WILLIAMS HOMES (BALA) LTD

WEST GORTON MEDICAL CENTRE, HYDE ROAD, WEST GORTON, MANCHESTER

PHASE 4 -SITE REMEDIATION VERIFICATION REPORT

REPORT No. E0849.P4.VER.R1

MARCH 2017

Client :	**WILLIAMS HOMES (BALA) LTD**
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1. INTRODUCTION.

1.1 Background and Terms of Reference

1.1.1 Williams Homes (Bala) Ltd instructed e-geo Solutions Ltd to prepare a Site Remediation Validation Report for a medical centre and pharmacy development site on Hydre Road, West Gorton, Manchester. The site which was previously undeveloped land is being redeveloped for commercial purposes.

1.1.2 During redevelopment of the site remediation activities were carried out to ensure the site was 'fit for use'. The site remediation activities undertaken were based on the findings of a previous study at the site which included:

Report on a Geo Environmental Investigation at Land Off Hyde Road, Manchester for LSP Developments Report Ref J2725/14/E. RGS Ltd. June 2014. (Ref 1) (Appendix 1)

Report on an Environmental Investigation at Land Off Hyde Road, Manchester for LSP Developments Report Ref J2725/14/E. RGS Ltd. September 2015. (Ref 2) (Appendix 2)

Letter Report on Gas Monitoring on Land Off Hyde Road, Manchester for LSP Developments Report Ref J2725/14/E. RGS Ltd. 25th September 2014 (Ref 3)

1.1.3 This Site Remediation Validation Report has been prepared in response to Planning Condition 17 detailed in Planning Tracker 108869/MO/2015/N2 dated 09.08.16 and presents documentary and photographic evidence of the remediation works carried out.

1.1.4 The report has been prepared for the sole use of the Client, for the purposes described and no extended duty of care applies to other parties. Any other party using this report for any purpose whatsoever do so at their own risk and any duty of care to that party is specifically excluded.

1.1.5 The comments given, and opinions expressed, in this report are based on the information available at the time the report was compiled, however there may be additional information and data which becomes available at a later date which has an impact on the report content. Where data supplied by others has been used it has been assumed that the information is correct. No responsibility can be accepted by e-geo Solutions Ltd for inaccuracies within the data supplied by others.

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1.2 Site Location

1.2.1 The site is located at the junction of Hyde Road and Clowes Street, West Gorton, Manchester. The site is cantered at NGR SJ86591 96700.

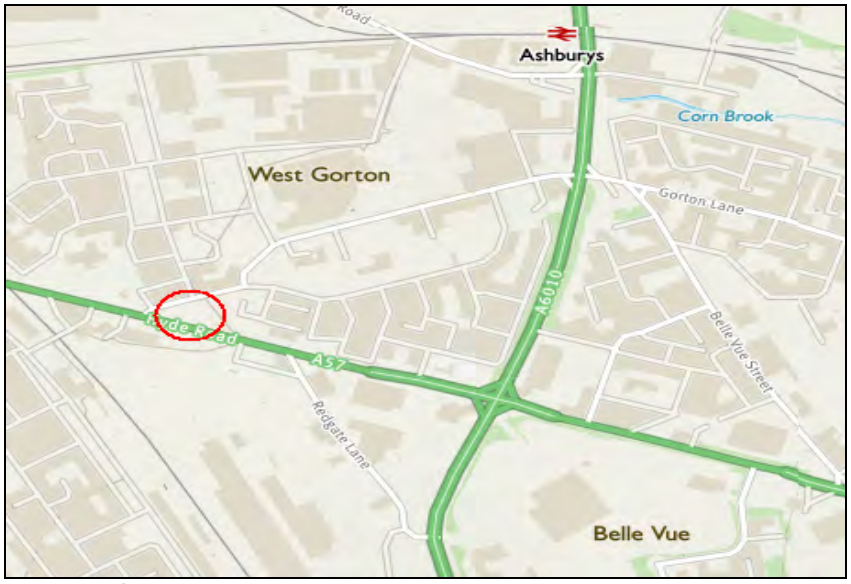


Figure 1 – Site Location

2. SITE CHARACHTERISTICS

2.1 Original Site Description and Topography

2.1.1 The site originally comprised an open area of undeveloped ground. Prior to this it was occupied by terraced housing. The ground within the site was generally flat and level.

2.2 Ground and Groundwater Conditions

2.2.1 The results of a previous intrusive investigation (Ref 1) (Appendix 1) indicates the following ground conditions:

Depth (m)	Strata type	Groundwater strikes (m)
0.2 0.3	Topsoil	None
0.15 2.1	Made ground	None
+2.2 – +8.5	Glacial till	None

2.2.2 The made ground below the layer of topsoil site comprises a black-brown silty clayey gravel of ash clinker, brick and concrete and is demolition rubble from the former terraced houses.

2.2.3 Below the made ground the natural ground comprised red brown silty sands and sandy silts and clay

2.2.4 No ground water was encountered.

2.3 Site Contamination

2.3.1 The previous ground investigation (Ref 1) (Appendix 1) identified the presence of elevated concentrations of lead, benzo(a)pyrene and indeno(b)pyrene when compared to screening values for residential development.

2.3.2 Trace levels of methane were detected with carbon dioxide concentrations to a maximum of 3.9% and depleted oxygen concentrations to a minimum of 17.9%. Based on the results the previous investigation report determined 'Gas Screening Values' of 0.0002 l/hr methane and 0.0078 l/hr carbon dioxide and classed the characteristic level 1.

2.4 Site Development

2.4.1 The initial intention was to develop the site for residential purposes (Ref 1) (Appendix 1) but this was revised and the site has been redeveloped for commercial use with a medical centre, pharmacy and store with associated access and parking areas.

3. REMEDIATION STRATEGY.

3.1 Site Remediation Approach

3.1.1 No specific 'Remediation Strategy Document' was produced for the site but the need for remediation measures to be undertaken to allow the site to be developed for residential use, and the scope of the remediation works, were described in a previous ground investigation report by RGS Ltd. June 2014 (Ref 1) (Appendix 1)

3.1.2 The remediation works required for residential development of the site are described in the report (Ref 1) sections 11.3.3. and involved:

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- In view of the presence of hydrocarbons it will be necessary to provide vapour barrier.
- Plastic services should be constructed in a surround of clean inert material and further testing may be required as recommended in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. Note: The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.
- In garden areas the provision of a capping layer of say 500mm of inert material, which will put the contaminated ground out of the end users' dig range. At the base of this layer a granular capillary break of say 100mm of free draining granular soil should be placed

3.2 Changes to Site Remediation Strategy

3.2.1 The site development proposals were revised to a commercial use with medical centre, pharmacy and retail unit (Figure 2). To allow the development to proceed the ground-works phase of the development will have to include the excavation of soil for removal to land fill. An additional investigation was undertaken to assess the disposal options for the excavated soils and the findings presented in a report:

Report on an Environmental Investigation at Land Off Hyde Road, Manchester for LSP Developments Report Ref J2725/14/E. RGS Ltd. September 2015. (Ref 2) (Appendix 2)

3.2.2 On the basis of the revised development proposals and the results of the additional investigation (Ref 2) (Appendix 2) the following remediation was proposed:

- The concentrations of contaminants encountered in soil underlying the site do not exceed the relevant CLEA soil guideline values (SGV's) for commercial end use. (Ref 2)
- Soils revealed at this site may be removed to a landfill that accepts inert waste
- Any imported soils should be subjected to validations tests



Figure 2 - Site Development Layout

4. SITE REMEDIATION WORKS.

4.1 Remediation Works Undertaken

4.1.1 Williams Homes (Bala) Ltd has indicated that the various aspects of the site remediation works were undertaken at the site as follows:

- Excavation of ground materials for off-site disposal to create suitable site levels
- Inspect exposed subgrade for evidence of contamination before filling
- Place inert granular sub base below buildings, pavements and sealed surface areas
- Place 600mm clean soil in landscape areas
- Test samples of imported/placed soils to indicate they are uncontaminated

4.2 Disposal of Excavated Contaminated Ground

4.2.1 The site remediation included the excavation and removal of near surface made ground from the site to achieve site levels that could accommodate the imported uncontaminated sub-base aggregate. This material was removed from site for disposal by:

W Maher and Sons Ltd
Soapstone Way
Off Fairhills Road
Irlam
Manchester
M44 6RA

4.2.2 A total of 970 m3 of ground material was removed from site to landfill operated by W. Maher and Sons Ltd which is an inert landfill.

4.2.3 Consignment notes for the materials removed from site are presented in Appendix 3.

4.2.4 Following removal of the excavated soils the formation was inspected. No evidence of contamination was noted. The results of previous investigations had confirmed that recorded contamination concentrations were below guideline concentrations for commercial end use.

4.3 Barrier Layer/Cover System

4.3.1 Williams Homes (Bala) Ltd has indicated that a barrier layer was provided below structures and hardstanding areas that comprised MOT type sub-base. Photographic evidence of the placement of the sub-base material across the site is presented below.



Plate 1 – MOT Sub-base barrier layer being placed

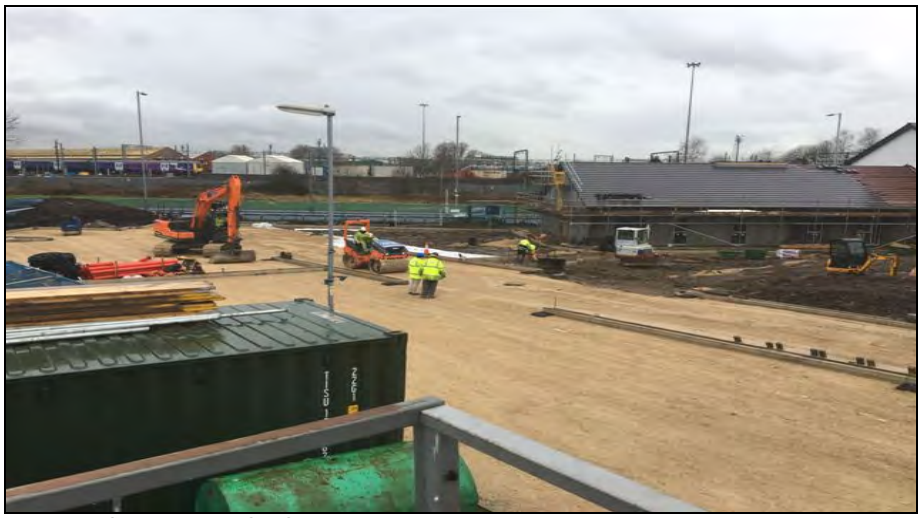


Plate 2 – Completed MOT Sub-base barrier layer in car park areas

4.3.2 In common garden and landscape areas of the site a barrier layer, 600mm thick, of imported topsoil was placed. Photographic evidence for the placement of the topsoil is presented below:



Plate 3 – Placed topsoil showing depth

4.3.3 Confirmation of the quality of the placed topsoil is presented in Appendix 4.

Appendix 1 - Report on a Geo Environmental Investigation at Land Off Hyde Road, Manchester Report Ref J2725/14/E. RGS Ltd. June 2014

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REPORT ON A GEO-ENVIRONMENTAL INVESTIGATION

at

LAND OFF HYDE ROAD, MANCHESTER

for

LSP DEVELOPMENTS LTD

Report No J2725/14/E

June 2014

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REPORT ON A GEO-ENVIRONMENTAL INVESTIGATION

at

LAND OFF HYDE ROAD, MANCHESTER

for

LSP DEVELOPMENTS LTD

Report No J2725/14/E **June 2014**

1. SYNOPSIS

This investigation has demonstrated that the site is underlain by up to 2.2m of made ground before encountering silty sands and silty clays representative of glacial till. These deposits could provide suitable bearing strata for the residential properties proposed on the site which could be founded on strip or spread footings. The contamination testing revealed the presence of some contaminants within the made ground which will require remediation. In addition the soak away testing indicated that the site is not suitable for soakaways.

2. INTRODUCTION

It is understood that LSP Developments plan to develop an area off Hyde Road that will be known as West Gorton Village Hub and will comprise residential developments. Accordingly, a site investigation has been undertaken in accordance with the information provided by the desk study and as instructed by the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. Additionally, contamination testing of the made ground has been undertaken to enable an assessment of the levels of contamination at this site.

This report presents the data obtained and discusses the ground conditions in relation to the proposed development.

3. LIMITATIONS

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

4. DESK STUDY

A Phase 1 Desk Study was provided which had been undertaken by Atkinson Peck consulting engineers Ltd and the results were presented as ref KM/C15719 25th July 2011. That study has been used extensively during the current intrusive investigation.

5. FIELDWORKS

The fieldworks were undertaken on the 20th May and included the following:

- Five machine dug trialpits.
- Three soakaway tests.
- Three windowless sample boreholes, one continued with rotary open-hole techniques.
- Three gas monitoring standpipes.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

5.1 Machine Dug Trialpits

Five trialpits were excavated in order to reveal the nature of the near surface soils using a 7 ton tracked 360° excavator. The soils were logged on site in general accordance with BS5930: 1999, as amended in 2007, and full descriptions are given on the trialpit records which are presented in Appendix 2. Samples were taken from the trialpits for both geotechnical and chemical testing. The chemical test specimens were retained in the appropriate air tight containers within cool boxes for onward transition to the chemical laboratory.

5.2 Soakaway Tests

Soakaway tests were conducted in the three of the trialpits excavated. The soakage tests where undertaken at the base of the pits, these tests were conducted and calculated in general accordance with the method given by BRE Digest 365 and the results are presented in Appendix 2.

5.3 Windowless Sample/Rotary Open-Hole Boreholes

These boreholes were sunk using a Dando terrier drilling rig with drive-in windowless sampling and rotary drilling techniques. The cores were undertaken in 1m lengths and reduced in diameter from 90mm for the first 1m through 80mm, 70mm and 60mm for subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. Borehole WS 1 was then advanced utilising rotary open hole methods to 9.5m. The soils were described in general accordance with BS5930: 1999, as amended in 2007, and full descriptions are given on the records which are presented in Appendix 3. Also included on these records are the core diameters and percentages of core recovered.

5.4 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes in accordance with the procedure given in BS1377: 1990: Part 9, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the N_{100} values. The results of the dynamic penetration tests are tabulated and presented as bar charts of N_{100} values versus depth in Appendix 4.

5.5 Gas Monitoring Standpipes

Gas monitoring standpipes were installed to the full depth of the windowless sample boreholes. Details of the installations are shown on the appropriate borehole records. In all cases, the monitoring standpipe consisted of a perforated pipe from the base of the borehole to between 0.5m and 1.0m below surface, with a non-perforated pipe to ground level. The response zone was filled with pea gravel, with a bentonite seal above and the installation was capped with a stop box cover in a concrete surround.

6. GEOLOGY

An examination of the published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: *Geological Data for the Site*

Strata Type	Strata Name[1]	Previous Name[2]	Description[2]
Superficial Geology	Glacial Till	-	Glacial till is unsorted glacial sediment which is the part of a glacial drift that was deposited directly by the glacier. It may vary from clays to mixtures of clay, sand, gravel and boulders.
Solid Geology	Collyhurst Sandstone Formation	Lower Permian Sandstone, Permian Sandstone	A soft red sandstone with abundant beds of "millet seed" sand grains alternating with beds of fine-grained sharp sand

7. STRATA CONDITIONS

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: *Generalised strata profile*

Depth (m)	Strata type	Groundwater strikes (m)
0.2 – 0.3	Topsoil	None
0.45 – 2.1	Made ground	None
+ 2.2 – +9.5	Glacial till	None

'+' Denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

This profile is considered in more detail below.

7.1 Topsoil

The site was found to be capped by between 0.20m and 0.30m of brown silty sandy clayey topsoil.

7.2 Made Ground

Underlying the topsoil, made ground was revealed to depths between 0.45m and 2.1m depth. This was generally described as black-brown silty clayey gravel of ash clinker, brick and concrete. It is considered that this represents demolition material from the former terraced houses that once occupied the site. TP3 and TP4 also

[1] Sources: BGS Geology of Britain Viewer
[2] Sources: BGS Lexicon of Named Rock Units

encountered sandstone cobble pavement surfacing associated with the former housing. In addition, at 2.2m depth in TP4, a disused drainage/sewage pipe was encountered and ran in north - south direction on the east end of the site.

7.3 Glacial Till

On penetrating made ground across the site red brown silty sands and sandy silt/clay was encountered to full depth of all trial pits TP1, TP4 and TP5 and in all boreholes. It is considered that these represent deposits of glacial till known to underlie the site.

7.4 Groundwater

The normal rate of boring does not permit the recording of an equilibrium water level for any one strike. Moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions.

