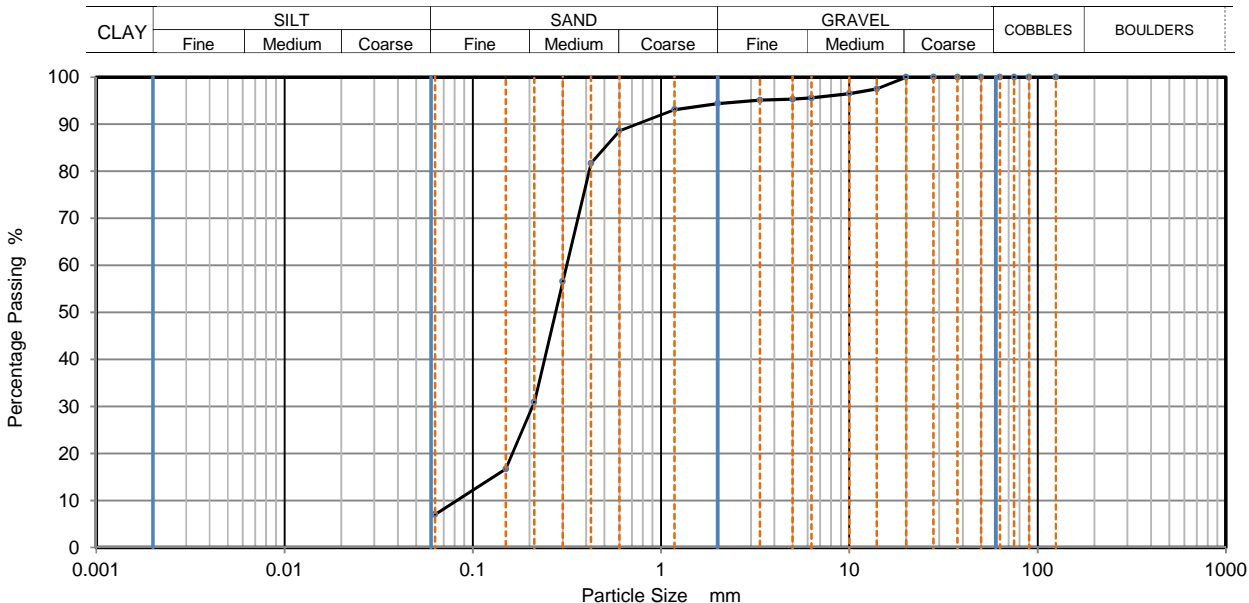
Sample Type: B

Location: TP107

Depth Top [m]: 1.00

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	98		
10	97		
6.3	96		
5	95		
3.35	95		
2	94		
1.18	93		
0.6	89		
0.425	82		
0.3	57		
0.212	31		
0.15	17		
0.063	7		

Dry Mass of sample [g]: 824

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	5.60
Sand	87.10
Fines <0.063mm	7.20

Grading Analysis		
D100	mm	20
D60	mm	0.314
D30	mm	0.208
D10	mm	0.0811
Uniformity Coefficient		3.9
Curvature Coefficient		1.7

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE**Determination of Particle Size Distribution**

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006192

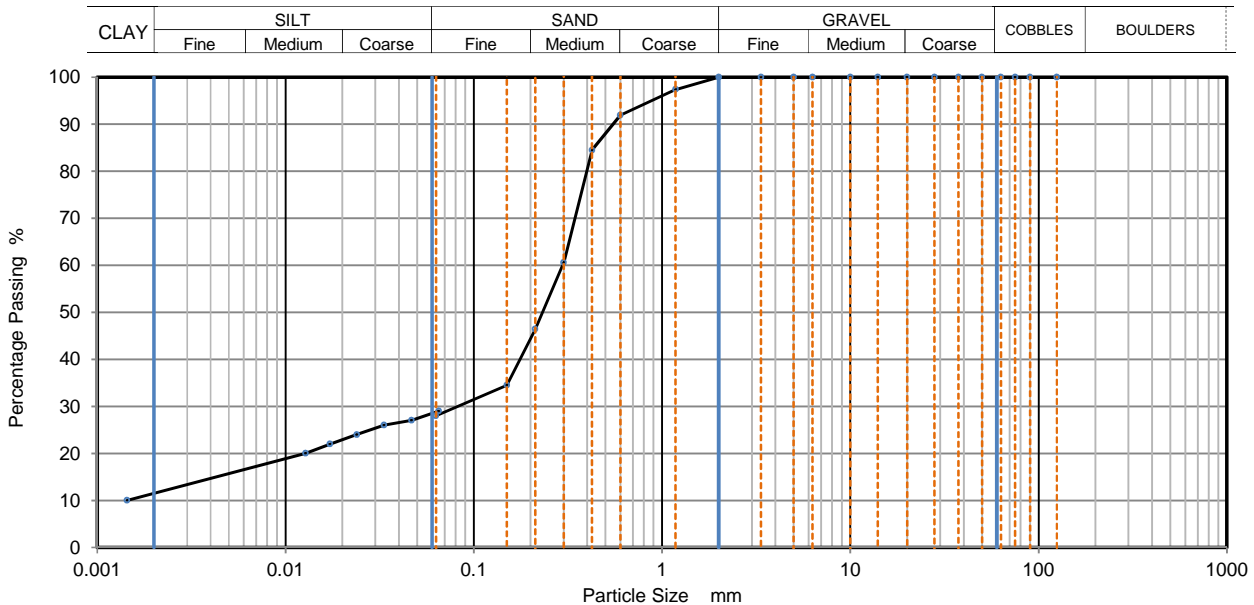
Sample Reference: Not Given

Sample description: Yellowish brown slightly gravelly slightly silty clayey SAND

Sample Type: B

Location: TP108
Supplier: Not Given

Depth Top [m]: 1.20
Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0651	29
90	100	0.0467	27
75	100	0.0333	26
63	100	0.0239	24
50	100	0.0172	22
37.5	100	0.0128	20
28	100	0.0014	10
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	97		
0.6	92		
0.425	85		
0.3	61		
0.212	46		
0.15	35		
0.063	29		

Dry Mass of sample [g]: 498

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	0.00
Sand	71.50
Silt	16.90
Clay	11.60

Grading Analysis		
D100	mm	2
D60	mm	0.296
D30	mm	0.0802
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



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TEST CERTIFICATE

Determination of Particle Size Distribution

Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006197

Sample Reference: Not Given

Sample description: Mottled brown gravelly very sandy SILT and CLAY

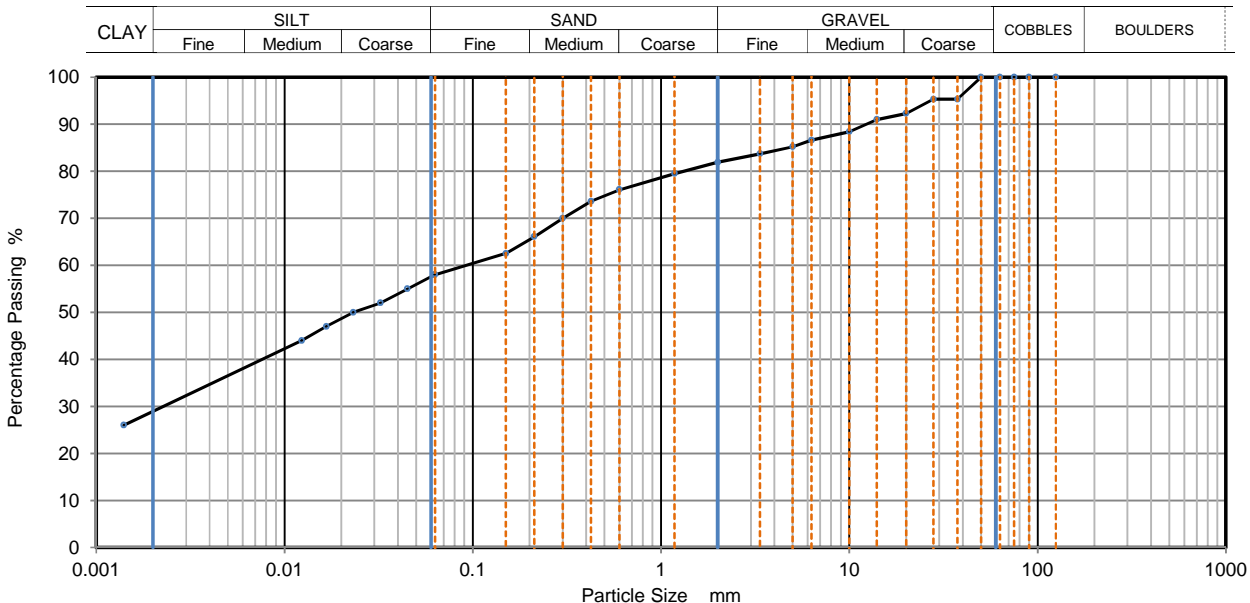
Sample Type: B

Location: TP123

Depth Top [m]: 1.90

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0626	58
90	100	0.0450	55
75	100	0.0323	52
63	100	0.0232	50
50	100	0.0167	47
37.5	95	0.0123	44
28	95	0.0014	26
20	92		
14	91		
10	88		
6.3	87		
5	85		
3.35	84		
2	82		
1.18	80		
0.6	76	Particle density (assumed)	
0.425	74	2.65	Mg/m3
0.3	70		
0.212	66		
0.15	63		
0.063	58		

Dry Mass of sample [g]: 2273

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	18.10
Sand	23.60
Silt	29.20
Clay	29.10

Grading Analysis		
D100	mm	50
D60	mm	0.0893
D30	mm	0.00224
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Particle Size Distribution

Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 10/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