Notwithstanding the above, no groundwater was encountered during the investigation

8. INSITU TESTING

8.1 Soakaway Tests

Soakaway tests were conducted in three of the trial pits. These tests were undertaken in general accordance with the method prescribed in BRE 365. The results obtained from the soakaway tests are summarised below:

Table 3: *Soakaway Test Results*

TP	Depth (m)	Soakage Area Dimensions (average)	Soil Description (Base of Borehole)	Infiltration Rate (m/sec)	Drainage Characteristics
TP1	2.2	2.0m (L) x 0.6m (W)	Very Silty Sand	None	None
TP4	2.2	2.2m (L) x 0.6m (W)	Very Silty Sand	None	None
TP5	3.6	2.2m (L) x 0.6m (W)	Very Silty Sand	None	None

8.2 Standard Penetration Tests

Standard penetration tests (SPTs) were undertaken within WS1 and the results of this work illustrated that the silty glacial sands yielded a resistance to penetration of 37 to 44 blows/300mm, suggesting a dense insitu condition.

8.3 Dynamic Penetration Tests

Dynamic penetration tests were conducted adjacent to the windowless sample boreholes WS2 and WS3. These results demonstrated that low resistances to

penetration of 0 to 2 blows/100mm were initially revealed within the made ground. Upon penetrating the silty sands and clay/silts the resistance to penetration was noted to increase generally with depth with effective refusal[3] being recorded at depth of 6.0m. It should be appreciated that upon driving the DCP at position WS3, the rods penetrated to 1.90m then dropped into the hole. It is possible that this area is underlain by disused chamber associated with the drain/sewer pipe encountered in TP4 which is now disused after the demolition of the historic terraced houses. It is recommended that this feature is further investigated before construction commences on site.

8.4 Gas and Water Level Monitoring

The standpipes were monitored between the 15th and 29th of May 2014. Further testing will be undertaken and the results will be issued under separate cover. The results of the gas monitoring undertaken to date are tabulated below.

Table 4: ***Gas and water monitoring***

Borehole No	Date	CH_4 (%)	CO_2 (%)	O_2 (%)	Flow	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
WS1	15/5/2014	0.0	1.6	19.8	0.2	1031	2.78	5.0
	22/5/2014	0.1	3.0	19.1	0.0	997	-	
	29/5/2014	0.1	3.9	17.1	0.1	1012	2.77	
WS2	15/5/2014	0.0	2.7	17.8	0.1	1031	2.18	3.9
	22/5/2014	0.1	2.3	19.9	0.1	997	2.18	
	29/5/2014	0.1	2.9	18.4	0.1	1012	2.02	
WS3	15/5/2014	0.0	3.8	15.0	0.1	1031	-	1.7
	22/5/2014	0.1	3.1	18.9	0.1	997	-	
	29/5/2014	0.1	2.5	18.4	0.1	1012	-	

This work was undertaken using a Geotechnical Instruments (UK) Ltd. GA2000+ (serial No GA08272) which was last calibrated on the 4th October 2013.

It is considered that the water encountered during the monitoring of the boreholes represents perched water within the granular soils and does not represent the phreatic surface.

9. LABORATORY TESTING - GEOTECHNICAL

A programme of laboratory testing has been undertaken in accordance with BS1377 unless stated otherwise and the results are presented in Appendix 5. Each type of test is briefly summarised below and the results have been used to assist in the formulation of the discussion of ground conditions.

[3] 25 blows/100mm

9.1 Moisture Content Determinations (Part 2 : 1990 : 3)

Selected samples of the cohesive soils have been subjected to moisture content determinations. The results indicate that the natural water content of the cohesive soils was between 16% and 25%.

9.2 Index Property Tests (Part 2 : 1990 : 4, 5 and 6.5)

The liquid and plastic limits of the clay deposits were determined. The results of tests yielded liquid limits in the range 33% to 47%, in association with plastic limits of 14% to 20%. These results demonstrate that the cohesive soils may be generally classified as low and intermediate plasticity clays.

These results demonstrate that on the basis of the consistency index has a firm to stiff consistency[4]. In addition, the NHBC classification[5] indicates that the clay revealed at this site possesses a moderate volume change potential in the most onerous case.

9.3 Particle Size Distribution (Part 2: 1990: 9.2)

Seven samples of the granular glacial till have been subjected to sieve analysis in order to establish their particle size distribution. The results of these tests indicate that the soils may be classified as slightly clayey silty sands and clayey silts.

9.4 Sulphate Content and pH Values

Sulphate content and pH values of selected samples of soil were determined and the results are presented on the chemical test results sheet. Total sulphate contents ranging between 0.072% and 0.21% and soluble sulphate contents of 0.026g/l to 0.048g/l were recorded, these being associated with pH values of between 7.5 and 8.1.

10. LABORATORY TESTING - ENVIRONMENTAL

A suite of testing was undertaken on samples from across the site and the following testing regime was undertaken.

- Metals – Cd, Cr, Cu, Hg, Ni Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN^- and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO_4^{2-}.

[4] BS EN ISO 14688-2, Table 6 – Consistency index of silts and clays
[5] NHBC Standards, Chapter 4.2, *Building near trees*, Table 1 – *Volume change potential*

This testing was undertaken by Chemtest Ltd and the results of all of the chemical testing are presented in Appendix 6 of this report.

11. DISCUSSION OF GROUND CONDITIONS - ENVIRONMENTAL

11.1 Discussion of Test Results

As the proposed works are to include the construction of a residential development with gardens, soft landscaping driveways and access roads, the site may be classified as being a residential with plant uptake.

11.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website[6] and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 6. These results indicate the following:

Table 5: ***Summary of contaminated areas.***

Borehole Location	Contaminants found to be exceeding SSVs (Residential with Plant Uptake)
WS1	Lead, PAH (Chrysene, benzo(a)pyrene, Indeno(123cd)pyrene, , dibenzo(ah)anthracene, benzo[g,h,i]perylene).
WS2	Lead.
WS3	Lead, PAH (Chrysene, benzo(a)pyrene, Indeno(123cd)pyrene, , dibenzo(ah)anthracene, benzo[g,h,i]perylene).

Concentrations of chromium, selenium, free cyanide, phenols, PAHs and petroleum hydrocarbons (aliphatic C5 to C12, aliphatic C16 to C44 and aromatic C5 to C12) were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values.

It should be appreciated that the soil screening values for the PAHs represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the combined assessment criterion[7]. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion given by CLEA if free

[6] http://www.atrisksoil.co.uk/pages/general/subscribers.asp
[7] Ref: ATRISK soil, SSVs derived using CLEA v1.04 for 6% SOM, Residential with home grown produce land use, 14.12.09.

product is not observed, the values for which are also provided on the summary of contamination analysis. In this case, no free product was observed, with the higher result most likely associated with the ash and clinker described on the logs. It is therefore considered that the CLEA criteria should be adopted for the PAHs at this site. The results of the contaminants found to exceed these screening values are tabulated below:

Table 6: ***Summary of areas contaminated by PAHs.***

Borehole Location	Contaminants found to be exceeding CLEA Criterion (Residential with Plant Uptake)
WS1	PAH (Benzo(a)pyrene, Indeno(123cd)pyrene).
WS2	None.
WS3	PAH (Benzo(a)pyrene, Indeno(123cd)pyrene).

On the basis of all the information provided above, it is considered that the site is contaminated with lead, benzo(a)pyrene and indeno(123cd)pyrene.

11.1.2 Gas Concentrations

With respect to ground gas, the results of the monitoring visits indicated maximum methane gas concentrations of 0.1% methane. Concentrations of carbon dioxide were noted to range between 1.6% and 3.9%, in association with oxygen levels of between 17.1% and 19.9%. It should be appreciated that on non contaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum recorded flow rate of 0.2 litres per hour will be employed in any calculations.

The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. It has been noted that measurements undertaken solely during high pressure conditions may be of lesser value. At this site the readings undertaken to date were at atmospheric pressures of between 997mb and 1031mb.

It should be noted that further monitoring is required and the full set of results will be issued under separate cover.

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case the 0.1% (0.001) methane recorded, along with 3.9% (0.039) carbon dioxide, in association with a maximum flow detection limit of 0.2l/hr. This results in a GSV of 0.0002 l/hr for methane and a GSV of 0.0078 l/hr for carbon dioxide.

In accordance with Table 8.5, *Modified Wilson and Card classification* of the CIRIA report C665, *Assessing risks posed by ground gasses to building,* the site may be characterised as *Characteristic Situation Level 1*. It is therefore considered that there is a low risk of harm to end users and site operatives however some protection measures are recommended in accordance to Table 8.6, *Typical scope of gas protection measures,* of CIRIA report C665.

11.2 Site Specific Risk Assessment

11.2.1 Chemical Contamination

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency[8] advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.[9] This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'[10]

11.2.2 Conceptual Ground Model

In view of the results of the chemical testing undertaken a conceptual site model has been prepared accordingly

Unless otherwise stated, potential sources of contamination include the following:

On site – Made ground.

[8] R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.
[9] The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.
[10] See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.

Table 7: *Potential Harm to Humans and Animals (fauna)*

SOURCES: ON-SITE AND OFF-SITE		
Pathways	**Receptor**	**Linkage Present?**
Direct contact/dermal absorption/soil ingestion	Operative	Yes – contact with soil likely during works.
	End User	Yes – site to be developed into residential housing with garden areas.
	Neighbours	No – possible source on site, however site is bounded by main highways on two sides with the land on the remaining boundary being capped and utilised as a public pathway.
Inhalation of Dust/Vapours	Operative	Yes – contact with soil likely during works and vapours may accumulate in enclosed spaces.
	End User	Yes – source on, residential end use and vapours may accumulate in enclosed spaces.
	Neighbours	No – possible source on site, however site is bounded by main highways on two sides with the land on the remaining boundary being capped and utilised as a public pathway.
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or water sources in the area of the proposed new works.
	End User	Yes – site to be developed into residential housing with garden areas.
	Neighbours	No – Possible source on site, however, the site is bounded by main highways on two sides with the land on the remaining boundary being capped and utilised as a public pathway. In addition the site is currently fenced.
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	No – Gas monitoring indicates low levels of gas in addition the site soils are generally of low permeability.
	End User	No – Gas monitoring indicates low levels of gas in addition the site soils are generally of low permeability.
	Neighbours	No – Gas monitoring indicates low levels of gas in addition the site soils are generally of low permeability.

Table 8: *Potential Harm to Controlled Waters and Groundwater*

SOURCES: ON-SITE AND OFF-SITE		
Pathways	**Receptor**	**Linkage Present?**
Spillage/loss/run off direct to receiving water	Controlled Waters	Possible source on site, however site is bounded by main highways on two sides with the land on the remaining boundary being capped and utilised as a public pathway
Migration via permeable unsaturated strata	Controlled Waters	No – possible source on site however site soils are generally of low permeability.
Run off via drainage/sewers etc	Controlled Waters	No – possible source on site however site soils are generally of low permeability and site is bounded by main highways on two sides with the land on the remaining boundary being capped and utilised as a public pathway.

Table 9: *Potential Harm to Plants (flora)*

SOURCES: ON-SITE AND OFF-SITE		
Pathways	**Receptor**	**Linkage Present?**
Direct contact with contaminated soils	Plants	Yes – Contamination present and site to be developed into residential housing with garden areas. Neighbouring properties with gardens and landscaping are present.
Uptake via root system	Plants	Yes – Contamination present and site to be developed into residential housing with garden areas. Neighbouring properties with gardens and landscaping are present.

Table 10: *Potential Harm to Buildings/Structures*

SOURCES: ON-SITE AND OFF-SITE		
Pathways	**Receptor**	**Linkage Present?**
Direct contact with contaminated soils	Building Materials	No – some contaminants however low levels of sulphates and neutral pH of soils. However further testing may become necessary due to the elevated PAH's for supply pipes by the statutory undertaker.
Direct contact with contaminated groundwater	Building Materials	No – some contaminants present however low levels of sulphates and neutral pH of soils. Standpipes indicated some groundwater which is considered to represent perched.

11.2.3 Risk Assessment

The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

Low - A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.

Moderate - The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary

High - The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.

Table 11: *Site Specific Risk Assessment*

SOURCES: ON-SITE AND OFF-SITE			
Pathways	**Receptor**	**Risk Rating**	**Notes**
Direct contact/dermal absorption/soil ingestion	Operative	Moderate/High	The investigation revealed lead and some PAH contaminants exceeding screening values for residential with plant uptake.
	End User		
Inhalation of Dust/Vapours	Operative	Moderate	The investigation revealed lead and some PAH contaminants exceeding screening values for residential with plant uptake.
	End User		

Ingestion of fruit/vegetables and/or waters	End User	Moderate	The investigation revealed lead and some PAHs contaminants exceeding screening values for residential with plant uptake.
Direct contact with contaminated soil	Plants	Moderate	The investigation revealed lead, and some PAH's contaminants exceeding screening values for residential with plant uptake.
Uptake via root system	Plants		
Direct contact with contaminated soils	Building Materials	Low	The concrete design class for the levels of sulphate present is DS1.
Direct contact with contaminated groundwater	Building Materials		
Migration of mine gas via permeable strata	Operative	Low	Gas monitoring indicated lo w levels of gas and the site is categorised as low risk
	End User		
	End User		

11.3 Remediation Strategy

In view of the site specific risk assessment it is considered that remediation will be required at this site. Such a strategy should include the following main elements.

11.3.1 Remediation Objectives

Based on the site specific risk assessment the object of the remediation is likely to be as follows.

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect the end user from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect plastic services from penetration or degradation due to the presence of PAHs in the soil.

11.3.2 Development Requirements

Whilst the precise nature of this development has not been finalised it is understood that it is to be developed by the construction of a residential properties with gardens. In view of the above a site specific remediation strategy should be undertaken after the proposed development has been finalised. However, for preliminary design and costing the following remediation proposals are offered.

11.3.3 Strategy

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.

Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the hazards of working with contaminated soils.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Any stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- In view of the presence of hydrocarbons it will be necessary to provide vapour barrier.

- Plastic services should be constructed in a surround of clean inert material and further testing may be required as recommended in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. Note: The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.

Garden and Landscaped Areas

In view of the potential contamination it is considered that the gardens and landscaped areas will require some remediation. This should include the provision of a capping layer of say 500mm of inert material, which will put the contaminated ground out of the end users' dig range. At the base of this layer a granular capillary break of say 100mm of free draining granular soil should be placed. This expedient should also provide a suitable root barrier to isolate the plants from the underlying contaminated ground.

It should be appreciated that this could be achieved by removing 600mm of the soil to a licensed landfill, replacing it with clean inert fill. However, it is considered that this approach would be rather expensive thus it may be financially advantageous to raise the ground level by the appropriate amount.

In any event it will be necessary to validate the thickness of the remedial works. This may be undertaken by the excavation of shallow hand auger boreholes through the topsoil and subsoil to the gravel capillary break. These should be undertaken on a random grid giving coverage of one borehole every 25m^2.

11.3.4 Imported Fill Material

It should also be appreciated that any imported fill should be subjected to the following validation testing to assess its suitability.

Table 12: *Validation testing*

Contaminant	Screening Value (mg/kg)	Reference
As	32	Atrisk soil screening values, 6% soil organic matter
Cd	10	Atrisk soil screening values, 6% soil organic matter
Cr	14.7	Atrisk soil screening values, 6% soil organic matter
Cu	4020	Atrisk soil screening values, 6% soil organic matter
Hg	1	Atrisk soil screening values, 6% soil organic matter
Ni	130	Atrisk soil screening values, 6% soil organic matter
Pb	168	Atrisk soil screening values, 6% soil organic matter
V	115	Atrisk soil screening values, 6% soil organic matter
Zn	17200	Atrisk soil screening values, 6% soil organic matter
TPH CWG	-	See Atrisk soil screening values
PAH 16 EPA	-	See Atrisk soil screening values

The frequency of such testing should be sufficient to give statistical confidence for the validation results. For sub-soil the frequency should be 1 per 250m^3 or a minimum of three samples, whichever is the greater.

Verification Report

In order to demonstrate that the remedial works and provision of a clean layer has been sufficiently carried out, it will be necessary to produce a verification report for submission to any statutory authorities.

It will be necessary for this report to include the following:

- The assessment of the extents of any contamination 'hot-spots' identified including the details of sampling points, such as location and descriptive logs, and the results of any chemical testing.
- Characterisation of the suitability of the clean material including the derivation of the material, comments from a visual screen, the tests results of chemical screening, delivery tickets where appropriate and the conditions by which the clean material has been stored and handled on site.
- Photographic and logged evidence the clean material has been handled on site and placed in a sufficient thickness. This may be either at the time of placement or after placement by means of hand excavated trialpits. Photographs should include visual site references or reference boards to prove the location and date taken. A measurement reference should be visible in the photographs to substantiate the thickness of material placed. Please note that it may also be necessary to undertake a topographical survey and the requirement for which should be checked with any statutory authorities.

The report detailed above should be produced by a suitably qualified engineer. The number of verification areas for the development should be confirmed with any statutory authorities for the site.

12. DISCUSSION OF GROUND CONDITIONS – GEOTECHNICAL

It is understood that the site is to be developed by the construction of a houses with gardens and access roads.

It cannot be recommended that foundations be constructed directly within the made ground revealed at this site. These soils are present in a weak and variable condition such that excessive total and or differential settlement could occur under moderately light surface loading.

12.1 Strip and Spread Foundations

It is considered that foundations could be placed within the glacial soils revealed at this site. However both granular and cohesive soils were encountered at foundation

depths and it is therefore recommended that foundations be placed wholly within the medium dense sands or firm cohesive soils in order to limit any differential settlement of the soils. It is considered that strip or spread foundations constructed within this material at a minimum depth of say 2m could be designed assuming an allowable increase in load given in the following table.

Table 7: *Allowable increase in stress*

Foundation type		**Strip Footings**			**Spread Footings**		
Foundation Breadth	(B)	0.6	1.0	1.5	1.0	2.0	3.0
Foundation Depth	(D)	2.0			2.0		
Allowable Increase in Stress	(kN/m²)	95	90	85	150	145	130

The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of 50kN/m^2 at the foundation depths. Settlements at the above loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils are carefully inspected immediately final trimming has taken place. Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil.

Should seepages of groundwater be encountered it is considered that they could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

The stability of the excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations. Additionally, the excavated soils should be regarded as being contaminated, thus if such material is to be removed from the site it would have to be transported to a licensed landfill or a waste transfer station.

12.2 Soakaways

On the basis of the soakaway tests undertaken at the site, it cannot be recommended that that soakaway are used. The test undertaken did not drain away. This is likely to be due to the high silt content within the glacial till.

12.3 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2[11], which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well

[11] Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brown field sites*

compacted buried concrete should be designed in accordance with Class DS-1 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1[12], which can be found in Part D, *Specifying concrete for general cast-in-situ use,* of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

13. REFERENCES

- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes,* B.S.I., London.
  Part 9: 1990: *In situ tests*.

- British Standards Institution (1999) BS5930: *Code of practice for site investigations*, B.S.I., London.

- British Geological Survey (NERC) (2014), BGS, Keyworth.
  Geology of Britain Viewer:
  (*http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)*
  Lexicon of Named Rock Units:
  (*http://www.bgs.ac.uk/lexicon/)*
  Borehole Scans:
  (http://www.bgs.ac.uk/data/boreholescans/)

- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground.
  Part C: *Assessing the aggressive chemical environment.*
  Part D: *Specifying concrete for general cast-in-situ use.*

- Building Research Establishment (BRE), Working platforms for tracked plant: *Good practice guide to the design, installation, maintenance and repair of ground-supported working platforms,* 2004.

- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.

- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.

[12] Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings,* CIRIA Report C665.

- Building Research Establishment (BRE) (1991) Digest 365, *Soakaway Design*, BRE Press, Garston.

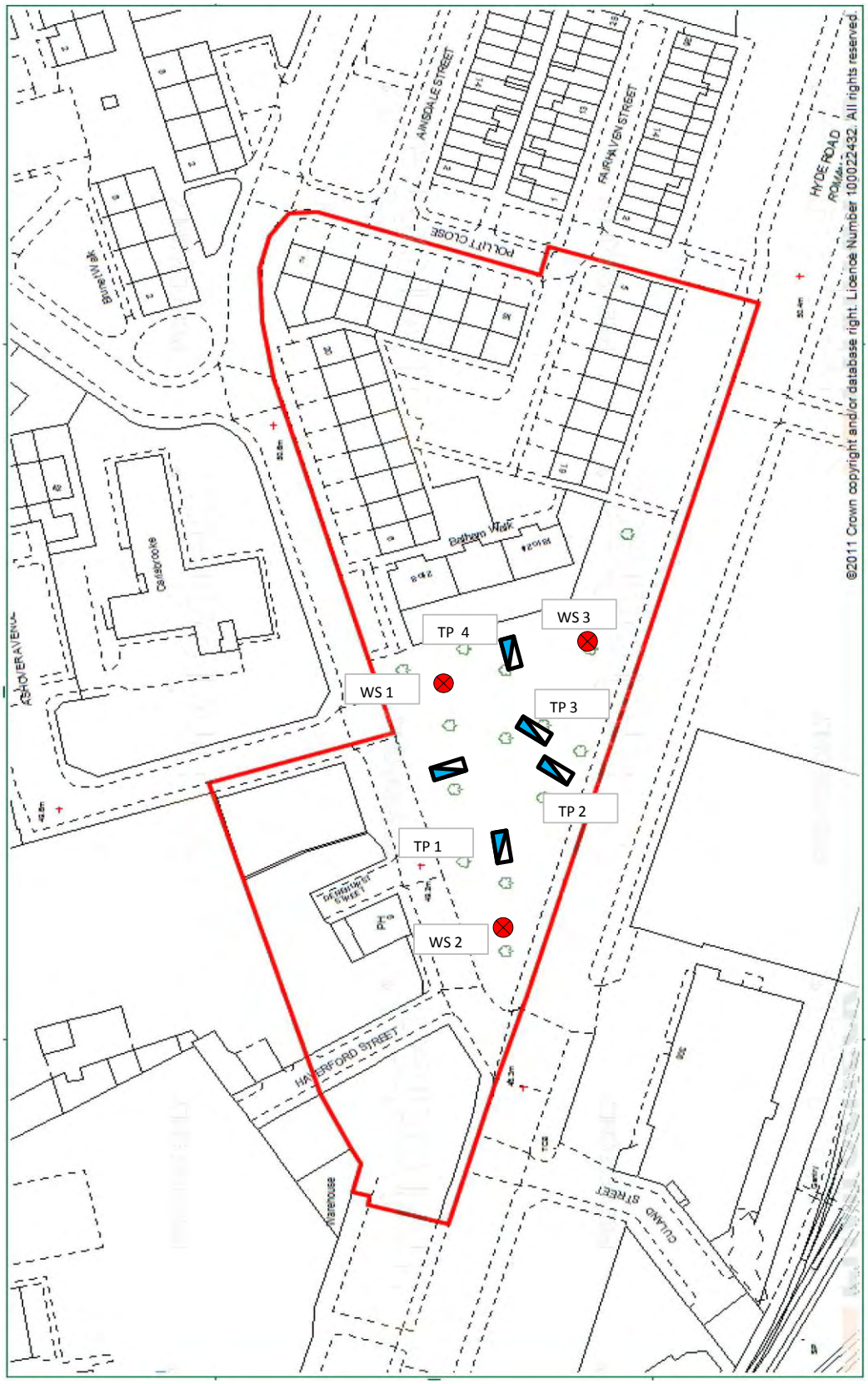
For and on behalf of
Rogers Geotechnical Services Ltd,

R. Lewis BSc (Hons)FGS
Geotechnical Engineer

S.P. Rogers CEng, CGeol, MICE, MCIHT, FGS
Technical Director

APPENDIX 1

SITE PLAN



Title

Borehole Location Plan

Rogers Geotechnical Services Ltd	Contract: **West Gorton, Manchester**	Contract No: **J2725/14/E**

APPENDIX 2

MACHINE DUG TRIALPITS AND SOAKAWAYS

RGS

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Trialpit No
TP1
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Clowes Street, West Gorton	J2725/14/E	Level: -	06/05/2014

Location: Clowes Street, West Gorton, M12

Dimensions: 2.00m
Depth 2.20m
0.60m

Scale 1:50

Client: LSP Developments

Logged By RML

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL (Soft brown silty sandy clayey topsoil)
						MADE GROUND (Loose black/brown silty clayey gravel of ash clinker brick, concrete and cobbles of brick and concrete)
			1.20			Firm red-brown occasionally mottled grey silty clay CLAY
			1.80			Medium dense very silty SAND
			2.20			Trialpit Complete at 2.20 m

Remarks:

Groundwater:

AGS

HoleBASE 3.1 (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

RGS

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Trialpit No
TP2
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Clowes Street, West Gorton	J2725/14/E	Level: -	06/05/2014

Location: Clowes Street, West Gorton, M12

Dimensions: 2.00m
Depth 0.45m
0.60m

Scale 1:50

Client: LSP Developments

Logged By RML

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20			TOPSOIL (Soft brown silty sandy clayey topsoil)
			0.43			MADE GROUND (Loose black/brown silty clayey gravel of ash clinker brick, concrete and cobbles of brick and concrete)
			0.45			MADE GROUND (Sandstone cobble surfacing)
						Trialpit Complete at 0.45 m

Remarks:

Groundwater:

AGS

HoleBASE 3.1 (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov03

RGS

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Trialpit No
TP3
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Clowes Street, West Gorton	J2725/14/E	Level: -	06/05/2014

Location: Clowes Street, West Gorton, M12

Dimensions: 2.30m; Depth 0.62m; 0.60m

Scale 1:50

Client: LSP Developments

Logged By RML

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						TOPSOIL (Soft brown silty sandy clayey topsoil)
			0.30			MADE GROUND (Loose black/brown silty clayey gravel of ash clinker brick, concrete and cobbles of brick and concrete)
			0.62			MADE GROUND (Sandstone cobble surfacing)
			0.62			Trialpit Complete at 0.62 m

1 2 3 4 5 6 7 8 9

Remarks:

Groundwater:

AGS

HoleBASE 3.1 (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

RGS

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Trialpit No
TP4
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Clowes Street, West Gorton	J2725/14/E	Level: -	06/05/2014

Location: Clowes Street, West Gorton, M12

Dimensions: 2.20m
Depth 2.60m
0.60m

Scale 1:50

Client: LSP Developments

Logged By RML

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.25			TOPSOIL (Soft brown silty sandy clayey topsoil)
						MADE GROUND (Loose black/brown silty clayey gravel of ash clinker brick, concrete and cobbles of brick and concrete)
			1.80			Firm red-brown mottled grey slightly sandy silty CLAY
			2.20			Medium dense very silty SAND
			2.60			Trialpit Complete at 2.60 m

Remarks: Disused drainage/sewer pipe revealed at 2.2m depth.

Groundwater:

AGS

HdBASE 3.1 (Bld 426.46) Standard Trialpit Log v2 dated 27th Nov 03

RGS

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Trialpit No
TP5
Sheet 1 of 1

Project Name	Project No.	Co-ords: -	Date
Clowes Street, West Gorton	J2725/14/E	Level: -	06/05/2014

Location: Clowes Street, West Gorton, M12

Dimensions: 2.20m
Depth 3.60m
0.60m

Scale 1:50

Client: LSP Developments

Logged By RML

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.30			TOPSOIL (Soft brown silty sandy clayey topsoil)
						TOPSOIL (Soft brown silty sandy clayey topsoil)
			1.70			Firm red-brown occasionally mottled grey silty CLAY
			2.20			Medium dense very silty SAND
			3.60			Trialpit Complete at 3.60 m

Remarks:

Groundwater:

AGS

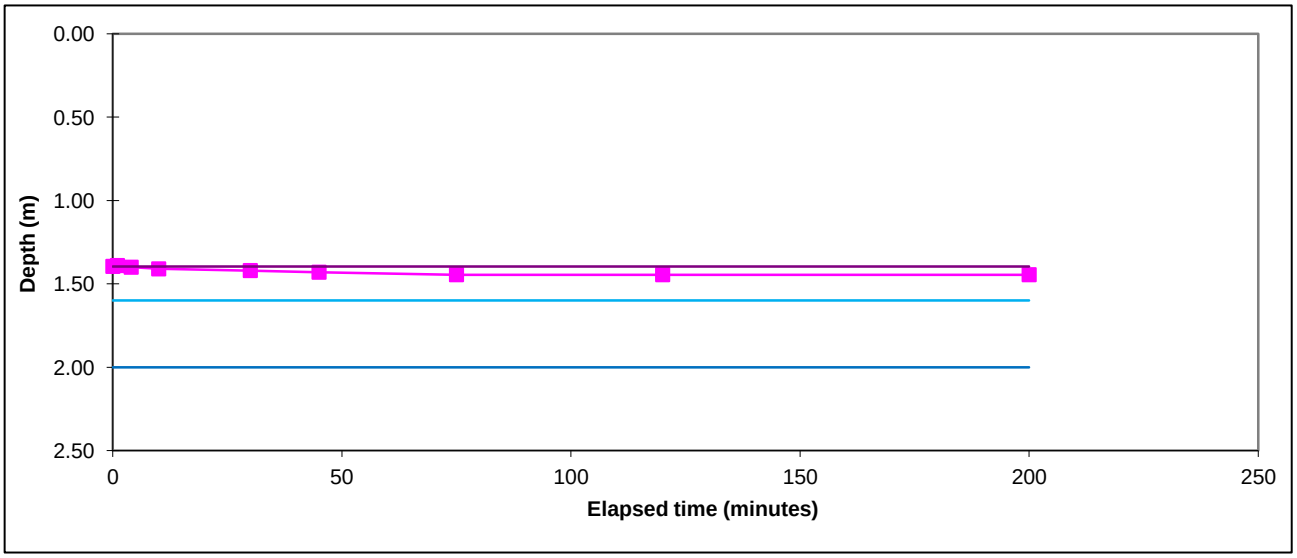
HoleBASE 3.1 (Bld 426.48) Standard Trialpit Log v2 dated 27th Nov 03

Rogers Geotechnical Services Ltd

Soakaway Test

Trial Pit No:	TP1	Test No:	1	Date:	06/05/2014
Length (m):	2.000		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	2.20		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.395		
1	1.390		
4	1.400		
10	1.410		
30	1.420		
45	1.430		
75	1.445		
120	1.445		
200	1.445		



Start water depth for analysis (mbgl):	1.40		
75% effective depth (mbgl):	1.60	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.80		
25% effective depth (mbgl):	2.00	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	2.20		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			3.28
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

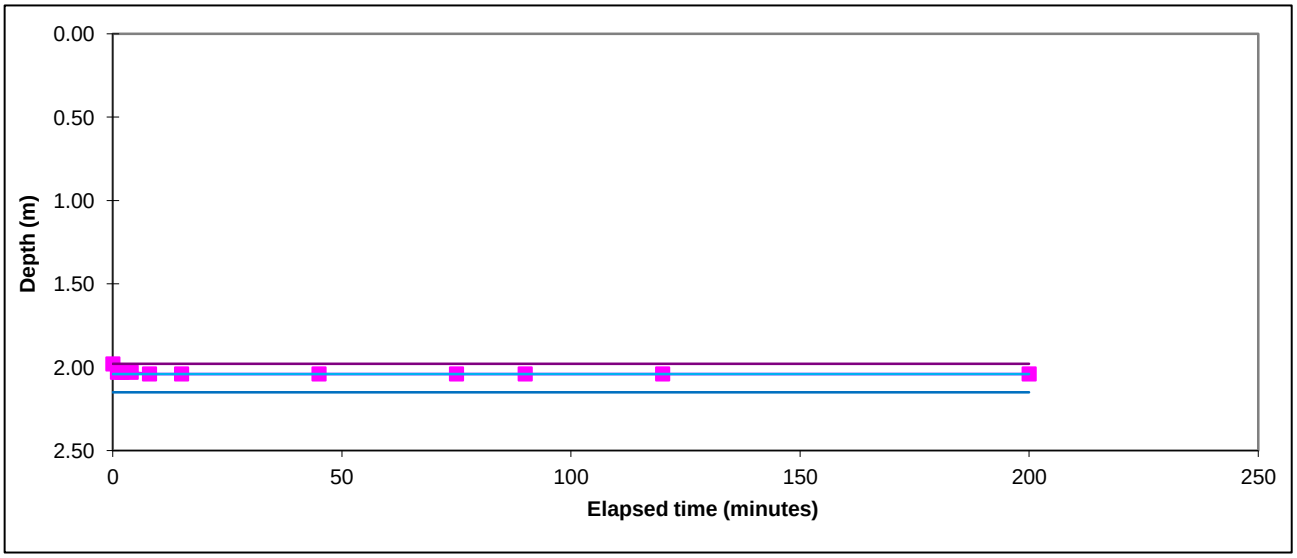
Client:	LSP Developments Ltd.	**TP1**
Site:	West Gorton, Mancherster	

Rogers Geotechnical Services Ltd

Soakaway Test

Trial Pit No:	TP4	Test No:	1	Date:	06/05/2014
Length (m):	2.200		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	2.20		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.980		
1	2.030		
2	2.030		
4	2.030		
8	2.040		
15	2.040		
45	2.040		
75	2.040		
90	2.040		
120	2.040		
200	2.040		



Start water depth for analysis (mbgl):	1.98		
75% effective depth (mbgl):	2.04	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	2.09		
25% effective depth (mbgl):	2.15	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	2.20		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):		1.94	
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