TEST RESULTS

Laboratory Reference: 1006198

Sample Reference: Not Given

Sample description: Dark brown slightly gravelly slightly sandy very clayey SILT

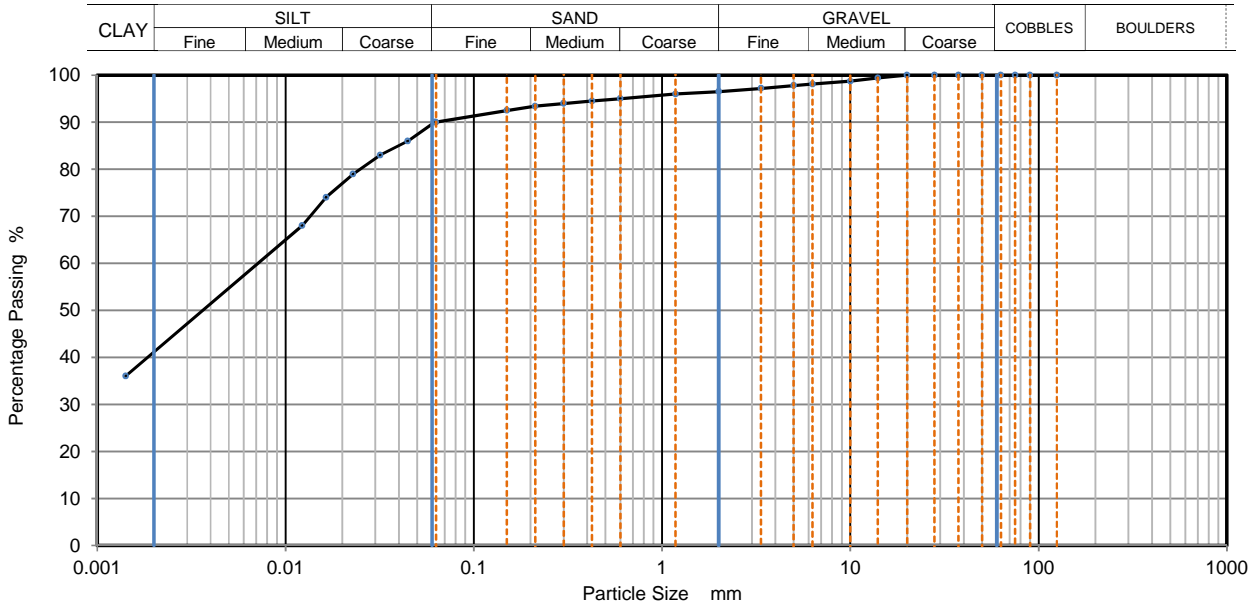
Sample Type: B

Location: TP124

Depth Top [m]: 1.40

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0621	90
90	100	0.0446	86
75	100	0.0318	83
63	100	0.0228	79
50	100	0.0164	74
37.5	100	0.0122	68
28	100	0.0014	36
20	100		
14	99		
10	99		
6.3	98		
5	98		
3.35	97		
2	97		
1.18	96		
0.6	95	Particle density (assumed)	
0.425	95	2.65	Mg/m3
0.3	94		
0.212	93		
0.15	93		
0.063	90		

Dry Mass of sample [g]: 510

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	3.50
Sand	6.40
Silt	49.00
Clay	41.10

Grading Analysis		
D100	mm	20
D60	mm	0.00729
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Particle Size Distribution

Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 09/04/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

TEST RESULTS

Laboratory Reference: 1006199

Sample Reference: Not Given

Sample description: Dark brown slightly gravelly slightly sandy very silty CLAY

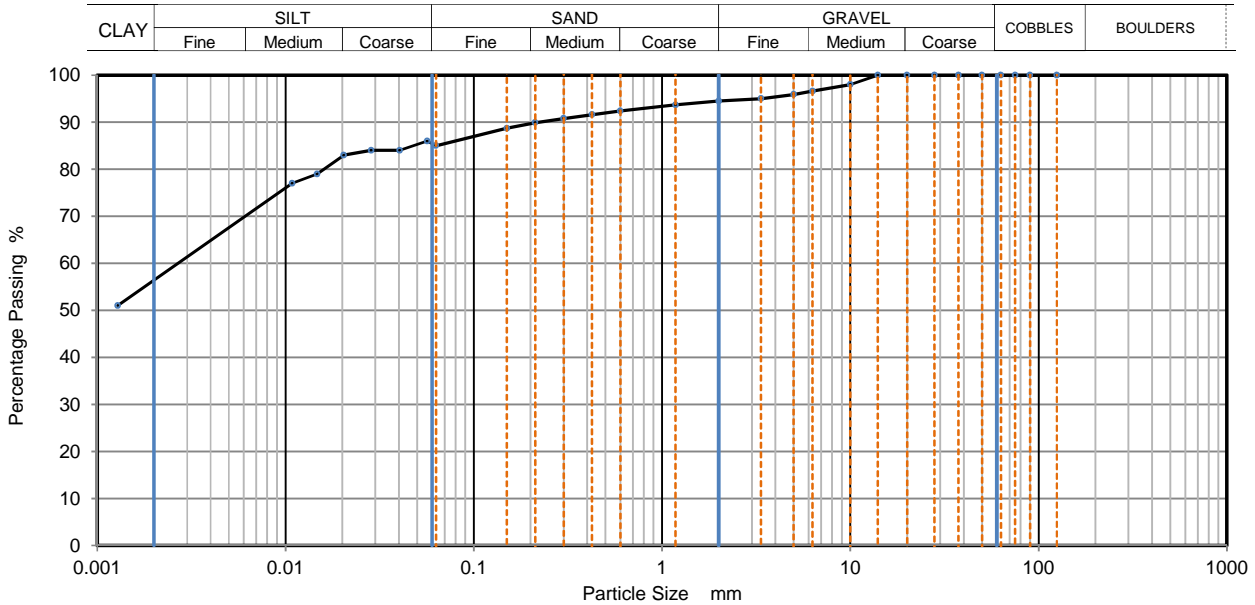
Sample Type: B

Location: TP128

Depth Top [m]: 2.20

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0566	86
90	100	0.0404	84
75	100	0.0286	84
63	100	0.0204	83
50	100	0.0147	79
37.5	100	0.0108	77
28	100	0.0013	51
20	100		
14	100		
10	98		
6.3	97		
5	96		
3.35	95		
2	95		
1.18	94		
0.6	92	Particle density (assumed)	
0.425	92	2.65	Mg/m3
0.3	91		
0.212	90		
0.15	89		
0.063	86		

Dry Mass of sample [g]: 564

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	5.50
Sand	8.70
Silt	29.70
Clay	56.10

Grading Analysis		
D100	mm	14
D60	mm	0.00272
D30	mm	
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Determination of Particle Size Distribution

Tested in Accordance with BS1377:Part 2:1990, clauses 9.2 and 9.5

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester, M1 5NG

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 09/07/2018
Date Received: 16/07/2018
Date Tested: 28/07/2018
Sampled By: Melanie Booth

Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

TEST RESULTS

Laboratory Reference: 1006202

Sample Reference: Not Given

Sample description: Greyish brown clayey very silty SAND and GRAVEL

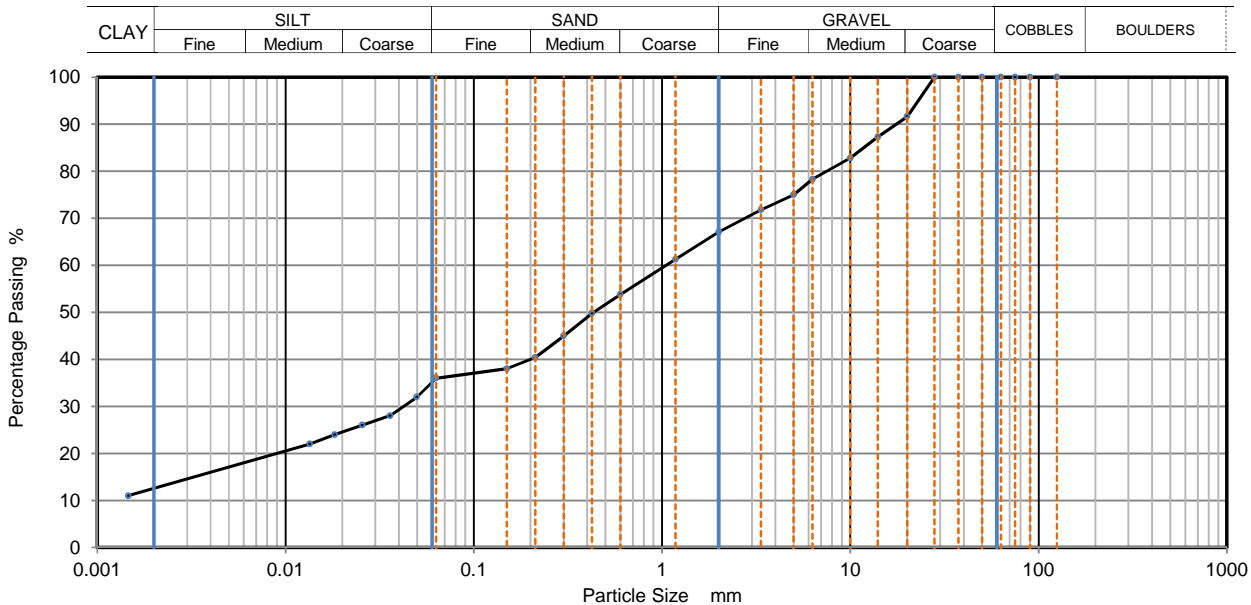
Sample Type: B

Location: TP136

Depth Top [m]: 2.50

Supplier: Not Given

Depth Base [m]: Not Given



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0630	36
90	100	0.0498	32
75	100	0.0359	28
63	100	0.0255	26
50	100	0.0183	24
37.5	100	0.0134	22
28	100	0.0015	11
20	92		
14	87		
10	83		
6.3	78		
5	75		
3.35	72		
2	67		
1.18	61		
0.6	54	Particle density (assumed)	
0.425	50	2.65	Mg/m3
0.3	45		
0.212	40		
0.15	38		
0.063	36		

Dry Mass of sample [g]: 3310

Sample Proportions	% dry mass
Very coarse	0.00
Gravel	32.90
Sand	30.80
Silt	23.60
Clay	12.70

Grading Analysis		
D100	mm	28
D60	mm	1.05
D30	mm	0.0425
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks
Preparation and testing in accordance with BS1377 unless noted below

Approved:

Signed:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Dry Density / Moisture Content Relationship Light Compaction