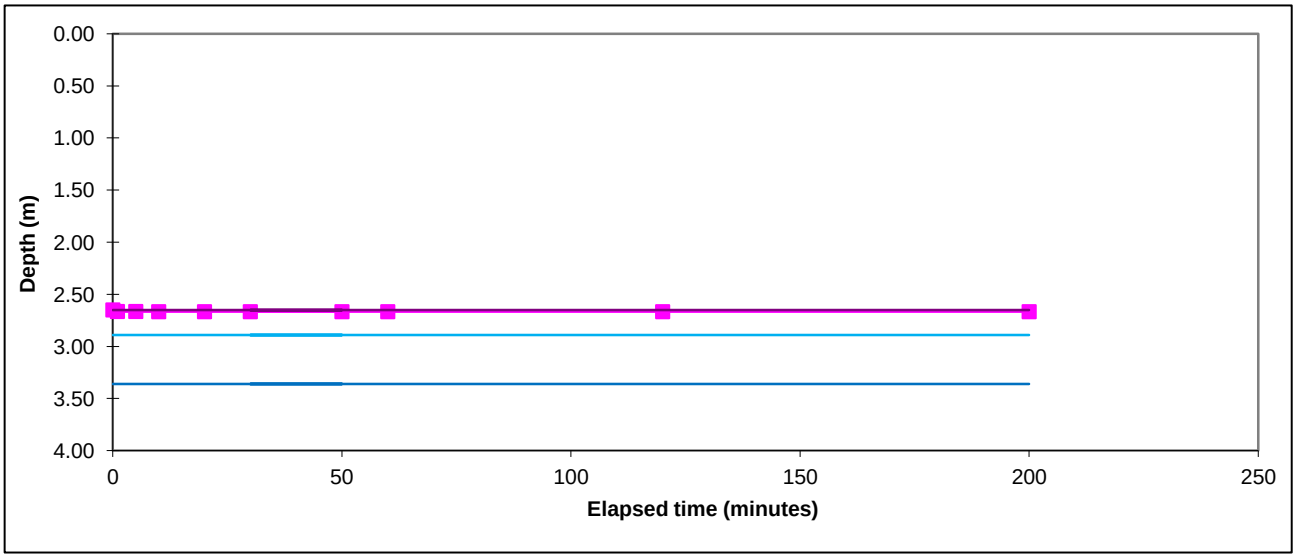
Client:	LSP Developments Ltd.	**TP4**
Site:	West Gorton, Mancherster	

Rogers Geotechnical Services Ltd

Soakaway Test

Trial Pit No:	TP5	Test No:	1	Date:	06/05/2014
Length (m):	2.200		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	3.60		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	2.650		
1	2.665		
5	2.665		
10	2.667		
20	2.667		
50	2.667		
30	2.667		
60	2.667		
120	2.667		
200	2.667		



Start water depth for analysis (mbgl):	2.65		
75% effective depth (mbgl):	2.89	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	3.13		
25% effective depth (mbgl):	3.36	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	3.60		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):		3.95	
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

Client:	LSP Developments Ltd.	**TP5**
Site:	West Gorton, Mancherster	

APPENDIX 3

WINDOW SAMPLE BOREHOLE RECORDS

RGS

www.rogersgeotech.co.uk

Borehole No **WS1**
Sheet 1 of 1

Project Name: Clowes Street, West Gorton	Project No. J2725/14/E	Co-ords: -	Hole Type WLS
Location: Clowes Street, West Gorton, M12		Level: -	Scale 1:50
Client: LSP Developments		Dates: 06/05/2014	Logged By

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			TOPSOIL (Soft brown silty sandy clayey topsoil)
		0.00-1.00	C					MADE GROUND (Loose black/brown silty clayey gravel of ash clinker brick, concrete and cobbles of brick and concrete)
		1.00	SPT	N=6 (,1,1,1,2,2)	1.00			Dense red-brown silty occasionally clayey SAND
		1.00-2.00	C					
	▽	2.00	SPT	N=44 (3,5,8,10,10,16)				
		2.00-3.00	C					
		3.00	SPT	N=44 (5,8,10,10,11,13)				
		3.00-4.00	C					
		4.00	SPT	N=37 (5,7,10,9,9,9)	4.00			Dense red-brown silty occasionally clayey SAND with oocasional gravel of mixed lithology and lenses of clay
		4.00-5.00	C					
					5.00			End of Borehole at 9.50 m

Type Results

Remarks: Core recovery 0-1m 80%, 1-2m 100% and 2-3m 100%, 3-4m 100% and 4-5m 100%

AGS

HoleBASE 3.1 (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

RGS

www.rogersgeotech.co.uk

Borehole No
WS2
Sheet 1 of 1

Project Name: Clowes Street, West Gorton	Project No. J2725/14/E	Co-ords: -	Hole Type WLS
Location: Clowes Street, West Gorton, M12		Level: -	Scale 1:50
Client: LSP Developments		Dates: 06/05/2014	Logged By

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.00-1.00	C		0.25			TOPSOIL (Soft brown silty sandy clayey topsoil)
								MADE GROUND (Loose black/brown silty clayey gravel of ash clinker brick, concrete and cobbles of brick and concrete)
		1.00-2.00	C		1.20			Firm red-brown mottled grey slightly sandy silty CLAY
		2.00-3.00	C					
		3.00-4.00	C		3.20			Firm red-brown SILT
					4.00			End of Borehole at 4.00 m
			Type	Results				

Remarks: Core recovery 0-1m 100%, 1-2m 100% and 2-3m 100% and 3-4m 100%

AGS

HoleBASE 3.1 (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

RGS

www.rogersgeotech.co.uk

Borehole No
WS3
Sheet 1 of 1

Project Name: Clowes Street, West Gorton	Project No. J2725/14/E	Co-ords: -	Hole Type WLS
Location: Clowes Street, West Gorton, M12		Level: -	Scale 1:50
Client: LSP Developments		Dates: 06/05/2014	Logged By RML

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.25			TOPSOIL (Soft brown silty sandy clayey topsoil)
		0.00-1.00	C					MADE GROUND (Loose black/brown silty clayey gravel of ash clinker brick, concrete and cobbles of brick and concrete)
		1.00-2.00	C					
					2.10			
					2.30			Soft red-brown very silty CLAY
		2.00-3.00	C					Dense red-brown silty occasionally clayey SAND with oocasional gravel of mixed lithology
	▽	3.00-3.70	C					
					3.70			End of Borehole at 3.70 m

Type	Results

Remarks: Core recovery 0-1m 100%, 1-2m 100% and 2-3m 70% and 3-3.7m 100%

AGS

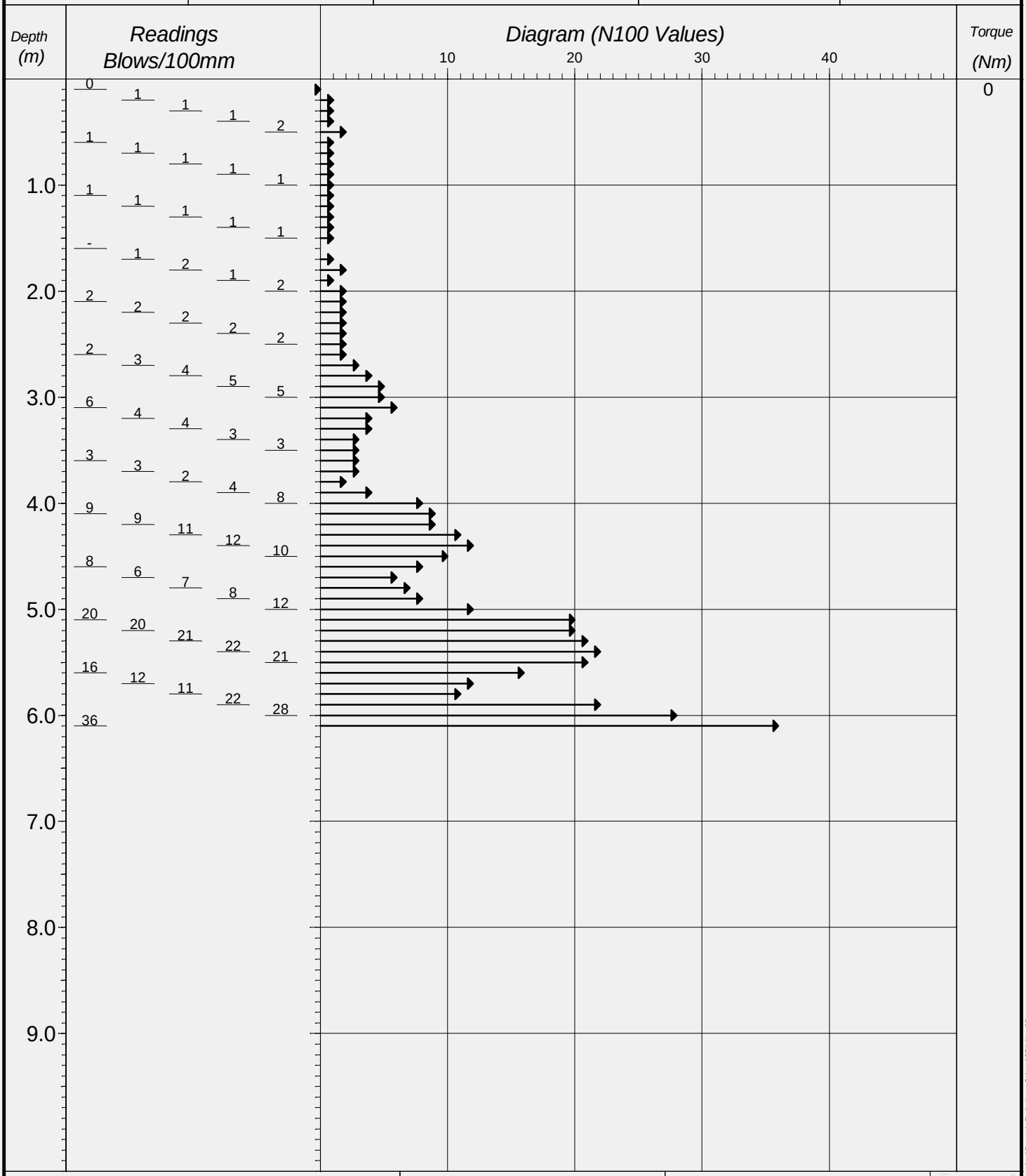
HoleBASE 3.1 (Bld 426.48) Standard Borehole Log v2 dated 27th Nov 03

APPENDIX 4

DYNAMIC PROBES

DYNAMIC PROBING

			Probe No **DP2**	
Client **LSP Developments**			Sheet 1 of 1	
Site **Clowes Street, West Gorton**			Project No **J2725/14/E**	
E -	N -	Level -	Date **06/05/2014**	Logged by **RML**



Abrupt refusal at 6.0m.

Fall Height	**750**	Cone Base Diameter	**0**
Hammer Wt	**63.50**	Final Depth	**6.00**
Probe Type	**DPSH**	Log Scale	1:50

RGS

www.rogersgeotech.co.uk

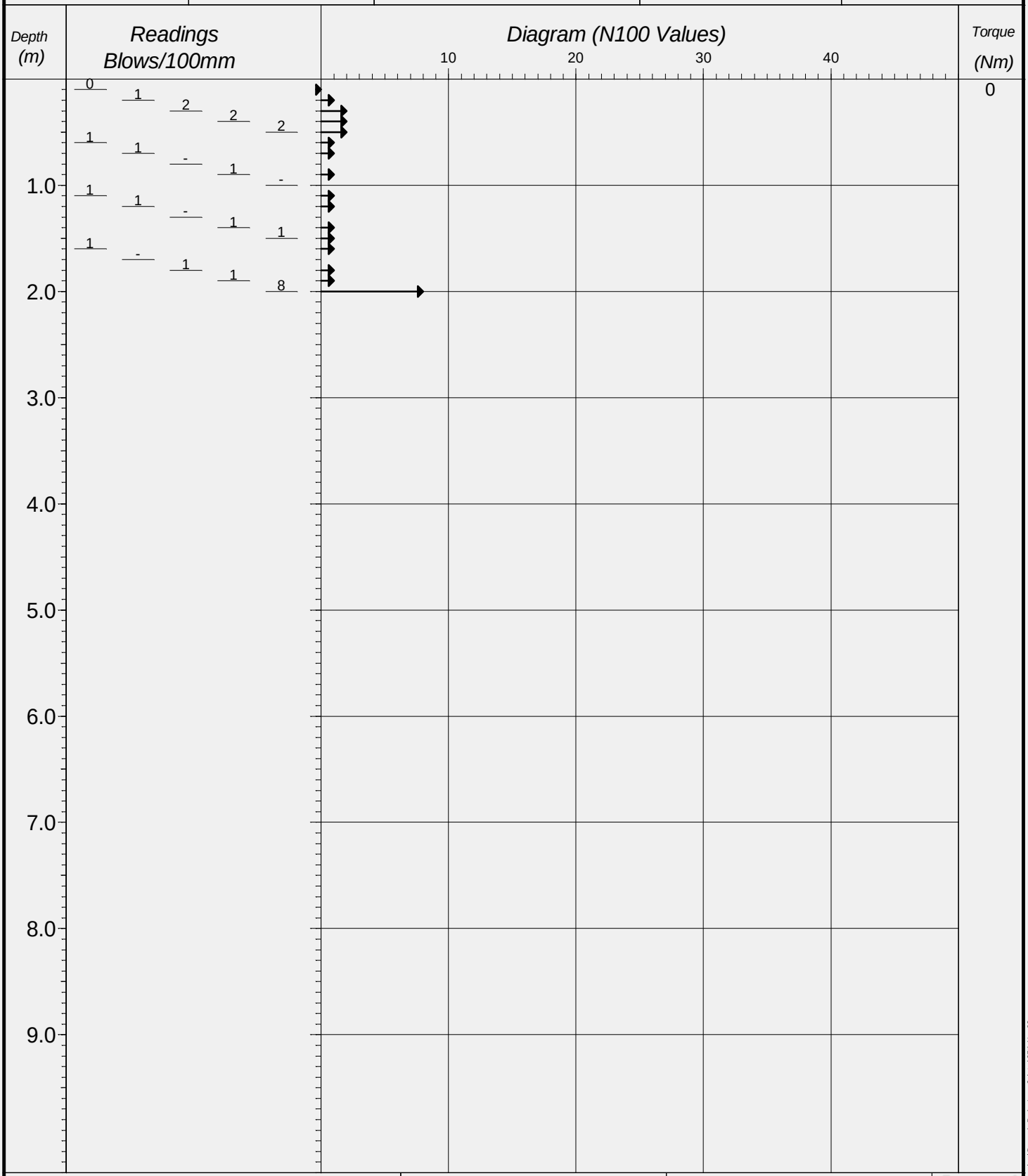
AGS

HoleBASE 3.1 (Bld 426.48) Standard Dynamic Probe Log v2 dated 27th Nov 03

DYNAMIC PROBING

Probe No **DP3**	
Client **LSP Developments**	Sheet 1 of 1
Site **Clowes Street, West Gorton**	Project No **J2725/14/E**

E -	N -	Level -	Date **06/05/2014**	Logged by **RML**



Probe lost at 1.9m.

Fall Height	**750**	Cone Base Diameter	**0**
Hammer Wt	**63.50**	Final Depth	**1.90**
Probe Type	**DPSH**	Log Scale	1:50

RGS www.rogersgeotech.co.uk

AGS

HoleBASE 3.1 (Bld 426.48) Standard Dynamic Probe Log v2 dated 27th Nov 03

APPENDIX 5

LABORATORY TESTING – GEOTECHNICAL

Rogers Geotechnical Services Ltd
Offices 1&2 Barncliffe Business Park,
Near Bank, Shelley
Huddersfield
HD8 8LU
www.rogersgeotech.co.uk
Tel : 0843 5066687 **Fax : 0843 5159930**

Job No:	
J2725/14/E	
Site: West Gorton	Client: LSP Developments Ltd
Date: 02.06.14	Sheet: 1

Determination of Moisture Content, Liquid and Plastic Limits

BS. 1377 : PART 2 : 1990 : 3.2, 4 and 5

borehole/ trial pit no.	sample no.	sample depth (m)	moisture content (%)	sample prep.	test method	fraction >0.425mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description/remarks
WS1	C2	1.25	25	A	X	0	47	20	27	brown silty CLAY
WS1	C2	1.80	20	A	X	4	34	16	18	brown silty CLAY
WS2	C2	1.80	18	A	X	2	27	14	13	brown sandy silty CLAY
WS2	C3	2.50	16	A	X	19	33	16	17	brown silty CLAY

remarks:

notes: moisture content undertaken in accordance with BS1377 : Part 2 : 1990 : 3.2 (unless specified)

sample preparation:

A - as recieved
B - washed on 0.425mm sieve
C - air dried
D - oven dried (50°C)
E - not known

test method (liquid limit):

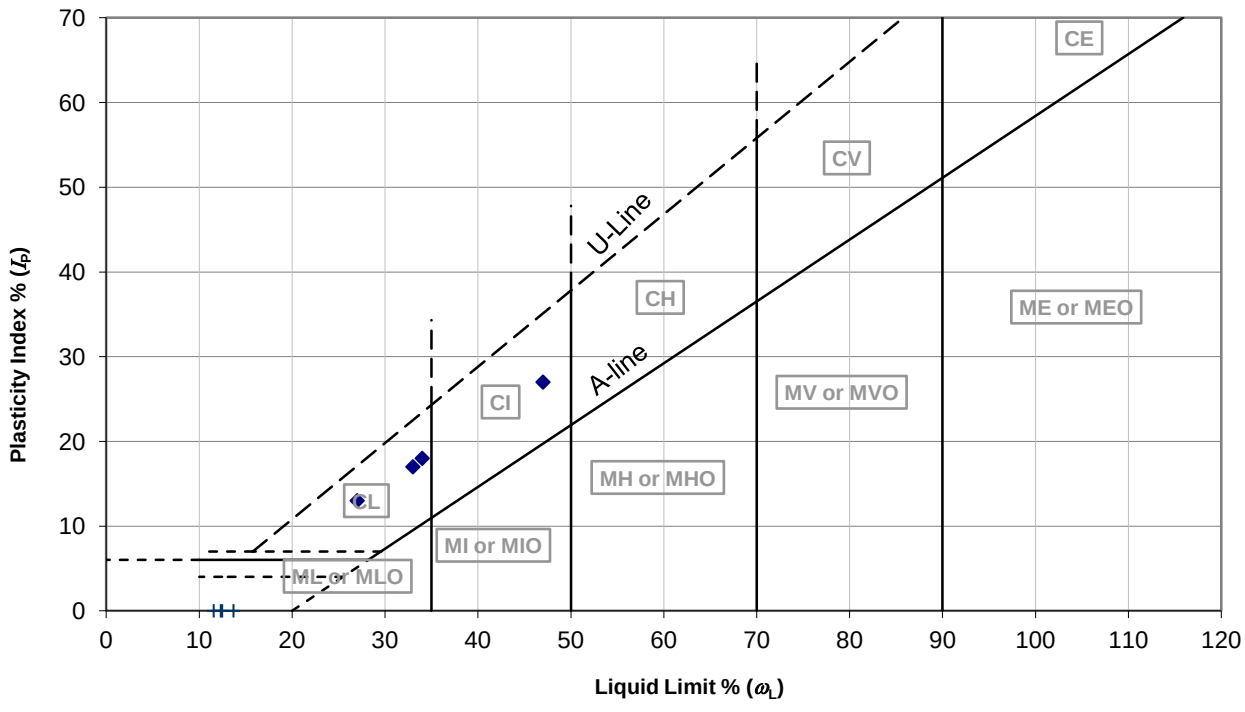
X - cone penetrometer (test 4.3)
Y - one point cone penetrometer (test 4.4)
Z - Casagrande apparatus (test 4.5)

Rogers Geotechnical Services Ltd
Offices 1&2 Barncliffe Business Park,
Near Bank, Shelley
Huddersfield
HD8 8LU
www.rogersgeotech.co.uk
Tel : 0843 5066687 **Fax : 0843 5159930**

Job No:	
J2725/14/E	
Site: West Gorton	Client: LSP Developments Ltd
Date: 02.06.14	Sheet: 2

Interpretation of Moisture Content, Liquid and Plastic Limits

Location	Depth	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Retained by 425µm	Modified	Modified	Liquidity/ Consistency		Casagrande Class	N.H.B.C Class
		(ω)	(ω_L)	(ω_P)	(I_P)		(ω')	(I_P')	(I_L)	(I_C)		
	(m)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)		(%)
WS1	1.25	25	47	20	27	0	25	27	0.2	0.8	C I	MEDIUM
WS1	1.80	20	34	16	18	4	21	17	0.2	0.8	C L	LOW
WS2	1.80	18	27	14	13	2	18	13	0.3	0.7	C L	LOW
WS2	2.50	16	33	16	17	19	20	14	0.0	1.0	C L	LOW



Rogers Geotechnical Services Ltd.

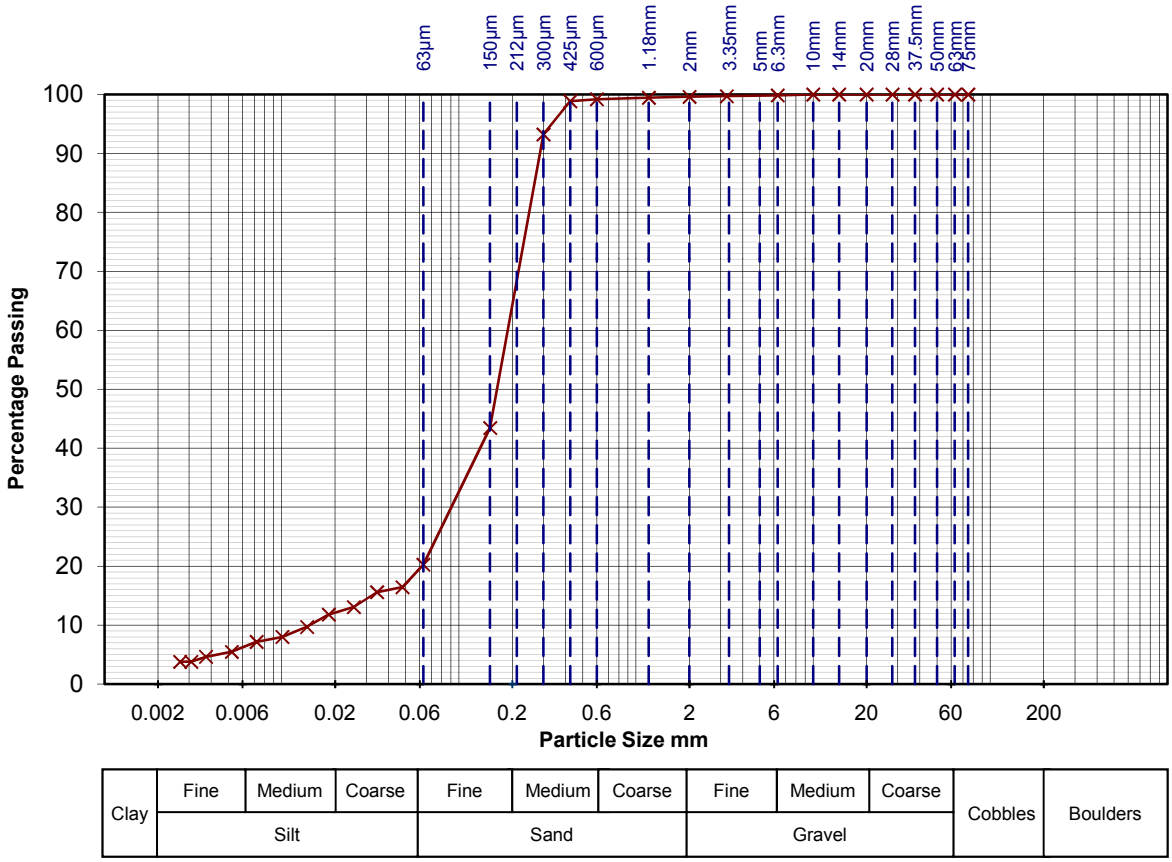
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS1
Sample No. C3
Depth: 2.50m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	99.7	99.6	99.5	99.2	98.9	93.2	-	43.4	20.3



DESCRIPTION: Slightly clayey, silty fine and medium SAND.

Remarks:	Contract Number J2725/14/E
	Figure number 3

Rogers Geotechnical Services Ltd.

Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS1
Sample No. C3
Depth: 2.50m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	99.7	99.6	99.5	99.2	98.9	93.2	-	43.4	20.3

Size	0.04800	0.03448	0.02550	0.01841	0.01390	0.01008	0.00721	0.00522	0.00373	0.00308
Percentage Passing	16.44	15.60	13.07	11.80	9.70	8.01	7.17	5.48	4.64	3.79
Size	0.00267									
Percentage Passing	3.79									

DESCRIPTION: Slightly clayey, silty fine and medium SAND.

Remarks:	Contract Number J2725/14/E
	Figure number 3

Rogers Geotechnical Services Ltd.

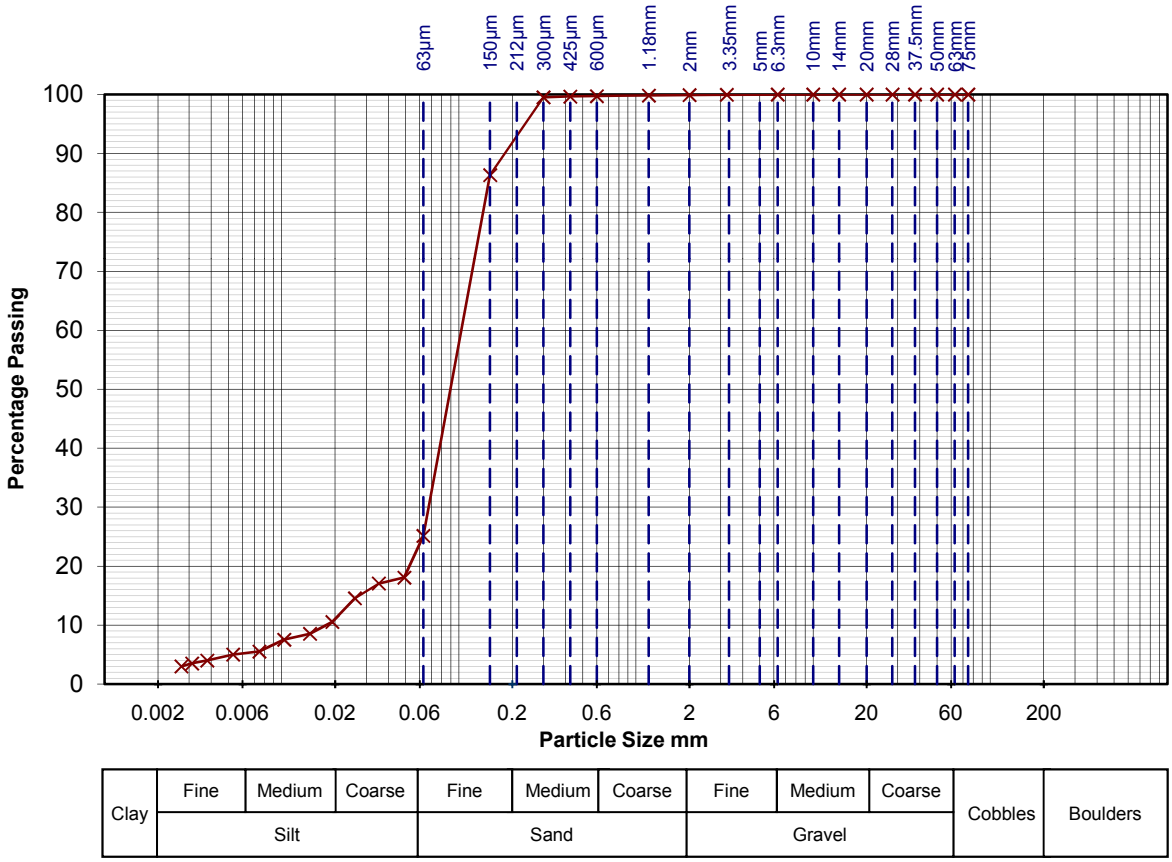
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN/TJS **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS1
Sample No. C4
Depth: 3.30m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	100.0	99.9	99.8	99.7	99.6	99.5	-	86.3	25.1



DESCRIPTION: Slightly clayey, silty fine and medium SAND.

Remarks:	Contract Number J2725/14/E
	Figure number 4

Rogers Geotechnical Services Ltd.

Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS1
Sample No. C4
Depth: 3.30m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	100.0	99.9	99.8	99.7	99.6	99.5	-	86.3	25.2

Size	0.04914	0.03528	0.02586	0.01928	0.01442	0.01032	0.00747	0.00531	0.00379	0.00312
Percentage Passing	18.07	17.07	14.56	10.54	8.53	7.53	5.52	5.02	4.02	3.51
Size	0.00271									
Percentage Passing	3.01									

DESCRIPTION: Slightly clayey, silty fine and medium SAND.

Remarks:	Contract Number J2725/14/E
	Figure number 4

Rogers Geotechnical Services Ltd.

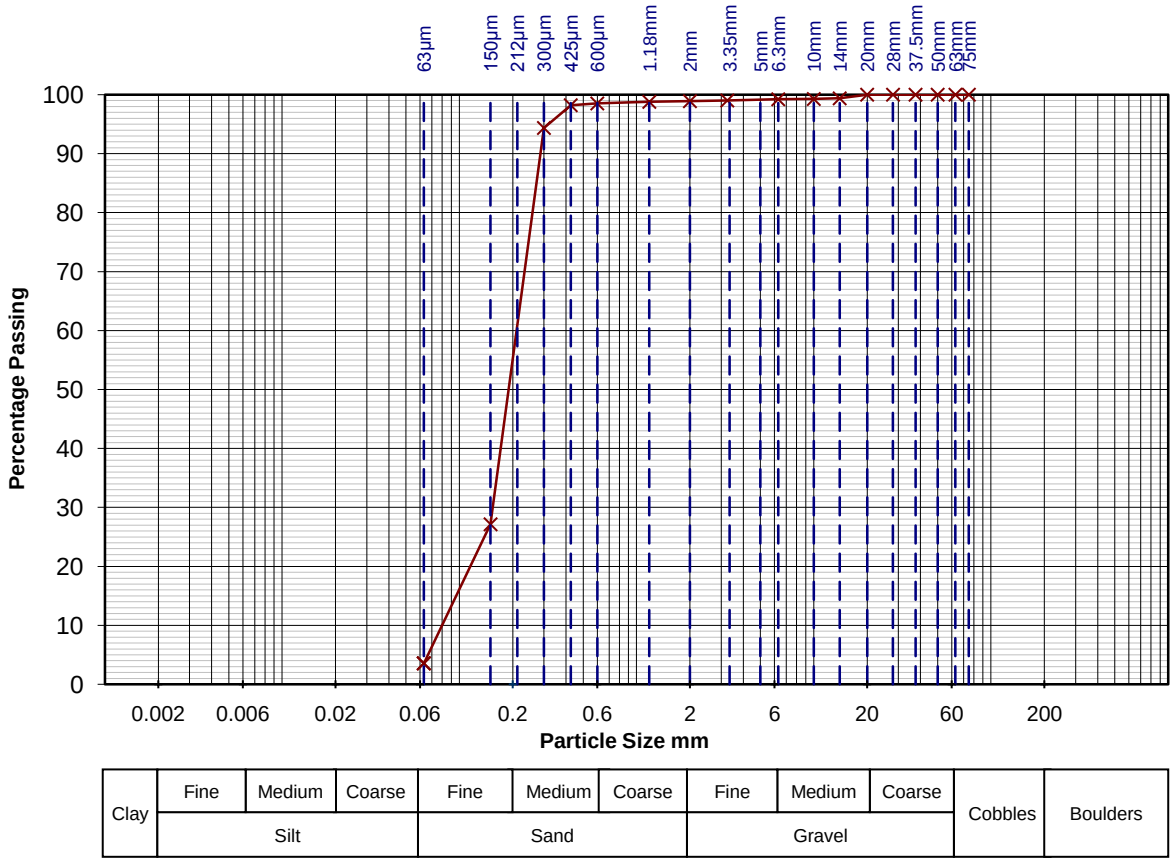
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: TJS **Chkd by:**
Date: 27.05.14 **Date:**

BH/TP No. WS1
Sample No. C4
Depth: 3.80m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	99.4	99.3	99.2	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	99.0	98.9	98.8	98.5	98.2	94.4	-	27.1	3.6



DESCRIPTION: Slightly clayey, slightly silty, slightly gravelly SAND.

Remarks:	Project Number J2725/14/E
	Figure number 5

Rogers Geotechnical Services Ltd.