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



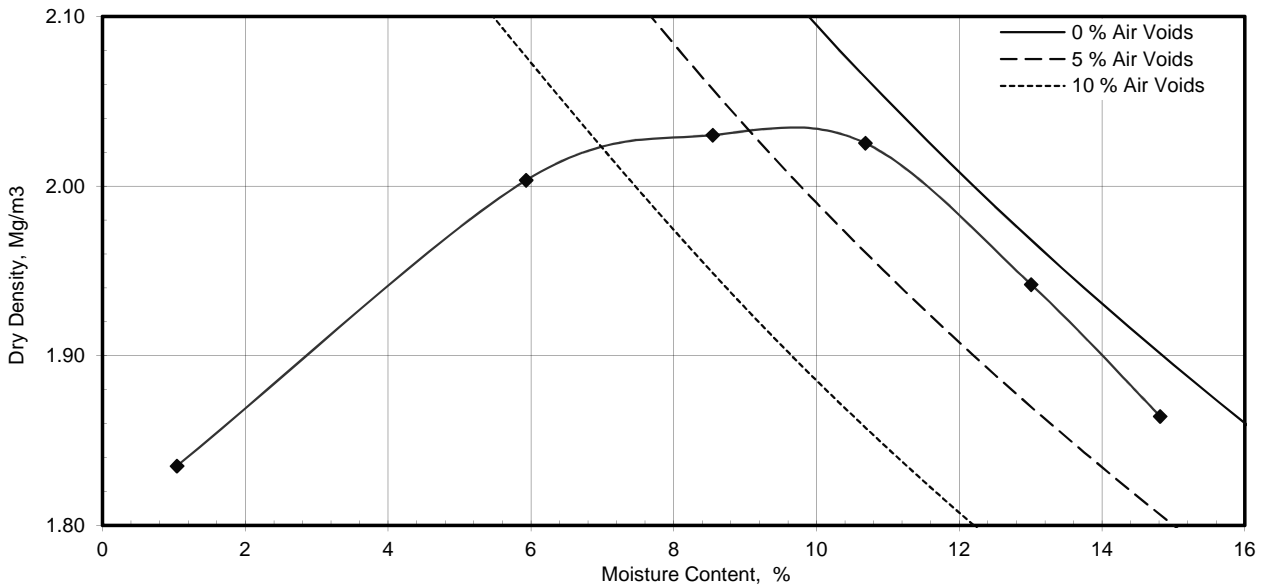
Tested in accordance with BS 1377-4:1990: Clause 3.3 using 2.5kg[light] Rammer

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester
M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 31/07/2018
Sampled By: Melanie Booth

TEST RESULTS

Laboratory Reference: 1006186
Hole No.: AP01
Sample Reference: Stockpile
Sample Description: Dark brown very gravelly slightly sandy slightly clayey SILT
Depth Top [m]: 0.00
Depth Base [m]: Not Given
Sample Type: B



Preparation	Material used was natural	
Mould Type	1 Litre	
Samples Used	Composite specimens tested	
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m ³	2.65
As received Moisture Content	%	1.0
Maximum Dry Density	Mg/m ³	2.03
Optimum Moisture Content	%	9.6

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Date Reported: 02/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Dry Density / Moisture Content Relationship Light Compaction

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



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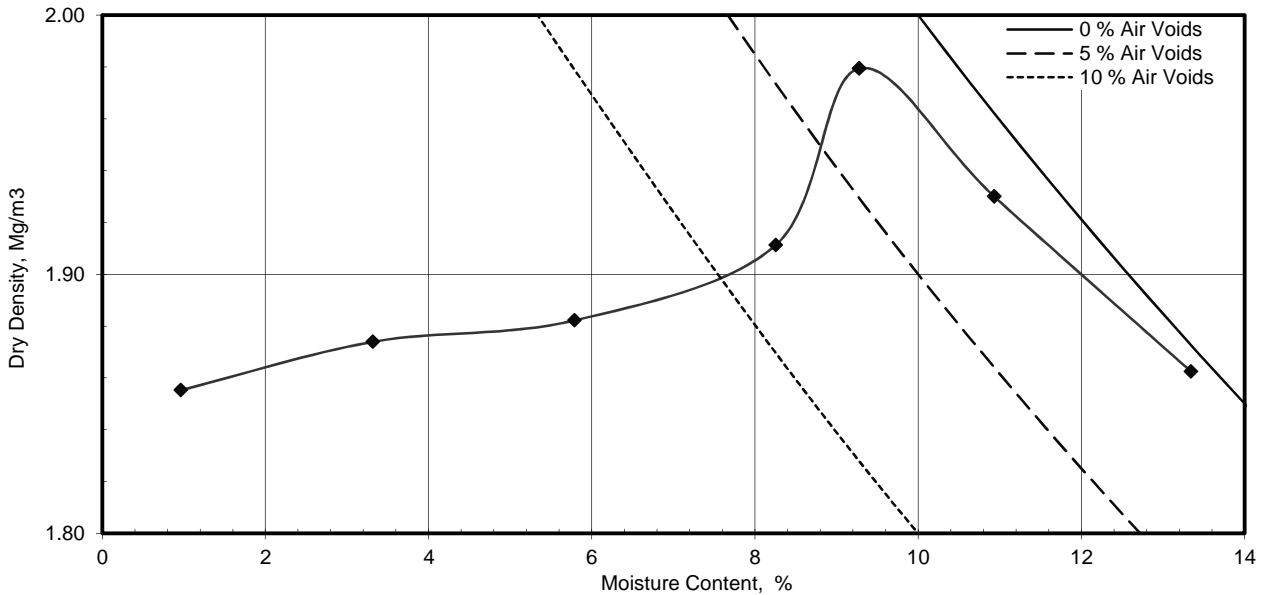
Tested in accordance with BS 1377-4:1990: Clause 3.3 using 2.5kg[light] Rammer

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester
M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 31/07/2018
Sampled By: Melanie Booth

TEST RESULTS

Laboratory Reference: 1006187
Hole No.: AP02
Sample Reference: Stockpile
Sample Description: Greyish brown slightly gravelly slightly sandy clayey SILT
Depth Top [m]: 0.00
Depth Base [m]: Not Given
Sample Type: B



Preparation	Material used was natural	
Mould Type	1 Litre	
Samples Used	Composite specimens tested	
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m³	2.50
As received Moisture Content	%	1.0
Maximum Dry Density	Mg/m³	1.98
Optimum Moisture Content	%	9.3

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Signed:

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Dry Density / Moisture Content Relationship Light Compaction

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



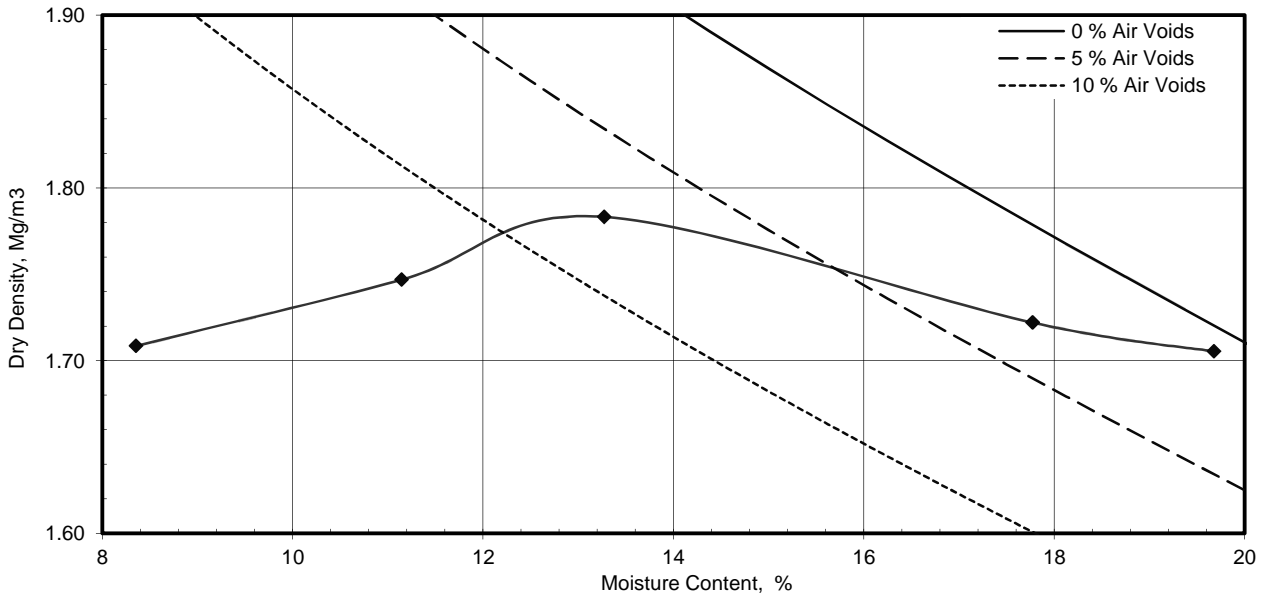
Tested in accordance with BS 1377-4:1990: Clause 3.3 using 2.5kg[light] Rammer

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester
M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 31/07/2018
Sampled By: Melanie Booth

TEST RESULTS

Laboratory Reference: 1006194
Hole No.: TP113
Sample Reference: Not Given
Sample Description: Yellowish brown sandy CLAY
Depth Top [m]: 0.80
Depth Base [m]: Not Given
Sample Type: B



Preparation	Material used was natural	
Mould Type	1 Litre	
Samples Used	Composite specimens tested	
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m ³	2.60
As received Moisture Content	%	18
Maximum Dry Density	Mg/m ³	1.78
Optimum Moisture Content	%	13

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Signed:

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

Dry Density / Moisture Content Relationship Light Compaction

i2 Analytical Ltd
7 Woodshots Meadow
Croxley Green Business Park
Watford Herts WD18 8YS