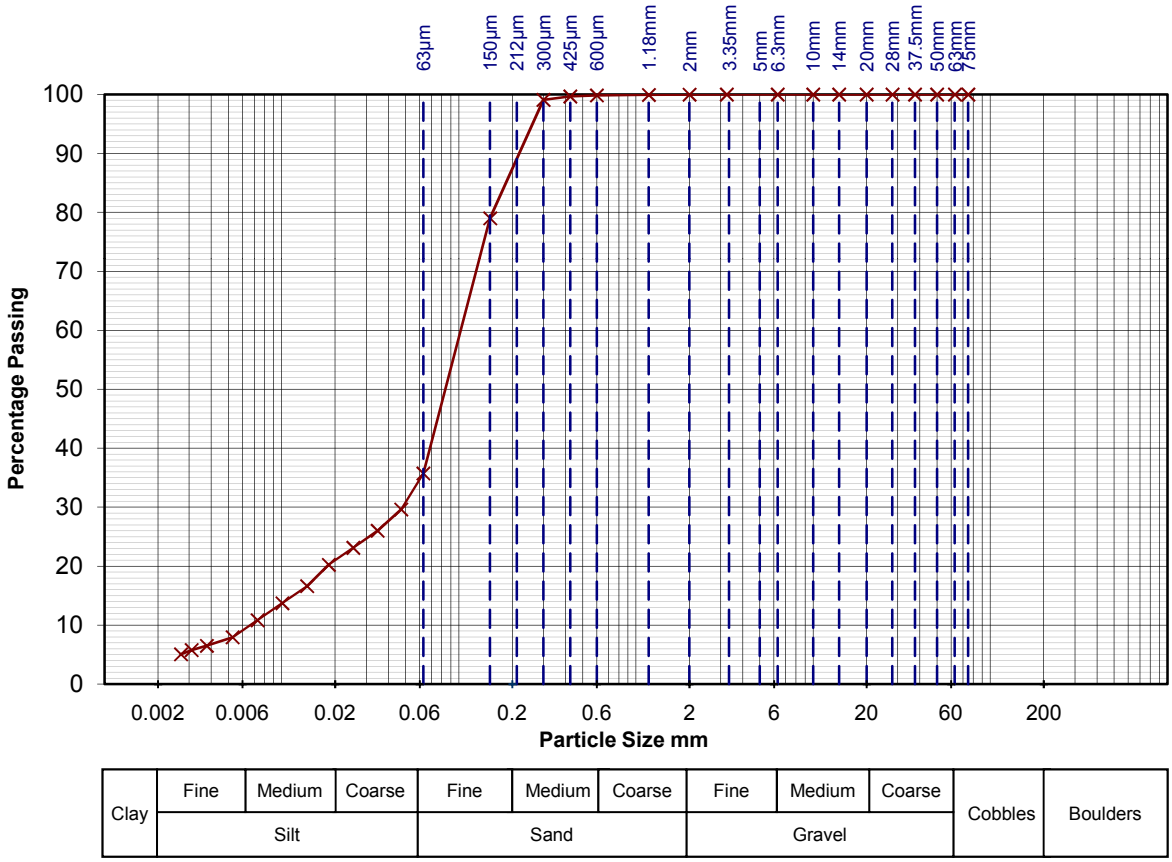
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS1
Sample No. C5
Depth: 4.50m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	100.0	100.0	99.9	99.8	99.7	99.1	-	79.0	35.7



DESCRIPTION: Slightly clayey, silty fine and medium SAND.

Remarks:	Contract Number J2725/14/E
	Figure number 6

Rogers Geotechnical Services Ltd.

Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS1
Sample No. C5
Depth: 4.50m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	100.0	100.0	99.9	99.8	99.7	99.1	-	79.0	35.7

Size	0.04722	0.03475	0.02532	0.01841	0.01390	0.01008	0.00730	0.00528	0.00377	0.00310
Percentage Passing	29.63	26.02	23.13	20.24	16.62	13.73	10.84	7.95	6.51	5.78
Size	0.00270									
Percentage Passing	5.06									

DESCRIPTION: Slightly clayey, silty fine and medium SAND.

Remarks:	Contract Number J2725/14/E
	Figure number 6

Rogers Geotechnical Services Ltd.

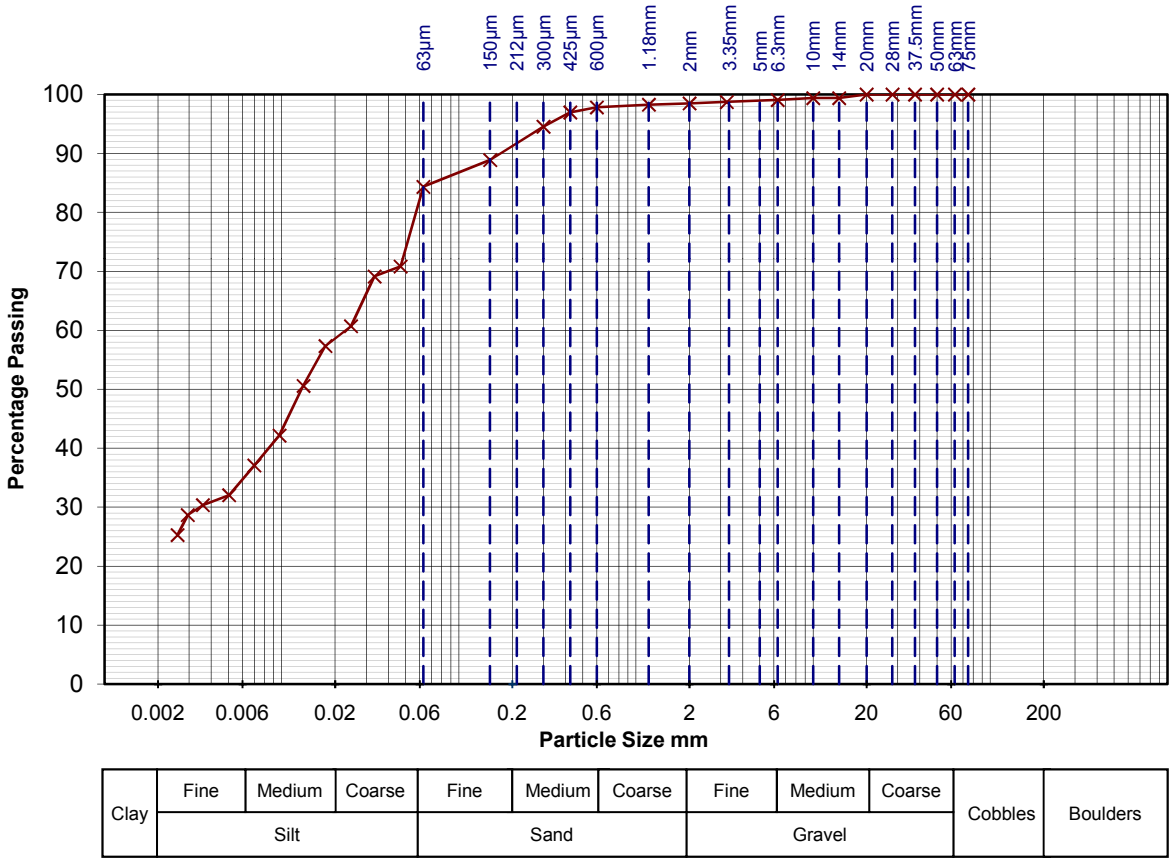
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS2
Sample No. C4
Depth: 3.50m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	99.4	99.4	99.1	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	98.7	98.5	98.3	97.8	97.0	94.5	-	88.9	84.3



DESCRIPTION: Clayey, sandy SILT.

Remarks:	Contract Number J2725/14/E
	Figure number 7

Rogers Geotechnical Services Ltd.

Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: CJN **Chkd by:**
Date: 30.05.14 **Date:**

BH/TP No. WS2
Sample No. C4
Depth: 3.50m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	99.4	99.4	99.1	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	98.7	98.5	98.3	97.8	97.0	94.5	-	88.9	84.3

Size	0.04682	0.03339	0.02457	0.01764	0.01326	0.00970	0.00699	0.00504	0.00359	0.00294
Percentage Passing	70.83	69.14	60.71	57.34	50.59	42.16	37.10	32.04	30.36	28.67
Size	0.00258									
Percentage Passing	25.29									

DESCRIPTION: Clayey, sandy SILT.

Remarks:	Contract Number J2725/14/E
	Figure number 7

Rogers Geotechnical Services Ltd.

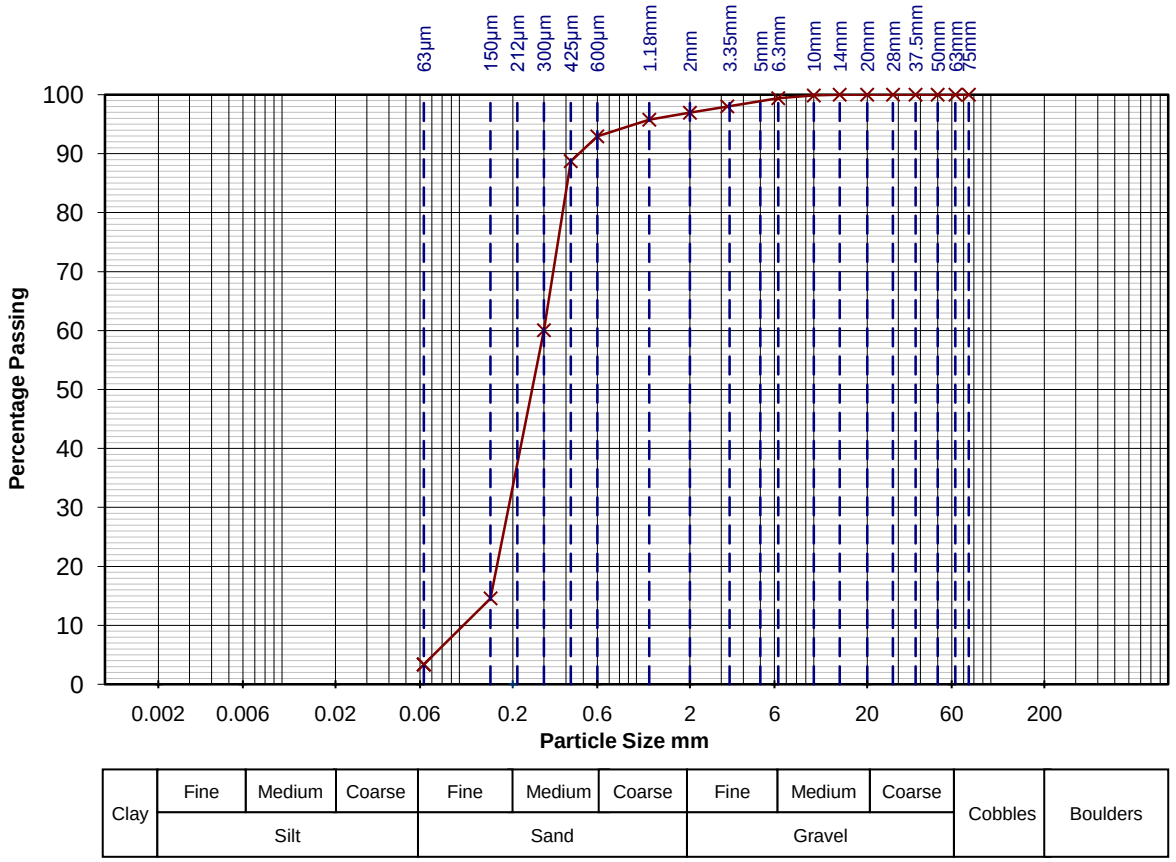
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: TJS **Chkd by:**
Date: 27.05.14 **Date:**

BH/TP No. WS3
Sample No. C3
Depth: 2.75m

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.4	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	98.0	96.9	95.8	92.9	88.7	60.1	-	14.6	3.4



DESCRIPTION: Slightly clayey, slightly silty, slightly gravelly SAND.

Remarks:	Project Number J2725/14/E
	Figure number 8

Rogers Geotechnical Services Ltd.

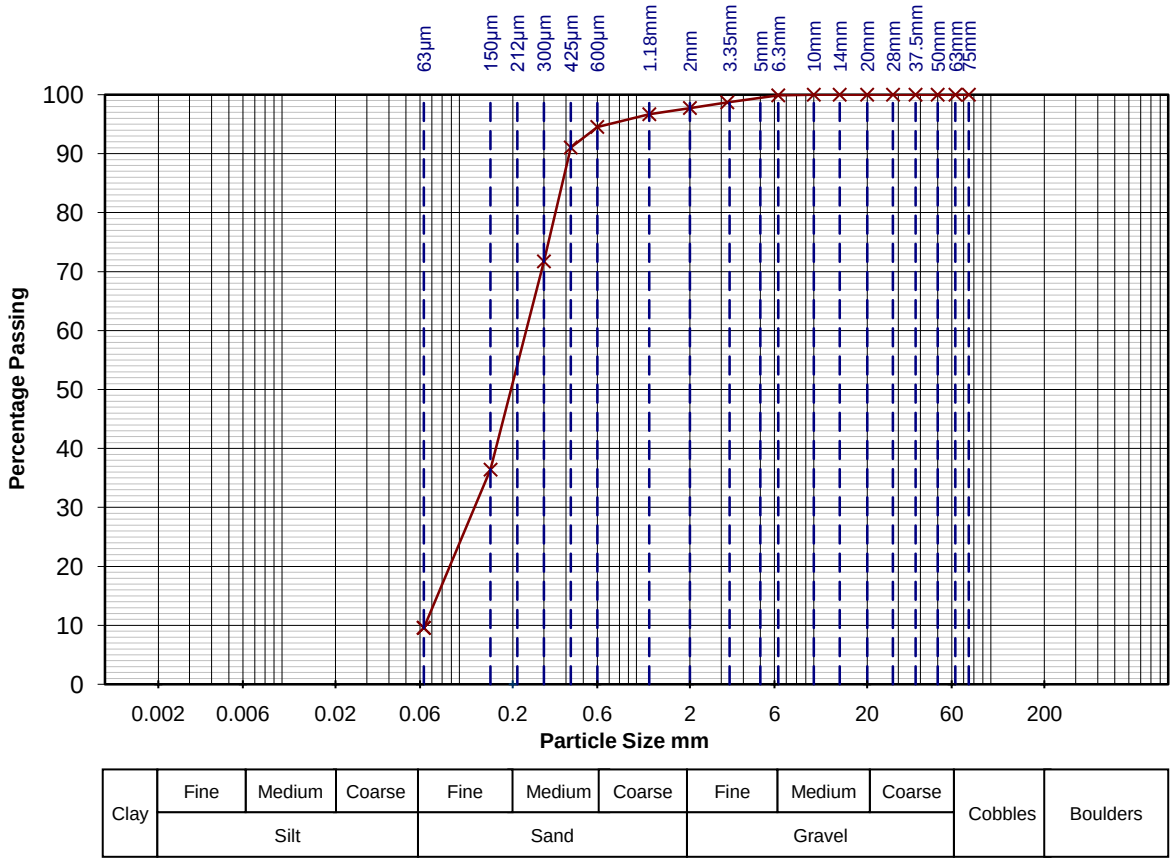
Particle Size Distribution

BS 1377 : Part 2 : 1990 : 9.2 / 9.3

Client: LSP Developments Ltd
Site: West Gorton
Tested by: TJS **Chkd by:**
Date: 27.05.14 **Date:**

BH/TP No. WS3
Sample No. C4
Depth: 3.65

Sieve Size	75	63	50	37.5	28	20	14	10	6.3	
Percentage Passing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	
Sieve Size	5	3.35	2	1.18	0.6	0.425	0.3	0.212	0.15	0.063
Percentage Passing	-	98.7	97.7	96.7	94.5	91.0	71.7	-	36.4	9.6



DESCRIPTION: Slightly clayey, slightly silty SAND.

Remarks:	Project Number J2725/14/E
	Figure number 9

APPENDIX 6

LABORATORY TESTING – ENVIRONMENTAL

Rogers Geotechnical Services Ltd.

SUMMARY OF CONTAMINATION ANALYSIS - including Atkins ATRISK SSVs

Client: LSP Developments Ltd
Site: West Gorton

Job Number: J2725/14/E
Date: 02/06/2014

Tox Data Report No.	Compound	Range of Values Found (mg/kg)		Residential with Homegrown Produce Landuse (mg/kg)		Reference
	Metals	*Min*	Max			
3	Cadmium	0.25	0.79	10		A
4	Chromium	<0.5	<0.5	14.7		A
	Copper	44	76	4020		A
7	Mercury	0.31	0.65	1.00		A
8	Nickel	24	35	130		A
	Lead	360	640	168		A
	Zinc	130	550	17200		A
	Vanadium	18	27	115		A
	Semi and Non Metals					
1	Arsenic	9.6	13	32		A
10	Selenium	<0.2	<0.2	350		A
	Free Cyanide	<0.5	<0.5	34		A
9	Phenols (total)	<0.3	<0.3	420		A
	Poly Aromatic Hydrocarbons			ATRISK	CLEA	
20	Napthalene	<0.1	<0.1	8.71		A
	Acenaphthene	<0.1	<0.1	937	2130	A
	Fluorene	<0.1	<0.1	746	1930	A
	Anthracene	<0.1	1.20	20.9	18300	A
	Fluoranthene	0.67	6.70	113	2160	A
	Pyrene	0.82	7.30	13.2	1550	A
	Benzo(a)anthracene	<0.1	3.20	8.54		A
2	Chrysene	<0.1	5.00	2.64	927	A
2	Benzo(b)fluoranthene	<0.1	4.30	7.29	9.86	A
2	Benzo(k)fluoranthene	<0.1	2.00	4.12	100	A
2	Benzo(a)pyrene	<0.1	3.40	0.998		A
2	Dibenzo(a,h)anthracene	<0.1	0.65	0.0236	1	A
2	Indeno(1,2,3-cd)pyrene	<0.1	2.20	0.368	9.75	A
2	Benzo(g,h,i)perylene	<0.1	2.20	0.112	103	A
	Petroluem Hydrocarbons					
	Aliphatic C5-C6	<0.1	<0.1	26.1		A
	Aliphatic C6-C8	<0.1	<0.1	87.8		A
	Aliphatic C8-C10	<0.1	<0.1	14.5		A
	Aliphatic C10-C12	<1	<1	87.7		A
	Aliphatic C12-C16	<1	<1	126		A
	Aliphatic C16-C21	<1	<1	88200		A
	Aliphatic C21-C35	<1	<1	88200		A
	Aromatic C5-C7 (Benzene)	<0.1	<0.1	0.33		A*
	Aromatic C7-C8 (Toluene)	<0.1	<0.1	610		A
	Aromatic C8-C10	<0.1	<0.1	23.7		A
	Aromatic C10-C12	<1	<1	132		A
	Aromatic C12-C16	1.1	1.1	452		A
	Aromatic C16-C21	4.3	23	804		A
	Aromatic C21-C35	8.1	35	1220		A
	Others					
	pH	7.5	8.1	-		-
	Organic Content (%)	8.6	14	-		-
	Soluble Sulphate (g/l)	0.026	0.048	-		-
	Total Sulphate (%)	0.072	0.21	-		-

A = WS ATKINS PLC, ATRISK SOIL SCREENING VALUES BASED ON 6% SOIL ORGANIC MATTER

For PAHs ATRISK assumes free product is avalable whilst CLEA assumes no free product

A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.

Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Test Report Number:	14-02404
Issue:	1
Date of Issue:	30/05/2014
Contact:	Rob Lewis
Customer Details:	Rogers Geotechnical Services Ltd Offices 1 & 2, Barncliffe Business Near Bank Shelley Huddersfield West Yorkshire
Quotation No:	
Order No:	0514-25
Customer Reference:	J2725/14/E - West Gorton
Date Received:	23/05/2014
Date Approved:	30/05/2014
Details:	J2725/14/E - West Gorton
Approved by:	 Keith Jones, Technical Manager

Chemtest
The right chemistry to deliver results

Results Summary - Soil

Report No.: 14-02404_1

Project: J2725/14/E - West Gorton

				Customer Sample ID	**WS1**	**WS2**	**WS3**
				Chemtest Sample ID	12659	12660	12661
				Sample Type	**SOIL**	**SOIL**	**SOIL**
				Sample Depth (m)	0.40	0.30	0.60
				Sampling Date	21/05/2014	21/05/2014	21/05/2014
Determinand	**Accred**	**SOP**	**Units**	**LOD**			
Moisture	N	2030	%	0.02	26	16	16
Soil Colour	N			0	brown	brown	brown
Other Material	N			0	stones, roots	stones, roots	stones, roots
Soil Texture	N			0	clay	clay	clay
pH	M	2010		0	7.5	8.1	7.9
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/L	0.01	0.048	0.028	0.026
Cyanide (Free)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50
Sulphate (Total)	M	2430	%	0.01	0.21	0.11	0.072
Arsenic	M	2450	mg/kg	2	9.7	13	9.6
Cadmium	M	2450	mg/kg	0.1	0.79	0.25	0.26
Copper	M	2450	mg/kg	5	76	44	61
Mercury	M	2450	mg/kg	0.1	0.65	0.49	0.31
Nickel	M	2450	mg/kg	5	25	24	35
Lead	M	2450	mg/kg	5	540	640	360
Selenium	M	2450	mg/kg	0.2	< 0.20	< 0.20	< 0.20
Vanadium	M	2450	mg/kg	5	18	22	27
Zinc	M	2450	mg/kg	5	550	160	130
Chromium (Hexavalent)	N	2490	mg/kg	0.5	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.4	14	8.6	12
Aliphatic TPH >C5-C6	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2675	mg/kg	1	4.3	9.3	< 1.0
Aliphatic TPH >C16-C21	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	M	2675	mg/kg	5	< 5.0	9.3	< 5.0
Aromatic TPH >C5-C7	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2675	mg/kg	1	1.1	1.9	7.4
Aromatic TPH >C16-C21	M	2675	mg/kg	1	5.7	4.3	23
Aromatic TPH >C21-C35	M	2675	mg/kg	1	14	8.1	35
Aromatic TPH >C35-C44	N	2675	mg/kg	1	< 1.0	< 1.0	1.2
Total Aromatic Hydrocarbons	M	2675	mg/kg	5	20	14	67
Total Petroleum Hydrocarbons	M	2675	mg/kg	10	25	24	67
Naphthalene	M	2700	mg/kg	0.1	0.28	< 0.10	0.55
Acenaphthylene	M	2700	mg/kg	0.1	0.58	< 0.10	0.89

Results Summary - Soil

Report No.: 14-02404_1

Project: J2725/14/E - West Gorton

				Customer Sample ID	**WS1**	**WS2**	**WS3**
				Chemtest Sample ID	12659	12660	12661
				Sample Type	**SOIL**	**SOIL**	**SOIL**
				Sample Depth (m)	0.40	0.30	0.60
				Sampling Date	21/05/2014	21/05/2014	21/05/2014
Determinand	**Accred**	**SOP**	**Units**	**LOD**			
Acenaphthene	M	2700	mg/kg	0.1	0.52	< 0.10	0.63
Fluorene	M	2700	mg/kg	0.1	0.44	< 0.10	0.57
Phenanthrene	M	2700	mg/kg	0.1	4.2	0.52	4.7
Anthracene	M	2700	mg/kg	0.1	1.2	< 0.10	0.90
Fluoranthene	M	2700	mg/kg	0.1	6.7	0.67	6.0
Pyrene	M	2700	mg/kg	0.1	7.3	0.82	6.3
Benzo[a]anthracene	M	2700	mg/kg	0.1	3.2	< 0.10	2.5
Chrysene	M	2700	mg/kg	0.1	5.0	< 0.10	3.5
Benzo[b]fluoranthene	M	2700	mg/kg	0.1	4.3	< 0.10	3.0
Benzo[k]fluoranthene	M	2700	mg/kg	0.1	2.0	< 0.10	1.0
Benzo[a]pyrene	M	2700	mg/kg	0.1	3.4	< 0.10	2.4
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1	2.2	< 0.10	1.5
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1	0.65	< 0.10	0.42
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1	2.2	< 0.10	1.5
Total Of 16 PAH's	M	2700	mg/kg	2	44	2.0	36
Total Phenols	M	2920	mg/kg	0.3	< 0.30	< 0.30	< 0.30

Report Information

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SM	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable sample
N/E	not evaluated
<	means "less than"
>	means "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected

Sample Deviation Codes

a - No date of sampling supplied
b - Sample age exceeds stability time (sampling to extraction)
c - Sample not received in appropriate containers

Sample Retention and Disposal

All soil samples will be retained for a period of one month
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix 2	-	Report on an Environmental Investigation at Land Off Hyde Road, Manchester Report Ref J2725/14/E. RGS Ltd. September 2015

Environmental
Geotechnical
Specialists



REPORT

job number	site address
date	
written by	
checked by	issued by

Rogers Geotechnical Services Ltd
Telephone 0843 50 666 87 Fax 0843 51 599 30
Email enquiries@rogersgeotech.co.uk
www.rogersgeotech.co.uk
Offices 1 & 2, Barncliffe Business Park, Near Bank, Shelley,
Huddersfield, West Yorkshire HD8 8LU.

Constructionline
A UK GOVERNMENT CERTIFICATION SERVICE
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QMS OHSAS 18001 REGISTERED

GEOTECHNICAL ENVIRONMENTAL

REPORT ON AN ENVIRONMENTAL INVESTIGATION

at

LAND OFF HYDE ROAD, WEST GORTON, MANCHESTER

for

LSP DEVELOPMENTS

Report No J2725/14/E **September 2015**

1. SYNOPSIS

This investigation has demonstrated that made ground was revealed to the full depth of the hand dug trialpits. Waste acceptance criterion (WAC) testing has been undertaken and the results are discussed in the section 9 of this report.

2. INTRODUCTION

LSP Developments proposes to develop an area off Hyde Road, by the construction of a retail unit and doctors surgery. A site investigation has previously been undertaken at the site and a geo-environmental report was issued by Rogers Geotechnical Services in June 2014.

It is understood that the ground-works phase of the development will include the excavation of soil for removal to landfill. Therefore, this investigation was required to classify the underlying soils to establish if they could be accepted by a hazardous, non hazardous or inert landfill site. It should be appreciated that wastes can only be accepted at a particular landfill if they meet the relevant waste acceptance criteria (WAC) for that class of landfill. Accordingly, a site investigation has been undertaken in order to obtain samples for testing. This report describes the work undertaken, presents the data obtained and discusses the ground condition with respect to disposal of waste material.

3. LIMITATIONS

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

4. PREVIOUS REPORTS

On the basis of the geo-environmental report issued in June 2014, the following relevant information was found:

- *The concentrations of contaminants encountered in soil underlying the site do not exceed the relevant CLEA soil guideline values (SGV's) for commercial end use.*

5. FIELDWORKS

The fieldworks were undertaken on the 11th September 2015 and included the excavation of three hand dug trialpits. The locations of the trialpits are shown on the site plan which is presented in Appendix 1. The soils were logged on site in general accordance with BS5930: 1999, as amended in 2010, and full descriptions are given on the trialpit records which are presented in Appendix 2. Samples were taken from the trialpits for waste acceptance criteria (WAC) testing. The test specimens were retained in the appropriate air tight containers within cool boxes for onward transition to the chemical laboratory.

6. GEOLOGY

An examination of the published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: *Geological Data for the Site*

Strata Type	Strata Name[1]	Previous Name[2]	Description[2]
Superficial Geology	Glacial Till	-	Glacial till is unsorted glacial sediment which is the part of a glacial drift that was deposited directly by the glacier. It may vary from clays to mixtures of clay, sand, gravel and boulders.
Solid Geology	Collyhurst Sandstone Formation	Lower Permian Sandstone, Permian Sandstone	A soft red sandstone with abundant beds of "millet seed" sand grains alternating with beds of fine-grained sharp sand

However, the previous investigation revealed significant thicknesses of made ground before penetrating the glacial till. Considering the limited exploratory depths achieved during hand dug trialpitting, it is possible that the underlying geology will not be penetrated during this investigation.

7. STRATA CONDITIONS

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: *Generalised strata profile*

Depth (m)	Strata type	Groundwater strikes (m)
+1.2m	Made Ground	None

'+' Denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

Soil descriptions are presented on the trialpit records within Appendix 2.

8. LABORATORY TESTING - ENVIRONMENTAL

In order to establish the basic characterisation of the waste to be disposed, waste acceptance criteria (WAC) testing has been undertaken on three samples of the made ground revealed during this investigation. This testing was conducted by Chemtest Ltd and the results are presented in Appendix 3 of this report.

[1] Sources: BGS Geology of Britain Viewer
[2] Sources: BGS Lexicon of Named Rock Units

9. DISCUSSION OF GROUND CONDITIONS

The WAC have been set as maximum limit values which must not be exceeded and should not be viewed as minimum treatment specifications for landfill. The following table has been extracted from the Environment Agency[3], and adapted to compare against the chemical test results attached to this letter.

Table 3: *Landfill Waste Acceptance Criteria for Granular Wastes*

Parameter	Maximum (Average) Concentration (mg/kg)*	Limit Values for Landfill Sites			Class of Landfill Maximum(Average)
		Inert	Stable	Hazardous	
Total Organic Carbon %	5.1 (3.7)	3	5	6	Stable (Stable)
Loss on Ignition %	8.6 (7.3)			10	Inert (Inert)
BTEX	<0.01 (<0.01)	6			Inert (Inert)
PCB's	<0.1 (<0.1)	1			Inert (Inert)
PAH's	28 (23)	100			Inert (Inert)
pH	8.5 (8.3)		>6		Stable (Stable)
Acid Neutralisation Capacity	0.042 (0.03)		To be evaluated	To be evaluated	Inert (Inert)
TPH Total WAC	100 (84)	500			Inert (Inert)
Limit values (mg/kg) for compliance leaching test using BS EN 12457 – 3 at L/S 10					
As	<0.05 (<0.05)	0.5	2	25	Inert (Inert)
Ba	0.57 (0.54)	20	100	300	Inert (Inert)
Cd	<0.01 (<0.01)	0.04	1	5	Inert (Inert)
Cr	<0.05 (<0.05)	0.5	10	70	Inert (Inert)
Cu	<0.05 (<0.05)	2	50	100	Inert (Inert)
Hg	<0.005 (<0.005)	0.01	0.2	2	Inert (Inert)
Mo	0.072 (0.068)	0.5	10	30	Inert (Inert)
Ni	<0.05 (<0.05)	0.4	10	40	Inert (Inert)
Pb	0.2 (0.1)	0.5	10	50	Inert (Inert)
Sb	0.03 (0.023)	0.06	0.7	5	Inert (Inert)
Se	0.017 (0.013)	0.1	0.5	7	Inert (Inert)
Zn	<0.5 (<0.5)	4	50	200	Inert (Inert)
Cl	17 (14)	800	15 000	25 000	Inert (Inert)
F	7.1 (6.1)	10	150	500	Inert (Inert)
SO_4	64 (30)	1000	20 000	50 000	Inert (Inert)
Total Dissolved Solids (TDS)	910 (777)	4000	60000	100 000	Inert (Inert)
Phenol index	<0.5 (<0.5)	1			Inert (Inert)
Dissolved Organic Carbon at own pH or pH 7.5-8.0	110 (85)	500	800	1000	Inert (Inert)

* Unless otherwise stated

The above information indicates that the average results of the testing generally fell within the parameters required for Inert Waste Landfill, with the exception of total organic carbon and pH. Consequently, it is considered that the soils revealed at this site may be removed to a landfill that accepts inert waste.

[3] Guidance on sampling and testing of wastes to meet landfill waste acceptance procedures, Version 1, April 2005.

Imported Fill Material

It should also be appreciated that any imported fill should be subjected to the following validation testing to assess its suitability.

Table 4: *Validation testing*

Contaminant	Screening Value (mg/kg)	Reference
As	640	Atrisk soil screening values, 6% soil organic matter
Cd	230	Atrisk soil screening values, 6% soil organic matter
Cr	330	Atrisk soil screening values, 6% soil organic matter
Cu	109000	Atrisk soil screening values, 6% soil organic matter
Pb	5370	Atrisk soil screening values, 6% soil organic matter
Hg	26	Atrisk soil screening values, 6% soil organic matter
Ni	1800	Atrisk soil screening values, 6% soil organic matter
Zn	917000	Atrisk soil screening values, 6% soil organic matter
TPH CWG	-	See Atrisk soil screening values
PAH 16 EPA	-	See Atrisk soil screening values

The frequency of such testing should be sufficient to give statistical confidence for the validation results. For sub-soil the frequency should be 1 per 250m^3 or a minimum of three samples, whichever is the greater.

For and on behalf of
Rogers Geotechnical Services Ltd,

R.A.Palmer MSc, FGS
Graduate Geotechnical Engineer

J. Farnsworth BEng, FGS
Senior Geotechnical Engineer

APPENDIX 1

SITE PLAN



Title	Trialpit Location Plan	
Rogers Geotechnical Services Ltd	Contract: West Gorton, Manchester	Contract No: J2725/14/E

APPENDIX 2

TRIALPIT RECORDS

Trial Pit Log

Trialpit No
HDTP1
Sheet 1 of 1

Project Name: Hyde Road, West Gorton	Project No. J2725/15/E	Co-ords: - Level:	Date 11/09/2015
Location: Manchester		Dimensions (m): Depth 1.20	Scale 1:25
Client: LSP Developments			Logged RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.00 - 0.30	D					MADE GROUND (Dark brown, silty slightly sandy gravelly CLAY with occasional rootlets and rare small cobbles of brick. Gravel is sub-angular to angular, fine to coarse of brick, coal and mixed lithologies).
	0.30 - 0.60	D					
	0.60 - 0.90	D		0.60			MADE GROUND (Dark grey, sandy slightly gravelly CLAY. Gravel is sub-angular to angular, fine to coarse of brick and sandstone).
	0.90 - 1.20						
				1.20			End of pit at 1.20 m

Remarks:

Stability:

Trial Pit Log

Trialpit No
HDTP2
Sheet 1 of 1

Project Name: Hyde Road, West Gorton	Project No. J2725/15/E	Co-ords: - Level:	Date 11/09/2015
Location: Manchester		Dimensions (m): Depth 1.20	Scale 1:25
Client: LSP Developments			Logged RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.00 - 0.30	D					MADE GROUND (Dark brown, silty slightly sandy gravelly CLAY with occasional rootlets. Gravel is sub-angular to angular, fine to coarse of brick, sandstone and glass).
	0.30 - 0.60	D		0.20			MADE GROUND (Dark reddish brown, silty slightly sandy slightly gravelly CLAY. Gravel is sub-angular to angular, fine to coarse of brick and coal).
	0.60 - 0.90	D		0.60			MADE GROUND (Dark grey, sandy slightly gravelly CLAY. Gravel is rounded to angular, fine to coarse of coal and mortar).
	0.90 - 1.20	D		0.90			MADE GROUND (Wood and rare brick fragments).
				1.20			End of pit at 1.20 m

1
2
3
4
5

Remarks:

Stability:

Trial Pit Log

Trialpit No
HDTP3
Sheet 1 of 1

Project Name: Hyde Road, West Gorton	Project No. J2725/15/E	Co-ords: - Level:	Date 11/09/2015
Location: Manchester		Dimensions (m): Depth 1.20	Scale 1:25
Client: LSP Developments			Logged RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.00 - 0.30	D					MADE GROUND (Brown and dark brown, silty slightly gravelly fine to medium SAND with occasional rootlets).
	0.30 - 0.60	D		0.30			MADE GROUND (Brown and dark brown, slightly sandy slightly gravelly CLAY).
	0.60 - 0.90	D		0.60			MADE GROUND (Dark grey, sandy very gravelly CLAY. Gravel is sub-rounded to angular, fine to coarse of mortar, coal, brick and mixed lithologies).
	0.90 - 1.20	D		0.90			MADE GROUND (Dark greyish brown, slightly sandy gravelly CLAY. Gravel is rounded to angular, fine to coarse of coal, brick and mixed lithologies).
				1.20			End of pit at 1.20 m

1
2
3
4
5

Remarks:

Stability:

APPENDIX 3

LABORATORY TESTING – ENVIRONMENTAL

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report Number:	15-21486 Issue-1
Initial Date of Issue:	22-Sep-2015
Client:	Rogers Geotechnical Services Ltd
Client Address:	Offices 1 & 2, Barncliffe Business Near Bank Shelley Huddersfield West Yorkshire HD8 8LU
Contact(s):	Rob Palmer
Project:	J2725/14/E - Hyde Rd. (West Gorton)

Quotation No.:		**Date Received:**	16-Sep-2015
Order No.:	0915-21	**Date Instructed:**	16-Sep-2015
No. of Samples:	3		
Turnaround: (Wkdays)	5	**Results Due Date:**	22-Sep-2015
Date Approved:	22-Sep-2015		

Approved By:



Details: Keith Jones, Technical Manager

Results - 2 Stage WAC

Project: J2725/14/E - Hyde Rd. (West Gorton)

Chemtest Job No: 15-21486 Chemtest Sample ID: 192694 Sample Ref: HDTP1 Sample ID: D Top Depth(m): 0.00 Bottom Depth(m): 0.60 Sampling Date: 15-Sep-2015							Landfill Waste Acceptance Criteria Limits		
							Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous	Hazardous Waste Landfill
Determinand	**SOP**	**Accred.**	**Units**						
Total Organic Carbon	2625	U	%			5.1	3	5	6
Loss on Ignition	2610	U	%			8.6	--	--	10
Total BTEX	2760	U	mg/kg			< 0.010	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			100	500	--	--
Total (of 17) PAHs	2700	N	mg/kg			28	100	--	--
pH	2010	U				8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.042	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
Arsenic	1450	U	0.0016	0.0029	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.056	0.055	< 0.50	0.55	20	100	300
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	0.0036	0.0023	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.0072	0.0067	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.012	0.0066	< 0.050	0.072	0.5	10	30
Nickel	1450	U	0.001	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.0012	0.022	< 0.010	0.2	0.5	10	50
Antimony	1450	U	0.0036	0.0022	< 0.010	0.023	0.06	0.7	5
Selenium	1450	U	0.0015	0.0011	< 0.010	0.011	0.1	0.5	7
Zinc	1450	U	0.0017	0.0041	< 0.50	< 0.50	4	50	200
Chloride	1220	U	3	1.5	< 10	17	800	15000	25000
Fluoride	1220	U	0.92	0.69	1.8	7.1	10	150	500
Sulphate	1220	U	14	5.5	28	64	1000	20000	50000
Total Dissolved Solids	1020	N	150	77	300	850	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	11	7.8	< 50	81	500	800	1000

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	8

Leachate Test Information	
Leachant volume 1st extract/l	0.335
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.182

Results - 2 Stage WAC

Project: J2725/14/E - Hyde Rd. (West Gorton)

Chemtest Job No: 15-21486
Chemtest Sample ID: 192695
Sample Ref: HDTP2
Sample ID: D
Top Depth(m): 0.00
Bottom Depth(m): 0.60
Sampling Date: 15-Sep-2015

Determinand	SOP	Accred.	Units				Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous	Hazardous Waste Landfill
Total Organic Carbon	2625	U	%			2.5	3	5	6
Loss on Ignition	2610	U	%			6	--	--	10
Total BTEX	2760	U	mg/kg			< 0.010	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			82	500	--	--
Total (of 17) PAHs	2700	N	mg/kg			16	100	--	--
pH	2010	U				8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.029	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
Arsenic	1450	U	0.0017	0.0023	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.074	0.03	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	0.0012	< 0.0010	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.006	0.0035	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.014	0.0058	< 0.050	0.067	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.0045	0.0042	< 0.010	0.042	0.5	10	50
Antimony	1450	U	0.0024	0.0011	< 0.010	0.012	0.06	0.7	5
Selenium	1450	U	0.0024	0.0011	< 0.010	0.012	0.1	0.5	7
Zinc	1450	U	< 0.0010	0.0013	< 0.50	< 0.50	4	50	200
Chloride	1220	U	3.1	1.4	< 10	16	800	15000	25000
Fluoride	1220	U	0.71	0.4	1.4	4.3	10	150	500
Sulphate	1220	U	9.1	< 1.0	18	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	120	50	240	570	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	7.8	6.1	< 50	63	500	800	1000

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	8

Leachate Test Information	
Leachant volume 1st extract/l	0.335
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.187

Results - 2 Stage WAC

Project: J2725/14/E - Hyde Rd. (West Gorton)

Chemtest Job No: 15-21486 Chemtest Sample ID: 192696 Sample Ref: HDTP3 Sample ID: D Top Depth(m): 0.00 Bottom Depth(m): 0.60 Sampling Date: 15-Sep-2015							Landfill Waste Acceptance Criteria Limits		
Determinand	**SOP**	**Accred.**	**Units**				**Inert Waste Landfill**	**Stable Non-reactive Hazardous waste in non-hazardous**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%			3.5	3	5	6
Loss on Ignition	2610	U	%			7.3	--	--	10
Total BTEX	2760	U	mg/kg			< 0.010	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg			< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg			71	500	--	--
Total (of 17) PAHs	2700	N	mg/kg			24	100	--	--
pH	2010	U				8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg			0.02	--	To evaluate	To evaluate
Eluate Analysis			**2:1 mg/l**	**8:1 mg/l**	**2:1 mg/kg**	**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
Arsenic	1450	U	0.0022	0.0024	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.086	0.053	< 0.50	0.57	20	100	300
Cadmium	1450	U	0.0001	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	0.0078	0.0034	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.0087	0.0057	< 0.050	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.013	0.0058	< 0.050	0.066	0.5	10	30
Nickel	1450	U	0.0024	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.0029	0.0066	< 0.010	0.062	0.5	10	50
Antimony	1450	U	0.0055	0.003	0.011	0.033	0.06	0.7	5
Selenium	1450	U	0.0022	0.0016	< 0.010	0.017	0.1	0.5	7
Zinc	1450	U	0.0031	0.0015	< 0.50	< 0.50	4	50	200
Chloride	1220	U	2.6	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	1	0.65	2	6.9	10	150	500
Sulphate	1220	U	15	< 1.0	30	16	1000	20000	50000
Total Dissolved Solids	1020	N	150	84	300	910	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	12	11	< 50	110	500	800	1000

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	7.5

Leachate Test Information	
Leachant volume 1st extract/l	0.336
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.192

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

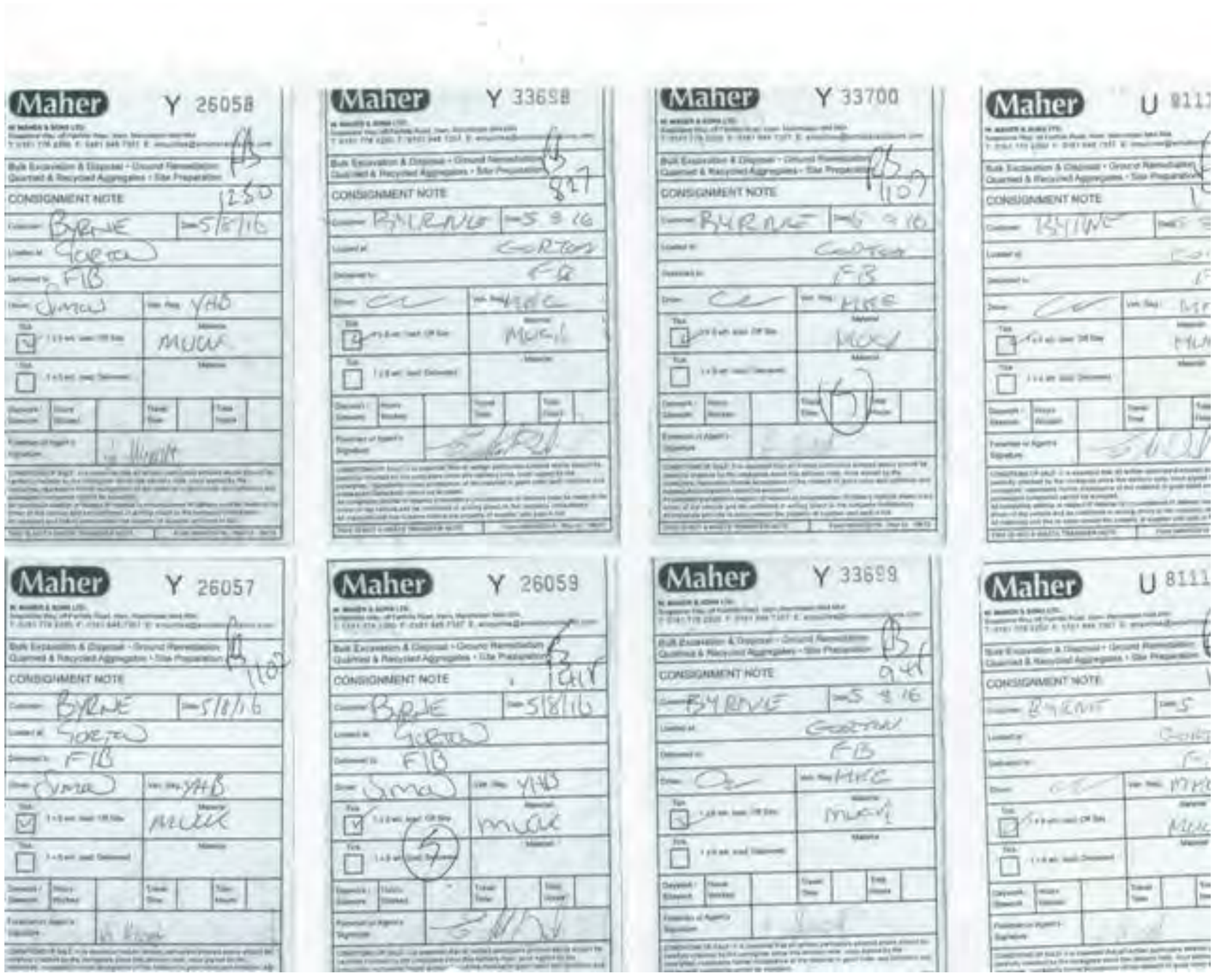
Sample Retention and Disposal

All soil samples will be retained for a period of 60 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix 3 - Consignment Notes for Soils Removed from Site


Maher
Y 20889
Maher
Y 20891
Maher
Y 20893
Maher
Y 260
CONSIGNMENT NOTE
902
1144
1520
Maher
Y 20888
Maher
Y 20890
Maher
Y 20892
Maher
Y 260
CONSIGNMENT NOTE
1028
1335


Maher
Y 26058
CONSIGNMENT NOTE
Maher
Y 33658
CONSIGNMENT NOTE
Maher
Y 33700
CONSIGNMENT NOTE
Maher
U 8111
CONSIGNMENT NOTE
Maher
Y 26057
CONSIGNMENT NOTE
Maher
Y 26059
CONSIGNMENT NOTE
Maher
Y 33699
CONSIGNMENT NOTE
Maher
U 8111
CONSIGNMENT NOTE


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Maher
Y 25614
Maher
Y 25618
Maher
Y 25616
Maher
Y 31
Maher
Y 25458
Maher
Y 25615
Maher
Y 25617
Maher
Y 2


Maher
Y 34243
Maher
Y 34245
Maher
Y 34247
Maher
Y 33
CONSIGNMENT NOTE
Maher
Y 33448
Maher
Y 34244
Maher
Y 34246
Maher
Y 34


Maher
U 63587
CONSIGNMENT NOTE
Maher
U 81117
CONSIGNMENT NOTE
Maher
U 81121
CONSIGNMENT NOTE
Maher
U 811
CONSIGNMENT NOTE
Maher
U 63985
CONSIGNMENT NOTE
Maher
U 63997
CONSIGNMENT NOTE
Maher
U 81119
CONSIGNMENT NOTE
Maher
U 811
CONSIGNMENT NOTE


Maher
U 81129
CONSIGNMENT NOTE
Maher
U 81133
CONSIGNMENT NOTE
Maher
U 81127
CONSIGNMENT NOTE
Maher
U 81131
CONSIGNMENT NOTE

Appendix 4 - Chemical Analysis on Imported Soils

Certificate of Analysis

Client: ANDREW RICHARDS
(M262) A R RICHARDS LTD
WARRANT HANGAR
SUTTON ROAD
TERN HILL
MARKET DRAYTON TF9 2JH

Originator: GRADE A TOPSOIL
SOIL

Lab ID: 21445 - 308186
Sample ID: GRADE A TOPSOIL
Sample Weight: 935g

Date Received: 17/06/2016
Date Reported: 27/06/2016

BS 3882 : 2015 SPECIFICATION FOR TOPSOIL
Multipurpose Grade

		Unit	Result	Multi-P	Compliant with range (Y/N) Acid	Calc	Low-F	Low-F Acid	Low-F Calc
Texture:	Clay	% w/w	8						
	Silt	% w/w	10		*See area of permitted soil textural*				
	Sand	% w/w	82		*classes in Fig. 1.*				
	Textural Class		Loamy Sand	Y	Y	Y	Y	Y	Y
Organic Matter:		% w/w	4.7	Y	Y	Y	Y	Y	Y
Coarse Fragment Content:	>2 mm	% w/w	3.7	Y	Y	Y	Y	Y	Y
	>20 mm	% w/w	0.0	Y	Y	Y	Y	Y	Y
	>50 mm	% w/w	0.0	Y	Y	Y	Y	Y	Y
Soil pH:				N	N	Y	N	N	
Carbonate:		% w/w			Y				Y
Available Plant Nutrients:	Nitrogen	% w/w	0.20	Y	Y				
	Phosphorus	mg/l	8.8 (4)	Y	Y	Y	N	N	N
	Potassium	mg/l	165.3 (2)	Y	Y				
	Magnesium	mg/l	62.4 (2)	Y	Y				
Carbon:Nitrogen Ratio:			13.6	Y	Y	Y	Y	Y	Y
Exchangeable Sodium Percentage:		%	1.7						
Phytotoxic Contaminants:	Total Zinc	mg/kg	170	Y	Y	Y	Y	Y	Y
	Total Copper	mg/kg	30.5	Y	Y	Y	Y	Y	Y
	Total Nickel	mg/kg	11.5	Y	Y	Y	Y	Y	Y
Visible Contaminants:	> 2mm	% w/w	0.05	Y	Y	Y	Y	Y	Y
	Plastics	% w/w	0.00	Y	Y	Y	Y	Y	Y
	Number of Sharps		0	Y	Y	Y	Y	Y	Y
Additional Analysis:	Available Sodium	mg/l	41.0						
	Available Calcium	mg/l	1898.7						
	Conductivity	uS/cm	2454	Y					
Compliancy:				Y	N	N	N	N	N

Registered Address
A.R. Richards Ltd
Warrant Hangar
Sutton Road
Tern Hill
Market Drayton
TF9 2JH
01630 650585

Results are expressed on a dry matter basis.
* Soil indices from RB209

Released by: *J Doyle* **Date: 27/06/2016**

DECLARATION: I certify that this sample has been analysed by NRM Ltd. in accordance with BS 3882 Specification for Topsoil (2015).

NRM Coopers Bridge, Frazers Lane, Bracknell, Berkshire RG42 6NS
Tel: +44 (0) 1344 886338 **Fax:** +44 (0) 1344 890972 **Email:** enquiries@nrm.uk.com **www**.nrm.uk.com