4041

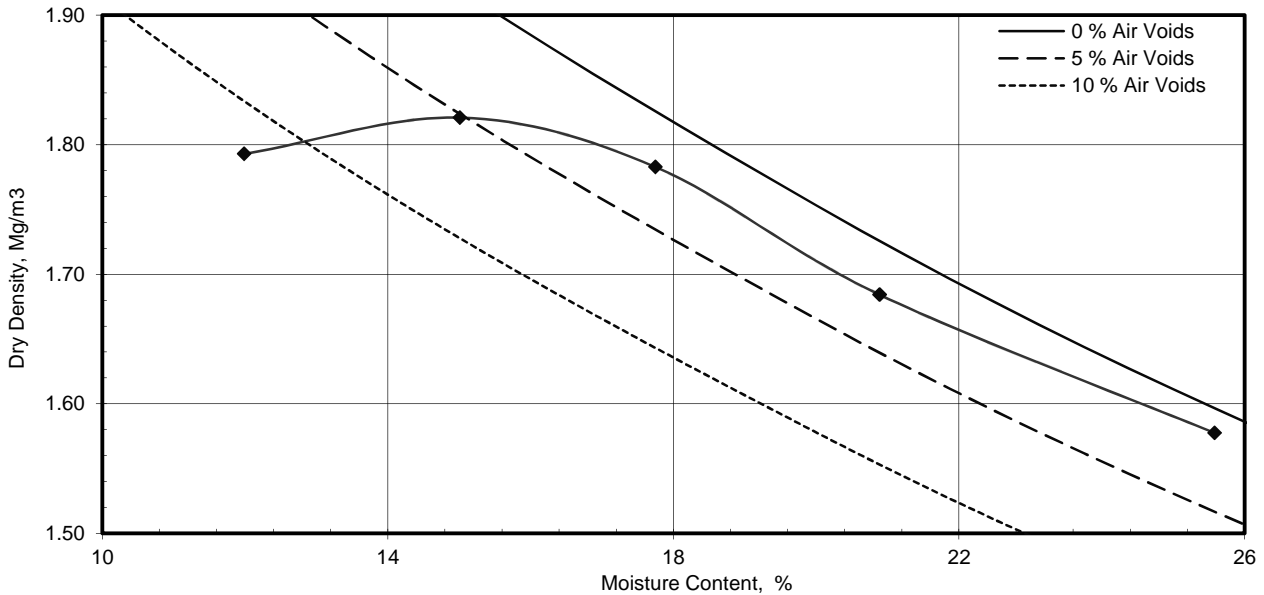
Tested in accordance with BS 1377-4:1990: Clause 3.3 using 2.5kg[light] Rammer

Client: Delta-Simons
Client Address: Suite GB
Barclay House
35 Whitworth Street West
Manchester
M1 5NG
Contact: Rachel Stringer
Site Name: Clitheroe Road, Whalley
Site Address: Not Given

Client Reference: 18-0886-03
Job Number: 18-93466
Date Sampled: 12/07/2018
Date Received: 16/07/2018
Date Tested: 31/07/2018
Sampled By: Melanie Booth

TEST RESULTS

Laboratory Reference: 1006195
Hole No.: TP119
Sample Reference: Not Given
Sample Description: Brown sandy CLAY
Depth Top [m]: 2.00
Depth Base [m]: Not Given
Sample Type: B



Preparation	Material used was natural	
Mould Type	1 Litre	
Samples Used	Composite specimens tested	
Material Retained on 37.5 mm Sieve	%	0
Material Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m ³	2.70
As received Moisture Content	%	26
Maximum Dry Density	Mg/m ³	1.82
Optimum Moisture Content	%	13

Remarks:

Approved:

Dariusz Piotrowski
PL Laboratory Manager
Geotechnical Section

Signed:

Darren Berrill
Geotechnical General
Manager

Date Reported: 02/08/2018

for and on behalf of i2 Analytical Ltd

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Analytical Report Number : 18-93463

Project / Site name:	Clitheroe Road, Whalley	Samples received on:	16/07/2018
Your job number:	18-0886.03	Samples instructed on:	19/07/2018
Your order number:	DS39658	Analysis completed by:	26/07/2018
Report Issue Number:	1	Report issued on:	26/07/2018
Samples Analysed:	10 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 18-93463

Project / Site name: Clitheroe Road, Whalley

Your Order No: DS39658

Lab Sample Number	1006169	1006170	1006171	1006172	1006173			
Sample Reference	TP102	TP104	TP107	TP110	TP113			
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Depth (m)	0.26	2.60	1.00	2.50	2.00			
Date Sampled	11/07/2018	12/07/2018	12/07/2018	11/07/2018	12/07/2018			
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	15	6.5	7.9	21
Total mass of sample received	kg	0.001	NONE	0.80	0.91	0.59	0.51	0.71

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.0	8.1	8.1	8.4	7.7
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	26	17	16	15	73
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013	0.0086	0.0081	0.0075	0.036
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	13.0	8.6	8.1	7.5	36.3



Analytical Report Number: 18-93463

Project / Site name: Clitheroe Road, Whalley

Your Order No: DS39658

Lab Sample Number	1006174	1006175	1006176	1006177	1006178			
Sample Reference	TP123	TP127	TP135	TP139	TP142			
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Depth (m)	1.90	0.30	3.00	0.50	1.70			
Date Sampled	12/07/2018	13/07/2018	09/07/2018	10/07/2018	13/07/2018			
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	16	12	15	12	19
Total mass of sample received	kg	0.001	NONE	0.90	0.53	0.50	0.56	0.63

General Inorganics

Parameter	Units	Limit of detection	Accreditation Status					
pH - Automated	pH Units	N/A	MCERTS	7.7	7.3	7.7	7.3	8.2
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	43	29	350	31	110
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.022	0.014	0.18	0.015	0.053
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	21.6	14.4	176	15.4	53.3



Analytical Report Number : 18-93463

Project / Site name: Clitheroe Road, Whalley

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1006169	TP102	None Supplied	0.26	Brown sandy loam with gravel.
1006170	TP104	None Supplied	2.60	Brown sand with gravel.
1006171	TP107	None Supplied	1.00	Light brown sand with gravel.
1006172	TP110	None Supplied	2.50	Light brown sand with gravel.
1006173	TP113	None Supplied	2.00	Brown clay and sand with gravel.
1006174	TP123	None Supplied	1.90	Brown clay and sand with gravel.
1006175	TP127	None Supplied	0.30	Brown loam and clay with vegetation.
1006176	TP135	None Supplied	3.00	Brown clay and sand.
1006177	TP139	None Supplied	0.50	Brown loam and clay with vegetation.
1006178	TP142	None Supplied	1.70	Brown clay.



Analytical Report Number : 18-93463

Project / Site name: Clitheroe Road, Whalley

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Appendix D – Soil Chemical Analysis Results



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Analytical Report Number : 18-92912

Project / Site name:	Whalley	Samples received on:	12/07/2018
Your job number:	18-0886.03	Samples instructed on:	18/07/2018
Your order number:	DS39619	Analysis completed by:	24/07/2018
Report Issue Number:	1	Report issued on:	24/07/2018
Samples Analysed:	13 soil samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 18-92912

Project / Site name: Whalley

Your Order No: DS39619

Lab Sample Number				1002928	1002929	1002930	1002931	1002932
Sample Reference				DS101	DS101	DS102	DS103	DS104
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.00-0.25	1.80-2.00	1.50-1.60	2.90-3.00	0.00-0.40
Date Sampled				11/07/2018	11/07/2018	11/07/2018	11/07/2018	11/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	6.1	24	14	12	6.0
Total mass of sample received	kg	0.001	NONE	0.98	1.3	1.3	1.4	1.1

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-	-	Not-detected

Speciated PAHs

	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.34	< 0.05	< 0.05	< 0.05	0.15
Anthracene	mg/kg	0.05	MCERTS	0.15	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.47	< 0.05	< 0.05	< 0.05	0.25
Pyrene	mg/kg	0.05	MCERTS	0.42	< 0.05	< 0.05	< 0.05	0.21
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.31	< 0.05	< 0.05	< 0.05	0.13
Chrysene	mg/kg	0.05	MCERTS	0.26	< 0.05	< 0.05	< 0.05	0.18
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.34	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.09	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.25	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	2.63	< 0.80	< 0.80	< 0.80	0.92

Heavy Metals / Metalloids

	mg/kg	1	MCERTS	11	4.6	9.8	6.8	11
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	4.6	9.8	6.8	11
Barium (aqua regia extractable)	mg/kg	1	MCERTS	76	-	-	-	86
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.60	-	-	-	0.66
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	-	-	-	0.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	0.4	0.7	1.0	0.6
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	-	-	-	< 1.2
Chromium (III)	mg/kg	1	NONE	22	7.8	16	13	18
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	22	7.6	16	13	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	23	16	12	19	24
Lead (aqua regia extractable)	mg/kg	1	MCERTS	47	11	14	16	52
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17	16	21	22	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.8	< 1.0	< 1.0	1.8	1.9
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	74	45	74	66	75

Analytical Report Number: 18-92912

Project / Site name: Whalley

Your Order No: DS39619

Lab Sample Number	1002928			1002929			1002930			1002931			1002932		
Sample Reference	DS101			DS101			DS102			DS103			DS104		
Sample Number	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Depth (m)	0.00-0.25			1.80-2.00			1.50-1.60			2.90-3.00			0.00-0.40		
Date Sampled	11/07/2018			11/07/2018			11/07/2018			11/07/2018			11/07/2018		
Time Taken	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status												

Monoaromatics

Parameter	Units	Limit of detection	Accreditation Status	1002928	1002929	1002930	1002931	1002932
Benzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
p & m-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
o-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Petroleum Hydrocarbons

Parameter	Units	Limit of detection	Accreditation Status	1002928	1002929	1002930	1002931	1002932
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

Parameter	Units	Limit of detection	Accreditation Status	1002928	1002929	1002930	1002931	1002932
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	13	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	18	< 10	< 10	< 10	< 10

Analytical Report Number: 18-92912

Project / Site name: Whalley

Your Order No: DS39619

Lab Sample Number	1002933			1002934			1002935			1002936			1002937		
Sample Reference	DS105			DS106			DS108			DS110			DS110		
Sample Number	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Depth (m)	0.00-0.25			0.00-0.25			2.20-2.50			0.00-0.40			2.50-2.60		
Date Sampled	11/07/2018			10/07/2018			10/07/2018			10/07/2018			10/07/2018		
Time Taken	None Supplied			None Supplied			None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status												
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Moisture Content	%	N/A	NONE	8.0	8.1	14	9.2	14							
Total mass of sample received	kg	0.001	NONE	1.0	1.0	1.4	1.1	1.6							

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Not-detected	-

Speciated PAHs

Compound	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.65	0.83	< 0.05	0.40	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.13	0.12	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.69	1.0	< 0.05	0.48	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.58	0.86	< 0.05	0.45	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.32	0.44	< 0.05	0.22	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.34	0.60	< 0.05	0.27	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.34	0.53	< 0.05	0.22	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.24	0.29	< 0.05	0.15	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.35	0.45	< 0.05	0.22	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.21	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.27	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	3.64	5.64	< 0.80	2.41	< 0.80

Heavy Metals / Metalloids

Compound	mg/kg	1	MCERTS	11	12	5.4	17	3.3
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	12	5.4	17	3.3
Barium (aqua regia extractable)	mg/kg	1	MCERTS	76	99	-	260	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.63	0.88	-	1.1	-
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	0.6	-	0.4	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	0.9	0.6	1.5	0.7
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	-	< 1.2	-
Chromium (III)	mg/kg	1	NONE	22	23	17	26	12
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	22	23	16	26	12
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27	20	18	19	17
Lead (aqua regia extractable)	mg/kg	1	MCERTS	41	32	13	31	9.4
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18	25	27	39	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.7	2.1	2.0	3.7	4.3
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	77	81	63	95	63

Analytical Report Number: 18-92912

Project / Site name: Whalley

Your Order No: DS39619

Lab Sample Number				1002933	1002934	1002935	1002936	1002937
Sample Reference				DS105	DS106	DS108	DS110	DS110
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.00-0.25	0.00-0.25	2.20-2.50	0.00-0.40	2.50-2.60
Date Sampled				11/07/2018	10/07/2018	10/07/2018	10/07/2018	10/07/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
				Monoaromatics				
Benzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
p & m-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
o-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	3.5	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	12	< 2.0	4.5
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	14	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	17	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	47	< 10	18
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	2.5	6.8	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	16	19	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	24	35	< 10	< 10

Analytical Report Number: 18-92912

Project / Site name: Whalley

Your Order No: DS39619

Lab Sample Number	1002938			1002939			1002940		
Sample Reference	DS111			DS111			DS112		
Sample Number	None Supplied			None Supplied			None Supplied		
Depth (m)	0.00-0.30			1.30-1.40			0.00-0.20		
Date Sampled	10/07/2018			10/07/2018			11/07/2018		
Time Taken	None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status						
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1			
Moisture Content	%	N/A	NONE	5.3	13	10			
Total mass of sample received	kg	0.001	NONE	0.93	1.1	1.0			

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected		

Speciated PAHs

Compound	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80		

Heavy Metals / Metalloids

Compound	mg/kg	1	MCERTS	9.6	10	12		
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.6	10	12		
Barium (aqua regia extractable)	mg/kg	1	MCERTS	150	-	77		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.82	-	0.77		
Boron (water soluble)	mg/kg	0.2	MCERTS	1.4	-	0.5		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	0.7	0.4		
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	-	< 1.2		
Chromium (III)	mg/kg	1	NONE	24	34	28		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	24	34	28		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	18	31	17		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	33	20	50		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	45	21		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	2.2	< 1.0	1.7		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	95	81	66		

Analytical Report Number: 18-92912

Project / Site name: Whalley

Your Order No: DS39619

Lab Sample Number				1002938	1002939	1002940		
Sample Reference				DS111	DS111	DS112		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.00-0.30	1.30-1.40	0.00-0.20		
Date Sampled				10/07/2018	10/07/2018	11/07/2018		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Monoaromatics								
Benzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
Toluene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
Ethylbenzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
p & m-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
o-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	11	< 10	< 10		



Analytical Report Number : 18-92912

Project / Site name: Whalley

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1002928	DS101	None Supplied	0.00-0.25	Brown loam and sand with vegetation.
1002929	DS101	None Supplied	1.80-2.00	Brown sand.
1002930	DS102	None Supplied	1.50-1.60	Brown clay and sand.
1002931	DS103	None Supplied	2.90-3.00	Brown sand with vegetation.
1002932	DS104	None Supplied	0.00-0.40	Brown loam and sand with vegetation.
1002933	DS105	None Supplied	0.00-0.25	Brown loam and sand with vegetation and gravel.
1002934	DS106	None Supplied	0.00-0.25	Brown loam and sand with vegetation and gravel.
1002935	DS108	None Supplied	2.20-2.50	Brown clay.
1002936	DS110	None Supplied	0.00-0.40	Brown loam and sand with vegetation and gravel.
1002937	DS110	None Supplied	2.50-2.60	Brown clay and sand.
1002938	DS111	None Supplied	0.00-0.30	Brown loam and clay with vegetation and gravel
1002939	DS111	None Supplied	1.30-1.40	Brown clay.
1002940	DS112	None Supplied	0.00-0.20	Brown loam and clay with vegetation.

Analytical Report Number : 18-92912

Project / Site name: Whalley

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L088/76-PL	W	MCERTS

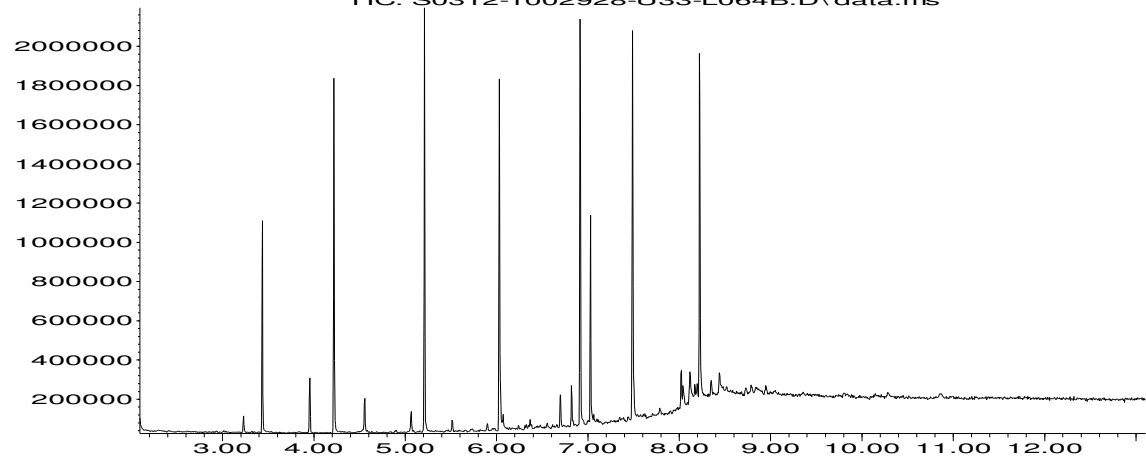
For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Abundance

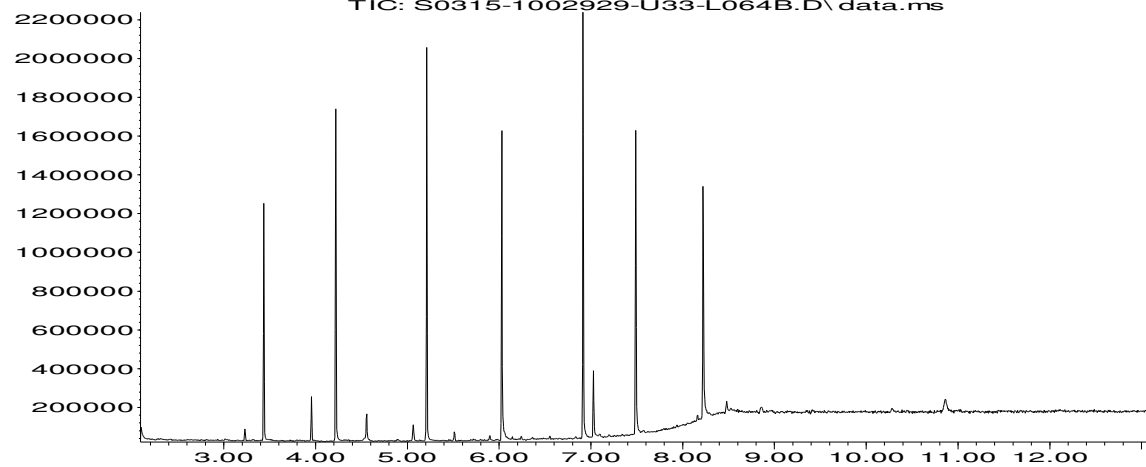
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Time-->

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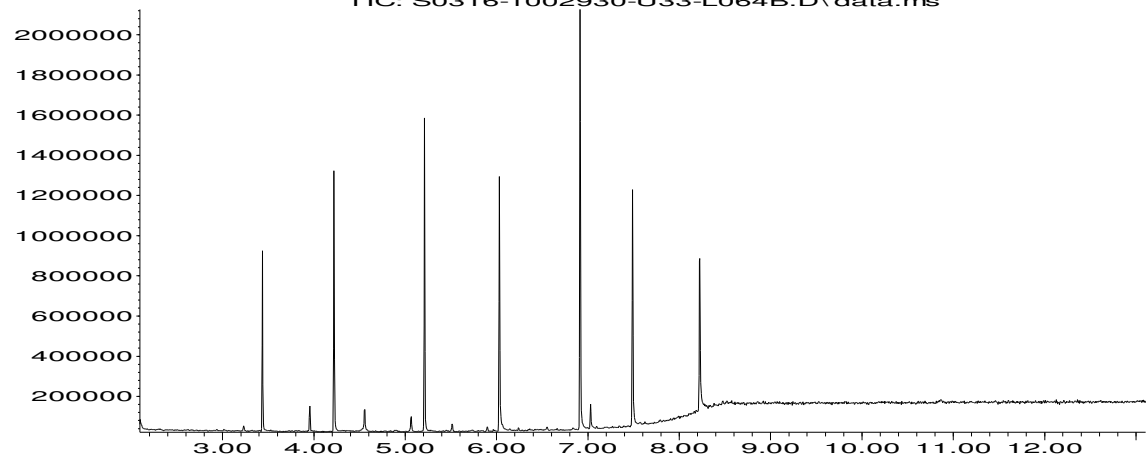
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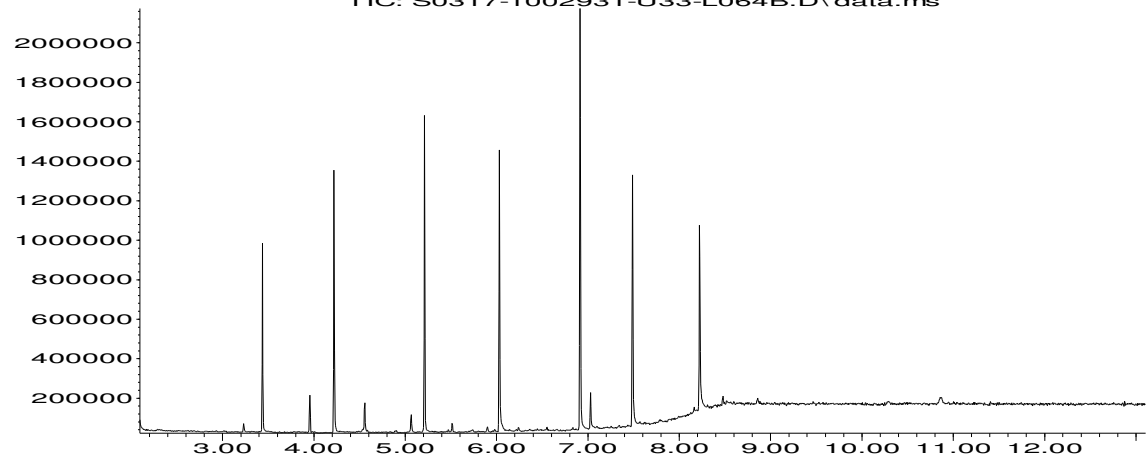
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Time-->

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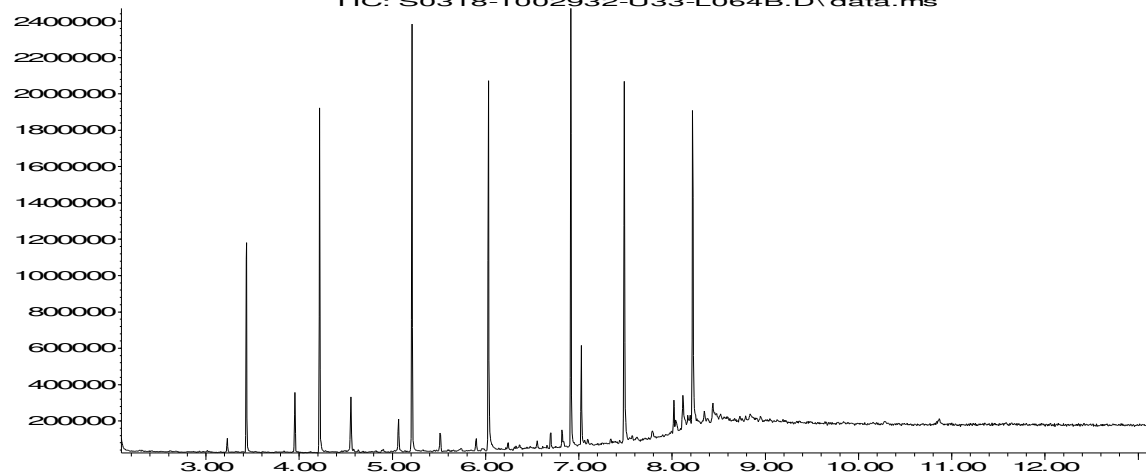
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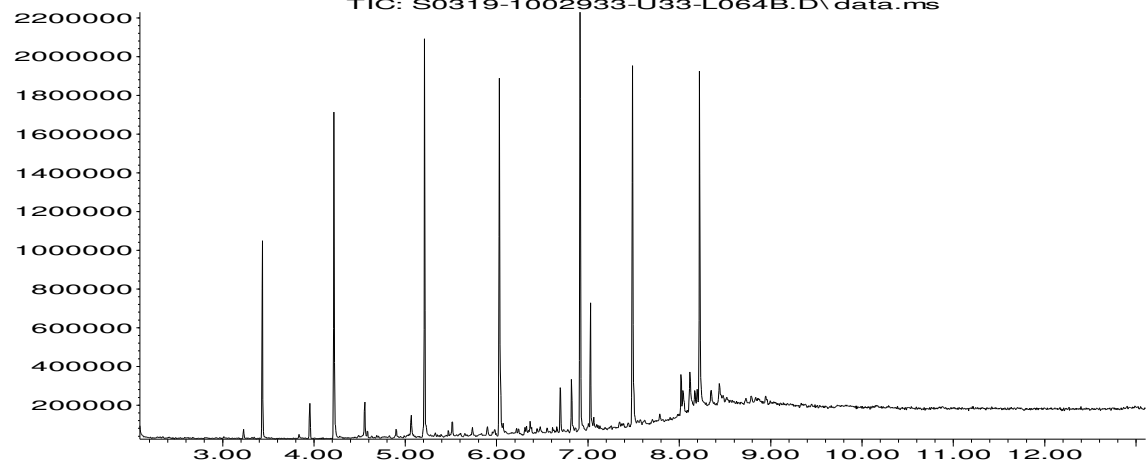
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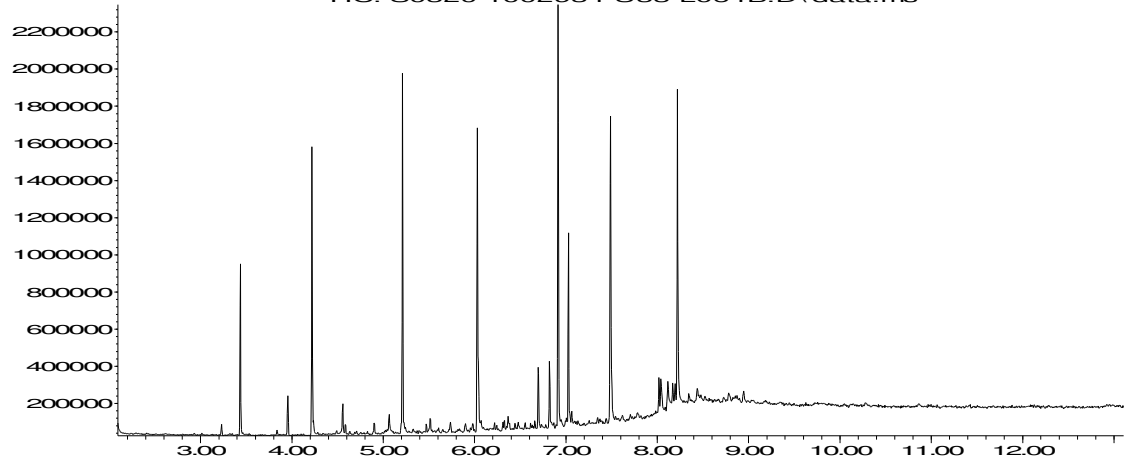
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Time-->

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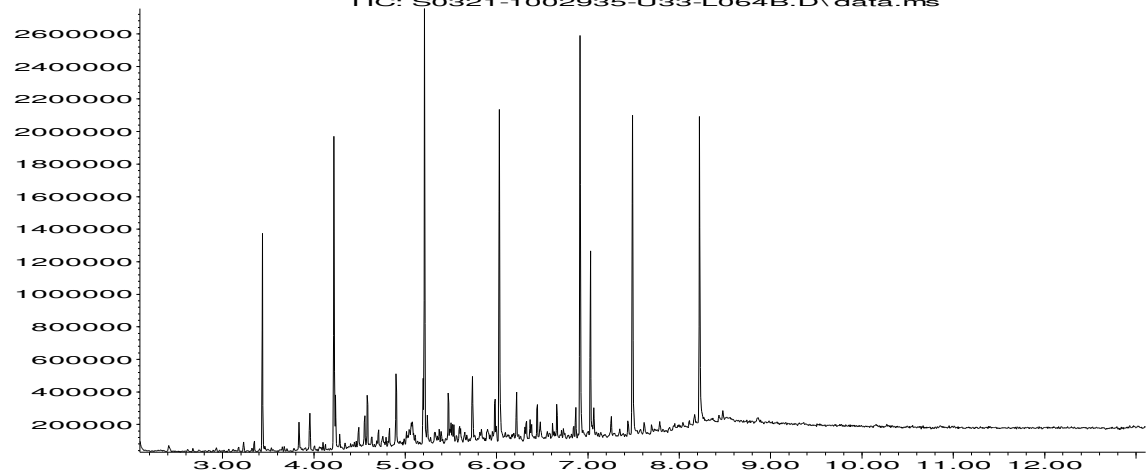
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Time-->

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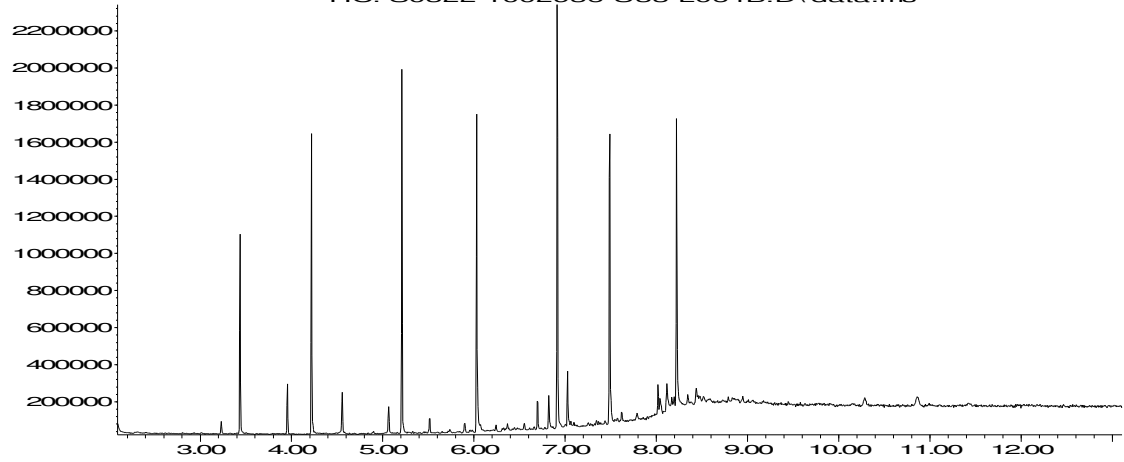
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Time-->

Abundance

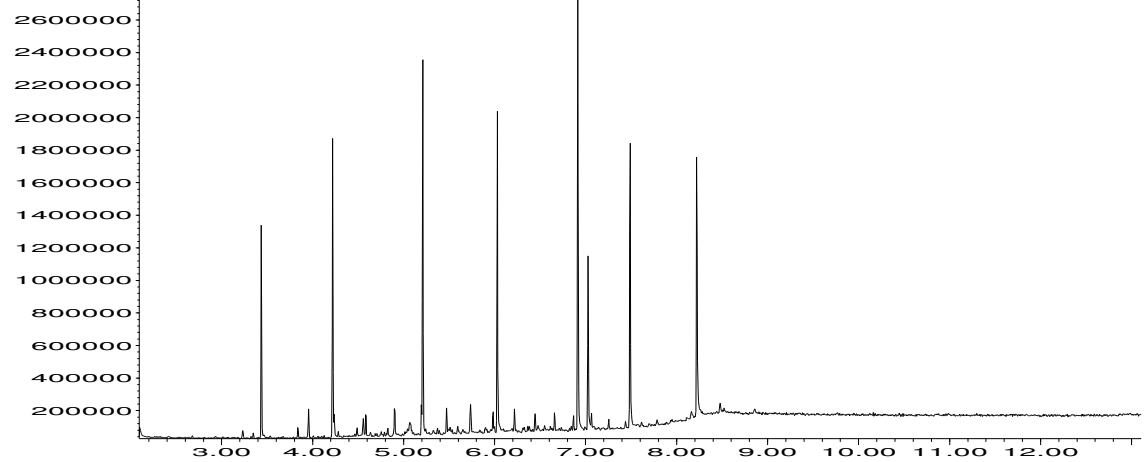
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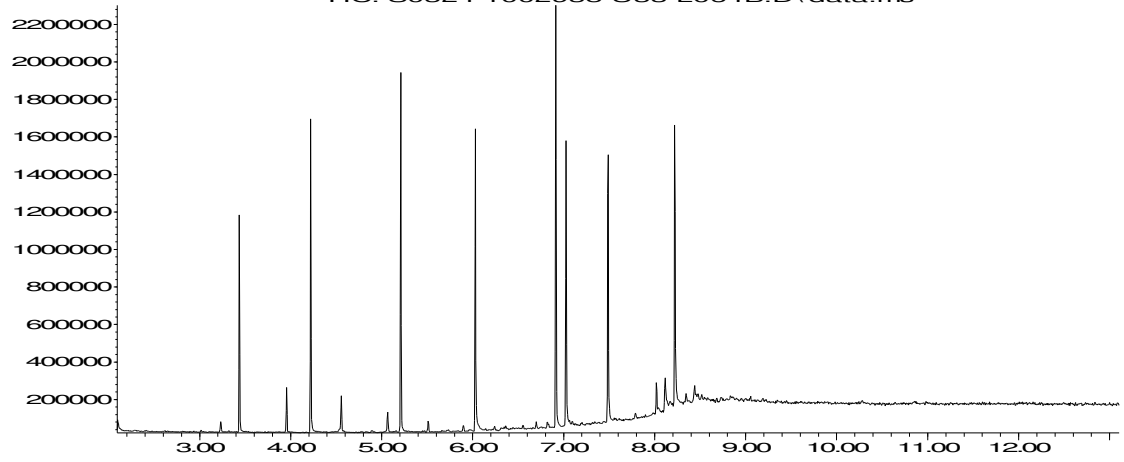
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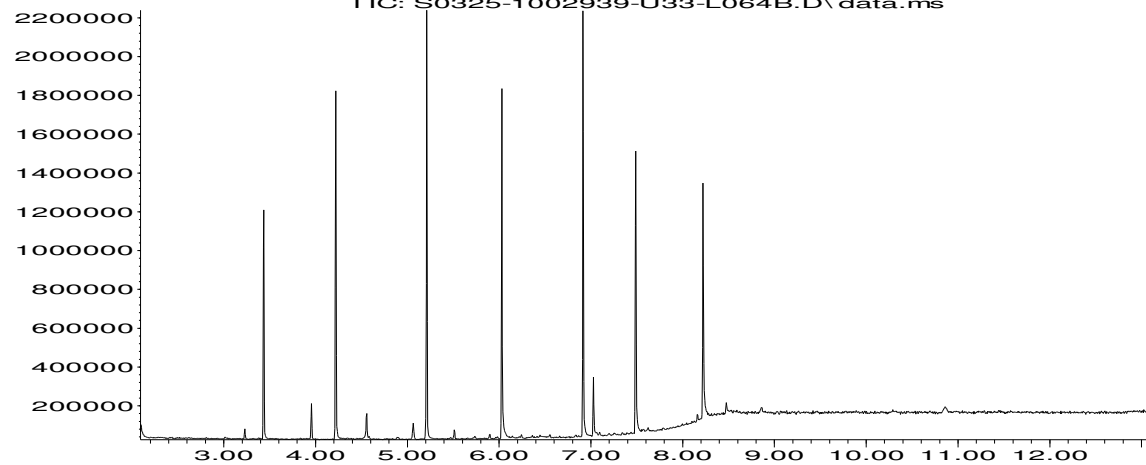
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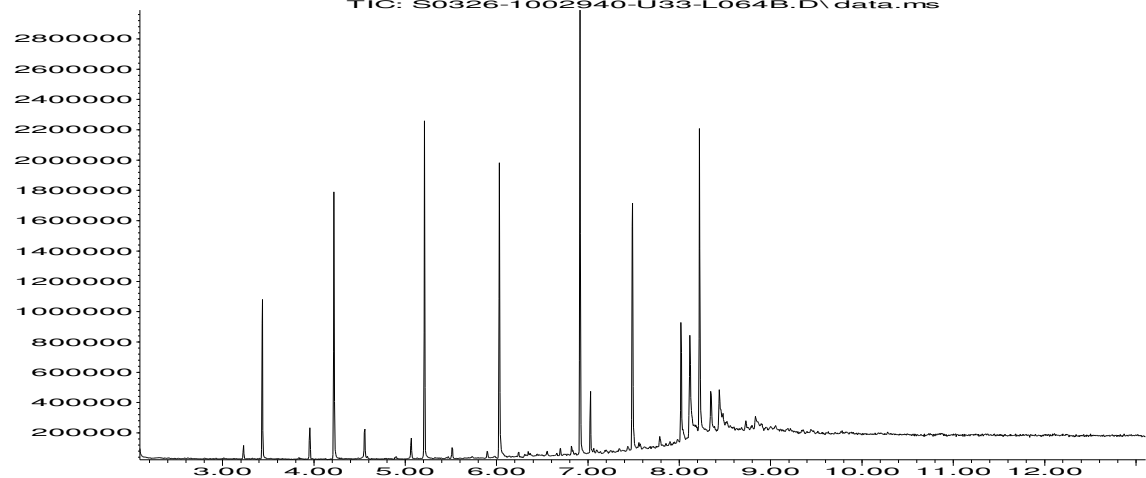
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Time-->

Abundance

TIC: S0326-1002940-U33-L064B.D\data.ms



Time-->

Appendix E – Groundwater Chemical Analysis Results



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Analytical Report Number : 18-94783

Project / Site name:	Clitheroe Road, Whalley	Samples received on:	01/08/2018
Your job number:	18-0886.03	Samples instructed on:	01/08/2018
Your order number:	DS39967	Analysis completed by:	08/08/2018
Report Issue Number:	1	Report issued on:	08/08/2018
Samples Analysed:	7 water samples		

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Analytical Report Number: 18-94783

Project / Site name: Clitheroe Road, Whalley

Your Order No: DS39967

Lab Sample Number	1013857				1013858		1013859		1013860		1013861	
Sample Reference	DS111				DS112		DS103		DS110		DS107	
Sample Number	None Supplied				None Supplied		None Supplied		None Supplied		None Supplied	
Depth (m)	None Supplied				None Supplied		None Supplied		None Supplied		None Supplied	
Date Sampled	31/07/2018				31/07/2018		31/07/2018		31/07/2018		31/07/2018	
Time Taken	None Supplied				None Supplied		None Supplied		None Supplied		None Supplied	
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status									

General Inorganics

Parameter	Units	Limit of detection	Accreditation Status	1013857	1013858	1013859	1013860	1013861
pH	pH Units	N/A	ISO 17025	7.0	7.2	6.5	7.1	7.1
Sulphate as SO ₄	µg/l	45	ISO 17025	27400	33500	12900	19400	24600
Sulphate as SO ₄	mg/l	0.045	ISO 17025	27.4	33.5	12.9	19.4	24.6

Heavy Metals / Metalloids

Parameter	Units	Limit of detection	Accreditation Status	1013857	1013858	1013859	1013860	1013861
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.21	-	-	-	-
Barium (dissolved)	µg/l	0.06	ISO 17025	120	-	-	-	-
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	-	-	-	-
Boron (dissolved)	µg/l	10	ISO 17025	27	-	-	-	-
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.06	-	-	-	-
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	-	-	-	-
Chromium (III)	µg/l	1	NONE	< 1.0	-	-	-	-
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.4	-	-	-	-
Copper (dissolved)	µg/l	0.5	ISO 17025	3.2	-	-	-	-
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	-	-	-	-
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	-	-	-	-
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.2	-	-	-	-
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	-	-	-	-
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.0	-	-	-	-

Monoaromatics

Parameter	Units	Limit of detection	Accreditation Status	1013857	1013858	1013859	1013860	1013861
Benzene	µg/l	1	ISO 17025	< 1.0	-	-	-	-
Toluene	µg/l	1	ISO 17025	< 1.0	-	-	-	-
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	-	-	-	-
p & m-xylene	µg/l	1	ISO 17025	< 1.0	-	-	-	-
o-xylene	µg/l	1	ISO 17025	< 1.0	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	-	-	-	-



Analytical Report Number: 18-94783

Project / Site name: Clitheroe Road, Whalley

Your Order No: DS39967

Lab Sample Number	1013857				1013858				1013859				1013860				1013861			
Sample Reference	DS111				DS112				DS103				DS110				DS107			
Sample Number	None Supplied				None Supplied				None Supplied				None Supplied				None Supplied			
Depth (m)	None Supplied				None Supplied				None Supplied				None Supplied				None Supplied			
Date Sampled	31/07/2018				31/07/2018				31/07/2018				31/07/2018				31/07/2018			
Time Taken	None Supplied				None Supplied				None Supplied				None Supplied				None Supplied			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status																	

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	-	-	-	-	-
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	-	-	-	-	-
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	-	-	-	-	-
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	-	-	-	-	-
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	-	-	-	-	-
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	-	-	-	-	-
Aliphatic >C10 - C12	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aliphatic >C12 - C16	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aliphatic >C16 - C21	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aliphatic >C21 - C35	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aliphatic >C10 - C35	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aromatic >C10 - C12	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aromatic >C12 - C16	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aromatic >C16 - C21	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aromatic >C21 - C35	µg/l	10	ISO 17025	< 10	-	-	-	-	-
Aromatic >C10 - C35	µg/l	10	ISO 17025	< 10	-	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 18-94783

Project / Site name: Clitheroe Road, Whalley

Your Order No: DS39967

Lab Sample Number				1013862	1013863			
Sample Reference				DS102	DS101			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				31/07/2018	31/07/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

General Inorganics

pH	pH Units	N/A	ISO 17025	6.4	6.3			
Sulphate as SO ₄	µg/l	45	ISO 17025	7630	8870			
Sulphate as SO ₄	mg/l	0.045	ISO 17025	7.6	8.9			

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.22	0.36			
Barium (dissolved)	µg/l	0.06	ISO 17025	68	160			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	22	22			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.19	0.47			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9	7.8			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.6	4.9			
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.7	0.8			
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.1	9.7			

Monoaromatics

Benzene	µg/l	1	ISO 17025	< 1.0	-			
Toluene	µg/l	1	ISO 17025	< 1.0	-			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	-			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	-			
o-xylene	µg/l	1	ISO 17025	< 1.0	-			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	-			



Analytical Report Number: 18-94783

Project / Site name: Clitheroe Road, Whalley

Your Order No: DS39967

Lab Sample Number				1013862	1013863			
Sample Reference				DS102	DS101			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				31/07/2018	31/07/2018			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	-			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	-			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	-			
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	-			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	-			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	-			
Aliphatic >C10 - C12	µg/l	10	ISO 17025	< 10	-			
Aliphatic >C12 - C16	µg/l	10	ISO 17025	< 10	-			
Aliphatic >C16 - C21	µg/l	10	ISO 17025	< 10	-			
Aliphatic >C21 - C35	µg/l	10	ISO 17025	< 10	-			
Aliphatic >C10 - C35	µg/l	10	ISO 17025	< 10	-			
Aromatic >C10 - C12	µg/l	10	ISO 17025	< 10	-			
Aromatic >C12 - C16	µg/l	10	ISO 17025	< 10	-			
Aromatic >C16 - C21	µg/l	10	ISO 17025	< 10	-			
Aromatic >C21 - C35	µg/l	10	ISO 17025	< 10	-			
Aromatic >C10 - C35	µg/l	10	ISO 17025	< 10	-			

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 18-94783

Project / Site name: Clitheroe Road, Whalley

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
TPH C10-C35 by GCxGC-FID	Determination of total petroleum hydrocarbons in water by GC x GC FID with carbon banding aliphatic and aromatic C10-C35. Accredited Matrices SW,GW,PW.	In-house method	L101B-PL	W	ISO 17025
TPH Chromatogram in Water	TPH Chromatogram in Water.	In-house method	L070-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	ISO 17025

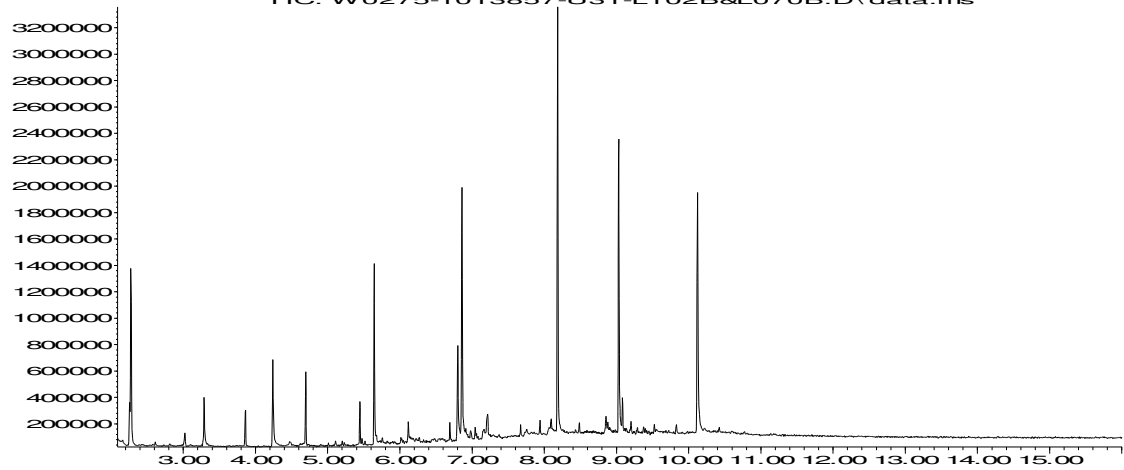
For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Abundance

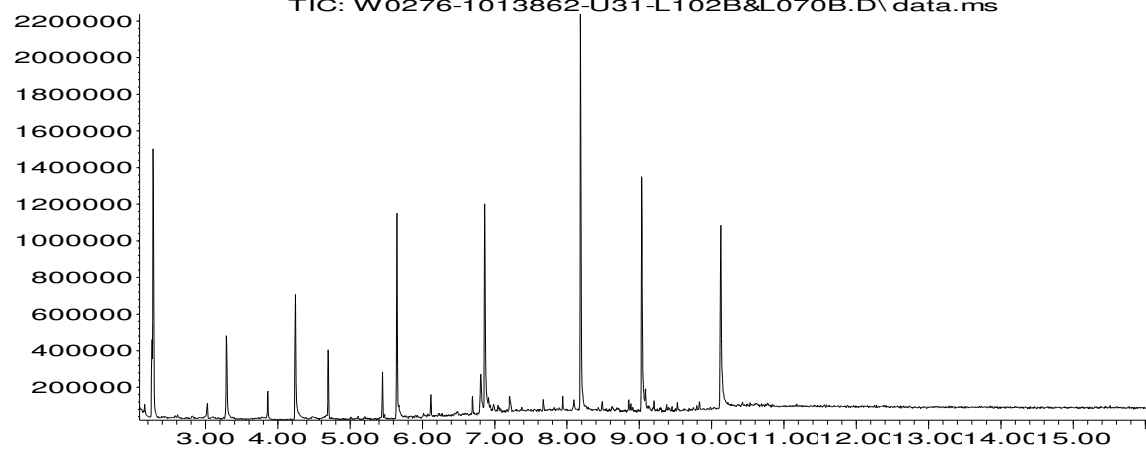
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Time-->

Abundance

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Appendix F – Gas and Groundwater Monitoring Data

Appendix G – Risk Definitions

Risk Definitions

The following methodology is based on the methodology presented in CIRIA C552 Contaminated Land Risk Assessment: A Guide to Good Practice 2001. It requires the classification of the:

- ▲ Magnitude of the potential consequence (severity) of the Risk occurring; and
- ▲ Magnitude of the Probability (likelihood) of the Risk occurring.

The classifications are then compared to indicate the risk presented by each pollutant linkage.

Consequence to Receptor Definition Matrix

	Human Health	Controlled Waters	Buildings/Services
Severe Consequence	Acute or chronic permanent impact on human health.	Sensitive controlled water pollution ongoing, or just about to occur.	Catastrophic collapse
Medium Consequence	Chronic permanent impact on human health	Gradual pollution of sensitive controlled water	Degradation of materials
Mild Consequence	Chronic temporary impact on human health	Gradual pollution of non-sensitive controlled water	Damage to building rendering it unsafe to occupy (eg foundation damage resulting in instability).
Minor Consequence	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc).	Slight discoloration of water	Easily repairable effects of damage to buildings, structures and services, i.e discoloration of concrete

Probability Definitions

Probability	Definition in Context
Higher	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution. Positive evidence of source, pathway and receptor.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term. Suspect source, pathway, and receptor
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term No evidence of hazard, pathway, and receptor

Standard Risk Matrix

		Consequence/ Magnitude of impact			
		Severe	Medium	Mild	Minor
Probability	High	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/low	Low
	Low Likelihood	Moderate	Moderate/low	Low	Very Low
	Unlikely	Moderate/low	Low	Very Low	Very Low

Classified risks and likely action

Significance Level	Definition/Comments
Very High Risk	<p>There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening.</p> <p>This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.</p> <p>Demonstrable contaminated land situation, highest threat & liability level, urgent action recommended.</p>
High Risk	<p>Harm is likely to arise to a designated receptor from an identified hazard.</p> <p>Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.</p> <p>Likely contaminated land situation, risk assessment and action recommended.</p>
Moderate	<p>It is possible that harm could arise to a designated receptor from an identified hazard. However, if is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild</p> <p>Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.</p> <p>Plausible contaminated land situation, risk assessment and possible action recommended.</p>
Low Risk	<p>It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.</p> <p>Unlikely contaminated land situation, possible risk assessment and possible action.</p>
Very Low Risk	<p>There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.</p> <p>Negligible risk, no action recommended except vigilance for changes in conditions.</p>